Financial Literacy and Mortgage Equity Withdrawals

John V. Duca
Research Department, Federal Reserve Bank of Dallas
P.O. Box 655906, Dallas, TX 75265
(214) 922-5154, john.v.duca@dal.frb.org
and
Southern Methodist University, Dallas, TX 75275

Anil Kumar
Research Department, Federal Reserve Bank of Dallas
P.O. Box 655906, Dallas, TX 75265
(214) 922-5856, anil.kumar@dal.frb.org

December 16, 2010

Abstract

The recent U.S. consumption boom has been linked to mortgage equity withdrawals (MEW's). MEW's are correlated with covariates consistent with a permanent income framework augmented for credit-constraints. Nevertheless, many households are financially illiterate. We assess the unexplored linkages between MEWs and different measures of financial literacy using panel data from the Health and Retirement Study (HRS). Findings indicate that declines in mortgage interest rates encouraged MEWs. Nevertheless, financially illiterate households were significantly more likely to withdraw housing equity. Also significant were state differences in debtor versus creditor interests in bankruptcy, with loan demand effects outweighing loan supply effects across states.

JEL Codes: E21, E32, E44, E51
Key Words: financial crisis, consumption, credit constraints, financial frictions

* We thank David Luttrell and Stacy Wohead for excellent research assistance. The views expressed are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Dallas, or the Board of Governors of the Federal Reserve System. Any remaining errors are our own.

Mortgage equity withdrawals (MEWs) have been linked to the UK consumption boom of the late 1980s (Miles, 1992, and Muellbauer and Murphy, 1997) and the U.S. consumption boom of the early 2000s (Greenspan and Kennedy, 2008, and Hurst and Stafford, 2004). At the macro-level, MEW has been linked to an increased sensitivity of consumption to housing wealth (Duca, 2006, and Carroll, Otsuka, and Slacelek, 2006). At the micro level, MEWs are correlated with liquidity constraints (Benito, 2009, and Browning, Gortz, and Leth-Petersen, 2008, Hurst and Stafford, 2004), consistent with permanent-income models incorporating credit constraints, which imply that housing wealth influences consumption by providing collateral for loans to otherwise credit-constrained families (Englehardt, 1996, and Muellbauer and Lattimore, 1995).

However, the recent mortgage bust suggests that many households were not reasonably aware of the risks they took, consistent with evidence that many are not financially literate and that some withdrew housing equity via refinancing even when their mortgage rates rose. Using data on a subset of middle and older age households in the Health and Retirement Study (HRS), Lusardi and Mitchell (2007) document that many families incorrectly answered questions on financial literacy which tested basic understanding about compound interest, money illusion, and portfolio diversification. Furthermore, incorrect answers have been linked to sub-optimal saving for retirements (Lusardi and Mitchell, 2007) and over-borrowing (Lusardi and Tufano, 2009). In addition, there is also evidence that many home-owners do not choose the lowest cost home purchase mortgage because they may be confused by terms in the mortgage contract (Woodward and Hall, 2010).

The literature has not examined the links between financial literacy and MEW behavior, a gap which this study addresses by examining whether answers to financial literacy questions are linked to which homeowners withdraw housing equity. To control for non-literacy influences,

we include household characteristics, individual gains from refinancing, home price appreciation and aspects of state bankruptcy laws. We also include measures of financial literacy and tested for interactions with variables reflecting the incentive to refinance mortgages, which proved insignificant. While interaction effects are hard to detect, we find that the financially literate are significantly less likely to withdraw housing equity via increasing mortgage debt. Our results have possible implications for the effectiveness of financial education programs that could help households make better decisions in managing their wealth.

Consistent with the limited literature on MEWs, we also find that the propensity for withdrawing housing equity rises with house price appreciation and the incentive to lower mortgage interest rates. In line with new evidence that cross-state variation in legal codes affect bankruptcy rates (Lefgren and McIntyre, 2009), we also find that differences in debtor legal conditions across states are correlated with MEW behavior, suggesting that legal differences have important implications for the cross-regional supply of consumer versus real-estate-secured debt. Moreover, in the presence of a variable controlling for legal differences across states, stronger effects of cross-state and cross-time differences in house price appreciation emerge. Financial literacy could be endogenous as it may be correlated with risk preferences which also affect the propensity to withdraw mortgage equity. We use survey-based measures of risk aversion in the HRS to account for any systematic differences in risk preferences which may bias our estimates of the impact of financial literacy on mortgage equity withdrawal. Except for the impact of house price appreciation, these findings—especially for financial literacy) are robust to controlling for a measure of risk aversion and year fixed effects. In addition, the results are robust for models that include yearl and state fixed effects , except for state legal differences which cannot be estimated while controlling for state fixed effects.

To present these findings, this study is organized as follows. The next section lays out the basic empirical specification which is based on theoretical factors affecting the propensity to withdraw housing equity. The third section presents the data and variables used. The fourth section provides estimation findings and some robustness checks, and the conclusion summarizes some possible implications for household behavior and public policy regarding consumer protection.

II. Basic Model Specification and Estimation Details

Let Y^* denote the unobservable gain to the household from refinancing to withdraw equity and let MEW be an indicator variable which equals 1 if $Y^* > 0$ and zero otherwise. We then have the following model for probability of refinancing to withdraw mortgage equity:

$$Prob(MEW = 1) = \beta_0 + \beta_1\, Dlit_i + \beta_2\, RefIncent_{it} + \beta_3\, Priceapp3yrs_{st} + \beta_4\, Garnish_s + \beta_5\, Chapter13_s + \beta_6\, Unemployed_{it} + \boldsymbol{Z\gamma} + u_{it}$$

where $i, t, and\ s$ index households, year, and state of residence, respectively. $Dlit_i$ is a dummy variable for whether the respondent is financially literate. $RefIncent_{it}$ measures how much refinancing lowers the mortgage payment, equal to the product of interest rate saving and the outstanding mortgage amount. $Priceapp3yrs_{st}$ is the state level three year average annual price appreciation. $Garnish_s$ and $Chapter13_s$ are state level legal variables that may be correlated with the incentive to withdraw equity. $Unemployed_{it}$, a dummy variable for whether the respondent is unemployed, allows us to account for the role of liquidity constraints on mortgage equity withdrawal. Z is a vector of demographic variables such as age, sex, education, and number of children in the household, which may influence the propensity to withdraw mortgage equity. Assuming a standard normal distribution for the error term, u_{it}, gives rise to a Probit model for estimating the determinants of the probability of withdrawing mortgage equity.

III. Data and Variables

Defining who withdrew mortgage equity

Our main data source is the HRS, a representative sample of U.S. heads of household age 50 and over. We then use a random subsample of HRS respondents who were selected to answer an additional three financial literacy questions in 2004. From these, we focus on homeowners who remained in their 1998 homes across five semi-annual HRS surveys conducted between 1998 and 2006.[1] We defined a household as withdrawing equity from their homes if their reported outstanding mortgage debt rose from one survey to the next (if so *MEW* =1, and 0 otherwise).[2] Effectively, MEW activity can occur if the household borrowed during a two-year interval using a home equity loan, another type of second or third mortgage, or refinanced their old mortgage debt into a larger new mortgage (a "cash-out" mortgage refinancing).

Demographic and Educational Background Control Variables

Each Probit model includes the same set of background control variables. Demographic controls include the age of the head of household (*AgeHead*), and 0-1 variables for whether the head is white (*WhiteHead*), male (*MaleHead*), or experienced unemployment over the prior two years (*Unemp*). If loan demand or acceptance of new financial products is declining in age, *Agehead* could have a negative sign. If older or white households face less binding credit constraints on consumer loans as other studies indicate (e.g., Duca and Rosenthal, 1993), their demand to withdraw housing equity would be lower, ceteris paribus. We also include the number of children living in the household (*NumChildren*), which likely has a positive effect if debt demand is higher for families with more children or if such families are more likely to face

[1] 1266 respondents were asked one of the financial literacy questions in 2004 yielding 4232 respondent years, after imputing the 2004 response for each respondent to all years the sample. 74% of these are homeowners and 92% of the homeowners did not buy or sell a house, leaving us with 2706 observations. After dropped observations due to any missing variables, we are left with 2433 observations in the baseline model in Model 3 of Table 2.

