Reverse mortgages: What homeowners (don't) know and how it matters

Thomas Davidoff [a], Patrick Gerhard [b,c], Thomas Post [b,c,*]

[a] University of British Columbia, Sauder School of Business, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada
[b] Maastricht University, School of Business and Economics, Department of Finance, Tongersestraat 53, 6211 LM Maastricht, The Netherlands
[c] Network for Studies on Pensions, Aging and Retirement (Netspar), P.O. Box 90153, 5000 LE Tilburg, The Netherlands

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ABSTRACT

Reverse mortgages allow elderly homeowners to unlock and consume home equity without leaving their homes. Relative to the number of elderly homeowners with limited financial resources, the take-up rates of reverse mortgages are low. To understand the low take-up rates we first survey U.S. homeowners aged 58 and older assessing their knowledge (literacy) about the most popular reverse mortgage product, the Home Equity Conversion Mortgage (HECM). Next, we study the relationship between knowledge and the intention to use a HECM. Awareness of reverse mortgages is high, but knowledge of contract terms is limited. More knowledgeable homeowners and those with peers who have a reverse mortgage express greater intention to use such a product. Respondents who would benefit most from reverse mortgages (those with low incomes and limited savings) express greater intention to use reverse mortgages, but lack knowledge of the contract terms. Our findings suggest that take-up rates might be increased through improving knowledge about contract terms or changing the product's design to make it easier to understand in the first place.

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1. Introduction

Reverse mortgage demand is low despite the substantial consumption smoothing benefits they can provide to cash-poor elderly homeowners (Davidoff, 2015). Mounting evidence suggests that the elderly may find reverse mortgages difficult to understand and for that reason shy away from using them. In his 2016 Ely Lecture delivered at the annual meeting of the American Economic Association John Y. Campbell specifically highlighted reverse mortgages as one of three examples (the others are retirement asset allocation and consumer credit) of markets that are prone to households making suboptimal financial decisions because of, for example, lack of financial literacy and a poor understanding of product terms (Campbell, 2016). We use a survey to determine and assess elderly homeowners' knowledge about the dominant U.S. reverse mortgage product, the Home Equity Conversion Mortgage (HECM), and how this knowledge relates to homeowners' intention to use the product. We find that general awareness of HECMs among U.S. elderly homeowners is high. However, product knowledge (product-specific literacy) is fairly low and lack of knowledge relates to low intention to use reverse mortgages. Strikingly, homeowners with limited financial resources who would benefit the most from reverse mortgages lack product

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 * Corresponding author at: Maastricht University, School of Business and Economics, Department of Finance, Tongersestraat 53, 6211 LM Maastricht, The Netherlands.
    E-mail addresses: thomas.davidoff@sauder.ubc.ca (T. Davidoff), p.gerhard@maastrichtuniversity.nl (P. Gerhard), t.post@maastrichtuniversity.nl (T. Post).

knowledge as well. Knowing others with a reverse mortgage is a strong predictor of the intention to use reverse mortgages. Offering survey participants the opportunity to read a short text explaining product features was not found to be a successful intervention to increase the intention to use the product.

Reverse mortgages enable homeowners to liquidate and consume home equity without relocating. Most retired households own a home and home equity is a large fraction of wealth for those households. According to the 2013 Survey of Consumer Finances, 87% of U.S. households aged 65+ own a home (the 2016 U.S. census figure is 79%), and the value of the primary residence represents 56% of total assets at the median. Housing assets provide a valuable stream of services to their owners, but adjustment of these services and partial liquidation of those assets is difficult and costly. Millions of American retirees may be classified as "house rich and cash poor" and so seem likely to benefit from reverse mortgages (Mayer and Simons, 1994a, 1994b; Rasmussen et al., 1995).[1] With 582,000 HECM reverse mortgages outstanding in 2012 (the most popular reverse mortgages type with 90% market share) (Shan, 2011; CFPB, 2012), actual demand is substantially behind predictions.

According to life-cycle saving and consumption theory, reverse mortgages increase a household's utility if they reduce liquidity constraints (allowing smoothing consumption over the life-cycle) and bequest motives are weak (Artle and Varaiya, 1978; Davidoff, 2009, 2010a, 2010b; Nakajima and Telyukova, 2013; Cocco and Lopes, 2014; Hanewald et al., 2016; Yogo, 2016). Moreover, reverse mortgages allow the household members to continue residing in their own house and to consume homeownership-specific utility, for example, derived from the opportunity to "age in place" (Davidoff, 2010c).

Apart from potentially high costs (e.g., Lucas, 2015), the empirical literature hints at several factors including financial literacy and limited product knowledge as potential explanations for the low demand for reverse mortgages. Dillingh et al. (2013) find evidence that bequest motives are related to low demand in household survey data from the Netherlands. Based on Italian household survey data, Fornero et al. (2016) find that high financial literacy is related to lower interest in reverse mortgages as more literate households might be better prepared for retirement. In both the Dutch and the Italian market, however, reverse mortgages are virtually unavailable and the general public has little awareness of the product. Duca and Kumar (2014) find in U.S. household survey data that more financially literate households use fewer home equity lines of credit (HELOC). Davidoff (2015) and Davidoff and Wetzel (2014) find that HECM borrowers do not recognize the significant value of the put option on the borrowers home embedded in HECMs protecting the borrower from home price risk.[2] Based on 31 qualitative interviews in Massachusetts (U.S.), Leviton (2002) conjectures that a reason for low reverse mortgage demand is homeowners' fear of losing their home, because of the their misconceptions and lack of understanding. Anecdotal evidence from the U.S. (CFPB, 2012, 2015; Stark et al., 2014) and survey evidence from Australia (Reed, 2009) suggest that the product's features may be misunderstood by the elderly with potentially negative implications for demand. In addition, a particular feature of the HECM market in the U.S. is that the product is primarily marketed through television and media advertising. Distribution of the product is primarily accomplished through call-centers or brokers, not through banks and community financial institutions (Lucas, 2015). In that sense, it is a unique market where information about the product may not be well diffused. Even the acquisition and interpretation of information about the product may pose a challenge to the elderly. As reverse mortgages are targeted to the elderly, age-related cognitive decline may impair their ability to make appropriate financial decisions (e.g., Li et al., 2013, 2015). The fact that consumers are required to attend a counselling session before entering into a HECM contract (see Section 2), indicates that the government views targeted consumers as having insufficient knowledge.

In general, it is difficult to identify the role of product knowledge in reverse mortgage demand, as large household surveys like the Survey of Consumer Finances (SCF) or Health and Retirement Study (HRS) do not contain information on reverse mortgage holdings. Reverse mortgage origination data is available from the U.S. Department of Housing and Urban Development (HUD). Shan (2011) matches this data with ZIP code level demographic data and county home price growth, and studies ZIP code characteristics correlated with reverse mortgage originations. Moulton et al. (2014) compare the demographic characteristics of households in the HRS with households attending a reverse mortgage counselling session, and those that took a reverse mortgage after attending counselling. These studies find that reverse mortgage take-up rates are higher among households with low income, high home values, and high payments for conventional mortgage debt. Due to the nature of the data used in both studies, however, the focus is on demographic variables rather than an assessment of knowledge about reverse mortgages in the respective overall target group.

Our research contributes to the literature on retirement finance in two ways. First, we assess the knowledge of U.S. elderly homeowners about reverse mortgages. That is, we provide a snapshot of the current knowledge and perceptions of reverse mortgages based on a survey among eligible homeowners. Second, we study how product knowledge and general financial literacy relate to the intention to use reverse mortgages. In doing so, we disentangle general and product-specific literacy. We build on earlier works that study literacy and knowledge for complex financial decisions and products, like debt literacy

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[1] Home equity lines of credit (HELOCs) or conventional mortgages are alternatives to reverse mortgages and allow homeowners to tap into their home equity. However, those homeowners who might especially benefit from reverse mortgages (low savings, low income) often do not pass the required payment to income tests. For reverse mortgages these tests are of lesser importance (see Section 2).

[2] HECMs include a no-negative equity guarantee for the borrower (see Section 2). That is, the borrower is not liable for the part of the loan amount that might exceed the home value when the loan is paid back. Thus, in essence, the borrower owns a put option for selling the home (underlying) to the lender with the loan amount as the strike price.

([Lusardi and Tufano, 2009](#)) and stock market-specific literacy ([Van Rooij et al., 2011](#)). Those studies suggest that for complex products, both domain-specific knowledge and general financial literacy drive financial choices. Our results complement the literature dealing with the difficulties consumers have understanding financial products that generate retirement income. [Brown et al. (2012)](#) analyze annuities and find that product complexity, misunderstanding of the product, and the inability to value the product explain why annuities are rarely used. The HECM is a particularly interesting case because it is a highly complex product that embeds liquidity, longevity and home price insurance in the form of limited liability protection and complex refinancing options, while being geared toward poorer and older households who may be expected to have limited financial literacy.

2. Reverse mortgages and the U.S. HECM program

A reverse mortgage is a non-recourse loan from a private lending institution using the borrower's home as collateral. While a conventional mortgage is used to finance the purchase of a home (and over time home equity is built up), a reverse mortgage works the other way around. Reverse mortgages let borrowers spend home equity or create a credit line without moving out of the home, and without any need to make capital or interest payments to the lender until they move or die.

The loan balance of a reverse mortgage grows over time. Interest accrued is not paid regularly, but added to the loan balance. To ensure that the collateral for the loan stays sufficiently large, the initial loan balance is set well below the appraised home value. The borrower may defer repayment of principal and interest until the loan becomes due when the borrower dies, moves out, or wants to sell the home. Upon one of those events, the borrower (or his heirs) can decide to repay the total outstanding loan balance or to have the property sold. In the latter case, any remaining positive difference between sales proceeds and loan amount will be paid out to the borrower or his heirs. If there is a shortfall, however, the borrower or heirs are not liable (no-negative equity guarantee). Borrowers' longevity and home price risk are thus transferred to the lender.

