

# Financial Literacy, Risk Aversion and Choice of Mortgage Type by Households

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**Abstract** This paper analyzes how financial literacy and reported willingness to take financial risk impact a household's choice of mortgage type. The results show that households reporting higher financial literacy and lower risk aversion are 55 to 97 % more likely to opt for interest-only mortgages. The results are robust to alternative explanations such as the involvement of financial advisors, the effect of peers, experience with prior home-ownership, and house price expectations. In general, alternative mortgage products, as opposed to traditional mortgages, are chosen by wealthier, older, and/or more sophisticated households that are more likely to have a greater understanding of the risks and benefits associated with these products.

**Keywords** Financial Literacy · Mortgage Choice · Risk Aversion · Alternative Mortgage Products

## Introduction

For many households, a house is the most valuable asset in their wealth portfolio (Campbell 2006), while most of these households need to finance at least part of their house purchase with mortgage debt. Mortgage markets have changed greatly over the last few decades, with an increasing number of products available in addition to extensive customization possibilities (Gerardi et al. 2010b). Driving forces behind the innovation of new mortgages were market deregulation, securitization, and increased competition.

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However, the increased menu of mortgage designs complicates the choice process that households face. There is a growing literature on financial decision making and the emerging empirical evidence indicates that households generally have only a limited understanding of basic economic principles (Van Rooij et al. 2011; Lusardi and Mitchell 2007a, b; Lee and Hogarth 1999). Such low levels of financial literacy impede a rational decision process due to limited understanding of the risks and features of financial products. The impact of financial literacy on household decision making is documented for stock market participation (Van Rooij et al. 2011; Grinblatt et al. 2011; Guiso and Japelli 2005), portfolio diversification and trading behavior (Grinblatt et al. 2012; Goetzmann and Kumar 2008), and retirement planning (Lusardi and Mitchell 2007a). However, empirical evidence on the role of literacy in mortgage decisions is so far limited (see Coulibaly and Li 2009; Moore 2003). This is surprising since the number of households with a mortgage is twice the number that participate in the stock market. Moreover, the rise of mortgage products that defer amortization—so-called alternative mortgage products (AMPs) (Cocco 2013; LaCour-Little and Yang 2010; Demyanyk and Van Hemert 2009)—has been a growing concern to governments and regulators (see Authority of Financial Markets 2008; Federal Reserve Board 2007; U.S. Government Accountability Office 2006). These concerns are fueled by the observation that these products have increasingly been offered to less sophisticated and less wealthy borrowers, who may not be well-informed about the risks inherent in these products.

This paper examines how financial literacy and risk attitude affects the choice of mortgage-type in Dutch households. The Dutch mortgage market offers several important advantages such as a recourse debt setting, homogeneity in mortgage supply (De Haan and Sterken 2011) and underwriting standards, and long term availability of AMPs.<sup>1</sup> Although AMP contracts are not by definition more complex than traditional amortizing contracts, the tax-benefits and amortization risks associated with AMP's are arguably better understood by households with higher levels of financial knowledge, thereby increasing the likelihood that they opt for these contracts.

Analysis of an extensive Dutch panel dataset indeed shows that higher levels of reported financial sophistication, proxied by self-assessed financial knowledge and participation in financial markets, significantly increases the probability that households choose AMPs, while more risk-averse households are more likely to opt for traditional contracts, as is consistent with LaCour-Little and Yang (2010). The findings also indicate that, at least in the Netherlands, AMP's have not systematically been purchased or offered to those households that are less financially literate or less willing to take financial risks. Further analyses show that the results are robust to controlling for financial advice, the effect of peers, or experience gained through prior homeownership. Involving professional advisors does increase the probability of choosing mortgages that defer amortization, while the opposite effect is found when family members or acquaintances are consulted instead. Whether the effect of financial

<sup>1</sup> Recourse debt holds households liable for complete repayment of their mortgage in case a foreclosure occurs and proceeds fall short of the outstanding balance. Strategic default is therefore never a valuable option as the costs always exceed the benefits.

advisors is good or bad is difficult to assess as maximizing tax-benefits of interest-rate deductibility can explain the observed pattern and is in the interest of the household.

This paper contributes to several literature streams. Its extension of the literature on financial literacy and its impact on decision making into the mortgage market explicitly accounts for the rising popularity of AMPs. Since mortgages constitute a substantial liability on a households' balance sheet, a better understanding of the factors underlying the decision processes, provides insights into how households' wealth portfolios are constructed, as well as permitting analysis of the portfolio in the life-cycle setting (e.g., Van Hemert 2010; Cocco et al. 2005; Cocco 2005; Campbell and Cocco 2003). The present paper also contributes to the literature on financial advice by documenting how the involvement of different advisors alters households' mortgage decisions (Collins 2010; Elmerick et al. 2002). This is in contrast to work by Mullainathan et al. (2010), Hackethal et al. (2012), and Schum and Faig (2006), who examined investment advice.

Finally, the results provide insights for regulatory authorities, as well as banks and financial intermediaries. Regulatory authorities want to prevent households from buying financial products that are unsuitable to their situation or preferences. We do not report evidence that risky mortgage products are systematically chosen by or sold to more vulnerable households in the Netherlands (e.g. those that are less financially literate or more risk-averse). Although this contrasts to some extent with findings for the U.S. (see Chiang and Sa-Aadu 2013), we note that substantial differences in institutional context such as mobility of homeowners, level of mortgage securitization, mortgage sales channels, recourse regime and foreclosure process, and extensiveness of contract differentiation are likely to account for diverging findings and are important factors to take into consideration when reforming housing market policy. As such we are cautious with policy recommendations governing product offering and availability for institutional settings that differ substantially on aforementioned aspects from the Netherlands. On the other hand, we conclude that financial institutions and intermediaries need to be aware of their influence and responsibility in consumer credit markets, including the necessity of clear product description, as especially less literate households rely on public sources of information instead of professional advice. Unclear presentation of the risks and benefits of financial products might be especially harmful to them.

This paper is organized as follows. The following section provides an overview of the literature on mortgage choice, financial literacy and risk aversion. The third section discusses the dataset, while the fourth contains the empirical analysis and robustness checks. The final section concludes the paper.

## Literature Overview

### Mortgage Choice

An extensive literature on mortgage choice has emerged the past three decades. Most studies have focused on households' choice between fixed-rate mortgages (FRMs) and adjustable-rate mortgages (ARMs) as these are the main mortgage products in the US (Campbell 2006). Brueckner and Follain (1988) showed that the interest rate differential between ARM and FRM mortgages and the level of the FRM rate is an important determinant of mortgage choice. Borrowers with shorter expected tenure also tended to prefer ARMs, for example, to

lock in lower initial teaser rates, a finding confirmed in subsequent studies by Stanton and Wallace (1999) and Coulibaly and Li (2009). Besides mobility expectations and the ARM–FRM spread, papers have also examined the effect of mortgage contract features such as the choice of points (Chang and Yavas 2009; Stanton and Wallace 1998; Kau and Keenan 1987), the rate of the contract (see for example Duca and Rosenthal 1994), and the intervals at which ARM rates are adjusted (Sa-Aadu and Sirmans 1995; Cunningham and Capone 1990) on mortgage choice. More recently, Koijen et al. (2009) examined the influence of bond risk premia on mortgage choice, finding that these premia are a more accurate predictor of mortgage choice than, for example, yield spreads. Other papers have related the choice explicitly to borrower characteristics of the household, such as the riskiness, in terms of FICO-scores and employment status, of the household (Harrison et al. 2004) or the choice for reverse mortgages by elderly homeowners (Fratantoni 1999).

Besides the influence of mortgage characteristics on mortgage choice, recent studies have examined households' optimal mortgage decisions in the context of a life-cycle model. Campbell and Cocco (2003), for example, showed that households with a risky income, as well as those that are risk-averse, are less attracted to an ARM contract since monthly payments are sensitive to changes in the interest rate. Van Hemert (2010) examined the interest rate risk for households and—using a life-cycle setting—found that, in most cases, the ARM is the preferred contract, except for older, less-mobile, and risk-averse borrowers who hold FRM debt.<sup>2</sup> His findings corroborated those of Campbell and Cocco (2003).

The literature on AMPs is only starting to emerge. LaCour-Little and Yang (2010) documented that households with a larger tolerance for risk tend to choose non-amortizing contracts. Moreover, they documented that low-income and borrowing-constrained households have increasingly turned to these types of contracts. Non-amortizing contracts entail a larger equity-driven default risk since no principal repayments are made. Speculators and aggressive borrowers are attracted to these products to reap the benefits of rising house prices. Cocco (2013) used the British mortgage market as his laboratory, relying on the life-cycle consumption smoothing hypothesis, and he concludes that financially constrained households that expect their future income to be higher tend to choose products with deferred amortization. This decreases current mortgage payments and, as such, helps smooth their current consumption. However, it is questionable to what extent households actually understand the features of these new mortgage types.