[2] There was no difference in the sample if the threshold for an MEW were a $1 or $1,000 rise in mortgage debt.

binding loan limits in the market for consumer loans. A positive sign on the unemployment variable could emerge if the boost to loan demand from an increased likelihood of being unemployed sufficiently outweighs any decline in loan supply to the unemployed. Because we assess the role of financial literacy rather than general educational background, we include a common set of 0-1 variables for whether the household head only graduated from high school (*HSchoolGrad*), graduated from college (*CollegeGrad*) or graduated from high school but only attended college without graduating (*SomeCollege*). Summary statistics are in Table 1.

Measuring Financial Literacy

To gauge financial literacy, we used several 0-1 variables measuring if a household correctly answered a financial literacy question (=1 if correct, 0 otherwise). One question (*LitCompound*) asked whether one would have more than, equal to, or less than $1.02 in a deposit account after three years if one originally deposited $1 and earned an annual deposit rate of 2 percent. Another question (*LitMonIllus*) asked whether one could buy more of, the same, or less than a given basket of goods if one bought them today with $100, or if one waited a year, during which the inflation rate equaled 2 percent and the $100 were put in a bank deposit earning 1 percent annual interest. The third question (*LitPortRisk*) asked whether it were safer to invest in a stock mutual fund or an individual company's stock. Only 34 percent of respondents correctly answered all three questions, with 69, 78, and 55 percent, correctly answering the compound interest, money illusion, and portfolio diversification questions, respectively.

Standard MEW Supply and Demand Variables and Control Variables

Following Benito (2008) we control for standard MEW factors and other influences. Several reflect the reduced-form effects of loan supply and demand factors that work in the same (e.g., house price appreciation) or opposite (regional variation in the rights of debtors versus

creditors) direction. If whites are less liquidity constrained from having more inherited wealth or face easier constraints for non-secured credit than nonwhites, the coefficient on *WhiteHead* would reflect positively signed loan demand and loan supply effects. Other variables primarily reflect demand factors (some demographic controls). Nevertheless, if some demographic variables and the unemployment dummy are also correlated with credit constraints, then there may be some oppositely signed loan supply and demand effects. This implies that some estimated coefficients reflect the net effect of oppositely or ambiguously signed loan demand versus loan supply. For example, lower income from unemployment might lower loan demand or might increase the desperation need to tap housing wealth to smooth consumption, whereas loan supply will likely be restricted for the unemployed. We find a positive, but statistically insignificant sign on the 0-1 variable for being unemployed during the prior two years.

Mortgage Interest Rate Incentives to Refinance

Homeowners who do not sell their homes can withdraw housing equity by taking out a second mortgage or refinancing their old mortgage with a larger loan. Owing to the transactions costs of refinancing, the incentive to withdraw housing equity is enhanced if borrowers benefit from refinancing mortgages at lower interest rates. To control for the latter, we include the product of an individual's mortgage debt in the prior survey and maximum quarterly interest rate gap, defined as the average interest rate on outstanding mortgages minus the interest rate on new mortgages, *RefIncent*.[3] The higher the ratio, the more advantageous it is to refinance a mortgage and to withdraw housing equity via mortgage refinancing. We interacted this variable with different measures of financial literacy to test whether the financially literate are more likely to withdraw housing equity when refinancing entailed switching to a lower mortgage interest rate.

[3] Because we do not know the decision horizons of homeowners, we do not convert such differences into present value calculations, as in Hurst and Stafford (2004).

Freddie Mac data reveal there are periods when the average refinancing homeowner replaces a lower interest rate mortgage with one having a higher interest rate and larger principal balance. This pattern suggests a role for credit constraints since households can usually borrow against home equity at a lower interest rate than on unsecured loans. So even if a mortgage refinancing raises the interest rate on the owner's prior mortgage balance, it may be their lowest interest rate option for new borrowing. Another rational interpretation of borrowers replacing lower with higher interest rate mortgages is that they may be switching from adjustable-rate mortgage to a higher, but more stable, fixed rate mortgages. An alternative explanation is that financial illiterate borrowers might mistake the lower mortgage payments from lengthening the maturity of mortgages for the true cost of the mortgage rather than the higher interest rate. A related possibility is that the financially illiterate may not adequately consider the higher cost of refinancing their mortgages when withdrawing housing equity. These last two alternatives imply that the financially illiterate are more likely than the literate to withdraw housing equity.

House Price Appreciation

House price appreciation raises both loan supply, reflecting greater collateral, and loan demand, reflecting a greater ability to smooth consumption or rebalance asset portfolios. To control for house price appreciation, we included the annualized real appreciation rate of house prices over the three years preceding each HRS survey using state FHFA house price indexes deflated by the personal consumption expenditures deflator (*HomeApprec*).

Cross-State Differences in Bankruptcy and Default Laws

Recent literature examines the links between cross-state variation in lending laws and loan quality. Based on variables used by Lehnert and Maki (2007) and Lefgren and McIntyre (2009), we control for differences in laws about what portion of a bankrupt borrower's (1)

income is shielded from garnishment (*Garnish*) and (2) what percent of real estate assets are shielded by homestead exemptions from nonmortgage lenders (*Homestead*, scaled as a percent of median existing house prices, National Association of Realtors).[4] Using another data source,[5] we also control for whether (3) lenders need to file a lawsuit to start the foreclosure process (*Judicial* = 1 if only judicial proceedings allowed, .5 if nonjudicial and judicial are allowed, and 0 if only or predominantly nonjudicial) or (4) mortgage lenders have access to other borrower assets or income if there is a shortfall between the principal (plus fees) and the net value of real estate collateral collected on a repossessed home (*Deficiency*=1 if allowed, 0 if not or impractical).

In principle, such variables affect loan supply and loan demand, sometimes in opposite directions. For example, the higher the share of income exempt from garnishment (*Garnish*),[6] the more willing lenders are to supply real-estate secured loans relative to other forms of consumer credit. The reason is that unsecured consumer credit lenders have less recourse to a bankrupt borrower's future income, while mortgage lenders can still repossess a home. On the other hand, this effect on the relative supply of loans could be offset if a higher share of income shielded from garnishment may dissuade lenders from supplying credit in general to denizens of a state, resulting in a negative effect of garnishment on loan supply. The impacts of such considerations on loan demand are oppositely signed. In general, greater shielding from garnishment tends to boost loan demand in general, while giving borrowers more of an incentive to substitute unsecured loans for collateralized loans, ceteris paribus.

---

[4] We use data from Legal Consumer (http://www.legalconsumer.com/bankruptcy/laws/) on bankruptcy exemptions for nonfarm property for married or joint owners on standard residential homes (not mobile homes), excluding any extra exemptions for disabled, elderly, or mentally ill people. The exemption used also assumes that a family contains two minor children (minors affect the size of the bankruptcy exemption in Maine, Tennessee, and Virginia).

[5] Source: All Foreclosure, http://www.all-foreclosure.com/procedures.htm. For missing data on South Dakota, state laws indicated that deficiencies are allowed and that there is a mix of judicial and non-judicial proceedings.

[6] Most states follow federal laws making 25% of disposable income subject to garnishment. Some states set lower percentage limits. Where state guidelines exempt "living expenses," we multiply the share subject to garnishment by 50% to adjust for living expenses. In states shielding a nominal weekly amount of income, we annualize income and tdivide by 1999 state median family income downward by 25% to convert income into an after-tax equivalent.