To protect lenders from the risk of insufficient collateral when the reverse mortgage loan is due, the U.S. Congress created the Home Equity Conversion Mortgage (HECM) program in 1987. This program is backed by the U.S. government. Under this program the lending institution purchases insurance from the Federal Housing Administration to cover the risk of a shortfall. HECMs dominate the U.S. reverse mortgage market, making up about 90% of outstanding reverse mortgages ([Shan, 2011](#)).[3] In this study, we focus on HECM contracts.

In addition to the general reverse mortgage characteristics described above, HECM contracts have a number of specific features. To be eligible for a loan the youngest borrower in a household on the home's title has to be at least 62 years old. The maximum loan value is capped at $625,500. The home either needs to be debt-free or the remaining conventional mortgage debt needs to be repaid with the reverse mortgage proceeds. Borrowers can choose between line-of-credit, annuity, or lump-sum as payout options. The most commonly chosen option is lump-sum ([CFPB, 2012](#)). In 2014 a limit of 60% of the maximum loan amount was placed on the maximum lump-sum available in the first year of the contract ([Munnell and Sass, 2014](#)). Finally, households interested in HECM loans are required to attend a counseling session. Hosted by an independent counselor, the purpose of the session is to clarify any questions about the product, to make sure that specific product knowledge is provided and that households properly understand the implications and consequences of the loan ([MetLife report, 2012](#)). Costs for HECM loans include origination fees, third party closing costs and insurance premiums and total approximately 3–7% of home value.[4] The homeowner remains responsible for paying taxes and insurances, as well as maintaining the home. Not paying taxes or insurance premiums can trigger a foreclosure process.[5] At the time of our survey, there were no income or credit rating checks for the borrower. Beginning in 2015, the borrower is required to undergo a financial assessment to ensure he/she is able to pay taxes and insurance ([HUD, 2014](#)). Borrowers who are deemed unable to make principal and interest payments must hold back some loan proceeds in an escrow account.

3. Data and methodology

3.1. Survey design

To assess reverse mortgage product knowledge and relate it to demand we need data that matches information on product knowledge, product demand, and socio-demographic control variables. Large-scale household surveys such as the HRS or SCF do not specify reverse mortgage holdings or knowledge. The FIT (Financial Interview Tool) survey data, which is collected from each HECM applicant during the mandatory counselling session contains some demographic data, as well as some data about the reasons why a household might consider a reverse mortgage. However, this data includes only the selected subsample of households who are already interested in a HECM and potentially have a more favorable attitude

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[3] Most private competitors to HECM disappeared during the home price bust, so [Shan (2011)](#) likely understates today's HECM's market share.

[4] http://www.newretirement.com/reverse-mortgage/reverse-mortgage-interest-rates.aspx

[5] [Moulton et al. (2015)](#) report that 12% of HECM loans experienced a technical default due to not paying insurances or taxes. A foreclosure process is, however, not triggered right away. For example, untapped HECM loan balances are used to pay outstanding amounts or refinancing options are evaluated.

towards them when compared to the general population. Thus, existing data is not suited to address our research question. For that reason, we designed a survey to elicit the information of interest.

The survey was distributed to a representative sample of U.S. homeowners aged 58+ in November 2013 by SurveyMonkey. Thus, our sample population is not limited to the target group for reverse mortgages (house rich, cash poor), and is close to or already eligible for a HECM reverse mortgage, as the lower age boundary for HECM contracts is 62 (see Section 2). SurveyMonkey recruited participants and incentivized them by donating 50 cents to a charitable organization to be chosen by the participant and by letting participants take part in a lottery to win $100. The questionnaire assesses respondents' reverse mortgage knowledge and perceived complexity of HECMs, and their intention to use a reverse mortgage. Drawing on predictions from life-cycle models and previous studies' arguments explaining low product demand, we also include questions eliciting, for example, bequest motives, risk aversion, debt aversion, and home attachment.

The first five questions of the questionnaire assess general attitudes towards conventional and reverse mortgages and ask about familiarity with reverse mortgages. Next, three questions assess general financial literacy (Lusardi and Mitchell, 2011) and 13 questions assess HECM knowledge (described in detail in Section 3.2). Respondents are then asked whether they have any personal experience with reverse mortgages, and to specify the minimal payout ratio (i.e., the fraction of the home value paid out as a lump sum) required to determine if a reverse mortgage is a good deal. Next, respondents are randomly assigned to two experimental conditions. Approximately half (51.3%) of the respondents proceed with the questionnaire, while the other half (48.7%) is first shown an explanation of HECMs and their features, that is, knowledge about product features is provided (see Section 4.4). Then, this group proceeds with the questionnaire as well.

Afterwards, the intention to use a reverse mortgage is elicited by the question: "In general, how likely is it that you will be taking out a reverse mortgage (HECM)?" (scored on a Likert scale from 1 to 7, with 1 = not likely at all to 7 = very likely). Perceived complexity is elicited by asking agreement to the following statement: "Reverse mortgages (HECMs) are complex products." (scored on a Likert scale from 1 to 7, with 1 = totally disagree to 7 = totally agree). In the questionnaire's final part, demographic information and potential demand factors based on previous literature on reverse mortgage demand are elicited. For example, we obtain information about age, household income, household savings, bequest motives, subjective life expectancy, subjective health, debt aversion, and home attachment. Table 1 contains variable definitions, survey questions, and corresponding summary statistics. In Section 3.3 we compare our respondent characteristics with respondents in the Survey of Consumer Finances.

A total of 575 fully completed questionnaires were obtained from SurveyMonkey. Eighteen respondents were removed from the sample because matching demographic information provided directly by SurveyMonkey (gender and highest education level) was not available. Finally, we have 557 complete questionnaires for analysis.

3.2. Eliciting product knowledge

To measure product knowledge we use 13 questions. The questions are designed to assess knowledge about the main characteristics of reverse mortgages. We developed the questions by building on the literature that hints at a general misunderstanding among elderly homeowners of debt contracts and reverse mortgages (Leviton, 2002; Lusardi and Tufano, 2009; Reed, 2009; CFPB, 2012; Stark et al., 2014) as well on the FIT (Financial Interview Tool) reverse mortgage counselling questionnaire. Based on responses to the 13 questions, we construct a reverse mortgage knowledge score. Each correctly answered question scores one point. Thus, after totaling the score for the 13 questions, the knowledge score ranges between 0 and 13, where 13 means perfect understanding of revere mortgage features (all results reported subsequently are robust to constructing the knowledge score alternatively based on a factor analysis (Appendix A) or item response theory (Appendix B)). The wording of the individual questions and descriptive statistics on the percentage of correct answers is given in Table 2. Questions are labeled rmk'X', as an acronym for "reverse mortgage knowledge", question number "X".

In Table 2, the questions rmk6 (minimum age requirement) and rmk11 (maximum percentage of home value that a reverse mortgage would pay out as a lump-sum) contain a baseline and an alternative specification, which differ in how the intervals are set to count answers to the questions as being correct. Responses to these two questions may vary depending on whether respondents perceive the questions as being asked about HECMs in particular or reverse mortgages in general. We cannot rule out that respondents know about other reverse mortgages products. For the baseline specification used throughout the paper, we treat all answers as correct if they would fit reverse mortgages in general. Our alternative specification (given in parentheses) is restricted to those answers that are correct specifically for HECMs. At the time the survey was distributed, no income or credit score checks were required to qualify for a HECM. The loan was entirely secured by the home serving as collateral. The HECM program has been restructured to prevent borrowers from defaulting on the loan by being unable to pay property taxes and insurance (see, e.g., HUD, 2014; Moulton et al., 2015). As of 2015, lenders must perform credit and income checks on potential borrowers. Because some of the survey respondents may have been aware of these proposed changes in 2013, we ran the regressions in Sections 4.1 and 4.2 leaving out the question about prerequisites of reverse mortgages (rmk3). Results obtained were in line with the main specification. The same holds for using the alternative classification of correct responses.[6]

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[6] Results are available on request.

Table 1
Variable definitions.

Variable	mean	sd	med	Definition
RM known	0.97	0.16		Indicator variable taking the value 1 if respondent already heard about reverse mortgages; 0 otherwise
RM experience	0.02	0.13		Indicator variable taking the value 1 if participant has prior experience with reverse mortgages; 0 otherwise
RM knowledge	5.87	2.62	6	Aggregate reverse mortgage-specific knowledge score composed of 13 items: 0 = no question correct . . . 13 = all thirteen questions correct (details on the survey questions are given in Table 2)
Intention to use	1.60	1.25	1	Intention to use a reverse mortgage based on responses to the following question: "In general, how likely is it that you will be taking out a reverse mortgage (HECM)?˝1 = not likely at all . . . 7 = very likely
RM good deal	3.18	1.35	4	Agrement to the statement: "A reverse mortgage is generally a good deal.˝ 1 = totally disagree . . . 7 = totally agree
HECM penetration	0.03	0.02	0.03	Market penetration of HECM loans, based on ZIP code
Others known w. RM	0.18	0.38		Indicator variable taking the value 1 for respondent knowing other people who have a reverse mortgage; 0 otherwise
Required payout	79.99	34.21	80	Required payout (in% of home value) from a reverse mortgage to rate it as a good deal
Prob. loan underwater	44.21	34.05	50	Probability that loan balance exceeds home value based on responses to the following question: "How likely is it that the reverse mortgage loan balance over time becomes larger than the home value? Indicate a number ranging from 0 to 100, where 0 means 'impossible' and 100 means "for sure"."
Complex	5.39	1.61	6	Self-assessed product complexity based on responses to the following statement: "Reverse mortgages are complex products.˝1 = totally disagree . . . 7 = totally agree
Conv. mortgage	0.58	0.49		Indicator variable taking the value 1 for having a mortgage on home; 0 otherwise
Gender	0.49	0.50		Gender: 0 = female, 1 = male
Age	64.84	5.86	64	Age of respondent in years as of November 2013
Marital status	0.75	0.43		Indicator variable taking the value of 1 for respondent being married; 0 otherwise
Retirement	0.54	0.50		Indicator variable taking the value of 1 for respondent being already retired; 0 otherwise
Higher education	0.74	0.44		Indicator variable taking the value of 1 for respondent reporting highest education being "associate or bachelor degree" or "graduate degree"; 0 for respondent reporting highest eduaction being "less than high school degree", "high school degree", or "some college".
White	0.92	0.26		Indicator variable taking value of 1 for respondent being white; 0 otherwise
Children	0.79	0.41		Indicator variable taking the value 1 if respondent has children; 0 otherwise
Bequest motive	4.92	1.96	5	Self-expressed bequest motive based on responses to the following statement: "I would like to leave an inheritance.˝1 = certainly not . . . 7 = certainly yes
Financial literacy	2.60	0.71	3	Aggregate financial literacy score: 0 = no question correct . . . 3 = all three questions correct (Lusardi and Mitchell, 2008)
Planning skill	4.94	1.39	5	Self-assessed financial planning skills based on responses to the following question: "In general, how would you assess your understanding of financial planning?˝1 = very poor . . . 7 = very good (HRS)
Risk aversion	6.25	2.19	6	Risk aversion based on responses to the following question: "Are you generally a person who is willing to take risk?"1 = unwilling to take risk . . . 10 = willing to take risk (Dohmen et al., 2011)
Debt aversion	5.06	1.85	5	Debt aversion based on agreement to the following statement: "Being in debt is never a good thing.˝1 = disagree . . . 7 = totally agree