### Financial Literacy and Risk Aversion

The literature on financial literacy and its impact on decision making is developing rapidly. Studies by Lusardi and Mitchell (2007b, 2008) showed that financial illiteracy is widespread among households and is not confined to certain groups or countries. Financial literacy measurement is not straightforward as it can involve a combination of interests, awareness (Guiso and Japelli 2005), cognitive ability, risk aversion (Dohmen et al. 2010), cultural values, and advice by peers, parents, neighbors or professionals

<sup>2</sup> The intuition behind this result is that the interest-rates on FRM contracts incorporate a term premium and are therefore less appealing to households who are currently borrowing-constrained or are more likely to move in the near future. Since they are generally younger, they are expected to choose ARM mortgages *ceteris paribus*, to take advantage of the lower initial interest rate.

(Hackethal et al. 2012; Shum and Faig 2006; Elmerick et al. 2002). Although the psychometric measurements and determinants of financial literacy is not the focus of this paper, we do briefly examine the indicators that have appeared in other empirical work.

Van Rooij et al. (2011) devised an extensive module of survey questions that measure the understanding of economic concepts like compound interest and inflation. They showed that even a very basic understanding of economics is limited among households and that low literacy levels deter stock market participation. Grinblatt et al. (2011) reported similar results for stock market participation, using IQ as an indicator for cognitive ability and reported as well in a related paper that affluent individuals earn larger risk-adjusted returns (Grinblatt et al. 2012). Households that are more sophisticated—that is wealthier, and higher-educated—are also less prone to investment mistakes, such as underdiversification and disposition bias (Goetzmann and Kumar 2008; Calvet et al. 2009).

Dohmen et al. (2010) examined the impact of cognitive abilities on risk aversion. Individuals with lower cognitive test scores are less likely to choose for lottery-type payoffs, indicating higher risk aversion. Their results held after controlling for educational attainment and income. Individuals with lower cognitive abilities were found to be less patient and might therefore take less time to understand contract designs. Moreover, risk aversion is found to decrease with increases in wealth (see Morin and Suarez 1983). Morin and Suarez also examined the impact of life-cycle effects and documented that risk aversion increases uniformly with age.

Consistent with studies on stock market participation and investment behavior, empirical research in mortgage markets has shown that the degree of literacy matters in households' decision-making process. Although the mortgage market is quite complex and not perfectly transparent (see Woodward and Hall 2010), the popularity of AMPs is widespread and not confined to more literate households (Gerardi et al. 2010a). Empirical work so far has mostly dealt with the mechanics of refinancing and interest rates, rather than choice of product type.

Miles (2004), for example, found that mortgage borrowers have limited understanding of interest rate risk and the potential savings arising from refinancing. Donker and Van Soest (1999), using survey data, showed that households who report to have a higher interest in financial matters take out smaller mortgages on their house, while Moore (2003) reported that households with lower financial literacy are more likely to take out a high-interest mortgage. Gerardi et al. (2010b) examined the role of financial illiteracy on subprime mortgage delinquency. Using numerical ability as an indicator for literacy, analysis showed that foreclosure rates are approximately two-thirds lower for groups with the highest numerical ability. This matches work by Bucks and Pence (2006), who showed that low-income and low-educated households tend to underestimate how much interest rates can change, which consequently can trigger default. The impact of literacy on mortgage-type choice has not been examined so far except for some indirect measures in LaCour-Little and Yang (2010) and Coulibaly and Li (2009).

## Data Description

The data used in this paper are obtained from the DNB Household Survey (DHS), a panel dataset comparable to the panel survey of income dynamics (PSID) in the U.S. It

has been administered by Centerdata (Tilburg University) among 2,000 Dutch households annually since 1993 and contains a wide variety of information on income, work, and psychological- and wealth-related topics. This paper uses all waves from 1994 up to 2009.

Administration of the survey takes place via the internet and, in earlier waves, through a Netbox providing internet via the television. Participants are recruited by phone and based on random selection. Households that do not have an internet connection or personal computer are provided one by Centerdata. Moreover, participants receive no financial compensation for participation in the household survey.

The survey does not require intervention of an interviewer and panel members can fill out the questionnaires at a time that is convenient for them.<sup>3</sup> Moreover, since the entire survey is administered at the panel member's residence, the probability of reporting errors is reduced because the member can directly look up their annual and bank balance statements. Finally, internet surveys are less prone to reporting biases than surveys administered via telephone (Chang and Krosnick 2009).

To obtain responses on the household level, we define the household head as the member that has the highest share in total household income. This has the advantage that his or her views are likely to have greater weight with respect to the financial consequences of decision making. For example, the implications of unemployment are largest for the household member with the highest income and their risk aversion might influence subsequent financial decisions of the household as a whole.

Inherent in all consumer surveys is measurement error. To alleviate biases due to response errors, we follow (Cocco 2013) and winsorize all continuous variables at 10 % of their distribution, while obvious response errors (e.g., if amounts were asked in thousands of euros and were not reported as such) were corrected in the dataset to the extent that they could be logically inferred from the other responses of the panel member. Moreover, the introduction of the euro in 2003 requires us to convert all amounts reported before 2003 to euros.

Because this paper analyzes how risk aversion and financial literacy matter in the households' decision of mortgage-type, we aim to rule out variations in unobserved effects. Therefore, we only include observations when the origination year of the mortgage coincides with the survey year to counteract endogeneity caused by learning effects. Although this condition reduces the sample substantially, it ensures that the impact of distorting factors is minimized. Moreover, questioning respondents ex-post on their literacy and risk aversion levels is infeasible as the responses are going to reflect the learning effect of the mortgage decision itself, especially when the transaction took place several years ago. In a number of cases, it is also impossible, due to attrition in the panel. Imposing this condition yields a sample of 774 observations, or a yearly average of 55 newly originated mortgages.

Since a large number of different mortgage contracts are available, they are sorted into three broad categories based on the repayment schedule. The three categories are traditional amortizing contracts, deferred amortization mortgages and interest-only mortgages. Our sample includes 292 amortizing mortgages, 137 deferred amortization mortgages and 348 interest-only mortgages. The [Appendix](#) offers a detailed discussion

<sup>3</sup> See for a more elaborate discussion Schober and Conrad (1997).

of the differences between the contracts and the evolution of interest and amortization payments over the mortgage term as well as the distribution of newly originated contracts over time.

Summary statistics reported in Table 1 show that interest-only mortgages tend to be chosen by older households and those smaller in size (implying grown children). Moreover, deferred amortization contracts are associated both with more expensive houses as well as with higher levels of mortgage debt.

A closer look at the dummy variables reveals that among those households with an interest-only mortgage only 14.2 % are first-time homebuyers (starters), while this is 32.5 % among those with a traditional contract. This is in line with the idea that older and wealthier households are less constrained in making a down-payment on an interest-only mortgage because they accumulate more assets and home-equity during their life. However, as down-payments are generally not required by lenders upon origination, loan-to-value ratios on new mortgages are high in the Netherlands often exceeding 100 %. We will test more elaborately for the effect of down payment constraints on contract choice in section 3.1.

Our measure of wealth is defined analogously to Morin and Suarez (1983) as the sum of checking and savings accounts, employer-sponsored savings plans, the value of life insurance, home equity, other real estate, and the value of holdings in financial assets minus total debt and is measured using quartile-dummies.<sup>4</sup> Households with interest-only mortgages are concentrated in the third and fourth wealth quartile in contrast to those with an amortizing contract which are more likely to be in the first and second quartile. Other controls reveal that households with interest-only contracts are those whose members are more likely to be retired, or self-employed, consistent with the observed age-differential. Furthermore, households with a deferred amortization or interest-only product are more likely to be highly educated e.g., at the higher vocational or university level. Finally, we note that the borrower demographic characteristics do not vary much between different survey waves.

## Analysis of Mortgage Choice

This section reports multivariate analysis of mortgage choice by households. We first estimate a basic multinomial model and then expand it with measures for risk aversion, financial literacy, and financial advice. We follow the same methodology as Sa-Aadu and Sirmans (1995) and Cocco (2013). Households can choose between three alternative mortgage products: amortizing mortgages ( $j = 1$ ), deferred amortization mortgages ( $j = 2$ ) and interest-only mortgages ( $j = 3$ ). Households'  $i$  choice for a certain mortgage contract  $j$  can be viewed as one that maximizes the utility function, where each alternative gives a utility of  $U_{ij}$  for  $i = 1, 2, \dots, N$  and  $j = 1, 2$  or  $3$ . A general function for the utility level can be defined as:

$$U_{ij} = \alpha_j + \beta_j \mathbf{X}_{ij} + \varepsilon_{ij} \quad (1)$$

<sup>4</sup> The number of observations per quartile is not equal to 25 % of the total because household wealth and the corresponding quartile are computed year by year allowing for the possibility of transition to another wealth quartile.