Withdrawing home equity should theoretically be increasing in the share of real estate assets shielded in bankruptcy from a nonmortgage lender (*Homestead*). The reason is that a nonmortgage lender has less recourse to a bankrupt's real estate assets, while mortgage lenders can still repossess a home. In theory, by raising the costs of collecting on delinquent mortgages, *Judicial* should be negatively related to lenders willingness to allow borrowers to withdraw housing equity. In contrast, by enabling mortgage lenders to collect more than collateral in the case of default, *Deficiency* should be positively (negatively) related with the propensity to make an MEW if loan supply effects outweigh (are outweighed by) loan demand effects. Variables like *Homestead*, *Judicial*, and *Deficiency* have been statistically insignificant in accounting for cross-state variation in loan quality, in contrast to variables accounting for garnishment or the relative use of chapter 13 versus chapter 7 bankruptcy (Lefgren and McIntyre, 2009).

State "legal cultures" can differ insofar as differences in legal precedents and formal legal restrictions and regulations favor the use of Chapter 13 bankruptcy over Chapter 7 bankruptcy. If a borrower files under Chapter 7, they allow all non-shielded assets (pensions and homestead-protected real estate are exempt) to be liquidated to settle their debts. If they file under Chapter 13, they commit to making negotiated loan payments over the next 3-5 years without having to liquidate unshielded assets. Garnishments (direct deductions from a borrower's paycheck to the lender) are still subject to state limits. If a borrower does not meet Chapter 13 commitments, the lender can start a new bankruptcy proceeding. Chapter 13 generally is seen as less advantageous to lenders and allows borrower attorneys to collect higher fees that lower net payouts to lenders. Of these legal variables, Lefgren and McIntyre (2009) find that only the garnishment (*Garnish*) and the Chapter 13 share of bankruptcy filings (*Chap13Share*) were statistically significant, with both having a positive correlation with cross-state variation in the rate of bankruptcy filings, and

Garnish explaining an economically significant portion of cross-state variation. Largely in line with this result, we find that the only significant legal variables are *Garnish* and *Chap13Share*.

IV. Estimation Results

We estimate probit models that all include a common set of demographic and background variables, but differ as to whether they include variables for financial literacy, legal differences across states, and some variables controlling for interactions between interest incentives to refinance and state appreciation rates. Findings from six models are reported in Table 2. The baseline model, model 1 in Table 2, includes family demographic variables, *RefIncent*, and *HomeApprec*. The last two have statistically significant positive coefficients, implying that there was a greater propensity to tap housing equity via MEWs among households having greater interest rate incentives to refinance and who saw greater house price appreciation in their states. In the baseline model, there are only three other variables that are statistically significant, with older and white households having a significantly lower propensity to withdraw housing equity and with the number of children having a positive effect on that propensity. Loan demand is likely to be less among the first two of those three categories, while unsecured loan supply could be greater if whites face easier credit constraints, consistent with Duca and Rosenthal (1993). For these reasons, the coefficients on these variables are loosely consistent with the view that credit constrained households are more likely to withdraw housing equity because empirically younger, nonwhite, and larger families have a greater likelihood of being credit constrained. The positive sign on the unemployment rate suggests that the increased loan demand effects associated with smoothing consumption have positive credit constraint effects on the likelihood of conducting an MEW that appear to offset any negative effects of loan supply or loan demand associated with bad job outcomes.

To test for intercept effects, model 2 adds the three financial literacy variables to model 1. Of these, only *LitPortRisk* was statistically significant, indicating a lower likelihood of conducting an MEW for those having some portfolio literacy. Starting with model 2, a model selection approach of progressively dropping the most *in*significant variable was adopted. This process left only one statistically significant financial literacy variable, that dealing with portfolio risk, in model 3. Due to the lack of time variation in financial literacy, all standard errors in this paper are clustered at the household level. We then tested for whether financial literacy affected the impact of interest rate and house price appreciation incentives on the likelihood of refinancing. We did this by adding two terms to model 3 that interacted portfolio literacy with the refinancing rate incentive and house price appreciation rate variables. Since the non-interactive versions of these variables should be positively related to refinancing, one would expect the interactive terms to have positive signs. However, neither interaction effect was significant, with non-interactive and interactive literacy variables each having negative signs and with the non-interactive term no longer statistically significant. This pattern and the counter-intuitive signs on the interaction terms likely reflect the overall negative effect of portfolio literacy on the likelihood of conducting an MEW.

Several legal variables were added to model 3, and a model selection procedure was adopted to progressively omit the most insignificant legal variable. In the end, only *Chap13Share* and *Garnish* were at least marginally significant. In particular, there was a statistically significant greater likelihood of families withdrawing housing equity via mortgages in states where the legal environment fostered the use of Chapter 13 over Chapter 7 bankruptcy. There was a marginally significant higher marginal propensity in states protecting a higher share of household income from garnishment. This suggests that the positive loan demand effects of

legal codes favoring debtors over creditors outweighed the impact of their negative loan supply effects. The apparent weaker effects on loan supply may reflect that much mortgage lending during the recent housing boom may have owed to lenders underestimating the downside risk of new mortgage practices and loan losses (see Duca, Muellbauer, and Murphy, 2010, on mortgage loss surprises). The only noteworthy effect from inclusion of the two legal variables on other coefficients is that the house price appreciation coefficient becomes larger and more significant.

Qualitative results with respect to the three literacy variables were not affected. Once again, as shown in model 5, the variables measuring literacy with respect to compound interest and money illusion were insignificant, while portfolio literacy stayed significant. And the model selection approach of successively dropping insignificant literacy variables also resulted in the inclusion of *LitPortRisk*, whose negative coefficient implies that the financially literate were marginally less likely to engage in mortgage equity withdrawals than the financially illiterate.

Identification

Our estimates in Table 2 may be biased due to two potential sources of endogeneity in self reported financial literacy. First, households may learn from any prior experience with mortgage borrowing. And second, much of the cross-sectional variation in financial literacy may simply be correlated with underlying differences in risk preferences across individuals that also affects the propensity to refinance. Suitable instruments for financial literacy remain elusive as plausible candidates such as exogenous changes in state level financial education mandates (Bernheim et. al 2000), father's and mother's education, average high school graduation rates, etc. are at best weak in our context.

We instead focus on eliminating the bias in estimates of financial literacy stemming from of risk preferences. Measures of risk tolerance in most datasets simply do not exist. However, a

unique set of income gambling questions administered to the HRS respondents allows us to control for this key source of omitted variable bias in the causal effect of financial literacy on mortgage equity withdrawal.[7] The key identifying assumption for our estimates is that controlling for differences in risk aversion and other demographic characteristics, any remaining individual level variation in financial literacy is due to exogenous factors unrelated to individual choice and any unobserved determinants of mortgage debt.

We enhance the specifications estimated in Table 2 by including survey-based measures of risk aversion. The results are reported in Table 3, where the risk aversion variable is marginally significant with the expected negative sign in four of the six models. Across the models, the financial literacy results are basically unchanged, except that portfolio literacy appears to have a slightly stronger and more statistically significant effect. The price appreciation variable is no longer significant in most models in Table 3, perhaps reflecting that those owning houses in states with more variable prices could be less risk averse than those from other states. This possibility suggests that less risk averse households sort themselves into states with more volatile prices or that higher price appreciation affects people's risk preferences. In addition, the statistical significance and coefficient magnitude of the interest rate incentive gain variable declines slightly in the presence of risk aversion. Finally, *Garnish* is no longer significant in models 4-6.