Table 1 (*Continued*)

Variable	mean	sd	med	Definition
Broker trust	3.24	1.46	3	Trust in mortgage brokers based on agreement to the following statement: "Mortgage brokers are people that generally can be trusted.í 1 = totally disagree . . . 7 = totally agree
Health	2.26	0.93	2	Self-perceived health: 1 = excellent . . . 5 = poor (HRS)
Subj. life expectancy	0.82	0.25		Subjective life expectancy based on responses to the following question: "What chance do you think there is that you will live another 10 years or more? Please indicate the chance on a sclae of 0 to 100, where 0 means 'no chance at all' and 100 means "absolutely certain"."
Obj. life expectancy	0.75	0.15	0.80	10-year life expectancy (based on Lee-Carter stochastic mortality model)
Health insurance	0.82	0.38		Indicator variable taking the value 1 for respondent having health insurance; 0 otherwise
Long-term care insurance	0.28	0.45		Indicator variable taking the value 1 for respondent having long-term care insurance; 0 otherwise
Home value	680	4000	250	Current home value (in $ '000)
Past home value growth	2.84	1.07	3	Subjective past development of home value based on responses to the satatement: "Over the last 5 years do you think the value of your home. . .í 1 = increased a lot (greater than 20%), 2 = increased moderately (between 5% and 20%), 3 = remained rather stable (between 5% and −5%), 4 = decreased moderately (between −5% and −20%), 5 = decrease a lot (greater than −20%)
Expected home value growth	2.38	0.70	2	Subjective future development of home value based on responses to the statement: "Over the next five years do you think the value of your home will. . .í 1 = increase a lot (greater than 20%), 2 = increase moderately (between 5% and 20%), 3 = remain rather stable (between 5% and −5%), 4 = decrease moderately (between −5% and −20%), 5 = decrease a lot (greater than −20%)
House price fluctuations	5.48	1.42	6	Agreement to statement "House prices can fluctuate a lot": 1 = totally disagree . . . 7 = totally agree
Stay home 7+	0.71	0.45		Indicator variable taking the value 1 if respondent plans to stay in current home for at least seven more years; 0 otherwise (FIT)
Home attachment	17.72	12.29	15	Home attachment based on responses to the following question: "How many years have you lived in your current home? (Enter the closest round number. If you have live in your current home less than a year, please enter 1.)"
Household savings	103.68	60.46	150	Total value of household savings (in $ '000) elicited with the question: "Excluding home value, what is the total value of your household savings? (including for example checking accounts, savings accounts, stocks, mutual funds, retirement accounts)ẅith answer choices being: 'less than $1500', "between $1500 and $10,000", "between $10,000 and $35,000", "between $35,000 and $100,000", and "more than $100,000". As savings measure, interval mid-points are used. The upper bound of savings is set to be equal to $150,000.
Sufficient savings	4.07	2.00	4	Consent with "I have enough savings": 1 = certainly not . . . 7 = certainly yes
Household income	59.82	21.96	75	Average yearly household income (in $ '000) elicited with the question: "What is your approximate average household income per year?ẅith answer choices being: 'under $10,000', "between $10,000 and $20,000", "between $20,000 and $35,000", "between $35,000 and $500,000", and "over $500,000". As income measure, interval mid-points are used. The upper bound of income is set to be equal to $75,000.
Sufficient pension	4.69	1.95	5	Consent with "I have/expect to have sufficient pension income": 1 = certainly not . . . 7 = certainly yes
N	557			

This table presents variable names, summary statistics, and definitions for the survey data. References for survey question wording which is based on existing literature or surveys are given in parentheses. RM abbreviates "Reverse Mortgage", HECM is "Home Equity Conversion Mortgage", HRS is "Health and Retirement Study", and FIT is "Financial Interview Tool." Home value is winsorized at the top 2% level.

Reverse Mortgage Knowledge.

Variable	Feature	Survey Question	Correct Answer	Percent			Continuous Response		
				Correct	Wrong	Don't Know	Mean	Median	Std
rmk1	unlock equity	A reverse mortgage allows you to withdraw wealth invested in your home.	true	82.59	6.64	10.77			
rmk2	loan character	A reverse mortgage helps you be debt-free if used to repay an existing mortgage.	false	43.63	28.55	27.83			
rmk3	prerequisites	For getting a reverse mortgage, your credit history and income will be checked.	false	19.93	50.99	29.08			
rmk4	loan balance	Over time, the loan balance of a reverse mortgage… [shrinks/stays constant/grows]	grows	46.68	26.39	26.93			
rmk5	life-long living right	Even when the reverse mortgage loan balance becomes larger than the home value, you do not have to move out.	true	56.01	8.26	35.73			
rmk6	age requirement	To be eligible for a reverse mortgage (HECM), how old do you have to be at least?	60–65 years (62 years)	71.10 (27.11)	28.90 (72.89)	n/a	58.62	62.00	11.99
rmk7	interest payments	When do you have to make interest payments on a reverse mortgage? [every month/once a year/when the loan is paid back/never]	when the loan is paid back/never	51.16	11.49	37.34			
rmk8	non-recourse loan	If the reverse mortgage loan balance is larger than the house value, the lender can force you to pay the loan off with other assets.	false	33.93	15.26	50.81			
rmk9	home protection	If you are unable to make your interest pay-ments on the reverse mortgage loan, a foreclosure process can be started on your home.	false	33.75	20.11	46.14			
rmk10	interest rates	When interest rates are higher, one gets less money when taking out a reverse mortgage.	true	28.37	19.57	52.06			
rmk11	costs	What percentage of home value are the likely costs for getting a reverse mortgage? [0.5%/1%/3%/…/15%]	3%–7% (5%)	19.82 (8.73)	15.82 (26.91)	64.36	5.45	5.00	4.30
rmk12	obligations	If you have a reverse mortgage, for which items do you still have to pay yourself? [property taxes/homeowner insurance/repair and maintenance/none of these]	property taxes; homeowner insurance; repair and maintenance costs	73.61	10.95	15.44			
rmk13	payout	How much of a home's value would a reverse mortgage (HECM) currently pay out as a lump sum to a 62-year old borrower? [5%/10%/…/130%]	40%–70%	30.70	69.30	n/a	58.48	60.00	31.41

This table presents the 13 questions used to construct the reverse mortgage knowledge score. Content in square brackets depicts the choices available to respondents; values in parentheses display alternative percentages correct/wrong if the narrower answer range is counted being correct. The variables' ordering resembles the original sequence in the survey.

Table 3
Comparison of Survey Respondents' Characteristics with the Survey of Consumer Finances.

			This Survey	SCF
Age	mean		64.84	69.91
	median		64	68
Health	excellent	%	19.57	18.97
	very good	%	46.50	
	good	%	24.96	46.60
	fair	%	6.64	25.90
	poor	%	2.33	8.52
Race	white	%	92.46	83.66
	black/afr.-am.	%	1.08	9.85
	hispanic/latino	%	0.90	3.90
	other	%	1.26	2.58
Education	<high school	%	0.54	12.00
	high school	%	6.46	33.83
	some college	%	19.21	15.80
	college degree	%	73.79	38.37
Bequest motive	not important	%	23.52	19.72
	somewhat imp.	%	16.16	31.90
	important	%	28.73	27.11
	very important	%	31.60	21.27
Household income	<10 k	%	2.33	2.97
	10–20 k	%	4.49	14.45
	20–35 k	%	11.67	34.52
	35–50 k	%	16.34	17.17
	>50 k	%	65.17	48.30
Household savings	<1.5 k	%	9.16	13.83
	1.5–10 k	%	6.82	13.47
	10–35 k	%	7.90	13.63
	35–100 k	%	15.44	13.67
	>100 k	%	60.68	45.40
Home value ('000)	mean		680	270
	mean (winsorized)		337	
	median		250	170
Conv. Mortgage	yes	%	59.07	43.21
N			557	1852

This table compares summary statistics of the current survey with the 2013 wave of Survey of Consumer Finances (SCF). Statistics from SCF are for the subset of respondents that match our survey criteria, that is, homeowners aged 58+. Savings in the SCF correspond to the variable financial assets, home value to the value of the primary residence. Home value from our survey is reported twice: once based on the raw data and once winsorized at the top 2% level.