**Table 1** Summary statistics

	Amortizing		Deferred amortization		Interest-only		Total		
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	<i>N</i>
Age (years)	39.72	37.00	38.63	37.00	50.54	51.00	44.44	42.00	774
Household size	2.93	3.00	3.17	3.00	2.62	2.00	2.83	2.00	774
Log yearly household income	10.49	10.61	10.48	10.55	10.51	10.60	10.50	10.60	774
Log house value	4.63	4.60	4.89	4.94	4.78	4.84	4.74	4.77	774
Log mortgage debt	4.68	4.70	5.07	5.09	4.69	4.69	4.76	4.79	774
Frequencies of dummy variables									
Starter	32.47 %		29.97 %		14.18 %		23.75 %		189
Wealth quartiles									
First wealth quartile	45.89 %		41.02 %		37.46 %		41.18 %		338
Second wealth quartile	10.74 %		14.79 %		9.53 %		10.96 %		85
Third wealth quartile	26.18 %		18.98 %		23.36 %		23.56 %		186
Fourth wealth quartile	17.18 %		25.21 %		29.64 %		24.31 %		165
Selfemployed	0.57 %		1.62 %		2.59 %		1.69 %		10
Retired	1.96 %		2.95 %		19.49 %		10.11 %		75
Higher vocational	25.71 %		33.02 %		26.20 %		27.32 %		204
University	13.41 %		8.13 %		20.31 %		15.55 %		104
Male	92.09 %		96.53 %		89.91 %		91.94 %		696
Married	84.88 %		91.38 %		81.54 %		84.60 %		630
<i>N</i>	292		137		348		774		

Weighted mean and median values for control variables are shown by mortgage type. The definition of mortgage categories can be found in Table 10. Data is from the DNB Household Survey and cover mortgages originated between 1994 and 2009

where  $\mathbf{X}_{ij}$  is a vector of control variables. If the error terms  $\varepsilon_{ij}$  have a Weibull-distribution, then the probability that household  $i$  chooses mortgage type  $j$  is given by:

$$P(y_i = j) = \frac{\exp(\alpha_j + \beta_j \mathbf{X}_{ij})}{\sum_{j=1}^3 \exp(\alpha_j + \beta_j \mathbf{X}_{ij})} \quad (2)$$

The vector  $\mathbf{X}_{ij}$  contains control variables for household demographics (age in years, log of yearly income, number of household members and dummies for marital status, gender and level of education), labor market position (dummies whether the household head is self-employed or retired), and mortgage pricing terms (yearly interest rate and fixed rate period dummy).<sup>5</sup> Additional controls for house value and amount of

<sup>5</sup> Unlike for example the U.S., origination fees in the form of points are non-existent in the Netherlands. Upon origination, lenders and intermediaries receive compensation through provisions which are calculated as a percentage of the initial balance. Inclusion of the interest rate and the size of the balance in our analyses ensures that effects due to pricing differentials are taken into account.



mortgage debt are also included alongside dummy variables for household wealth quartiles. In order to control for time trends- and supply effects, year-dummies are included in the specifications. All models are estimated by maximum likelihood and the households are weighted to ensure that the statistics are representative for the Dutch population. Reported are Hubert-White heteroskedasticity-robust standard errors.

### Mortgage Choice: The Base Model

Base results are reported in Table 2, which include house value in Panel A and the amount of mortgage debt in Panel B. The results indicate that deferred amortization mortgage products are being used to buy more expensive houses and that consequently debt levels are higher. These findings are in line with the descriptive statistics. We examine how our results change by including various sets of explanatory variables, such as mortgage terms, year effects and wealth quartiles.

Mortgage choice seems to be primarily explained by the age of the household head, with older households having a higher probability of choosing an interest-only mortgage, and household size, which decreases the probability of an interest-only contract. As previously mentioned, these households are probably wealthier due to equity built up in their previous residence, thereby enabling them to make a down payment. However, even in the absence of a down payment, households could get an interest-only mortgage with an additional premium on the interest-rate to account for the higher risk. In unreported analysis, we included the initial loan-to-value ratio in the regressions to proxy for the effect of down payment constraints on mortgage choice. These results show that LTV-ratio's are indeed somewhat lower for households with interest-only mortgages, but it is not affecting our main results.

Moreover, the choice of a contract is not significantly related to whether a household is new to the ownership market, since the inclusion of the starter-dummy does not change our results. If down-payment constraints are driving the choice of contract type beyond what is controlled for with the loan-to-value ratio or wealth dummies, than we would expect this effect to be most profound for new entrants to the homeownership market. Hence, if starting homeowners lack the capability to make a down payment than we would expect them to be significantly less likely to obtain an interest-only mortgage. However, we do not find this to be the case as the effect is insignificant.

Finally, we find that university-educated households have a lower chance of having a deferred amortization contract, in line with results reported by Cocco (2013). Probably these households are aware of the additional costs associated with life-annuity contracts and endowment funds, and are therefore less likely to choose this product type.

Because many of our control variables are insignificant (similar to Van Rooij et al. 2011), we examine whether collinearity problems are causing insignificance, though our explanatory variables are only moderately correlated. An F-test on multiple restrictions indicates that the demographic controls are jointly highly significant in all specifications while wealth controls are jointly insignificant.

### Mortgage Choice: Financial Literacy and Risk Aversion

As discussed, a variety of indicators for literacy and risk aversion such as holdings of financial assets, financial education, survey data, IQ, and cognitive ability tests have

**Table 2** Mortgage choice base model estimations

Independent Variables	(1)		(2)		(3)		(4)		(5)		(6)	
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only
Panel A Model with house value												
Log house value	0.784*** [4.25]	0.614*** [3.81]	0.399* [1.80]	0.346* [1.81]	0.397* [1.76]	0.368* [1.92]	0.384* [1.71]	0.350* [1.83]	0.319 [1.35]	0.359* [1.70]	0.286 [1.18]	0.390* [1.84]
Starter					0.071 [0.23]	-0.316 [-1.16]					0.134 [0.40]	-0.293 [-1.01]
Second wealth quartile							0.752* [1.81]	0.268 [0.75]			0.564 [1.30]	0.226 [0.61]
Third wealth quartile							-0.295 [-0.93]	0.101 [0.39]			-0.560 [-1.58]	0.003 [0.01]
Fourth wealth quartile							0.259 [0.79]	0.200 [0.71]			-0.006 [-0.02]	0.189 [0.61]
Log household income	-0.103 [-0.40]	-0.186 [-0.87]	0.439 [1.43]	-0.004 [-0.02]	0.438 [1.42]	-0.01 [-0.07]	0.473 [1.52]	-0.014 [-0.06]	0.283 [0.78]	-0.272 [-1.05]	0.326 [0.88]	-0.295 [-1.13]
Age	-0.007 [-0.61]	0.077*** [7.18]	-0.001 [-0.09]	0.088*** [7.46]	-0.000 [-0.02]	0.084*** [6.69]	-0.002 [-0.16]	0.087*** [7.34]	0.001 [0.08]	0.092*** [7.16]	0.004 [0.24]	0.088*** [6.42]
Self-employed	0.718 [0.58]	1.332 [1.06]	0.597 [0.48]	1.244 [1.02]	0.596 [0.48]	1.248 [1.02]	0.448 [0.39]	1.160 [0.97]	0.481 [0.38]	1.007 [0.78]	0.351 [0.29]	0.934 [0.73]
Retired	0.806 [1.00]	0.925* [1.82]	0.658 [0.68]	0.658 [1.16]	0.659 [0.69]	0.678 [1.20]	0.682 [0.71]	0.671 [1.17]	0.860 [0.98]	0.375 [0.62]	0.855 [0.96]	0.381 [0.63]
Higher vocational	0.127 [0.49]	-0.022 [-0.10]	0.119 [0.42]	0.174 [0.69]	0.114 [0.40]	0.168 [0.67]	0.132 [0.46]	0.179 [0.71]	0.211 [0.70]	0.135 [0.50]	0.234 [0.76]	0.124 [0.46]

Table 2 (continued)

