Financial Literacy and Mortgage Equity Withdrawals

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* The views expressed are those of the authors, and are not necessarily those of the Federal Reserve Bank of Dallas or of the Federal Reserve System.

Introduction

- Yet emerging evidence of financial illiteracy
  - Lusardi and Mitchell studied basic questions w.r.t. financial literacy e.g. retirement planning
  - Woodward & Hall (2010), confused households pick high cost mortgages
  - Campbell, et al. (AEA 2011 conference paper) implications of financial literacy w.r.t. consumer protection complicated
  - Gerardi, et al. (ES 2011 conference) subprime foreclosure link to financial illiteracy
  - Agarwal et. al. (2010): Financial education programs effective in lowering ex-post delinquency rates
- Home equity-based borrowing fuelled the consumption boom before 2006 and contributed to soaring delinquency rates since 2006 (Mian and Sufi, forthcoming)

Introduction
(continued)

- We examine the link between financial illiteracy and MEWs among those not moving (cash-out refis, HELC, 2nd mortgages)
  - Subset of HRS queried about financial literacy
  - Control for several factors in probit models of whether households did an MEW similar to studies of MEW activity by Benito for the UK and Hurst and Stafford for the U.S.
  - Check robustness w.r.t. risk aversion and state/time fixed effects
  - Of 3 questions on financial literacy (compound interest or numeracy, money illusion, or portfolio diversification), only portfolio literacy was significant
  - Some evidence that the illiterate more likely to have a MEW

Econometric Specification

- Probit model of mortgage equity withdrawal

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

- Financial literacy is time invariant so cannot include individual fixed effects
- Where ***Z*** is a vector of demographic variables such as age, sex, education, and number of children in the household. Sometimes *Z* includes measures of risk aversion, year fixed effects, and state fixed effects
- We tried other legal variables

Data Sample and Dependent Variable

- Health and Retirement Study (HRS)- 1998 to 2006
- Use a random subsample of HRS selected to answer an additional three financial literacy questions in 2004.
- Impute 2004 financial literacy responses for each person to other years
- Restrict sample to homeowners who did not move
- Baseline sample: 2433 observations (household years).
- 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).
  - Also tried setting a minimum of $1,000 to limit reporting error—but no real difference in results.
  - 16.6 % did an MEW over 1998-2006, average size was $8,200

Note that MEWs affected by incentives to refinance mortgages

Financial Literacy Variables

- ***LitPortRisk*** = 1 if correct answer to the following question: Do you think that the following statement is true or false? “Buying a single company stock usually provides a safer return than a stock mutual fund.”

- ***LitCompound*** = 1 if correct answer to the following question: Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than $102, exactly $102, less than $102?

- ***LitMonIllus*** = 1 if correct answer to the following question: Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?

- Only 34% of this sample of households aged 50 or over answered all three questions correctly.

Answers to Financial Literacy Questions

Lusardi and Mitchell Sample	Sample Size	% Correct Answer	% Incorrect Answer	Admitted Don't Know
Compound Interest	1,252	68%	23%	10%
Money Illusion	1,250	76%	13%	10%
Portfolio Diversification	1,258	53%	13%	34%
All three questions		35 % all correct	40% at least one wrong	

*Samples omitting the risk aversion or portfolio variables. Smaller samples for probits including those extra variables.

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Portfolio Diversification	1,258	53%	13%	34%
All three questions		35 % all correct	40% at least one wrong	

Our Sample (missing variables reduces size)*	Sample Size	% Correct Answer	% Incorrect Answer	Admitted Don't Know
Compound Interest	842	71%	22%	7%
Money Illusion	839	79%	12%	9%
Portfolio Diversification	845	55%	13%	32%
All three questions		38 % all correct	38% at least one wrong	

*Samples omitting the risk aversion or portfolio variables. Smaller samples for probits including those extra variables.