3.3. Survey data quality and additional data sources

SurveyMonkey samples from a representative pool of respondents. To check for representativeness of survey responses, we compare the survey information on income, savings, age, home value, education, race, bequest motives, and conventional mortgage debt with data from the 2013 wave of the Survey of Consumer Finances (SCF). Comparison with the SCF in Table 3 shows that our sample is fairly representative for U.S. homeowners aged 58+ on some but not all dimensions. Dimensions on which we observe some differences are included among the control variables in the regression analyses in Section 4.

Compared to the SCF statistics, respondents in our sample are better educated, and have slightly higher income and wealth. Average home value, however, is substantially larger in our sample ($680,000) than in the SCF ($270,000). A comparison with the sample median home value ($250,000) shows that the high average home value in our sample is driven by outliers (e.g., one respondent reporting a home value of $80 million) potentially caused by typos (respondents were ask to enter a number for the home value while for income and savings answer brackets were given). In order to account for such outliers, we winsorize the home value variable at the top 2 percentile. The winsorized variable, which is used in later analysis, has a mean of $337,000. This variable is highly correlated ($\rho = 0.400$, p-value = 0.000) with five digit ZIP code level median home value from 2012 ACS (American Community Survey) data, whereas the correlation of the raw home value with ACS data is low ($\rho = 0.083$, p-value = 0.052).

To further check the quality of our survey data and to generate additional control variables for the regressions in Section 4, we match the survey data based on respondents' five digit ZIP codes with HECM reverse mortgage origination data from HUD (U.S. Department of Housing and Urban Development) and ACS data. The HUD HECM origination data contains complete mortgage level origination data for the U.S. through November 2011. We first use the HUD data to calculate the number of reverse mortgages outstanding per ZIP code as of November 2011. Then, from the ACS data we use the matching 2011 wave to gather information on the number of households per ZIP code that are eligible for a reverse mortgage. The ACS contains ZIP code level information on the number of households aged 65+ as well as the fraction of homeowners aged 65+. Multiplying these numbers gives a close proxy for the number of households per ZIP code that are eligible for a reverse mortgage (a

perfect proxy would include homeowners households aged 62 +). Finally, by dividing the number of reverse mortgages outstanding (HUD) by the number of homeowners eligible for a reverse mortgage (ACS) we generate a ZIP code level reverse mortgage penetration variable (HECM penetration). ZIP codes are heterogeneous with regard to HECM penetration as the variable ranges between 0% and 17%. Mean (median) HECM penetration is 3% (2.5%), with a standard deviation of 2%. To check for the quality of our survey data, we relate this variable to the survey variable indicating whether a respondent knows somebody else having a reverse mortgage. This survey indicator variable is positively (ρ = 0.158, *p*-value = 0.000) correlated with the objective penetration variable. That is, respondents are more likely to report knowing a reverse mortgagor if they live near relatively more reverse mortgage borrowers.

In addition, we use MSA (Metropolitan Statistical Area) level data from the Federal Housing Finance Agency on home price growth in the five year period preceding our survey. We match that data to our respondents based on the respondents' ZIP codes and the corresponding MSA data. Next, we compare this objective home price growth data with the subjective five year past home price growth reported by respondents. As the subjective home price growth is reported in brackets (see Table 1), we recode the objective data into the same brackets. Both variables are positively and significantly correlated. The Spearman correlation coefficient between both measures is 0.212 (*p*-value = 0.001), which is rather high considering that the match of the objective with the subjective data is not perfect as the objective data is only available on the MSA level.

Similarly, the survey-based subjective probabilities to survive another ten years are close to their objective counterparts (calculated based on gender and age-specific U.S. data from the Human Mortality Database and a Lee-Carter Model mortality projection). On average, respondents overestimate their objective probability to survive by 6.5 percentage points (compare Table 1), which is in line with studies on subjective life expectancies of the elderly (e.g., Hamermesh, 1985; Hurd et al., 2009).[7]

4. Results

4.1. What do elderly homeowners know about reverse mortgages?

Table 1 contains descriptive statistics on the characteristics of respondents in our sample (reverse mortgage knowledge per question is given in Table 2). Of all respondents, 58% have a conventional mortgage on their home; 97% indicate that they have heard about reverse mortgages; 18% of the respondents know at least one other person that has a reverse mortgage. Ten respondents, about 2% of the sample, have practical experience with reverse mortgages, which is in line with actual take-up rates (Shan, 2011). The mean response for perceived complexity of reverse mortgages is 5.4 (on a 7-point scale with 7 indicating highest complexity). That is, respondents rate reverse mortgages to be fairly complex.

Respondents' average score for self-assessed financial planning skills is 4.94 out of 7 points, and 2.60 points (out of 3) for financial literacy. The fraction of correctly answered financial literacy questions is in line with the pattern documented in Lusardi and Mitchell (2011). In our sample, 87.43%, 90.48%, and 81.69% of respondents were able to correctly answer questions regarding interest compounding, inflation, and diversification, respectively. The percentage of correctly answered questions in our sample is higher than the sample used by Lusardi and Mitchell (2011), that is, 67.1%, 75.2%, and 52.3%. However, the fraction of white and well- educated respondents in our sample also is higher than in Lusardi and Mitchell (2011), who also report results split by race and education. White individuals answer the questions on interest compounding, inflation, and risk diversification correctly at rates of 72.3%, 78.5%, and 55.2%, respectively. For individuals with higher levels of education (who attended college or more), percentage of correctly answered questions is 81.2%, 85.1%, and 70.2%. Thus, our sample's responses are in line with results for individuals that have similar characteristics.

Next, we present details on the variables rmk1–13 that constitute reverse mortgage product knowledge. These are the 13 items we subsequently use to create the reverse mortgage knowledge score.

Three questions are answered correctly by most respondents (Table 2). Rmk1 checks respondents' understanding of the most basic feature of reverse mortgages, the ability to liquidate housing wealth (83% correct). Rmk6 asks for the minimum age requirement (62 years) to be eligible for a HECM mortgage. This question is correctly answered by 71% (applying the less strict answer range of 60–65 years) or 27% (applying only age 62 as the correct answer). Rmk12 asks about the costs the borrower is still responsible for, that is, property taxes, homeowner insurance, and repair and maintenance costs (74% correct).

Four questions are answered correctly by roughly half of the survey respondents. Forty-four percent of all respondents know that if they use the proceeds to repay a conventional mortgage, they will not be debt-free by taking on a reverse mortgage. Rmk4, which determines whether respondents are aware that the loan balance grows over time due to accrued interest being added to the loan balance, has 47% correct answers. Fifty-six percent of the respondents indicate correctly that a reverse mortgage grants a life-long right for the borrower to remain in the home even if the loan balance exceeds the

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[7] A potential problem with online surveys is that respondents might look up the information being asked for on the internet. To address this potential issue, we include in the regression explaining knowledge (see Section 4.2) survey completion time as a covariate (detailed results available on request). The coefficient for survey completion time (in s) is not significant and virtually equal to zero (0.0003). Thus, it is unlikely that some respondents perform better on the knowledge questions because of looking up information on the internet. Moreover, there may be an offsetting effect conceivable in that quicker respondents might be more knowledgeable.
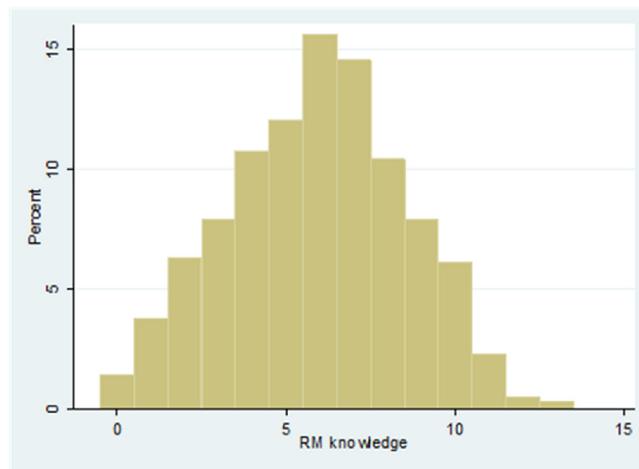
Fig. 1. Distribution of the Reverse Mortgage Product Knowledge Score This figure shows the distribution of the 13 item reverse mortgage product knowledge score.

home value (rmk5). The probability perceived for this event to happen is on average 44% (compare Table 3) which is higher than the historical probability of 10% (Hong and Lee, 2012) for reverse mortgage loans being assigned to the Federal Housing Administration (not all of these loans are necessarily underwater).[8] That no regular interest payments have to be made on a reverse mortgage loan is correctly indicated by 51% of our sample's respondents (rmk7).

Based on the percentage of correct answers, the remaining reverse mortgage knowledge questions turn out to be the most difficult ones. Roughly one third or less of our respondents correctly answer questions rmk3, 8, 9, 10, 11, and 13.

Rmk3 asks about prerequisites for a reverse mortgage loan and is correctly answered by 20% of respondents. Here, we identify whether survey respondents know that there are no credit history checks and income requirements, since the loan is backed exclusively by the home as collateral. To determine whether respondents are aware of the protection reverse mortgages offer from over indebtedness (non-recourse nature of the loan), we have them answer a true or false question about whether a lender can force a borrower to repay the loan with other assets than the home if the loan balance exceeds home value (rmk8). Unlike conventional mortgages, interest on a reverse mortgage is added to the loan balance and the borrower is not obliged to regularly pay interest. Hence, there can be no foreclosure process because of inability to make interest payments.[9] We elicit whether respondents are aware of this fact in item rmk9. Both rmk9 and rmk8 are answered correctly by only one third (34% for each) of respondents.