Addressing Robustness

There are two additional econometric issues that need to be addressed to assess the robustness of the results presented in Table 2. The first is whether the results are sensitive to

[7] The survey-based measure of risk aversion in HRS is from responses to a set of income gamble questions asking the respondent to choose between a job with guaranteed current income and alternative jobs with twice the current income but a of a lower income. The probabilities of lower income are 1/10, 1/5', 1/3, 1/2, and 3/4. Responses are classified into six categories from the least to the most risk averse.

selection effects associated with analyzing only homeowners who did not move and had outstanding mortgages. To address this, we plan to include standard Mills Ratio terms in future versions of this study.

Another set of robustness checks reported in Table 4 tests the sensitivity of our estimates of financial literacy to exclusion of legal variables and inclusion of time and year effects. Table 4 includes the 5 categorical measures of risk aversion in each regression. Here, models 1-3 are identical to models 4-6 from Table 3 except that the insignificant *Garnish* variable is omitted, which has no noticeable effect on other aspects of these models when compared with corresponding models in Table 3. Models 4 and 5 are identical to models 2 and 3 in Table 4, except that they include the year fixed effects to control for other factors that vary with time and which may be correlated with other refinancing propensity variables as well as, financial literacy, which is observed at only one point in the sample. The presence of the yearl fixed effects does not noticeably alter the results—especially the significance of portfolio literacy. Finally, models 6-8 redo models 1-3 by including both year and state fixed effects, the latter of which rule out including any state legal variable. Including both types of fixed effects helps control for omitted factors correlated with of financial literacy that vary over time and across geographic areas, the latter of which might reflect self-selection effects arising from correlations of unobserved preference or other variables with financial literacy. The qualitative and quantitative results are basically unchanged by including both time and spatial fixed effect variables.

A final set of robustness checks in Tables 5-7 add to each of the models in Tables 2-4 the original loan-to-value ratio observed in 1998 (*ltv1998*), liquid assets in 1998 (*liquid1998*), and the mean income over 1998-2006) of the high earner in the household (*meanhiearn*). This greatly reduced the sample size because of missing data on a number of households. The

addition of these variables had little effect on the qualitative results—especially in Tables 6 and 7 which control for risk aversion. The portfolio literacy variable is slightly less significant, but this difference likely reflects a smaller sample.

V. Interpretation and Conclusion

Households who have more children, are younger, are nonwhite, and are financially illiterate about portfolio risk are more likely to have withdrawn housing equity via mortgages during the U.S. mortgage borrowing boom of 1998-2005. The results regarding literacy accord with those of Lusardi and Mitchell, who find that literacy with respect to portfolio risk was more linked to suboptimal retirement preparation than literacy with respect to numeracy and money illusion based on answers to the 2002 Health and Retirement Study. Our results also are in accord with findings from the UK (Miles, 2004) and U.S. (Bucks and Pence, 2008) that many households do not fully understand important characteristics of their mortgages. Our results are loosely consistent those of Lusardi and Tufano (2009) and Stango and Zinman (2008), who find that illiteracy is linked to over-borrowing and under-accumulation of wealth.

Nevertheless, those latter studies defined literacy with respect to numeracy. We find that literacy based on computational questions involving compound interest or money illusion was insignificantly related to MEW activity, whether entering as separate variables or interacted with the interest-rate incentive to refinance ones mortgage. However, literacy in terms of understanding basic portfolio diversification was significant as a stand-alone variable and as an interactive variable. Aside from our use of a smaller sample, there is a plausible explanation for this apparent difference in findings with respect to Lusardi and Tufano (2008) and Stango and Zinman (2008). First, they assess financial behavior in quantitative terms, where computational literacy would, a priori, seem to matter. In contrast, our probit models assess whether or not a

household withdraws any housing equity at all, and for such a binary decision, basic financial sense rather than numeracy could plausibly matter more. Although our data do not allow us to examine the propensity to refinance (we only observe the change in the amount of mortgage debt, not the interest rate or date of origination), our findings illustrate that mortgage borrowing is affected by illiteracy. In this loose sense, our findings are not *in*consistent with Campbell's (2006) hypothesis that financial literacy contributed to his finding that many people did not refinance their mortgages when lower interest rates could have saved on borrowing costs.

We also find that households are more likely to withdraw housing equity in states where the legal code and culture make lenders less able to collect from bankrupt borrowers, consistent with Lefgren and McIntyre's (2009) emphasis that legal differences across states can help explain borrowing behavior. This suggests that MEW behavior differs across states not only due to differences in house price appreciation rates, but also with differences in bankruptcy practices.

This study's findings also have at least two public policy implications. First, during the U.S. mortgage boom of the late 1990s and early 2000's, financial illiteracy contributed to mortgage equity withdrawals that increased household debt service burdens. Given the macro implications of mortgage equity withdrawals for consumption during the recent boom and bust, as well as the micro implications for optimal behavior for individual households, this finding suggests a possible role for public policy to improve financial literacy and make mortgage information disclosure more readily understandable and more easily accessible to the general public. Second, although there are difficulties in redressing mathematical illiteracy among adults, the stronger link between MEW behavior and portfolio literacy compared to that involving numeracy offers hope that financial education might help prevent some suboptimal behavior. Nevertheless, designing effective education programs entails dealing with a number of

factors (e.g., more intensive lender screening and even cognitive decline over the life-cycle) as stressed by Agarwal, et al. (2009) and Agarwal, et al. (2010).

References

Agarwal, Sumit, Amromin, Gene, Ben-David, Itzhak, Chomsisengphet, Souphala, and Evanoff, Douglas D., (2010), "Learning to Cope: Voluntary Financial Education and Loan Performance during a Housing Crisis," *American Economic Review: Papers and Proceedings 100* (May), 495-500.

Agarwal, Sumit, Driscoll, John C., Gabaix, Xavier, and Laibson, David (2009), "The Age of Reason: Financial Decisions Over the Life-Cycle with Implications for Regulation," *Brookings Papers on Economic Activity* Fall, 51-117.

All Foreclosure, <http://www.all-foreclosure.com/procedures.htm>.

Benito, Andrew (2009), "Who Withdraws Housing Equity and Why?" *Economica* 76, 51-70.

Browning, M., Gortz, M., and Leth-Petersen, S. (2008), "House Prices and Consumption: A Micro Study," unpublished manuscript, Nuffield College, Oxford University.

Bucks, Brian and Pence, Karen (2008), "Do Borrowers Know Their Mortgage Terms?" *Journal of Urban Economics* 64, 218-33.

Campbell, John Y. (2006), "Household Finance," *Journal of Finance* 61, 1553-1604.

Canner, Glenn, Dynan, Karen. and Passmore,Wayne (2002), "Mortgage Refinancing in 2001 and Early 2002," *Federal Reserve Bulletin* 88, 469–81.

2002," *Federal Reserve Bulletin*, December 2002, 469–81.

Carroll, C., and Kimball, M. (2005), "Liquidity Constraints and Precautionary Saving," manuscript, Johns Hopkins University, <http://econ.jhu.edu/people/ccarroll/papers/liquidRevised.pdf> .

Carroll, Christopher., Otsuka, Misuzu., Slacalek, Jiri (2006), How Large Is the Housing Wealth Effect? A New Approach," mimeo, Johns Hopkins University.

Duca, John V. (2006), "Mutual Funds and the Evolving Long-Run Effects of Stock Wealth on U.S. Consumption" *The Journal of Economics and Business* 58, 202-221.

Duca, John V., Muellbauer, John, and Murphy, Anthony (2010), "Housing Markets and the Financial Crisis of 2007-2009: Lessons for the Future," *Journal of Financial Stability* 6(4), 203-17.

Duca, John V. and Rosenthal, Stuart S. (1993), "Borrowing Constraints, Household Debt, and Racial Discrimination in Loan Markets," *Journal of Financial Intermediation* 3, 77-103.