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Deferred amor	Interest- only	Deferred amor	Interest- only	Deferred amor	Interest- only
University	-0.867* [-1.92]	0.176 [0.62]	-0.963** [-1.99]	0.260 [0.87]	-0.967** [-2.00]	0.272 [0.91]
Male	0.296 [0.46]	-0.494 [-1.11]	0.513 [0.66]	-0.379 [-0.84]	0.504 [0.65]	-0.382 [-0.84]
Married	0.160 [0.34]	-0.0564 [-0.15]	0.331 [0.65]	0.159 [0.40]	0.328 [0.65]	0.136 [0.34]
Household size	0.074 [0.77]	-0.070 [-0.84]	0.015 [0.15]	-0.141 [-1.56]	0.022 [0.23]	-0.156* [-1.71]
Constant	-3.578 [-1.30]	-3.544 [-1.62]	-8.363** [-2.46]	-4.488* [-1.84]	-8.426** [-2.46]	-4.109* [-1.66]
Mortgage terms	No	No	No	No	No	No
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
Joint significance demographics ( <i>p</i> -value)	0.000	0.000	0.000	0.000	0.000	0.000
Joint significance wealth controls ( <i>p</i> -value)	-	-	-	0.330	-	0.335
No of Observations	757	757	757	757	660	660
Pseudo R-squared	0.137	0.221	0.222	0.226	0.224	0.231
Log-Likelihood	-680.7	-614.6	-613.5	-610.7	-528.0	-523.2

Table 2 (continued)

Independent Variables	(1)		(2)		(3)		(4)		(5)		(6)	
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only
Panel B Model with mortgage debt												
Log mortgage debt	1.278*** [4.52]	0.613*** [2.94]	0.813*** [2.36]	0.0158 [0.07]	0.807** [2.33]	0.0451 [0.20]	0.805** [2.29]	0.0188 [0.09]	0.775* [1.95]	-0.114 [-0.40]	0.773* [1.91]	-0.0844 [-0.29]
Starter					0.0840 [0.23]	-0.541 [-1.64]					0.102 [0.26]	-0.330 [-0.96]
Second wealth quartile							0.277 [0.49]	0.095 [0.21]			0.285 [0.50]	0.223 [0.49]
Third wealth quartile							-0.289 [-0.76]	-0.069 [-0.21]			-0.332 [-0.79]	-0.044 [-0.13]
Fourth wealth quartile							0.036 [0.09]	0.131 [0.38]			0.046 [0.10]	0.120 [0.33]
Log household income	-0.695* [-1.88]	-0.750** [-2.55]	-0.349 [-0.82]	-0.375 [-1.21]	-0.345 [-0.80]	-0.408 [-1.30]	-0.307 [-0.72]	-0.375 [-1.20]	-0.495 [-1.10]	-0.359 [-1.07]	-0.455 [-1.00]	-0.369 [-1.09]
Age	0.005 [0.30]	0.079*** [5.67]	0.002 [0.12]	0.083*** [5.74]	0.003 [0.15]	0.076*** [4.98]	0.000 [0.03]	0.089*** [5.68]	0.0086 [0.43]	0.080*** [4.94]	0.008 [0.41]	0.076*** [4.50]
Self-employed	0.350 [0.33]	0.718 [0.64]	0.405 [0.41]	1.069 [1.00]	0.353 [0.36]	1.054 [0.99]	0.319 [0.33]	1.026 [0.95]	0.253 [0.25]	0.864 [0.72]	0.150 [0.15]	0.843 [0.70]
Retired	0.849 [0.86]	1.044 [1.60]	0.828 [0.80]	0.640 [0.91]	0.812 [0.78]	0.669 [0.98]	0.923 [0.87]	0.676 [0.94]	0.551 [0.53]	0.428 [0.62]	0.593 [0.56]	0.461 [0.67]
Higher vocational	0.115 [0.35]	-0.186 [-0.62]	0.239 [0.69]	-0.002 [-0.01]	0.230 [0.67]	-0.001 [-0.01]	0.237 [0.68]	-0.006 [-0.02]	0.289 [0.81]	-0.011 [-0.03]	0.284 [0.79]	-0.009 [-0.03]

Table 2 (continued)

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)						
	Deferred amor	Interest- only	Deferred amor	Interest- only	Deferred amor	Interest- only						
University	-1.379*** [-2.65]	-0.015 [-0.05]	-1.200** [-2.12]	0.101 [0.28]	-1.213** [-2.15]	0.139 [0.39]	-1.262** [-2.17]	0.067 [0.18]	-1.137* [-1.90]	0.181 [0.48]	-1.224** [-1.99]	0.167 [0.43]
Male	0.652 [0.93]	-0.101 [-0.24]	0.761 [0.94]	-0.009 [-0.02]	0.738 [0.89]	-0.029 [-0.06]	0.741 [0.93]	-0.001 [-0.00]	0.615 [0.76]	-0.190 [-0.39]	0.569 [0.71]	-0.199 [-0.41]
Married	0.101 [0.19]	0.161 [0.41]	0.327 [0.57]	0.348 [0.83]	0.331 [0.57]	0.318 [0.74]	0.336 [0.58]	0.349 [0.83]	0.234 [0.38]	0.347 [0.79]	0.250 [0.40]	0.337 [0.76]
Household size	0.089 [0.82]	-0.173 [-1.61]	0.0167 [0.14]	-0.269** [-2.34]	0.027 [0.23]	-0.300** [-2.55]	0.007 [0.07]	-0.272** [-2.37]	-0.016 [-0.14]	-0.322*** [-2.64]	-0.018 [-0.15]	-0.343*** [-2.78]
Constant	-0.370 [-0.10]	2.377 [0.81]	-2.306 [-0.55]	-1.616 [-0.51]	-2.421 [-0.57]	-0.767 [-0.24]	-2.615 [-0.62]	-1.623 [-0.51]	-0.077 [-0.02]	3.925 [1.13]	-0.201 [-0.04]	4.007 [1.14]
Mortgage terms	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Joint significance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
demographics (p-value)												
Joint significance wealth controls (p-value)	-	-	-	0.966	-	-	0.966	-	-	-	0.964	-
No of Observations	503	503	503	503	503	503	503	503	465	465	465	465
Pseudo R-squared	0.158	0.244	0.248	0.246	0.248	0.246	0.246	0.243	0.243	0.246	0.246	0.246
Log-Likelihood	-437.0	-392.2	-390.1	-391.4	-390.1	-391.4	-391.4	-358.9	-358.9	-357.4	-357.4	-357.4

This table shows weighted multinomial logit regression results for mortgage choice of households. Included are mortgages originated between 1994 and 2009 with amortizing mortgages being the reference category (see Table 10). Robust t-statistics are reported in brackets. \*\*\*, \*\*, \* denotes significant at 1, 5 and 10 % level respectively. Data is from the DNB Household Survey

appeared in empirical work. No consensus has emerged yet as to which measurement protocol yields the most reliable information on household financial decision making. The empirical analysis makes use of two indicators for financial literacy: one self-reported measure and one based on asset holdings. Risk aversion is measured using a comprehensive scale based on six survey questions. The exact wording of the questions is reported in the [Appendix](#).

The first literacy measure (*Financial Literacy*) asks to which extent respondents consider themselves knowledgeable with respect to financial matters, ranging from not knowledgeable to very knowledgeable. Our second indicator (*Financial Active*) measures holdings of financial assets by households. The survey distinguishes between seven different asset classes, ranging from stockholdings to positions in derivatives. We construct a scale ranging from 0 (no holdings of financial assets) to 7 (positions in all mentioned asset classes), rather than looking at specific financial assets. There are two reasons for this approach. First, it is not clear a priori which asset classes correlate to financial literacy and which ones not. Coulibaly and Li (2009), for example, only use stockholdings as a proxy for financial sophistication of the household. Second, the resulting scale is a measure both of the sophistication of the household in terms of diversification (Goetzmann and Kumar 2008; Calvet et al. 2009) as well as awareness in financial markets (Guiso and Japelli 2005).

Obviously, both measures are imperfect proxies for financial literacy. Household responses and their actions might be driven by for example overconfidence rather than financial literacy. Overconfidence in self-reported data and in financial behavior is reported for example in Barber and Odean (2001). An obvious indicator for overconfidence is the ‘better than average’ effect, which occurs when more than half of the households report they are better than the average household (see for example Nosić and Weber 2010). Unfortunately, we lack the necessary data to assess overconfidence in this way. However, we do observe that the scores on *Financial Literacy* are close to the scale average (which is 2.5), and that this remains stable over time. If overconfidence was present, we would expect the response average to be higher, and potentially varying with the economic climate.