Slightly more than a quarter (28%) of the respondents understand that a higher loan interest rate results in lower total borrowing amount (rmk10). Rmk11 captures awareness about the costs borne by opting for a reverse mortgage, which are approximately 5% of home value (Section 2). Only 20% of all respondents answer this question correctly if the correct answer range for costs is set to 3–7%.

Rmk13 asks respondents to estimate the approximate payout ratio (as a percentage of home value) applicable to a 62-year old reverse mortgage borrower. At the time of the survey, this payout ratio was around 50% based on quotes from an online reverse mortgage calculator.[10] The mean (median) response for this question is 58% (60%). However, only 31% of respondents, using a range from 40 to 70% for correct answers, answer this question correctly.[11] Interestingly, the mean response to a question about the payout ratio that respondents would require to rate a reverse mortgage a good deal is 80% (compare Table 1). That is, the average "desired" payout ratio exceeds the payout ratio offered by the market. In particular, 26% of respondents indicate a higher desired payout ratio, than what they believe (rmk13) a reverse mortgage would actually pay.

Next, we aggregate the responses to the 13 product knowledge questions into the reverse mortgage knowledge score (0 points for each incorrect and "don't know" response, 1 point for each correct answer). The resulting mean knowledge score is 5.91; the 25% (50%; 75%) quartile is 4 (6; 8). Fig. 1, showing the distribution of the reverse mortgage knowledge score, highlights that there is considerable heterogeneity in respondents' reverse mortgage product knowledge.

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[8] Of all loans (origination years 1989 to 2011) in the HUD HECM origination data (see Section 3.3), 1.4% are flagged as having been underwater when the mortgage was terminated. Looking only at loans originated before 2000 (and thus having had a longer time to become underwater) 3.3% of loans are flagged of having been underwater.

[9] There can be a foreclosure process because of inability to pay taxes or insurance premiums, but the survey question explicitly mentioned only interest payments.

[10] http://www.reversemortgage.org/About/ReverseMortgageCalculator.aspx

[11] We use a range that is −10% to +20% around the correct payout ratio. We use a higher upper end of the range as the payout ratio increases strongly with age (Shan, 2011). Many borrowers in the sample are older than 62 and might have answered this question reflecting more their own situation.

For the main analyses we use this reverse mortgage knowledge score. Analyses based on extracting a single factor from the knowledge score, differentiating between whether an item was answered correctly or incorrectly or "don't know" vs. another answer, yield results in line with the main results (see Appendix A). Likewise, modelling heterogeneity in question difficulty explicitly based on item response theory yields results in line with the main results (see Appendix B).

4.2. Reverse mortgage product knowledge and respondent characteristics

In this section, we relate reverse mortgage product knowledge to respondent characteristics. We first regress the 13-item knowledge score on a set of basic demographic characteristics (age, being retired, gender, education, race, marital status, having children, income, savings, home value) and a set of variables potentially related to financial sophistication and experience with reverse mortgage products (financial literacy, financial planning skills, number of people known with a reverse mortgage, personal experience with reverse mortgages, ZIP code-specific HECM penetration). Next, in a second regression model, we add a set of variables based on previous empirical and theoretical literature that might also play a role in respondents' perceptions of reverse mortgages (see, e.g., Davidoff, 2009; Nakajima and Telyukova, 2013; Cocco and Lopes, 2014; Fornero et al., 2016; Hanewald et al., 2016). In addition, we include the survey item eliciting the perceived complexity of reverse mortgages products. Regression results are given in Table 4.

With respect to demographics (Table 4, model 1), older, male (potentially proxying the household's financial planner), and white respondents have a better understanding of reverse mortgages. General financial literacy and self-assessed financial planning skill are positively and significantly related to knowledge.

When adding the additional set of variables to the regression model (Table 4, model 2) we find that having long-term care insurance is negatively related to knowledge. Having insurance potentially decreases the necessity to rely on home equity to fund future medical expenses and care costs. However, the theoretically expected relationship is complex and ambiguous (Davidoff, 2009). Higher trust in mortgage brokers is negatively related to knowledge indicating that greater reliance on a broker's expertise reduces incentives to acquire own knowledge. The negative and significant coefficient for risk aversion is potentially in line with the theoretical predictions of Eeckhoudt and Godfroid (2000). That is, the value of acquiring information can fall with risk aversion if a decision maker in advance had expected a high likelihood not to take action (and thus the information is likely not to be valuable). Age is no longer (marginally) significant in the second model specification. Less knowledge is marginally significantly associated with respondents rating the product to be more complex.

Having personal experience with the product and knowing others with a reverse mortgage is positively and significantly related to product knowledge.[12] These results hold even though we control for ZIP code-specific HECM penetration and thus unobserved location-specific factors related to reverse mortgage knowledge. That is, peer effects seem to play an important role for knowledge about reverse mortgages.

Generally, regression results indicate a striking tendency: Those respondents that would benefit most from reverse mortgages and thus should have more incentives to acquire knowledge about the product do not have better knowledge about the product than other respondents. For example, neither having lower income, higher home values, lower savings, existing mortgage debt, nor having (no) children are associated with greater product knowledge.

The regression in model 2 includes two variables for both savings and income: the dollar measures for both income and savings, as well as subjective evaluations of each measure (sufficient savings, sufficient pension income). The insignificance of the coefficients for the subjective measures might be caused by multicollinearity between the objective and subjective measures. When using only the subjective measures, the model yields a positive and marginally significant coefficient of 0.136 (p-value = 0.065) for the subjective evaluation for savings. Respondents who evaluate their savings to be sufficient know more about reverse mortgages. Once again, this indicates that respondents who have better financial planning skills and are better prepared for retirement have better product knowledge.[13] This is contrary to the notion that those individuals who are more in need of the benefits that may be derived from a reverse mortgage might have a greater incentive to acquire the knowledge necessary to become consumers of the product.

Overall, product knowledge is explained by financial sophistication, being well-prepared for retirement, individual experience with the product as well as knowing peers having the product, but not by financial needs to obtain a reverse mortgage.

4.3. Reverse mortgage knowledge and intention to use a reverse mortgage

Next, we analyze respondents' intention to use a reverse mortgage. In general, the intention is low, which is in line with actual demand numbers. The mean of intention to use a reverse mortgage is 1.6 (range = 1 to 7, where 1 = "not likely at

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[12] An alternative specification, in which we exclude the ten respondents with personal reverse mortgage experience from the sample yields similar results in terms of coefficient magnitudes and significance (detailed results available on request).

[13] These findings are potentially consistent with the evidence in Meier and Sprenger (2013) and Lusardi et al. (2015). These authors show, that individuals who put a greater weight on future consumption (i.e., discount the future less or have a need to transfer financial resources over time) acquire more financial literacy as the future benefits from this investment are valued more and returns on financial investments might be improved. We do not assess subjective discount factors or a preference for saving, but being better prepared for retirement may proxy for putting greater emphasis on future consumption.

Table 4
Explaining Reverse Mortgage Product Knowledge.

	RM knowledge (1)	RM knowledge (2)
Age	0.037*	0.022
	(0.021)	(0.022)
Retirement	0.033	−0.076
	(0.242)	(0.250)
Gender	0.696***	0.564**
	(0.216)	(0.223)
Higher education	0.217	0.234
	(0.248)	(0.250)
White	0.996**	0.894**
	(0.401)	(0.398)
Marital status	0.053	−0.028
	(0.267)	(0.265)
Children	0.224	0.323
	(0.263)	(0.273)
Ln(household income)	−0.061	0.102
	(0.222)	(0.228)
Ln(household savings)	0.075	0.060
	(0.080)	(0.087)
Ln(homevalue)	0.027	−0.058
	(0.195)	(0.201)
Financial literacy	0.780***	0.690***
	(0.165)	(0.168)
Planning skill	0.305***	0.283***
	(0.082)	(0.085)
Conv. mortgage	0.041	0.085
	(0.225)	(0.231)
RM experience	1.906**	1.958**
	(0.802)	(0.797)
Others known w. RM	0.532*	0.551**
	(0.273)	(0.273)
HECM penetration	5.176	4.456
	(5.088)	(5.148)
Stay home 7+		0.135
		(0.238)
Subj. life expectancy		−0.857*
		(0.483)
Health		0.027
		(0.127)
Health insurance		−0.370
		(0.279)
Long-term care insurance		−0.644***
		(0.238)
Sufficient savings		0.117
		(0.077)
Sufficient pension		−0.026
		(0.072)
Broker trust		−0.243***
		(0.073)
Bequest motive		0.037
		(0.056)
Risk aversion		−0.133**
		(0.052)
Debt aversion		0.043
		(0.059)
Past home value growth		0.153
		(0.108)
Expected home value growth		−0.216
		(0.178)
Home attachment		0.008
		(0.009)
House price fluctuations		0.001
		(0.076)
Complex		−0.110*
		(0.065)
Constant	−2.199	0.206
	(2.530)	(2.913)
Observations	557	557
Adj. R^2	0.196	0.247

This table presents the results from OLS regressions of the 13 item reverse mortgage product knowledge score on respondent characteristics. Variables are defined in Table 1. Standard errors are given in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

all" to 7 = "very likely"). We regress respondents' intention to use a reverse mortgage on the reverse mortgage knowledge score and additional variables.[14] We employ the same independent variables used previously to explain reverse mortgage product knowledge (compare Table 4, models 1 and 2), with one exception. We exclude the variable indicating personal experience with reverse mortgages (currently having one or having had one in the past) from the regression model and the corresponding 10 respondents from the sample. Table 5 (models 1 and 2) contains the regression results.