Engelhardt, Gary V. (1996), "Consumption, Down Payments and Liquidity Constraints," *Journal of Money Credit and Banking* 28 (2), 255-71.

Greenspan, Alan and Kennedy, James (2008), "Sources and Uses of Equity Extracted from Homes," *Oxford Review of Economic Policy* 24 (1), 120-44.

Hurst, Erik. and Stafford, Frank (2004), "Home Is Where the Equity Is: Mortgage Refinancing and Household Consumption, *Journal of Money, Credit, and Banking* 36 (6), 985–1014.

Lefgren, Lars, and McIntyre, Frank (2009), "Explaining the Puzzle of Cross-State Differences in Bankruptcy Rates," *Journal of Law and Economics* 52, 367-93.

Legal Consumer <http://www.legalconsumer.com/bankruptcy/laws/>..

Lehnert, Andreas, and Maki, Dean M. (2007), "Consumption, Debt, and Portfolio Choice: Testing the Effects of Bankruptcy Law," in Sumit Agarwal and Brent Ambrose, eds., *Financial Instruments for Households: Credit Usage from Mortgages to Credit Cards.* New York: Palgrave Macmillan.

Lusardi, Annamarie, and Mitchell, Olivia (2006), "Financial Literacy and Planning: Implications for Retirement Wellbeing," Working paper 2006-1, Pension Research Council.

Lusardi, Annamarie, and Mitchell, Olivia (2007), "Baby Boomer Retirement Security: The Roles of Planning, Financial Literacy, and Housing Wealth. *Journal of Monetary Economics* 54, 205–224.

Lusardi, Annamarie, and Tufano, Peter (2009), "Debt Literacy, Financial Experiences, and

Overindebtedness," working paper, Dartmouth College.

Miles, David (1992), "Housing Markets, Consumption, and Financial Liberalization," *European Economic Review* 36, 1093-1136.

Miles, David (2004), "The UK Mortgage Market: Taking a Longer-TermView," working paper, UK Treasury.

Muellbauer, John, and Lattimore, Richard (1995), "The Consumption Function: a Theoretical and Empirical Overview," in Pesaran, H. and Wickens, M. (Eds.), *Handbook of Applied Econometrics*, Blackwell.

Muellbauer, John and, Murphy, Anthony (1997), "Booms and Busts in the U.K. Housing Market, *The Economic Journal* 107, 1701–27.

Stango, Victor and, Zinman, Jonathan (2008), "Exponential Growth Bias and Household Finance," working paper, Dartmouth College.

Woodward, Susan E, and Hall, Robert E., (2010), "Consumer Confusion in the Mortgage Market: Evidence of Less than a Perfect Transparent and Competitive Market," *American Economic Review: Papers and Proceedings 100* (May), 511-16.

Table 1: Summary Statistics

	LitPortRisk=1	LitPortRisk=0	Overall
Whether Cashed Out	.171	.159	.166
Cashout Amount	7622.496	8518.272	8209.268
	(33571.98)	(33728.3)	(33601.28)
	[0]	[0]	[0]
RefIncent	.085	.154	.125
	(.277)	(1.012)	(.804)
	[0]	[0]	[0]
HomeApprec	.234	.234	.235
	(.155)	(.157)	(.156)
	[.177]	[.183]	[.179]
Garnish	.777	.76	.767
	(.202)	(.214)	(.209)
	[.75]	[.75]	[.75]
Judicial	.496	.517	.505
	(.462)	(.461)	(.462)
	[.5]	[.5]	[.5]
Deficiency	.728	.715	.716
	(.445)	(.451)	(.451)
	[1]	[1]	[1]
Chap13Share	.283	.272	.276
	(.138)	(.138)	(.137)
	[.28]	[.25]	[.28]
Unemp	.007	.014	.011
AgeHead	65.446	62.213	63.523
	(10.939)	(9.634)	(10.276)
	[64]	[60]	[62]
HSchoolGrad	.355	.316	.329
SomeCollege	.252	.247	.247
CollegeGrad	.178	.345	.281
MaleHead	.357	.474	.431
WhiteHead	.859	.923	.897
NumChildren	3.304	2.716	2.956
	(2.107)	(1.749)	(1.924)
	[3]	[2]	[3]

Note: Only means are presented for dummy variables. Standard errors in parentheses; median in square brackets. Estimates have been weighted by HRS household weights.

Table 2: Probit Models of Whether Households Withdrew Housing Equity

	(1)	(2)	(3)	(4)	(5)	(6)
LitPortRisk		-0.184**	-0.161**		-0.170**	-0.146*
		(-2.273)	(-2.041)		(-2.118)	(-1.863)
LitCompound		0.014			0.012	
		(0.155)			(0.140)	
LitMonIllus		0.108			0.103	
		(1.061)			(1.008)	
RefIncent	0.454**	0.462**	0.473**	0.460**	0.470**	0.481**
	(4.809)	(4.901)	(4.982)	(4.870)	(4.995)	(5.076)
HomeApprec	0.411**	0.347	0.397*	0.516**	0.450**	0.500**
	(1.960)	(1.620)	(1.880)	(2.448)	(2.089)	(2.350)
Unemp	0.289	0.309	0.309	0.319	0.340	0.338
	(0.959)	(1.028)	(1.022)	(1.072)	(1.140)	(1.134)
AgeHead	-0.031**	-0.033**	-0.032**	-0.032**	-0.034**	-0.033**
	(-7.108)	(-7.210)	(-7.250)	(-7.190)	(-7.280)	(-7.312)
HSchoolGrad	0.130	0.171	0.152	0.167	0.210*	0.188*
	(1.146)	(1.477)	(1.332)	(1.479)	(1.818)	(1.651)
SomeCollege	0.132	0.176	0.151	0.158	0.203	0.175
	(1.014)	(1.330)	(1.159)	(1.223)	(1.540)	(1.342)
CollegeGrad	0.075	0.127	0.106	0.107	0.159	0.133
	(0.597)	(0.980)	(0.826)	(0.851)	(1.229)	(1.041)
MaleHead	0.090	0.087	0.087	0.097	0.092	0.092
	(1.208)	(1.145)	(1.163)	(1.309)	(1.217)	(1.226)
WhiteHead	-0.363**	-0.368**	-0.336**	-0.317**	-0.323**	-0.292**
	(-3.677)	(-3.606)	(-3.296)	(-3.151)	(-3.097)	(-2.817)
NumChildren	0.074**	0.069**	0.071**	0.076**	0.071**	0.073**
	(4.468)	(4.052)	(4.286)	(4.652)	(4.234)	(4.466)
Garnish				0.324	0.358*	0.352*
				(1.639)	(1.755)	(1.755)
Chap13Share				0.615**	0.618**	0.610**
				(2.162)	(2.139)	(2.126)

Constant	0.719**	0.833**	0.848**	0.229	0.317	0.331
	(2.252)	(2.382)	(2.598)	(0.653)	(0.836)	(0.926)
Observations	2447	2400	2433	2447	2400	2433
Pseudo-R-square	0.08	0.09	0.09	0.09	0.10	0.09

Note: The dependent variable is whether the household withdrew housing equity. The t-stats presented in parenthesis are based on standard errors clustered by households. * p<0.10, ** p<0.05.