Moreover, Van Rooij et al. (2011) show that objective and subjective measures of financial literacy are strongly correlated: people that assess their own knowledge as being higher also show higher scores on objective questions regarding financial concepts. Although we use the same data-set, the measures employed in this paper are slightly different. Therefore we obtained the literacy data from Van Rooij et al. (2011) and analyzed to what extent our measures correlate to both their subjective and objective measures. The results are positive and significant correlations. An one-way ANOVA indicates that the basic literacy score in Van Rooij et al. (2011) is increasing in our measures and that those differences are highly significant ( $F = 4.31$ ,  $p = 0.004$ ).

Furthermore, we have tested the validity of our self-reported measure by regressing it on the more objective financial literacy score from Van Rooij et al. (2011) while simultaneously controlling for income, wealth, education and demographic characteristics. This robustness test gives a positive and statistically significant effect indicating that the subjective measure is able to explain (part of) the objective literacy score. Unfortunately, we cannot use the objective measure in our mortgage decision analysis because it is only available for 1 year in our dataset. As mentioned before, we need the panel dimension of our data in order to have a sufficient amount of newly originated mortgages.

*Risk aversion* is measured using six statements that question to what extent households are willing to take risk on investments. Households that are more willing to borrow money for investments or are prepared to lose money on investments are supposedly more tolerant towards risk. After recoding responses on questions 3, 5, and 6, the resultant scale shows high consistency with a Cronbach Alpha of 0.927. A natural question is to what extent self-reported measures of literacy and risk aversion actually predict household financial behavior. Schooley and Worden (1996) compared the reported willingness of households to take financial risk to the actual riskiness of their portfolio and concluded that portfolio allocations are consistent with self-reported risk aversion. One drawback of our measure is that it does not explicitly questions willingness to take risk with respect to homeownership, but investments in general. It is conceivable that the risk-attitude varies per asset class. Unfortunately, we lack suitable data to elicit more directly the extent to which households are willing to take real-estate risks. The inclusion of wealth, age, education and income volatility controls should however reasonably control for the general willingness to take risks of households, and the marginal effect of the expressed risk attitude of the household is probably relatively universal across asset classes once these main determinants have been taken into account.

Weighted descriptive statistics on risk aversion and financial literacy across mortgage types and demographics are reported in Table 3.<sup>6</sup> Households with AMPs appear to be less risk averse and have more positions in financial assets than those with traditional amortizing contracts (consistent with LaCour-Little and Yang 2010), but the level of financial literacy is not very different between mortgage-types. Holdings of financial assets and risk aversion across demographics show patterns that are consistent with existing literature as they increase with age, income, and wealth (Goetzmann and Kumar 2008; Morin and Suarez 1983). Financial literacy appears to be decreasing in age, especially after the respondent is 60 years old. This probably reflects an effect of cognitive aging (Korniotis and Kumar 2011). Literacy helps households to increase wealth since literate households tend to save more, as documented by Lusardi and Mitchell (2007a) and Hilgert et al. (2003). As before we find that the share of AMPs, especially interest-only mortgages, is higher among older and wealthier households.

Table 4 reports regression results when financial literacy and risk aversion are added to the model, controlling for the variables of specification 6 in Table 2, Panel A. Unfortunately, the dataset has many missing observations on literacy and risk aversion measures, thereby reducing the sample. Moreover, if these non-responses occur non-random than our results suffer potentially from selection bias.

We examined the data in order to assess the severity of a selection effect. First, we found that the relative distribution of mortgage types is similar between respondents and non-respondents e.g. non-respondents are not clustered in one type of mortgage. Second, we analyzed to what extent non-respondents to the literacy and risk aversion questions have different demographic characteristics from those who did respond to the questions. This analysis shows that - except for income and wealth - there are no

<sup>6</sup> The increase in average household income is taken into account. Average income amounted to €32,500 in 2009, compared to only €21,780 in 1994. Low income is defined as households with an annual reported income below national average. Medium incomes are defined as households with an average up to twice the average income, and high-income are those households whose income exceeds twice the average income.



**Table 3** Risk aversion and financial literacy across mortgage types and demographics

## Panel A Literacy and Risk Aversion across mortgage types

	Amortizing	Deferred amortization	Interest-only
Risk Aversion	20.27	18.40	19.85
Financial Literacy	2.22	2.31	2.29
Financial Active	0.24	0.36	0.59
Number of observations	292	137	348

## Panel B Literacy and Risk aversion across demographics

	Age categories				
	20–30 years	31–40 years	41–50 years	51–60 years	61+ years
Amortizing mortgages	46.8 %	46.4 %	37.2 %	26.0 %	10.0 %
Deferred amortization mortgages	26.7 %	26.5 %	22.4 %	6.0 %	4.2 %
Interest-only mortgages	26.5 %	27.1 %	40.4 %	68.0 %	85.8 %
Risk Aversion	18.29	18.55	19.19	22.05	20.98
Financial Literacy	2.51	2.30	2.16	2.38	2.05
Financial Active	0.30	0.32	0.42	0.44	0.75
Number of observations	88	258	194	129	101
	Income classes				
	Low		Medium	High	
Amortizing mortgages	33.0 %		35.6 %	40.1 %	
Deferred amortization mortgages	22.2 %		19.9 %	13.0 %	
Interest-only mortgages	44.8 %		44.5 %	46.8 %	
Risk Aversion	23.41		24.80	25.50	
Financial Literacy	2.26		2.24	2.34	
Financial Active	0.27		0.46	0.47	
Number of observations	209		410	158	
	Education level				
	Primary or secondary		Higher vocational	University	
Amortizing mortgages	38.93 %		33.36 %	30.58 %	
Deferred amortization mortgages	19.12 %		22.97 %	9.94 %	
Interest-only mortgages	41.95 %		43.68 %	59.49 %	
Risk Aversion	23.69		25.68	26.22	
Financial Literacy	2.27		2.31	2.20	
Financial Active	0.38		0.41	0.59	
Number of observations	466		204	104	
	Wealth quartiles				
	First QRT	Second QRT	Third QRT	Fourth QRT	
Amortizing mortgages	40.29 %	35.45 %	40.17 %	25.55 %	
Deferred amortization mortgages	18.68 %	25.32 %	15.10 %	19.44 %	
Interest-only mortgages	41.04 %	39.24 %	44.73 %	55.01 %	
Risk Aversion	21.45	23.51	26.83	26.01	
Financial Literacy	2.21	2.19	2.22	2.39	
Financial Active	0.22	0.12	0.33	0.80	
Number of observations	338	85	186	165	

This table shows weighted mean values for risk aversion and financial literacy by mortgage type (Panel A) and demographics (Panel B). The exact measurement of risk aversion and financial literacy can be found in the Appendix. The definition of mortgage categories can be found in Table 10. Data is from the DNB Household Survey and cover mortgages originated between 1994 and 2009

**Table 4** Analysis of risk aversion and financial literacy on mortgage choice

Independent Variables	(1)	(2)	(3)	(4)	(5)
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor
					Interest-only
Panel A Mortgage choice without controlling for household wealth					
Risk Aversion	-0.020 [-1.52]	-0.030** [-2.33]		-0.020 [-1.37]	-0.026* [-1.90]
Financial Literacy		-0.001 [-0.00]	0.440** [2.11]	0.028 [0.11]	-0.036** [-2.67]
Financial Active					0.523** [2.31]
Demographics/Mortgage terms	Yes	Yes	0.124 [0.51]	0.519*** [2.69]	0.0661 [0.22]
Year fixed effects	Yes	Yes	Yes	Yes	Yes
No of Observations	439	463	513	409	405
Pseudo R-squared	0.259	0.270	0.252	0.285	0.288
Log-Likelihood	-337.3	-346.7	-393.8	-300.1	-279.9
Panel B Mortgage choice controlling for household wealth					
Risk Aversion	-0.018 [-1.36]	-0.032** [-2.45]		-0.019 [-1.31]	-0.023* [-1.68]
Financial Literacy		0.002 [0.01]	0.426** [1.99]	0.0451 [0.18]	-0.038*** [-2.80]
Financial Active					0.522** [2.24]
			0.173 [0.68]	0.561*** [2.70]	0.145 [0.47]
					-0.034** [-2.50]
					0.653*** [2.62]

Table 4 (continued)

Independent Variables	(1)		(2)		(3)		(4)		(5)	
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only
Demographics/Mortgage terms	Yes		Yes		Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes		Yes		Yes	
No of Observations	439		463		513		409		405	
Pseudo R-squared	0.267		0.276		0.258		0.295		0.293	
Log-Likelihood	-333.6		-343.5		-391.0		-296.0		-295.8	

This table shows weighted multinomial logit results for mortgage choice of households when measures for risk aversion and financial literacy are introduced (see for demographics Table 2). The exact wording and response categories of the questions are reported in the [Appendix](#). Included are mortgages originated between 1994 and 2009 with amortizing mortgages being the reference category (see Table 10). Robust t-statistics are reported in brackets. \*\*\*, \*\*, \* denotes significant at 1, 5 and 10 % level respectively. Data is from the DNB Household Survey

significant differences between respondents and non-respondents. The differences in income and wealth indicate that non-response is potentially more common among less literate households. However, as the distribution of contracts is not significantly different between respondents and non-respondents, these less literate non-responding households are evenly distributed among all mortgage categories. Therefore the literacy and risk aversion effect that we document to explain the choice between the different mortgage categories is unlikely to be solely driven by a selection effect.