4.3.1. Knowledge and financial literacy

We find a significant positive relation between knowledge and the intention to use a reverse mortgage. Better understanding of reverse mortgages is related to higher intention to use a (HECM) reverse mortgage. General financial literacy, however, is marginally significantly and negatively related to the intention to use a reverse mortgage (model 2). The latter result resembles the Italian survey evidence from Fornero et al. (2016), and the U.S. evidence in Duca and Kumar (2014) for standard home equity conversion loans. Note however, that the channel through which financial literacy operates in our case is not clear. Duca and Kumar (2014) conjecture that less financially literate households underestimate the downside risks from borrowing against one's home and for that reason borrow more (or even too much). For reverse mortgages, however, there is virtually no risk for the homeowner, as they have a lifelong living right and the loan is non-recourse. Potentially, homeowners' widespread misconception about the protective features of reverse mortgages may make the more financial literate shy away from the product as well. Alternatively, the financial literacy variable may be related to various aspects regarding being financially prepared for retirement, not fully controlled for by the measures for income and savings. Thus, as more financially sophisticated households have potentially better planned for retirement, there is less need for them to extract home equity.

4.3.2. Peer effects

Knowing other people who have a reverse mortgage is positively related to the intention to use a reverse mortgage. The coefficient for this variable is significant in all models, even when we control for ZIP code specific HECM penetration. Hence, the variable is picking up peer effects and not unobserved location specific factors related to reverse mortgage demand. This finding relates to the literature on peer effects in financial and retirement decision making. For example, Duflo and Saez (2002, 2003) find that enrollment in a pension plan, as well as investment decisions are impacted by peer effects. Hong et al. (2004) and Brown et al. (2008) find that an individual's stock market participation increases through word-of-mouth communication and social interaction. Chalmers et al. (2014) find that retirement timing decisions are influenced by having coworkers in a similar decision situation. In our case, both familiarity with the product through personal knowledge, and knowing other people who have a reverse mortgage increase the intention to use a reverse mortgage. In fact, both of these variables, are amongst the regressors that have the largest explanatory power for the intention to use a reverse mortgage based on a decomposition of the R^2 (Owen values) of the regression model (2). Knowing other people explains 11.60%, personal knowledge 9.72% of the R^2. Two other important variables are having a conventional mortgage (13.29%) and sufficient savings (11.13%). Note that peer effects increase the intention to use a reverse mortgage in two ways. First, peer effects serve to increase objective familiarity and general product knowledge (see Section 4.2). Second, as we control for knowledge in the regressions shown in Table 5, it is apparent that peer effects also increase perceived familiarity of the product.

Finding evidence for peer effects further supports the interpretation that (lack of) knowledge about reverse mortgages drives the (low) demand. Peer effects emerge especially in decision environments characterized by complexity, uncertainty about decision outcomes, little individual experience and knowledge, long-term tradeoffs, and delayed and noisy feedback. In such environments an individual is more likely to follow the behavior of peers by inferring good and appropriate decisions (e.g., Park and Lessig, 1977; Mitchell and McGoldrick, 1996; Steinberg and Monahan, 2007).

4.3.3. Further factors

A stronger bequest motive reduces the intention to use a reverse mortgage (model 2). That is, as taking out a reverse mortgage (and consuming the proceeds) lowers the bequest, respondents with higher bequest motives are reluctant to opt for a reverse mortgage.

Total household savings have no significant relationship with the intention to use a reverse mortgage in model 1, but contrary to expectations, there is a positive and significant relationship in model 2. Model 2 includes, however, also the subjective savings measure. The coefficient for the variable indicating having sufficient savings is negatively and significantly related to the intention to use a reverse mortgage. That is, respondents who rate their savings to be insufficient, have a higher intention to use a reverse mortgage. The dollar amount of household savings may thus not be a good indicator of respondents' consumption needs. For example, low savings may not be a problem per se if consumption needs are adapted to those savings and savings are rated to be sufficient.

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[14] Employing an ordered logit or probit regression to account for the fact that the dependent variable can only take discrete values between one and seven yields results in line with the OLS specification. Moreover, we employ logit and probit regressions (depended variable = 0 if intention to use = 1 and 1 if intention to use is >1) to check robustness of results with respect to the skewed distribution of the intention to use variable (around 70% of respondents select the lowest value of 1 on the scale). Again, results are in line with the OLS specification. Detailed results for the four models are available on request.

Table 5
Explaining the Intention to Use a Reverse Mortgage.

	Intention to Use (1)	Intention to Use (2)	Intention to Use (3)
RM knowledge	0.047**	0.047**	0.047**
	(0.019)	(0.019)	(0.019)
Age	−0.010	−0.008	−0.008
	(0.009)	(0.009)	(0.009)
Retirement	−0.105	−0.022	−0.018
	(0.106)	(0.109)	(0.110)
Gender	0.100	0.032	0.034
	(0.096)	(0.099)	(0.099)
Higher education	−0.007	0.036	0.035
	(0.109)	(0.110)	(0.110)
White	−0.259	−0.265	−0.264
	(0.175)	(0.174)	(0.175)
Marital status	0.072	0.063	0.063
	(0.118)	(0.117)	(0.117)
Children	−0.171	−0.133	−0.133
	(0.116)	(0.121)	(0.121)
Ln(household income)	−0.179*	−0.168*	−0.166*
	(0.097)	(0.100)	(0.100)
Ln(household savings)	0.030	0.077**	0.077**
	(0.035)	(0.038)	(0.038)
Ln(homevalue)	−0.137	−0.103	−0.102
	(0.085)	(0.088)	(0.088)
Financial literacy	−0.105	−0.144*	−0.145*
	(0.075)	(0.076)	(0.076)
Planning skill	−0.026	−0.011	−0.011
	(0.037)	(0.038)	(0.038)
Conv. mortgage	0.286***	0.260**	0.261**
	(0.099)	(0.101)	(0.102)
Others known w. RM	0.316***	0.286**	0.285**
	(0.121)	(0.121)	(0.121)
HECM penetration	0.341	0.047	0.011
	(2.244)	(2.272)	(2.277)
Stay home 7+		0.023	0.020
		(0.104)	(0.105)
Subj. life expectancy		0.055	0.060
		(0.212)	(0.212)
Health		0.075	0.075
		(0.056)	(0.056)
Health insurance		0.211*	0.212*
		(0.123)	(0.123)
Long-term care insurance		−0.040	−0.039
		(0.105)	(0.105)
Sufficient savings		−0.072**	−0.072**
		(0.034)	(0.034)
Sufficient pension		−0.028	−0.028
		(0.032)	(0.032)
Broker trust		0.054*	0.053
		(0.032)	(0.032)
Bequest motive		−0.049**	−0.049**
		(0.025)	(0.025)
Risk aversion		−0.060***	−0.060***
		(0.023)	(0.023)
Debt aversion		0.050*	0.050*
		(0.026)	(0.026)
Past home value growth		0.013	0.013
		(0.048)	(0.048)
Expected home value growth		−0.071	−0.073
		(0.078)	(0.079)
Home attachment		0.001	0.001
		(0.004)	(0.004)
House price fluctuations		−0.005	−0.004
		(0.033)	(0.033)
Complex		−0.035	−0.035
		(0.029)	(0.029)
Treatment group			0.028
			(0.091)
Constant	4.204***	3.891***	3.874***
	(1.109)	(1.272)	(1.274)
Observations	547	547	547
Adj. R²	0.076	0.134	0.134

This table presents the results from OLS regressions of the intention to use a reverse mortgage survey variable on the 13 item reverse mortgage product knowledge score and respondent characteristics. Variables are defined in Table 1. Standard errors are given in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

In line with theoretical models (e.g., Hanewald et al., 2016), respondent income is negatively related to the intention to use a reverse mortgage. Having existing conventional mortgage debt is positively related to the intention to use a reverse mortgage. This finding is at odds with the predictions of Hanewald et al. (2016). In their life-cycle model, existing debt reduces the welfare gains from reverse mortgages, as a fraction of the reverse mortgage proceeds cannot be consumed but needs to be used to retire the existing debt. Our findings are, however, in line with the empirical evidence in CFPB (2012) and Moulton et al. (2014). Compared to other households, reverse mortgage borrowers are more likely to have existing conventional mortgage debt in the first place and conditional on having debt, their debt comprises a larger fraction of home value.

Trust in mortgage brokers is positively related to the intention to use a reverse mortgage (model 2). A reverse mortgage is a difficult product to understand and there have been reports of reverse mortgage scams (see, e.g., Carswell et al., 2013; Stark et al., 2014). Consumers who trust the party offering the product are more likely to decide to use it. The effect of risk aversion, however, is opposite to theoretical predictions from life-cycle models (e.g., Hanewald et al., 2016). Being more risk averse reduces the intention to use a reverse mortgage. This effect may be driven by the general misconception of the product (see Section 4.2). Instead of viewing the product as reducing risks (e.g. outliving financial resources, exposure to home prices), our results indicate that respondents often believe the opposite. Respondents in our sample, for example, believe that if they have a reverse mortgage, they may be forced to move out of the home. Another interpretation of the negative coefficient on risk aversion is that this variable picks up respondents' uncertainty of whether the product in general is beneficial for them. Reverse mortgages are complex products and respondents need to evaluate long-term tradeoffs to make an informed decision. For example, respondents may be uncertain about future consumption needs and may find it difficult to evaluate how a reverse mortgage might change future consumption opportunities. This interpretation of the risk aversion variable is consistent with the findings on trust. Both variables are closely (and negatively) related to decision making in risky situations. While trust helps to overcome the uncertainty of a risky situation (the choice in favor of a poorly understood product), risk aversion has the opposite effect (see, e.g., Johnson and Grayson, 2005).

Contrary to results from the Italian survey by Fornero et al. (2016), model 2 shows that debt aversion is positively related to the intention to use a reverse mortgage. This finding is in line with our respondents' product misperception that reverse mortgages will help them become debt free. Having health insurance increases the intention to use a reverse mortgage as being insured can reduce the need to keep the (complete) home's value as a buffer against large unexpected expenses (see, e.g., Davidoff, 2009).

Other factors, which according to theoretical models should be related to reverse mortgage demand, such as experienced and expected home price growth, subjective life expectancy, having long-term care insurance or home attachment do not significantly relate to the intention to use a reverse mortgage.