Table 3: Probit Models of Whether Households Withdrew Housing Equity (Controlling for Risk Aversion)

	(1)	(2)	(3)	(4)	(5)	(6)
LitPortRisk		-0.238**	-0.254**		-0.217**	-0.235**
		(-2.389)	(-2.565)		(-2.160)	(-2.356)
LitCompound		-0.112			-0.136	
		(-0.949)			(-1.149)	
LitMonIllus		0.054			0.057	
		(0.406)			(0.432)	
RefIncent	0.451**	0.475**	0.465**	0.457**	0.481**	0.471**
	(3.651)	(3.815)	(3.758)	(3.678)	(3.841)	(3.793)
HomeApprec	0.313	0.263	0.278	0.469*	0.453	0.437
	(1.153)	(0.947)	(1.015)	(1.657)	(1.570)	(1.528)
Unemp	0.064	0.071	0.104	0.089	0.090	0.128
	(0.185)	(0.202)	(0.296)	(0.264)	(0.262)	(0.376)
AgeHead	-0.029**	-0.032**	-0.031**	-0.030**	-0.034**	-0.032**
	(-4.456)	(-4.967)	(-4.786)	(-4.669)	(-5.239)	(-5.035)
HSchoolGrad	0.125	0.136	0.169	0.149	0.153	0.189
	(0.818)	(0.890)	(1.105)	(0.959)	(0.975)	(1.209)
SomeCollege	0.198	0.202	0.214	0.202	0.198	0.214
	(1.102)	(1.110)	(1.194)	(1.117)	(1.087)	(1.183)
CollegeGrad	0.044	0.097	0.105	0.058	0.102	0.112
	(0.263)	(0.566)	(0.621)	(0.340)	(0.584)	(0.647)
MaleHead	0.166*	0.202**	0.182*	0.172*	0.209**	0.185*
	(1.700)	(2.040)	(1.881)	(1.773)	(2.110)	(1.919)
WhiteHead	-0.340**	-0.303**	-0.308**	-0.286**	-0.245*	-0.257**
	(-2.750)	(-2.379)	(-2.498)	(-2.265)	(-1.878)	(-2.037)
NumChildren	0.095**	0.093**	0.093**	0.095**	0.092**	0.093**
	(3.851)	(3.645)	(3.691)	(3.844)	(3.624)	(3.674)
rrisk2	0.162	0.163	0.166	0.122	0.115	0.129
	(0.644)	(0.633)	(0.642)	(0.466)	(0.426)	(0.474)
rrisk3	-0.450*	-0.547**	-0.554**	-0.485*	-0.585**	-0.583**
	(-1.845)	(-2.183)	(-2.188)	(-1.888)	(-2.219)	(-2.186)

rrisk4	-0.148	-0.162	-0.177	-0.176	-0.191	-0.200
	(-0.701)	(-0.744)	(-0.806)	(-0.789)	(-0.831)	(-0.860)
rrisk5	-0.245	-0.301	-0.286	-0.294	-0.355	-0.329
	(-1.139)	(-1.357)	(-1.281)	(-1.313)	(-1.543)	(-1.411)
rrisk6	-0.245	-0.308	-0.309	-0.281	-0.349	-0.338
	(-1.197)	(-1.473)	(-1.451)	(-1.291)	(-1.567)	(-1.490)
Garnish				0.126	0.111	0.154
				(0.480)	(0.422)	(0.590)
Chap13Share				0.830**	0.929**	0.831**
				(2.102)	(2.307)	(2.072)
Constant	0.643	1.043**	0.905*	0.318	0.731	0.557
	(1.315)	(2.060)	(1.834)	(0.570)	(1.266)	(0.981)
Observations	1245	1235	1240	1245	1235	1240
Pseudo R-square	0.09	0.10	0.09	0.09	0.11	0.10

Note: The dependent variable is whether the household withdrew housing equity. The t-stats presented in parenthesis are based on standard errors clustered by households. The variables rrisk2-rrisk6 are the five categories of risk aversion with increasing degree of risk aversion; rrisk1, i.e., least risk averse, is the omitted category. * p<0.10, ** p<0.05.

Table 4: Probit Models of Whether Households Withdrew Housing Equity (Controlling for Risk Aversion)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LitPortRisk		-0.218**	-0.237**	-0.217**	-0.236**		-0.234**	-0.252**
		(-2.176)	(-2.384)	(-2.157)	(-2.367)		(-2.267)	(-2.450)
LitCompound		-0.137		-0.141			-0.197	
		(-1.164)		(-1.193)			(-1.624)	
LitMonIllus		0.058		0.061			0.061	
		(0.439)		(0.455)			(0.445)	
RefIncent	0.452**	0.477**	0.465**	0.422**	0.419**	0.358**	0.378**	0.373**
	(3.656)	(3.821)	(3.759)	(3.246)	(3.237)	(2.643)	(2.743)	(2.737)
HomeApprec	0.506*	0.485*	0.481*	0.397	0.410	0.322	0.419	0.443
	(1.854)	(1.748)	(1.750)	(1.370)	(1.432)	(0.601)	(0.767)	(0.815)
Chap13Share	0.896**	0.986**	0.910**	0.965**	0.891**			
	(2.418)	(2.614)	(2.416)	(2.546)	(2.352)			
Unemp	0.084	0.085	0.122	0.065	0.108	0.139	0.136	0.184
	(0.249)	(0.247)	(0.357)	(0.189)	(0.315)	(0.395)	(0.378)	(0.511)
AgeHead	-0.030**	-0.034**	-0.032**	-0.035**	-0.033**	-0.031**	-0.035**	-0.033**
	(-4.670)	(-5.239)	(-5.025)	(-5.249)	(-5.054)	(-4.596)	(-5.076)	(-4.888)
HSchoolGrad	0.146	0.150	0.186	0.148	0.185	0.120	0.117	0.160
	(0.936)	(0.961)	(1.190)	(0.936)	(1.170)	(0.738)	(0.728)	(0.984)
SomeCollege	0.199	0.197	0.212	0.202	0.217	0.138	0.156	0.171
	(1.105)	(1.081)	(1.175)	(1.098)	(1.192)	(0.745)	(0.845)	(0.927)

CollegeGrad	0.053	0.099	0.107	0.105	0.113	0.025	0.077	0.081
	(0.314)	(0.567)	(0.624)	(0.593)	(0.647)	(0.136)	(0.416)	(0.439)
MaleHead	0.170*	0.208**	0.183*	0.207**	0.182*	0.160	0.194*	0.165
	(1.753)	(2.099)	(1.902)	(2.082)	(1.877)	(1.558)	(1.862)	(1.616)
WhiteHead	-0.285**	-0.245*	-0.256**	-0.246*	-0.259**	-0.290**	-0.232*	-0.261**
	(-2.266)	(-1.877)	(-2.037)	(-1.884)	(-2.052)	(-2.257)	(-1.740)	(-2.034)
NumChildren	0.096**	0.093**	0.094**	0.092**	0.093**	0.107**	0.104**	0.106**
	(3.853)	(3.630)	(3.688)	(3.552)	(3.624)	(4.083)	(3.874)	(3.955)
rrisk2	0.106	0.101	0.109	0.099	0.108	0.038	0.073	0.069
	(0.412)	(0.382)	(0.411)	(0.370)	(0.404)	(0.145)	(0.270)	(0.252)
rrisk4	-0.499**	-0.598**	-0.600**	-0.603**	-0.604**	-0.516**	-0.591**	-0.602**
	(-1.979)	(-2.308)	(-2.291)	(-2.318)	(-2.294)	(-2.002)	(-2.270)	(-2.267)
rrisk4	-0.188	-0.202	-0.215	-0.213	-0.223	-0.258	-0.248	-0.268
	(-0.859)	(-0.893)	(-0.941)	(-0.938)	(-0.972)	(-1.164)	(-1.104)	(-1.160)
rrisk5	-0.308	-0.367	-0.346	-0.374*	-0.352	-0.344	-0.382*	-0.368
	(-1.395)	(-1.626)	(-1.510)	(-1.650)	(-1.527)	(-1.543)	(-1.684)	(-1.580)
rrisk6	-0.295	-0.362*	-0.356	-0.374*	-0.363	-0.347	-0.397*	-0.394*
	(-1.392)	(-1.667)	(-1.607)	(-1.714)	(-1.634)	(-1.605)	(-1.814)	(-1.746)
Constant	0.403	0.806	0.660	0.778	0.651	1.659	1.657**	1.462**
	(0.796)	(1.544)	(1.284)	(1.464)	(1.251)	(1.528)	(3.074)	(2.732)
year effects	No	No	No	Yes	Yes	Yes	Yes	Yes
state effects	No	No	No	No	No	Yes	Yes	Yes
Observations	1245	1235	1240	1235	1240	1209	1199	1204

Pseudo-R-square	0.09	0.11	0.10	0.11	0.10	0.11	0.12	0.12

Note: The dependent variable is whether the household withdrew housing equity. The t-stats presented in parenthesis are based on standard errors clustered by households. The variables rrisk2-rrisk6 are the five categories of risk aversion with increasing degree of risk aversion; rrisk1, i.e., least risk averse, is the omitted category. * $p<0.10$, ** $p<0.05$.