Standard MEW/Refinancing Variables

- ***RefIncent*** = interest rate reduction from refinancing * pre-refi loan principal, like Hurst and Stafford (2002)
- ***Priceapp3yrs*** = state level annualized house price appreciation prior 3 years (FHFA)
- ***Unemp*** (= 1 if unemployed)
- Demographic controls
  - Age *(**AgeHead**)*, gender *(**MaleHead**)*, race (***WhiteHead***) and marital status (***dmarried***) of household head
  - Number of children in household (***NumChildren***)
  - Categorical education dummies for household head (***HschoolGrad***, ***CollegeGrad***, ***SomeCollege***)

Standard MEW/Refinancing Variables (continued)

- ***LTV1998*** = loan-to-value ratio on home in 1998, controls for an aspect of starting condition of household finances. If variable captures preference for high leverage, coefficient should be positive.
- ***Liquid1998*** = liquid assets in 1998, a measure of liquidity in starting sample of 1998. Could have negative coefficient if reduced liquidity constraints negatively affects the need for an MEW
- ***Meanhiearn*** = mean real income of high earner in household over the biennial samples 1998-2006, controls for differences in permanent income

Legal Variables
(similar to Lefgren & McIntyre, *JLE* 2009)

Some sets of probit models tried these legal variables

- ***Garnish*** = ratio of income shielded from garnishment/average state household income.
- ***Chap13share*** = what share of state personal bankruptcies were under chapter 13 versus chapter 7 bankruptcy. Under chapter 7, lenders have access to other assets, borrower income can be garnished, and if borrower fails to repay under new terms, lender does not have to file a new case. Lefgren and McIntyre (2009) find a higher chapter 13 share is positively related to consumer loan delinquency and argue that it reflects a state legal culture/environment favoring debtors.

Identification

- Financial literacy may be endogenous
  - Households may learn from any prior experience with mortgage borrowing.
  - Cross-sectional variation in financial l literacy may be correlated with underlying differences in risk preferences
- Plausible instruments for financial literacy
  - state level financial education mandates (Bernheim et. al 2000)
  - father's and mother's education
  - average high school graduation rates
- Instruments turn out to be weak
- We control for survey-based measures of risk aversion to account for bias due to omitted risk preferences

Risk Aversion Categorical Variables

- **Basic risk question:** Respondents asked to choose between a job that guarantees current income and another job that offers a chance at doubling income with a 50% probabilty but also has a 50% probability of x% lower income):
  - ***rrisk1*** = 1 if prob. of lower income = 75%, 3.7% of sample
  - ***rrisk2*** = 1 if prob. of lower income = 50%, 6.7% of sample
  - ***rrisk3*** = 1 if prob. of lower income = 33%, 10.7% of sample
  - ***rrisk4*** = 1 if prob. of lower income = 20%, 17.0% of sample
  - ***rrisk5*** = 1 if prob. of lower income = 10%, 20.5% of sample
  - ***rrisk6*** = 1 if prob. of lower income = 0%, 41.4% of sample

Estimation Results

	(1)
LitPortRisk	**-0.184****
	(-2.273)
LitCompound	**0.014**
	(0.155)
LitMonIllus	**0.108**
	(1.061)
RefIncent	**0.462****
	(4.901)
HomeApprec	**0.347**
	(1.620)
Garnish	
Chap13Share	
Risk Aversion	**No**
Year Effects	**No**
State Eeffects	**No**
Income, LTV, Liquid	**No**

Estimation Results

	(1)	(2)
LitPortRisk	**-0.184****	**-0.170****
	(-2.273)	**(-2.118)**
LitCompound	**0.014**	**0.012**
	(0.155)	**(0.140)**
LitMonIllus	**0.108**	**0.103**
	(1.061)	**(1.008)**
RefIncent	**0.462****	**0.470****
	(4.901)	**(4.995)**
HomeApprec	**0.347**	**0.450****
	(1.620)	**(2.089)**
Garnish		**0.358***
		(1.755)
Chap13Share		**0.618****
		(2.139)
Risk Aversion	**No**	**No**
Year Effects	**No**	**No**
State Eeffects	**No**	**No**
Income, LTV, Liquid	**No**	**No**

Estimation Results

	(1)	(2)	(3)
LitPortRisk	**-0.184****	**-0.170****	**-0.217****
	(-2.273)	**(-2.118)**	**(-2.160)**
LitCompound	**0.014**	**0.012**	**-0.136**
	(0.155)	**(0.140)**	**(-1.149)**
LitMonIllus	**0.108**	**0.103**	**0.057**
	(1.061)	**(1.008)**	**(0.432)**
RefIncent	**0.462****	**0.470****	**0.481****
	(4.901)	**(4.995)**	**(3.841)**
HomeApprec	**0.347**	**0.450****	**0.453**
	(1.620)	**(2.089)**	**(1.570)**
Garnish		**0.358***	**0.111**
		(1.755)	**(0.422)**
Chap13Share		**0.618****	**0.929****
		(2.139)	**(2.307)**
Risk Aversion	**No**	**No**	**Yes**
Year Effects	**No**	**No**	**No**
State Eeffects	**No**	**No**	**No**
Income, LTV, Liquid	**No**	**No**	**No**