Since financial literacy and risk aversion might be interrelated, we also examine their impact simultaneously. Moreover, we check whether inclusion of household wealth in Panel B alters the results, since households might privately save in order to pay down their mortgage.

Panel A shows that households that are more risk-averse are 97 % less likely to choose interest-only mortgages. This result is intuitive, as interest-only mortgages are more sensitive to equity-driven default risk, making them unattractive for risk-averse households. Coulibaly and Li (2009) mention the importance of risk attitude in contract choice, and we do find support for this statement. Specifications 2 and 3 include financial literacy and activity; those households that consider themselves more knowledgeable on financial matters and those that hold financial assets were found to be respectively 55 % and 68 % more likely to choose for interest-only mortgages. No effects were found for contract-types that defer amortization and the results do not change in sign or magnitude when household wealth is added to the model.

The inclusion of risk aversion and financial literacy simultaneously in specifications 4 and 5 does not significantly alter the results, except that risk aversion has now a marginal negative impact on the choice of a deferred amortization contract. Examination of the correlation between risk aversion and financial literacy ( $r = 0.001$ ) and financial activity ( $r = -0.033$ ) confirms that collinearity in these measures is not an issue. Moreover, the low correlation between the measures shows that they measure quite different constructs. A moderate correlation was found between literacy and activity ( $r = 0.21$ ), probably that the asset holdings of the household are more related to ‘awareness’ than to ‘literacy’ given the low correlation.

The results so far indicate the importance of risk attitudes and literacy in household financial decision making. However, in contrast with the concerns expressed by the Dutch financial regulator (Authority of Financial Markets 2008), we found that AMPs are generally chosen by households with higher levels of literacy. Although deferral of amortization increases riskiness of mortgages, people who are potentially more aware of these risks generally tend to choose deferred amortization and interest-only mortgages.

### Robustness Checks

This section assesses the robustness of our results considering a variety of alternative explanations. One such explanation could be that households that are more literate have received more education in economics. Van Rooij et al. (2011) controlled for the level and use of economics but found insignificant results on stock market participation. Unfortunately, this data is unavailable for most years, which prevents us from exploiting this explanation further. However, Mandell and Klein (2009) showed that

the level of economics education received, is of limited influence on later levels of financial literacy.

Moreover, literacy might be correlated to some unobserved ‘ability’, making causal inferences problematic. Although we acknowledge the potential severity of this problem, it is not possible to append the dataset with potential exogenous instruments (such as information on siblings), for the reasons mentioned in section 3. Since Van Rooij et al. (2011) relied on the same dataset, the potential severity of this bias is likely to be similar. Through an extensive set of robustness checks, that study showed that their main results are robust to ‘ability’ endogeneity. Other explanations for our results could include the impact of financial advice, peers, and prior experiences with homeownership. As the dataset contains information on these topics, the robustness of the results is checked against these explanations.

### Mortgage Choice: The Impact of Advice

Households that face complex financial decisions affecting their wealth portfolio might rely on sources of advice to receive information and increase their understanding of financial products. For example, Elmerick et al. (2002) showed that older, larger households and those with more financial assets are significantly more likely to receive credit and borrowing advice. Several papers show that receiving professional advice indeed alters and improves investment decisions of households (Hackethal et al. 2012), as well as borrower credit profiles (Elliehausen et al. 2007). If difference in information or seeking advice are correlated with literacy and risk aversion, than our results so far would suffer from omitted variable bias.

Our dataset contains several alternative sources of advice (see Table 5), ranging from passive forms like newspapers to active involvement of family and acquaintances and professional financial advisors.<sup>7</sup> Consistent with prior work, Table 5 Panel A, shows that more risk-averse and high-literate households tend to rely on professional financial advice, while low-literate households rely on public advertisements (TV, newspapers, etc.). Usage of financial literature such as books is also more widespread among more literate households and those that are more active in financial markets.

Breaking up the sample according to mortgage types reveals that households with interest-only mortgages rely in 14 % of the cases on parents and family and in only 28 % on professional advisors. These numbers are low compared to households with an amortizing or deferred amortization mortgages. Consultation of newspapers is popular among households with interest-only mortgages and those with more financial assets in their portfolio. Demographically, it appears that older, higher-educated, or wealthier households tend to seek professional advice, which was also found in Elmerick et al. (2002) and Hackethal et al. (2012). Conversely, lower-educated households and those with lower income tend to rely more on advice by parents and acquaintances or public media. Internet and financial program usage is not widespread, with less than 8 % of households relying on these channels.

<sup>7</sup> Financial advisors are often paid on commission base and might impact the decision process according to the incentives provided to them (Inderst and Ottaviani 2009) rather than truthful and honest information disclosure. In additional analysis, we find no bivariate dependence between advisor involvement and contract choice.

**Table 5** Literacy, risk aversion, mortgage types and demographics by source of advice

## Panel A Source of advice and literacy and risk aversion

	Literacy and risk aversion indicators		
	Risk Aversion	Financial Literacy	Financial Active
Parents, family and acquaintances	26.40	2.06	0.33
Newspapers	30.16	2.31	0.78
Financial literature (magazines, guides and books)	27.19	2.75	0.71
Brochures from bank or mortgage advisors	29.67	2.12	0.39
Advertisements in the media (TV, newspapers etc.)	26.71	1.78	0.10
Professional financial advisors	28.77	2.32	0.44
Financial computer programs	25.89	2.34	0.56
Financial information on the internet	28.33	2.50	0.45
Number of observations	423	423	423

## Panel B Source of advice across mortgage types

	Mortgages types		
	Amortizing	Deferred amortization	Interest-only
Parents, family and acquaintances	22.26 %	23.85 %	13.92 %
Newspapers	6.64 %	1.53 %	11.95 %
Financial literature (magazines, guides and books)	8.02 %	2.10 %	9.31 %
Brochures from bank or mortgage advisors	9.49 %	5.28 %	9.07 %
Advertisements in the media (TV, newspapers etc.)	2.42 %	2.40 %	1.51 %
Professional financial advisors	30.71 %	40.23 %	28.23 %
Financial computer programs	1.30 %	2.33 %	0.93 %
Financial information on the internet	4.61 %	4.79 %	8.39 %
Number of observations	152	72	199

## Panel C Source of advice across demographics

	Age classes				
	20–30 years	31–40 years	41–50 years	51–60 years	61+ years
Parents, family and acquaintances	31.77 %	26.09 %	14.63 %	10.25 %	10.38 %
Newspapers	2.22 %	3.08 %	5.66 %	14.37 %	21.29 %
Financial literature (magazines, guides and books)	3.76 %	3.39 %	10.12 %	13.45 %	8.52 %
Brochures from bank or mortgage advisors	5.57 %	5.97 %	10.09 %	12.93 %	7.27 %
Advertisements in the media (TV, newspapers etc.)	6.46 %	0.00 %	1.94 %	1.52 %	3.76 %
Professional financial advisors	17.86 %	32.94 %	34.46 %	33.05 %	27.48 %
Financial computer programs	0.00 %	2.06 %	0.97 %	0.00 %	1.09 %
Financial information on the internet	6.92 %	5.53 %	5.08 %	8.70 %	8.03 %
Number of observations	58	127	95	86	65