4.3.4. Robustness

Due to the cross-sectional nature of our data, we cannot establish causality. The question is whether reverse mortgage product knowledge drives the intention to use a reverse mortgage or whether the relationship is the other way around. Looking jointly at the results from Sections 4.2 and 4.3 provides evidence consistent with the notion that product knowledge drives the intention to use a reverse mortgage. The analyses in Section 4.3 show that respondents with insufficient savings have a higher intention to use reverse mortgages. But, the analyses in Section 4.2 reveal that those respondents have less knowledge. If the relation between knowledge and the intention to use a reverse mortgage is the other way around, we would expect to observe an opposite effect: Respondents with a higher intention to use the product (e.g., because of their insufficient savings) should have greater knowledge.

4.3.5. Summary

Overall, several results about the intention to use a reverse mortgage emerge. First, respondents with more knowledge about reverse mortgages generally express a higher intention to use a reverse mortgage. This group of respondents is more likely to make a decision based on information. Second, respondents seem to be influenced by peers having a reverse mortgage. Third, respondents for whom a reverse mortgage is more appropriate (e.g., having lower income, insufficient savings) express a higher intention to use a reverse mortgage. This group of respondents, however, does not have strong product knowledge. Thus, potentially the target group for reverse mortgages is not making a well-informed decision, and may insufficiently evaluate alternative options for their retirement financial planning. These findings relate to the literature examining the low demand for annuities. Brown et al. (2012) find that product complexity, misunderstanding of the product, and inability to value the product, explain why annuities are rarely used.

4.4. The impact of information transfer on the intention to use a reverse mortgage

In this section we test whether respondents differ in their intention to use a reverse mortgage after they had the opportunity to learn about reverse mortgage product features. Half of the respondents were assigned to the treatment group that received information, the other half served as the control group. The treatment group was asked to read a short and rather

simple[15] product description, which explains the most important features of HECM reverse mortgages. The following text was shown:

Please read the following information carefully. If you have finished, please click 'next'. A Home Equity Conversion Mortgage (HECM) allows seniors to access their home equity without any requirement to meet income or credit qualifications. Similar to a "conventional" mortgage, it is a loan which uses the house as a security. The homeowner, who borrows money against his home, has the choice between a onetime payment (lump sum), a line of credit, which can be used any time, a supplement to monthly retirement income (annuity), or any combination of these. Over time, interest charges are added to the loan amount, thus the loan amount rises. Repayment of the loan is required if the homeowner sells the home, moves out, or dies. When those events occur, the home can be sold to pay back the loan. HECM borrowers are protected against the possibility that their home may fall in value. If the home is worth less than the loan amount due, the borrower is not obliged to pay the bank more than the value of the home to satisfy the loan. As long as the loan is in place, the borrower remains the owner of the house, including all duties that come along with homeownership, such as obligation to pay property taxes and insurances. If the homeowner still repays an existing mortgage, a reverse mortgage can only be taken if the funds received from it are used to repay the existing mortgage

Survey respondents in the treated group seem to have read the text. On average they spent three minutes and 20 s on this survey page.

Results in Table 5, model 3 show that the intention to use a reverse mortgage is not significantly different between the treatment and control group. The difference in means for the intention to use a reverse mortgage between the treated and control group is 0.028 and not statistically significant (p-value = 0.755). In addition, we find no significant heterogeneous treatment effects based on analyzing subsamples split along several dimensions (e.g., product knowledge, gender, financial literacy, being retired or not, knowing others with a reverse mortgage or not, education, and time spent reading the text; detailed results available on request).

Educating potential borrowers about the product does not increase the intention to use a reverse mortgage. The effect of education might be different in personal interviews, as done with the counselling sessions for HECM loans. However, homeowners who attend counselling sessions must first have a sufficient amount of interest in, and knowledge about, the product.

Providing homeowners with a relatively simple description of HECM, which is a complex product, does not have an effect on their intention to use a reverse mortgage. This result relates to the literature in two ways. First, it is in line with the *meta*-analysis of Fernandes et al. (2014) who claim that interventions to improve general financial literacy have often (but not always) little explanatory power for subsequent behaviors. Second, Wong-Parodi et al. (2013) find in the domain of energy conservation brochure materials, that helping to educate via simplification does work for straightforward information material, but not for complex material.

5. Conclusion

We find that an important factor relating to low reverse mortgage demand is potential borrowers' insufficient knowledge, or product-specific literacy.

Our results are based on a survey of U.S. homeowners aged 58 and older. Our survey elicits information about our respondents' knowledge about HECM mortgages and the intention to use a reverse mortgage. Almost all of the respondents in our sample (who are, on average, better educated and wealthier than the general U.S. population), claim that they have heard of reverse mortgages. However, on average, knowledge is low among eligible homeowners. Around three quarters of respondents understand that the purpose of a reverse mortgage is to unlock home equity, know the minimum age requirement, and are aware that they need to continue to pay taxes and homeowner insurance as part of the duties of a reverse mortgage consumer. Around half of respondents do know that a reverse mortgage is actually a loan, the loan balance grows over time, no regular interest payments have to be made, and that a reverse mortgage grants a life-long right to remain in the home without repaying any of the loan. Only one third of respondents know that a lender cannot force them to leave the home when the loan balance becomes larger than the home value, are aware of the relationship between interest rates and maximum loan amounts, and have realistic expectations about maximum payout amounts.

Respondents who are financially sophisticated, have personal experience with reverse mortgages, and/or know other people with reverse mortgages have superior product knowledge. However, those respondents that would theoretically benefit most from reverse mortgages (e.g., those having lower income, higher home values, lower savings) do not have better knowledge about the product.

Our results show that reverse mortgage product knowledge is positively related to the intention to use a reverse mortgage. On average, knowledge among respondents is fairly low, implying that potential factors for low product demand are limited knowledge and misconceptions of the product. Peer influence (knowing other people with a reverse mortgage) is a strong predictor of the intention to use a reverse mortgage. Homeowners who theoretically could benefit most are indeed more likely to use a reverse mortgage. But these homeowners lack product knowledge and thus may insufficiently evaluate

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[15] The description has a Flesch-Kincaid grade level of 10.5. A Flesch-Kincaid grade level statistic of 10.5 indicates that the text requires the level of education of grade 10 to 11 based on U.S. education (e.g., Oakland and Lane, 2004).

alternative options to finance retirement consumption. Not assessing alternative options properly is especially relevant as reverse mortgages are expensive and include substantial fees (see Lucas, 2015 as well as Section 2), and thus may turn out to be more costly than alternatives.

Our results support the growing body of evidence that the functioning and growth of reverse mortgage market is hindered by multiple factors. There are no easy or obvious fixes when trying to sell an inherently complex and potentially expensive product to poorer and older households that have limited financial literacy and product knowledge.

We find that providing potential consumers with a brief text explaining key reverse mortgage product features had no impact on the intention to use a reverse mortgage. One way to interpret this finding is that an avenue to make the product more appealing to homeowners is not to educate them better, but to reduce the complexity inherent in the product itself. We also find some evidence that indicates that respondents may be uncertain about whether or not a reverse mortgage would be beneficial to them. This contributes to a lower intention to use reverse mortgages and also indicates that reduced product complexity might increase product consumption. It could also be that the use of a simple explanatory text is not a powerful enough tool when compared with, for example, providing visualizations. Campbell (2016) suggests that bundling reverse mortgages with attractive and easier to understand products (like long-term care insurance) might make the package more appealing. We leave testing these approaches to future research.

Appendix A. Factor Analysis of the Reverse Mortgage Knowledge Index

The reverse mortgage knowledge score as used for our analyses is a composite score which has the advantage of being intuitively interpretable as the final knowledge score for each individual ranges between 0 and 13. Hence, when using the score in regression analyses, any changes can be immediately attributed to changes in this score. However, the way the composite score is created has a drawback: correctly answered questions increase the score by one, whereas incorrectly answered questions and "don't know" answers both translate into zero points for a particular question.

Don't know answers can be taken explicitly take into account, as they might indicate a good self-perception of survey respondents. Furthermore, there is substantial variation amongst knowledge items regarding the percentage of respondents answering questions with "don't know". The percentage of "don't know" answers varies from as low as 11% for rmk1 to almost 65% for rmk11 (see Table 2 for details). A way to explicitly take into account "don't know" responses is to obtain Bartlett factor scores and to use them as weights to construct a reverse mortgage literacy index, similarly to the procedure used by Van Rooij et al. (2011) in an analysis of stock market literacy.

We create one dummy variables to indicate for each item whether a respondent answered a knowledge question correct (1) or incorrect (0) and a second dummy variable indicating if a response was "don't know" (1) or not (0). Exceptions are items rmk6 and rmk13, which due to the nature of those questions did not contain "don't know" answers as possible choices. Excluding those two items, factor analysis using iterated principal factoring allows to extract a single factor for reverse mortgage knowledge. As all items used to identify knowledge are tailored towards reverse mortgage knowledge, theoretical reasoning suggests a single factor to be extracted. Inspection of the corresponding Scree plot shows a large kink after factor 1, also pointing towards a single factor to be extracted. Furthermore, the first factor explains 74.5% of variance in the individual responses, which also supports the notion of a single factor. Factor loadings for this single-factor solution are presented in Table 6.

The resulting Bartlett factor scores are used as weights in an alternative reverse mortgage knowledge index. To analyze robustness of the reverse mortgage knowledge results (as summarized in Table 4), we use the Bartlett factor score-based index to replicate the same model specifications explaining reverse mortgage knowledge. Results are presented in Table 7, models 1 and 2. A comparison between Tables 4 and 7 highlights the robustness of the knowledge questions and their determinants. In both model specifications, all coefficient signs are the same for the composite knowledge score and the factor-based index. Overall, results are robust and leave the interpretation unchanged, no matter which way the reverse mortgage knowledge items are aggregated and weighted. The same holds when including the factor-weighted index in the intention to use a reverse mortgage regressions. Thus, both the composite score with its easy interpretation and the more elaborate index using factor weights allow for the same conclusion.