Estimation Results

	(1)	(2)	(3)	(4)
LitPortRisk	**-0.184****	**-0.170****	**-0.217****	**-0.217****
	(-2.273)	**(-2.118)**	**(-2.160)**	**(-2.157)**
LitCompound	**0.014**	**0.012**	**-0.136**	**-0.141**
	(0.155)	**(0.140)**	**(-1.149)**	**(-1.193)**
LitMonIllus	**0.108**	**0.103**	**0.057**	**0.061**
	(1.061)	**(1.008)**	**(0.432)**	**(0.455)**
RefIncent	**0.462****	**0.470****	**0.481****	**0.422****
	(4.901)	**(4.995)**	**(3.841)**	**(3.246)**
HomeApprec	**0.347**	**0.450****	**0.453**	**0.397**
	(1.620)	**(2.089)**	**(1.570)**	**(1.370)**
Garnish		**0.358***	**0.111**	
		(1.755)	**(0.422)**	
Chap13Share		**0.618****	**0.929****	**0.965****
		(2.139)	**(2.307)**	**(2.546)**
Risk Aversion	**No**	**No**	**Yes**	**Yes**
Year Effects	**No**	**No**	**No**	**Yes**
State Eeffects	**No**	**No**	**No**	**No**
Income, LTV, Liquid	**No**	**No**	**No**	**No**

Estimation Results

	(1)	(2)	(3)	(4)	(5)
LitPortRisk	**-0.184****	**-0.170****	**-0.217****	**-0.217****	**-0.234****
	(-2.273)	**(-2.118)**	**(-2.160)**	**(-2.157)**	**(-2.267)**
LitCompound	**0.014**	**0.012**	**-0.136**	**-0.141**	**-0.197**
	(0.155)	**(0.140)**	**(-1.149)**	**(-1.193)**	**(-1.624)**
LitMonIllus	**0.108**	**0.103**	**0.057**	**0.061**	**0.061**
	(1.061)	**(1.008)**	**(0.432)**	**(0.455)**	**(0.445)**
RefIncent	**0.462****	**0.470****	**0.481****	**0.422****	**0.378****
	(4.901)	**(4.995)**	**(3.841)**	**(3.246)**	**(2.743)**
HomeApprec	**0.347**	**0.450****	**0.453**	**0.397**	**0.419**
	(1.620)	**(2.089)**	**(1.570)**	**(1.370)**	**(0.767)**
Garnish		**0.358***	**0.111**		
		(1.755)	**(0.422)**		
Chap13Share		**0.618****	**0.929****	**0.965****	
		(2.139)	**(2.307)**	**(2.546)**	
Risk Aversion	**No**	**No**	**Yes**	**Yes**	**Yes**
Year Effects	**No**	**No**	**No**	**Yes**	**Yes**
State Eeffects	**No**	**No**	**No**	**No**	**Yes**
Income, LTV, Liquid	**No**	**No**	**No**	**No**	**No**

Estimation Results

	(1)	(2)	(3)	(4)	(5)	(6)
LitPortRisk	**-0.184** **(-2.273)**	**-0.170** **(-2.118)**	**-0.217** **(-2.160)**	**-0.217** **(-2.157)**	**-0.234** **(-2.267)**	**-0.225*** **(-1.688)**
LitCompound	**0.014** **(0.155)**	**0.012** **(0.140)**	**-0.136** **(-1.149)**	**-0.141** **(-1.193)**	**-0.197** **(-1.624)**	**-0.178** **(-1.153)**
LitMonIllus	**0.108** **(1.061)**	**0.103** **(1.008)**	**0.057** **(0.432)**	**0.061** **(0.455)**	**0.061** **(0.445)**	**0.113** **(0.636)**
RefIncent	**0.462** **(4.901)**	**0.470** **(4.995)**	**0.481** **(3.841)**	**0.422** **(3.246)**	**0.378** **(2.743)**	**0.114** **(0.701)**
HomeApprec	**0.347** **(1.620)**	**0.450** **(2.089)**	**0.453** **(1.570)**	**0.397** **(1.370)**	**0.419** **(0.767)**	**0.410** **(0.571)**
Garnish		**0.358*** **(1.755)**	**0.111** **(0.422)**			
Chap13Share		**0.618** **(2.139)**	**0.929** **(2.307)**	**0.965** **(2.546)**		
Risk Aversion	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Year Effects	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**
State Eeffects	**No**	**No**	**No**	**No**	**Yes**	**Yes**
Income, LTV, Liquid	**No**	**No**	**No**	**No**	**No**	**Yes**