**Table 5** (continued)

	Education level			
	Primary or secondary	Higher vocational	University	
Parents, family and acquaintances	18.29 %	22.43 %	13.56 %	
Newspapers	6.38 %	9.14 %	13.07 %	
Financial literature (magazines, guides and books)	7.38 %	7.83 %	7.79 %	
Brochures from bank or mortgage advisors	8.35 %	8.44 %	9.27 %	
Advertisements in the media (TV, newspapers etc.)	2.89 %	1.32 %	0.00 %	
Professional financial advisors	30.21 %	31.57 %	34.21 %	
Financial computer programs	1.97 %	0.73 %	0.00 %	
Financial information on the internet	6.07 %	6.29 %	7.91 %	
Number of observations	239	119	65	
	Income classes			High
	Low	Medium		
Parents, family and acquaintances	24.12 %	20.43 %		9.65 %
Newspapers	5.99 %	8.29 %		9.98 %
Financial literature (magazines, guides and books)	1.43 %	5.79 %		16.82 %
Brochures from bank or mortgage advisors	10.22 %	6.70 %		11.52 %
Advertisements in the media (TV, newspapers etc.)	7.21 %	0.61 %		0.99 %
Professional financial advisors	21.10 %	34.10 %		32.69 %
Financial computer programs	0.00 %	1.30 %		2.41 %
Financial information on the internet	7.46 %	6.54 %		5.38 %
Number of observations	96	236		91
	Wealth quartiles			
	First QRT	Second QRT	Third QRT	Fourth QRT
Parents, family and acquaintances	19.41 %	23.61 %	19.30 %	14.95 %
Newspapers	5.83 %	2.68 %	8.15 %	13.11 %
Financial literature (magazines, guides and books)	6.57 %	4.55 %	4.63 %	12.51 %
Brochures from bank or mortgage advisors	6.84 %	9.09 %	9.34 %	9.22 %
Advertisements in the media (TV, newspapers etc.)	2.47 %	4.76 %	1.80 %	0.47 %
Professional financial advisors	26.55 %	30.21 %	35.00 %	32.92 %
Financial computer programs	1.31 %	0.00 %	2.67 %	0.64 %
Financial information on the internet	3.78 %	8.60 %	6.75 %	7.86 %
Number of observations	160	55	126	127

This table shows weighted mean values and percentages for literacy and risk aversion (Panel A), mortgage types (Panel B) and demographics (Panel C) by source of advice. The exact measurement of literacy and risk aversion can be found in the Appendix. The definition of mortgage categories can be found in Table 10. Data is from the DNB Household Survey and cover mortgages originated between 1994 and 2009



The multivariate model examines the impact of the most prevalent forms of advice: parents, family and acquaintances (18 % of the respondents), and professional financial advisors (30.1 % of the respondents). The theoretical reason for doing this is that face-to-face consultation tends to have a larger impact on decision making than passive forms of advice (Quercia and Spader 2008). From a practical point of view, the inclusion of all forms of advice leads to collinearity as some forms of advice have only a very limited number of observations available.

Table 6 presents the results after controlling for financial advice. At first glance, our results remain virtually unchanged compared to those without inclusion of advisors. Risk-averse (more literate) households are still significantly less (more) likely to choose interest-only mortgages, while no significant impact was observed regarding the probability of deferred-amortization contracts.

On second look shows that the role of advice is a significant determinant of contract choice as distinct from literacy and risk aversion. Professional advisors increase the probability that households have deferred-amortization contracts. Probably, advisors make households aware of the affordability and interest deduction benefits of these products, thereby increasing the probability that these are chosen.

Advice by relatives, on the other hand, decreases the likelihood of AMPs being chosen. Although we do not know to what extent parents are questioned, a generational difference between the advisor and the household can explain why this negative coefficient was observed. When the households' parents chose their first mortgage, the popularity of AMPs – especially interest-only mortgages – was substantially lower. If the advice by parents is based on their own 'first-mortgage experience', then they might be more inclined to recommend a product that is similar to the one they chose when entering the homeownership market. As this is some two decades ago it is likely to be an amortizing product.

### Mortgage Choice: The Impact of Peer Effects

In order to shed more light on the impact of advice and the robustness of risk aversion and literacy as determinants of mortgage choice, the impact of peer effects on mortgage choice was considered. As argued in several studies (Hong et al. 2004; Brown et al. 2008), the impact of peer effects is not negligible in portfolio choice, as households might learn from the experiences of others. We use the level of education and income of the households' peers to assess this hypothesis, since these are related to the degree of financial sophistication in general. Table 7 examines the impact for literacy and risk aversion and Table 8 does the same for financial advice.

Including the education level of peers (Panel A) decreases the explanatory power of risk aversion and literacy substantially. Peers of the household that attained higher education increase the probability that the household chooses an interest-only mortgage. There appears to be a learning effect present, but the risk-aversion and literacy measures remain significant overall.

Moreover, Panel B suggests that the education of peers is a closer substitute for literacy and risk aversion than the level of income. Peer income does increase the probability that interest-only products are chosen, but the main effects for the household are less affected compared to the inclusion of peer education levels.

**Table 6** Analysis of advice on mortgage choice

Independent Variables	(1)		(2)		(3)		(4)		(5)	
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only
Panel A Mortgage choice and advice from professional financial advisor										
Professional advisor	1.175*** [2.67]	0.016 [0.05]	1.021*** [2.66]	0.059 [0.19]	1.159*** [2.83]	0.041 [0.12]	1.187*** [2.70]	0.016 [0.05]	1.220*** [2.67]	0.055 [0.15]
Risk Aversion	-0.027* [-1.67]	-0.033** [-2.27]					-0.028* [-1.69]	-0.036** [-2.49]	-0.026 [-1.60]	-0.031** [-2.11]
Financial Literacy			0.027 [0.11]	0.489** [2.27]			0.065 [0.24]	0.584** [2.41]		
Financial Active					0.203 Yes	0.532**			0.162 Yes	0.565**
Demographics/Mortgage terms	Yes		Yes		Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes		Yes		Yes	
No of Observations	399		450		416		399		378	
Pseudo R-squared	0.299		0.291		0.302		0.309		0.318	
Log-Likelihood	-286.7		-326.5		-296.8		-282.6		-263.7	
Panel B Mortgage choice and advice from family										
Advice from family	-0.761 [-1.53]	-0.725* [-1.71]	-0.415 [-1.01]	-0.646* [-1.78]	-0.832* [-1.77]	-0.863** [-2.15]	-0.754 [-1.48]	-0.586 [-1.40]	-0.926* [-1.73]	-0.837* [-1.89]
Risk Aversion	-0.011 [-0.71]	-0.030** [-2.13]					-0.011 [-0.73]	-0.034** [-2.36]	-0.009 [-0.59]	-0.027* [-1.87]
Financial Literacy			0.047 [0.21]	0.442** [2.02]			0.030 [0.11]	0.542** [2.23]		

Table 6 (continued)

Independent Variables	(1)	(2)	(3)	(4)	(5)
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor
Financial Active					
			0.135 [0.43]	0.527** [2.19]	0.142 [0.43]
Demographics/Mortgage terms	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
No of Observations	399	450	416	399	378
Pseudo R-squared	0.289	0.283	0.294	0.297	0.309
Log-Likelihood	-290.9	-330.3	-300.1	-287.3	-267.2

This table shows weighted multinomial logit results for mortgage choice of households when measures for risk aversion and financial literacy and financial advice are introduced. The exact wording and response categories of the questions are reported in [Appendix A](#). "Professional advisor" is a dummy equaling 1 if the household relies on a professional financial advisor for decision making. "Advice from family" equals 1 when the household reports to rely on advice of family or acquaintances for their decision making. The demographics are the same as those in [Table 2](#). Included are mortgages originated between 1994 and 2009 with amortizing mortgages being the reference category (see [Table 10](#)). Robust t-statistics are reported in brackets. \*\*\*, \*\*, \* denotes significant at 1, 5 and 10 % level respectively. Data is from the DNB Household Survey

**Table 7** Analysis of peer effects on mortgage choice

Independent variables	(1)		(2)		(3)		(4)		(5)	
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only
Panel A Level of education of peers										
Risk Aversion	-0.018 [-1.21]	-0.027* [-1.82]					-0.017 [-1.14]	-0.028* [-1.94]	-0.014 [-0.96]	-0.022 [-1.47]
Financial Literacy			-0.235 [-0.94]	0.358 [1.63]			-0.172 [-0.64]	0.402* [1.73]		
Financial Active					0.232 [0.71]	0.621** [2.53]			0.242 [0.69]	0.661** [2.53]
Education peers: intermediate vocational	0.411 [0.82]	0.726* [1.68]	0.635 [1.30]	0.773* [1.96]	0.541 [1.08]	0.729* [1.73]	0.461 [0.90]	0.639 [1.50]	0.539 [1.02]	0.782* [1.73]
Education peers: higher vocational/university	0.503 [0.87]	0.737 [1.45]	0.787 [1.37]	0.742 [1.53]	0.857 [1.49]	1.080** [2.09]	0.615 [1.01]	0.555 [1.10]	0.824 [1.35]	1.170** [2.16]
Demographics/Mortgage terms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of Observations	375		419		390		375		357	
Pseudo R-squared	0.258		0.265		0.263		0.266		0.270	
Log-Likelihood	-283.8		-314.4		-294.1		-280.7		-266.5	
Panel B Income of peers										
Risk Aversion	-0.033 [-1.64]	-0.047** [-2.42]					-0.033 [-1.64]	-0.048** [-2.50]	-0.0307 [-1.54]	-0.047** [-2.38]
Financial Literacy			-0.058 [-0.19]	0.498* [1.94]			0.0185 [0.06]	0.485* [1.82]		