Even though it might be possible to question the validity of the single factor solution of the factor analysis, due to low factor loadings of some items, results are robust. A stepwise exclusion of those rather low-loading items, which are rmk3, rmk4, rmk11, and rmk12 and obtaining Bartlett scores for each of the remaining 14 items still leaves the emerging pattern unchanged in terms of coefficient signs and variable significance (detailed results available upon request). Hence, items with loadings which might be considered too low for inclusion are not confounding the results.

Table 6
Factor Loadings of the Reverse Mortgage Knowledge Index.

Variable	Survey Question		Factor Loadings
rmk1	A reverse mortgage allows you to withdraw wealth invested in your home.	Correct	0.4317
		Don't know	−0.5209
rmk2	A reverse mortgage helps you be debt-free if used to repay an existing mortgage.	Correct	0.5476
		Don't know	−0.5438
rmk3	For getting a reverse mortgage, your credit history and income will be checked.	Correct	0.2886
		Don't know	−0.3034
rmk4	Over time, the loan balance of a reverse mortgage. . . [shrinks/stays constant/grows]	Correct	0.3262
		Don't know	−0.5331
rmk5	Even when the reverse mortgage loan balance becomes larger than the home value, you do not have to move out.	Correct	0.5396
		Don't know	−0.6196
rmk7	When do you have to make interest payments on a reverse mortgage? [every month/once a year/when the loan is paid back/never]	Correct	0.5507
		Don't know	−0.6357
rmk8	If the reverse mortgage loan balance is larger than the house value, the lender can force you to pay the loan off with other assets.	Correct	0.5950
		Don't know	−0.6834
rmk9	If you are unable to make your interest pay-ments on the reverse mortgage loan, a foreclosure process can be started on your home.	Correct	0.6033
		Don't know	−0.6495
rmk10	When interest rates are higher, one gets less money when taking out a reverse mortgage.	Correct	0.3518
		Don't know	−0.5935
rmk11	What percentage of home value are the likely costs for getting a reverse mortgage? [0.5%/1%/3%/. . ./15%]	Correct	0.3923
		Don't know	−0.3307
rmk12	If you have a reverse mortgage, for which items do you still have to pay yourself? [property taxes/homeowner insurance/repair and maintenance/none of these/don't know]	Correct	0.3999
		Don't know	−0.4719

This table presents factor loadings for 22 items based on 11 questions to assess reverse mortgage knowledge. Factor loadings are obtained using iterated principle factoring.

Table 7
Explaining Reverse Mortgage Product Knowledge using a Factor Weighted Index and IRT scores.

	Knowledge index (1)	Knowledge index (2)	IRT score (3)	IRT score (4)
Age	0.017**	0.010	0.002**	0.001
	(0.008)	(0.009)	(0.001)	(0.001)
Retirement	−0.050	−0.054	0.005	0.001
	(0.098)	(0.102)	(0.009)	(0.010)
Gender	0.302***	0.240***	0.018**	0.014
	(0.087)	(0.090)	(0.008)	(0.009)
Higher education	0.019	0.016	0.008	0.008
	(0.100)	(0.101)	(0.010)	(0.010)
White	0.371**	0.345**	0.047***	0.044***
	(0.165)	(0.163)	(0.015)	(0.015)
Marital status	0.030	−0.008	0.005	0.002
	(0.108)	(0.107)	(0.010)	(0.010)
Children	0.083	0.128	0.006	0.010
	(0.106)	(0.110)	(0.010)	(0.011)
Ln(household income)	−0.038	0.040	−0.004	0.001
	(0.090)	(0.093)	(0.009)	(0.009)
Ln(household savings)	0.045	0.037	0.003	0.002
	(0.033)	(0.035)	(0.003)	(0.003)
Ln(homevalue)	0.047	−0.003	0.002	−0.001
	(0.079)	(0.081)	(0.008)	(0.008)
Financial literacy	0.296***	0.260***	0.035***	0.033***
	(0.067)	(0.068)	(0.006)	(0.006)
Planning skill	0.121***	0.107***	0.011***	0.010***
	(0.033)	(0.034)	(0.003)	(0.003)
Conv. mortgage	0.013	0.062	0.004	0.007
	(0.091)	(0.094)	(0.009)	(0.009)
RM experience	0.867***	0.851***	0.072**	0.075**
	(0.323)	(0.320)	(0.031)	(0.031)

Table 7 (*Continued*)

	Knowledge index (1)	Knowledge index (2)	IRT score (3)	IRT score (4)
Others known w. RM	0.269**	0.271**	0.025**	0.025**
	(0.110)	(0.110)	(0.011)	(0.011)
HECM penetration	2.016	1.775	0.132	0.115
	(2.052)	(2.073)	(0.196)	(0.199)
Stay home 7+		−0.039		0.001
		(0.097)		(0.009)
Subj. life expectancy		−0.275		−0.038**
		(0.194)		(0.019)
Health		−0.007		−0.002
		(0.051)		(0.005)
Health insurance		−0.192*		−0.019*
		(0.113)		(0.011)
Long-term care insurance		−0.239**		−0.029***
		(0.096)		(0.009)
Sufficient savings		0.035		0.002
		(0.031)		(0.003)
Sufficient pension		−0.009		0.003
		(0.029)		(0.003)
Broker trust		−0.081***		−0.008***
		(0.029)		(0.003)
Bequest motive		−0.002		0.000
		(0.023)		(0.002)
Risk aversion		−0.059***		−0.004*
		(0.021)		(0.002)
Debt aversion		0.018		0.001
		(0.024)		(0.002)
Past home value growth		0.023		0.004
		(0.044)		(0.004)
Expected home value growth		−0.094		−0.007
		(0.072)		(0.007)
Home attachment		0.008**		0.000
		(0.003)		(0.000)
House price fluctuations		0.022		0.001
		(0.031)		(0.003)
Complex		−0.063**		−0.003
		(0.026)		(0.003)
Constant	−3.308***	−2.181*	0.522***	0.619***
	(1.025)	(1.180)	(0.097)	(0.113)
Observations	557	557	557	557
Adj. R^2	0.201	0.255	0.205	0.251

This table presents the results from OLS regressions of the reverse mortgage product knowledge index on respondent characteristics. Knowledge index is constructed using Bartlett factor scores as weights for the 22 individual items (models 1 and 2) or IRT scores for the 13 questions (models 3 and 4). Variables are defined in Table 1. Standard errors are given in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix B. Modelling Reverse Mortgage Knowledge using Item Response Theory

A potential drawback of the composite knowledge index is that it weights each item equally. Hence, it does not account for the differences in difficulty between individual items. Questions related to certain aspects of reverse mortgages might be answered by a larger fraction of respondents correctly if it is a generally easier question. To approach the potential concern of varying difficulty between questions, we apply item response theory (IRT) in order to explicitly model the probability to answer a knowledge question correctly. IRT methods are commonly used in developing tests and exams (for an overview of IRT methods see, e.g., StataCorp, 2015). The resulting item characteristic curves (ICC) are given in Fig. 2.

Fig. 2 shows the chance that a respondent with a given knowledge level of Theta answers a question correctly. Difficulty increases with Theta, which means that survey items with curves located more towards the right are more difficult to answer than those more to the left. Based on Fig. 2, questions rmk1, rmk6, and rmk12 are the easiest and require low general knowledge to be answered correctly, whereas questions rmk3 and rmk4 are the most difficult in our array of questions. The wide spread in question difficulty provides the rationale for applying IRT to account for heterogeneity in question difficulty. Instead of our composite reverse mortgage knowledge index, we next use the predicted IRT scores as variable indicating reverse mortgage knowledge. Regression results are given in Table 7, models 3 and 4. Compared with Table 4, coefficient signs and significance do not change. Thus, our baseline results are not confounded by heterogeneity in question difficulty.
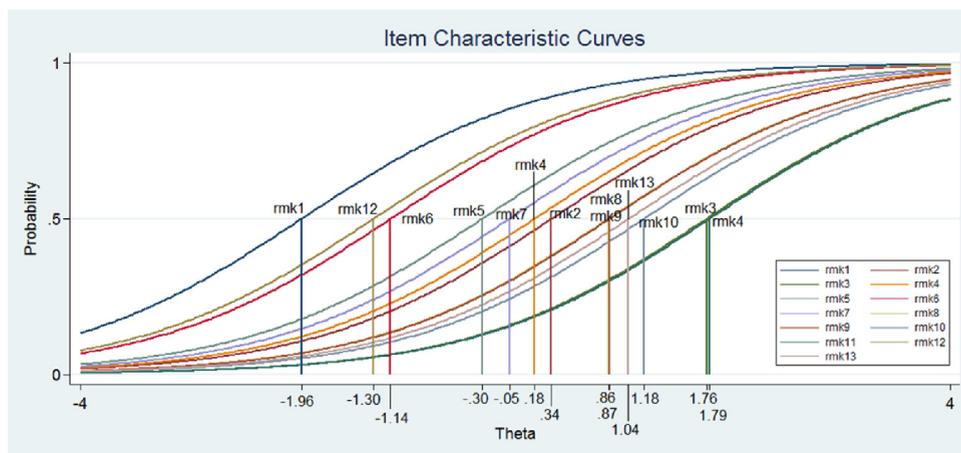
Fig. 2. Item Characteristic Curves for Reverse Mortgage Knowledge Questions This figure shows item characteristic curves for the 13 questions assessing reverse mortgage knowledge. The curves show the probability to correctly answer any of the 13 questions. Theta expresses the level of skill necessary to answer a question correctly. Difficulty of questions increases with Theta. The question content is given in Table 2.

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