Other Controls: RefIncent, HomeApprec, Unemp, AgeHead, HSchoolGrad, SomeCollege, CollegeGrad, MaleHead, WhiteHead, NumChildren

Table 7

	(2)	(3)	(4)	(5)	(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)**	
Chap13Share	**1.000****	**0.919****	**0.993****	**0.854***		
	(2.050)	**(2.448)**	**(2.016)**	**(1.748)**		
year effects	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
state effects	**No**	**No**	**No**	**No**	**Yes**	**Yes**

Other Controls: RefIncent, HomeApprec, Unemp, AgeHead, HSchoolGrad, SomeCollege, CollegeGrad, MaleHead, WhiteHead, NumChildren, dmarried, liquid1998, ltv1998, meanhiearn, Risk Aversion Categories.

Marginal Effects On *Prob*(MEW=1) (Table 7)

	(2)	(3)	(4)	(5)	(7)	(8)
LitPortRisk	**-0.049****	**-0.055****	**-0.048****	**-0.054****	**-0.053****	**-0.059****
	(0.022)	**(0.022)**	**(0.022)**	**(0.022)**	**(0.023)**	**(0.023)**
LitCompound	**-0.029**		**-0.030**		**-0.042**	
	(0.027)		**(0.027)**		**(0.028)**	
LitMonIllus	**0.005**		**0.004**		**0.003**	
	(0.028)		**(0.028)**		**(0.029)**	
Chap13Share	**0.206****	**0.192****	**0.201****	**0.187****		
	(0.081)	**(0.081)**	**(0.081)**	**(0.082)**		
Year effects	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
State effects	**No**	**No**	**No**	**No**	**Yes**	**Yes**

Other Controls: RefIncent, HomeApprec, Unemp, AgeHead, HSchoolGrad, SomeCollege, CollegeGrad, MaleHead, WhiteHead, NumChildren, dmarried, liquid1998, ltv1998, meanhiearn, Risk Aversion Categories.

Basic Findings for Refi and Demographic Variables Across Specifications

- Significant or marginally significant demographic variables with signed effects in parentheses: ***AgeHead*** (- but generally without fixed effects),), ***WhiteHead*** (- but only w/out fixed effects), ***NumChildren*** (+, the rich get richer, the poor get children, and the middle class gets poorer with MEWs. Others insignificant.
- Significant or marginally significant nonliteracy refinancing/financial variables among demographic variables: ***RefIncent*** (+ but generally without year effects), ***LTV1998*** (+), ***Meanhiearn*** (+). Others insignificant.

Basic Findings for Legal and Financial Literacy Variables Across Specifications

- The only significant literacy variable was ***LitPortRisk***. ***LitPortRisk*** rising from 0 to 1 implies a marginal decrease in the probability of an MEW of 2-5 percentage points. Suggests that a basic understanding of portfolio management rather than literacy w.r.t. numeracy is most important.
- In models without state effects, ***Chap13Share*** was generally significant, with a positive sign. Suggests that loan demand from more favorable legal climate for debtors outweighs oppositely signed loan supply effects. Sometimes ***Garnish*** was positive and significant, but result was sensitive to the inclusion of other variables.

Conclusion

- Literacy about portfolio diversification negatively associated with propensity to withdraw equity
- Literacy about compound interest numeracy or money illusion was not
- Financially illiterate and risk-loving households in states with legal cultures favoring debtors are most likely to have done an MEW.
- **Caveats**: small sample and inability to find good instruments for financial literacy. Also difficult to address literacy (see Agarwal papers)
- **Some next steps**:
  - Account for selection due to a sample of non-moving home-owners
  - Try other plausible instruments for financial literacy or use matching estimators
  - Explore responses at the intensive margin

Back-up Slides