Table 5: Probit Models of Whether Households Withdrew Housing Equity Adding Several Income and Wealth Controls that Reduce Sample Size

	(1)	(2)	(3)	(4)	(5)	(6)
LitPortRisk		-0.164*	-0.168*		-0.140	-0.144
		(-1.659)	(-1.746)		(-1.432)	(-1.501)
LitCompound		-0.076			-0.081	
		(-0.739)			(-0.775)	
LitMonIllus		0.077			0.075	
		(0.618)			(0.602)	
RefIncent	0.351**	0.377**	0.364**	0.354**	0.382**	0.370**
	(3.357)	(3.563)	(3.438)	(3.436)	(3.660)	(3.548)
HomeApprec	0.082	-0.023	0.039	0.140	0.053	0.096
	(0.306)	(-0.084)	(0.144)	(0.516)	(0.192)	(0.351)
Unemp	0.034	0.041	0.039	0.141	0.140	0.141
	(0.067)	(0.081)	(0.077)	(0.273)	(0.271)	(0.270)
AgeHead	-0.020**	-0.023**	-0.021**	-0.020**	-0.022**	-0.021**
	(-2.821)	(-2.987)	(-2.868)	(-2.770)	(-2.964)	(-2.817)
HSchoolGrad	0.125	0.162	0.164	0.167	0.197	0.201
	(0.922)	(1.161)	(1.197)	(1.223)	(1.401)	(1.451)
SomeCollege	0.062	0.124	0.103	0.091	0.147	0.123
	(0.384)	(0.741)	(0.626)	(0.551)	(0.858)	(0.738)
CollegeGrad	0.166	0.233	0.207	0.195	0.252	0.224
	(0.998)	(1.343)	(1.222)	(1.164)	(1.451)	(1.321)
MaleHead	0.135	0.142	0.132	0.139	0.143	0.133
	(1.397)	(1.470)	(1.378)	(1.453)	(1.493)	(1.409)
WhiteHead	-0.210	-0.190	-0.174	-0.176	-0.160	-0.146
	(-1.460)	(-1.298)	(-1.171)	(-1.194)	(-1.059)	(-0.965)
NumChildren	0.060**	0.057**	0.059**	0.061**	0.058**	0.060**
	(2.996)	(2.747)	(2.888)	(3.049)	(2.795)	(2.940)
dmarried	-0.096	-0.149	-0.105	-0.069	-0.122	-0.077
	(-0.553)	(-0.867)	(-0.609)	(-0.392)	(-0.704)	(-0.445)
liquid1998	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-1.399)	(-1.225)	(-1.274)	(-1.541)	(-1.363)	(-1.407)
ltv1998	1.037**	1.033**	1.040**	1.055**	1.043**	1.050**

	(5.170)	(5.049)	(5.101)	(5.702)	(5.502)	(5.568)
meanhiearn	0.000	0.000	0.000	0.000	0.000	0.000
	(0.449)	(0.676)	(0.794)	(0.498)	(0.694)	(0.822)
Garnish				0.415*	0.383	0.418*
				(1.716)	(1.532)	(1.702)
Chap13Share				0.497	0.512	0.461
				(1.391)	(1.400)	(1.283)
Constant	-0.154	0.067	-0.088	-0.758	-0.501	-0.680
	(-0.269)	(0.109)	(-0.153)	(-1.282)	(-0.793)	(-1.147)
Observations	1762	1726	1752	1762	1726	1752
Pseudo R-Square	0.13	0.13	0.13	0.13	0.14	0.13

Note: The dependent variable is whether the household withdrew housing equity. The t-stats presented in parenthesis are based on standard errors clustered by households. * p<0.10, ** p<0.05.

Table 6: Probit Models of Whether Households Withdrew Housing Equity Controlling for Risk Aversion and Adding Several Income and Wealth Controls that Reduce Sample Size

	(1)	(2)	(3)	(4)	(5)	(6)
LitPortRisk		-0.267**	-0.303**		-0.227*	-0.268**
		(-2.058)	(-2.367)		(-1.731)	(-2.064)
LitCompound		-0.190			-0.224	
		(-1.355)			(-1.564)	
LitMonIllus		0.101			0.107	
		(0.560)			(0.600)	
RefIncent	0.225	0.261*	0.241*	0.228*	0.264*	0.245*
	(1.626)	(1.868)	(1.745)	(1.655)	(1.884)	(1.774)
HomeApprec	-0.054	-0.179	-0.138	0.085	0.036	0.010
	(-0.147)	(-0.458)	(-0.362)	(0.218)	(0.087)	(0.024)
Unemp	-0.331	-0.268	-0.264	-0.228	-0.180	-0.174
	(-0.556)	(-0.429)	(-0.428)	(-0.379)	(-0.294)	(-0.281)
AgeHead	-0.012	-0.016	-0.014	-0.012	-0.017	-0.014
	(-1.256)	(-1.596)	(-1.391)	(-1.247)	(-1.637)	(-1.411)
HSchoolGrad	0.218	0.203	0.264	0.242	0.203	0.275
	(1.238)	(1.148)	(1.503)	(1.315)	(1.103)	(1.510)
SomeCollege	0.013	-0.001	0.031	0.010	-0.020	0.019
	(0.064)	(-0.006)	(0.146)	(0.046)	(-0.095)	(0.089)
CollegeGrad	-0.078	-0.003	0.015	-0.078	-0.025	0.000
	(-0.370)	(-0.014)	(0.070)	(-0.354)	(-0.113)	(0.001)
MaleHead	0.070	0.146	0.102	0.073	0.146	0.101
	(0.528)	(1.107)	(0.779)	(0.560)	(1.131)	(0.792)
WhiteHead	-0.194	-0.145	-0.158	-0.149	-0.096	-0.122
	(-1.137)	(-0.814)	(-0.947)	(-0.838)	(-0.516)	(-0.708)
NumChildren	0.089**	0.089**	0.089**	0.089**	0.088**	0.088**
	(2.552)	(2.501)	(2.516)	(2.486)	(2.436)	(2.450)
dmarried	0.150	0.073	0.140	0.192	0.109	0.179
	(0.661)	(0.329)	(0.629)	(0.859)	(0.486)	(0.811)
liquid1998	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000

	(-0.327)	(-0.044)	(-0.239)	(-0.335)	(-0.015)	(-0.243)
ltv1998	0.983**	0.986**	0.966**	1.015**	1.009**	0.986**
	(4.812)	(4.800)	(4.736)	(5.360)	(5.290)	(5.198)
meanhiearn	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(2.016)	(2.136)	(2.175)	(1.994)	(2.069)	(2.117)
rrisk2	-0.585**	-0.580**	-0.562**	-0.599**	-0.613**	-0.575**
	(-2.164)	(-2.083)	(-2.012)	(-2.107)	(-2.107)	(-1.961)
rrisk4	-0.726**	-0.753**	-0.774**	-0.751**	-0.782**	-0.786**
	(-2.636)	(-2.686)	(-2.715)	(-2.544)	(-2.624)	(-2.585)
rrisk4	-0.611**	-0.586**	-0.629**	-0.650**	-0.628**	-0.659**
	(-2.552)	(-2.300)	(-2.494)	(-2.531)	(-2.336)	(-2.447)
rrisk5	-0.577**	-0.637**	-0.623**	-0.628**	-0.696**	-0.661**
	(-2.365)	(-2.472)	(-2.409)	(-2.456)	(-2.635)	(-2.448)
rrisk6	-0.613**	-0.663**	-0.660**	-0.634**	-0.697**	-0.672**
	(-2.613)	(-2.763)	(-2.706)	(-2.507)	(-2.724)	(-2.562)
Garnish				0.254	0.135	0.231
				(0.790)	(0.423)	(0.733)
Chap13Share				0.806	0.924*	0.733
				(1.561)	(1.756)	(1.415)
Constant	-0.468	-0.014	-0.238	-1.004	-0.445	-0.721
	(-0.620)	(-0.018)	(-0.319)	(-1.216)	(-0.532)	(-0.886)
Observations	872	866	871	872	866	871
Pseudo R-Square	0.13	0.14	0.13	0.13	0.15	0.14

Note: The dependent variable is whether the household withdrew housing equity. The t-stats presented in parenthesis are based on standard errors clustered by households. The variables rrisk2-rrisk6 are the five categories of risk aversion with increasing degree of risk aversion; rrisk1, i.e., least risk averse is the omitted category. * p<0.10, ** p<0.05.

Table 7: Probit Models of Whether Households Withdrew Housing Equity Controlling for Risk Aversion and Adding Several Income and Wealth Controls that Reduce Sample Size

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LitPortRisk		-0.229*	-0.243**	-0.230*	-0.274**		-0.225*	-0.274**
		(-1.757)	(-2.439)	(-1.736)	(-2.098)		(-1.688)	(-2.078)
LitCompound		-0.229		-0.223			-0.178	
		(-1.628)		(-1.570)			(-1.153)	
LitMonIllus		0.108		0.110			0.113	
		(0.608)		(0.608)			(0.636)	
RefIncent	0.219	0.260*	0.459**	0.136	0.134	0.097	0.114	0.118
	(1.590)	(1.850)	(3.717)	(0.859)	(0.854)	(0.614)	(0.701)	(0.732)
HomeApprec	0.170	0.077	0.495*	0.038	0.059	0.516	0.410	0.523
	(0.453)	(0.195)	(1.796)	(0.093)	(0.146)	(0.739)	(0.571)	(0.735)
Chap13Share	0.947**	1.000**	0.919**	0.993**	0.854*			
	(1.988)	(2.050)	(2.448)	(2.016)	(1.748)			
Unemp	-0.247	-0.192	0.110	-0.223	-0.241	-0.338	-0.230	-0.265
	(-0.418)	(-0.315)	(0.320)	(-0.373)	(-0.398)	(-0.517)	(-0.343)	(-0.393)
AgeHead	-0.013	-0.017	-0.031**	-0.020*	-0.016	-0.015	-0.020*	-0.016
	(-1.265)	(-1.640)	(-4.828)	(-1.794)	(-1.546)	(-1.314)	(-1.752)	(-1.427)
HSchoolGrad	0.232	0.199	0.184	0.203	0.273	0.223	0.196	0.252
	(1.275)	(1.090)	(1.180)	(1.091)	(1.488)	(1.168)	(1.016)	(1.321)
SomeCollege	0.008	-0.020	0.210	-0.014	0.025	0.015	0.011	0.038

	(0.039)	(-0.096)	(1.166)	(-0.066)	(0.113)	(0.069)	(0.050)	(0.177)
CollegeGrad	-0.084 (-0.391)	-0.027 (-0.124)	0.105 (0.613)	-0.013 (-0.059)	0.008 (0.035)	-0.014 (-0.056)	0.049 (0.195)	0.068 (0.273)
MaleHead	0.065 (0.495)	0.143 (1.108)	0.167* (1.725)	0.151 (1.150)	0.100 (0.776)	0.054 (0.414)	0.104 (0.793)	0.062 (0.479)
WhiteHead	-0.144 (-0.812)	-0.092 (-0.498)	-0.274** (-2.171)	-0.092 (-0.491)	-0.118 (-0.677)	-0.215 (-1.224)	-0.174 (-0.923)	-0.197 (-1.143)
NumChildren	0.091** (2.533)	0.089** (2.462)	0.092** (3.562)	0.090** (2.429)	0.091** (2.482)	0.098** (2.636)	0.096** (2.580)	0.097** (2.606)
dmarried	0.174 (0.787)	0.099 (0.446)	0.137 (1.065)	0.122 (0.548)	0.187 (0.848)	0.080 (0.329)	-0.016 (-0.067)	0.060 (0.243)
liquid1998	-0.000 (-0.347)	-0.000 (-0.021)		0.000 (0.075)	-0.000 (-0.172)	-0.000 (-0.124)	0.000 (0.091)	-0.000 (-0.139)
ltv1998	1.007** (5.234)	1.008** (5.222)		1.028** (5.106)	0.997** (4.983)	1.018** (4.684)	0.991** (4.456)	0.978** (4.470)
meanhiearn	0.000** (1.985)	0.000** (2.072)		0.000** (2.060)	0.000** (2.100)	0.000 (1.579)	0.000* (1.656)	0.000* (1.709)
rrisk2	-0.628** (-2.249)	-0.628** (-2.188)	0.100 (0.376)	-0.642** (-2.190)	-0.612** (-2.084)	-0.649** (-2.194)	-0.621** (-2.064)	-0.606** (-1.998)
rrisk4	-0.779** (-2.715)	-0.797** (-2.748)	-0.605** (-2.340)	-0.812** (-2.779)	-0.825** (-2.778)	-0.588* (-1.934)	-0.589* (-1.944)	-0.598* (-1.916)
rrisk4	-0.671** (-2.660)	-0.639** (-2.409)	-0.229 (-1.015)	-0.661** (-2.457)	-0.697** (-2.603)	-0.612** (-2.345)	-0.561** (-2.130)	-0.586** (-2.171)

rrisk5	-0.654**	-0.711**	-0.351	-0.732**	-0.703**	-0.580**	-0.614**	-0.594**
	(-2.610)	(-2.741)	(-1.551)	(-2.786)	(-2.637)	(-2.187)	(-2.269)	(-2.124)
rrisk6	-0.665**	-0.714**	-0.355	-0.732**	-0.714**	-0.613**	-0.647**	-0.635**
	(-2.724)	(-2.877)	(-1.627)	(-2.922)	(-2.792)	(-2.405)	(-2.520)	(-2.386)
Constant	-0.815	-0.347	0.532	-0.160	-0.420	-0.979	-0.429	0.466
	(-1.070)	(-0.446)	(1.007)	(-0.181)	(-0.489)	(-1.081)	(-0.463)	(0.609)
year effects	No	No	No	Yes	Yes	Yes	Yes	Yes
state effects	No	No	No	No	No	Yes	Yes	Yes
Observations	872	866	1240	866	871	831	812	830
Pseudo R-Square	0.13	0.15	0.10	0.15	0.14	0.15	0.16	0.15

Note: The dependent variable is whether the household withdrew housing equity. The t-stats presented in parenthesis are based on standard errors clustered by households. The variables rrisk2-rrisk6 are the five categories of risk aversion with increasing degree of risk aversion; rrisk1, i.e., least risk averse, is the omitted category. * $p<0.10$, ** $p<0.05$.