Table 7 (continued)

Independent variables	(1)		(2)		(3)		(4)		(5)	
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only
Financial Active										
Income peers (€16,000 < €38,000)	0.312 [0.31]	1.159* [1.74]	0.139 [0.16]	1.539** [2.14]	0.424 [1.05]	0.861*** [2.59]	0.331 [0.32]	1.219* [1.65]	0.375 [0.82]	0.839** [2.41]
Income peers (>= €38,000)	0.805 [0.69]	1.093 [1.38]	0.588 [0.58]	1.388* [1.72]	0.035 [0.04]	0.658 [0.68]	0.766 [0.65]	1.162 [1.37]	0.678 [0.60]	0.828 [0.90]
Demographics/Mortgage terms	Yes		Yes		Yes		Yes		Yes	
No of Observations	262		291		270		262		250	
Pseudo R-squared	0.257		0.261		0.271		0.266		0.281	
Log-Likelihood	-197.7		-218.6		-201.0		-195.5		-182.8	

This table shows weighted multinomial logit results for mortgage choice of households controlling for peer effects. Panel A includes the level of education of peers, with elementary school education being the reference group. In Panel B the income of peers is included with income below €16,000 being the reference group. The exact wording and response categories of the questions are reported in the Appendix. The demographics are the same as those in Table 2. Included are mortgages originated between 1994 and 2009 with amortizing mortgages being the reference category (see Table 10). Robust t-statistics are reported in brackets. \*\*\*, \*\*, \* denotes significant at 1, 5 and 10 % level respectively. Data is from the DNIB Household Survey

**Table 8** Analysis of peer effects and advice on mortgage choice

Independent variables	(1)		(2)		(3)		(4)	
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only
Professional advisor	0.989*** [2.60]	0.166 [0.51]			0.832* [1.86]	0.198 [0.55]		
Advice from family			-0.504 [-1.18]	-0.955** [-2.53]			-0.708 [-1.25]	-1.492*** [-2.81]
Education peers: intermediate vocational	0.618 [1.25]	0.871** [2.07]	0.632 [1.28]	0.931** [2.21]				
Education peers: higher vocational/university	0.613 [1.09]	0.864* [1.72]	0.766 [1.34]	0.970* [1.92]				
Income peers (€16,000 < €38,000)					-0.154 [-0.19]	1.282* [1.90]	-0.152 [-0.19]	1.533** [2.20]
Income peers (>= €38,000)					0.343 [0.35]	0.991 [1.25]	0.392 [0.41]	1.405* [1.70]
Demographics/Mortgage terms	Yes		Yes		Yes		Yes	
No of Observations	410		410		283		283	
Pseudo R-squared	0.286		0.283		0.281		0.291	
Log-Likelihood	-298.7		-299.9		-207.4		-204.6	

This table shows weighted multinomial logit results for mortgage choice of households controlling for peer effects. Model 1 and 2 include the level of education of peers, with elementary school education being the reference group. Model 3 and 4 include the income of peers, with income below €16,000 being the reference group. “Professional advisor” is a dummy equaling 1 if the household relies on a professional financial advisor for decision making. “Advice from family” equals 1 when the household reports to rely on advice of family or acquaintances for their decision making. The demographics are the same as those in Table 2. Included are mortgages originated between 1994 and 2009 with amortizing mortgages being the reference category (see Table 10). Robust t-statistics are reported in brackets. \*\*\*, \*\*, \* denotes significant at 1, 5 and 10 % level respectively. Data is from the DNB Household Survey

The previous section found that advice by relatives decreases the probability of interest-only products being chosen. We argued that this might be due to a generation gap, which is driven by the ‘mortgage career’ of parents, for example. However, if households know this, they might rely mainly on advice by peers who are supposedly from the same generation, instead of parents or family. If this is the case, then controlling for peer effects would potentially render insignificant effects for the influence of family. However, Table 8 shows that even after controlling for peer effects, the sign and significance of advice by professionals and relatives remain unaffected. Households rely on various sources of advice when choosing a mortgage product and apparently these sources are compliments rather than substitutes.

### Mortgage Choice: The Impact of Prior Home-Ownership

So far, we have examined learning and information effects due to interaction with peers and advice. However, learning-by-doing might be very effective. This section examines

whether experience with prior home-ownership is driving mortgage choice rather than literacy or risk aversion. Experienced homeowners might be more aware of the mortgage market as well as the risks and features of certain mortgage products, subsequently altering their literacy and risk aversion levels.

Table 9 includes a dummy (prior home-ownership) measuring whether the household owned his previous house. It is implicitly assumed here that home-ownership is equivalent to having a mortgage, which is not necessarily true. Our dataset does not permit us to distinguish whether households had a mortgage and which type; however, 85 % of Dutch households take out a mortgage when purchasing a home so the majority of them have prior experience with the mortgage market. Our main results are not quantitatively and qualitatively affected: risk aversion and literacy remain significant in explaining mortgage choice. The magnitude of the effects is virtually equal to that found in Table 4.

### Additional Checks

Since Dutch mortgage debt is recourse, households remain liable for any outstanding balance in case of foreclosure. As mentioned, AMPs have a higher repayment risk than conventional contracts. However, the availability of mortgage insurance enables households to hedge the repayment risk away. As such, the availability of mortgage insurance might alter the choice of mortgage type at the expense of risk aversion. This potential explanation was examined, but the results on risk aversion measures were not altered. The insurance dummy shows a strong negative effect for interest-only mortgages, but this reflects the insurance terms as the insurance terms caps households' share of interest-only mortgages to 50 %.

Furthermore, the sensitivity of the regression model was examined in greater detail. Since our time dimension is relatively large to the cross-section, inclusion of dummy variables to measure retirement and self-employment is prone to collinearity with year-effects as the number of observations on these groups is small. In alternative models, we both included and excluded retirement, self-employment and year-effects. The results remain both quantitatively and qualitatively unchanged.

Finally, the impact of house price expectations and the financial situation of the household were examined, as these could be the main reasons for choosing AMPs (see Cocco 2013). The choice for AMPs, especially interest-only mortgages, might be explained by optimistic expectations about house price appreciation rather than literacy or risk aversion. Our model was appended with a measure for house price expectations, but the results remain unaffected.

A household's willingness to take financial risks is likely influenced by how financially constrained they are. For example, households might want to take more risks to improve their current situation or less risk to keep their problems manageable. In terms of mortgages, households with a budget deficit might opt for AMPs, despite their level of risk aversion, as they are *ceteris paribus* cheaper than traditional contracts. Although income is a proxy for the financially constrained, our dataset also includes a question asking whether the household's budget shows a monthly deficit or surplus. We do not find that the inclusion of this proxy alters our prior findings.



**Table 9** Analysis of experience on mortgage choice

Independent variables	(1)		(2)		(3)		(4)		(5)	
	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only	Deferred amor	Interest-only
Prior home-ownership	-0.278 [-0.66]	-0.038 [-0.10]	-0.338 [-0.77]	-0.047 [-0.13]	-0.323 [-0.79]	-0.362 [-1.05]	-0.594 [-1.31]	-0.092 [-0.24]	-0.405 [-0.88]	-0.087 [-0.23]
Risk Aversion	-0.017 [-1.31]	-0.032** [-2.44]					-0.018 [-1.25]	-0.038*** [-2.76]	-0.022 [-1.64]	-0.033** [-2.47]
Financial Literacy			-0.003 [-0.02]	0.427** [1.97]			0.0256 [0.10]	0.530** [2.22]		
Financial Active					0.167 [0.66]	0.553*** [2.66]			0.138 [0.44]	0.660*** [2.62]
Demographics/Mortgage terms	Yes		Yes		Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes		Yes		Yes	
No of Observations	439		463		513		409		405	
Pseudo R-squared	0.263		0.274		0.259		0.293		0.29	
Log-Likelihood	-335.2		-334.9		-390.4		-296.5		-297.1	

This table shows weighted multinomial logit results for mortgage choice of households when controlled for previous home-ownership. "Prior home-ownership" is a dummy equaling 1 when the respective household has owned their previous house. The exact wording of the literacy and risk aversion questions can be found in the [Appendix](#). The demographics are the same as those in [Table 2](#). Included are mortgages originated between 1994 and 2009 with amortizing mortgages being the reference category (see [Table 10](#)). Robust t-statistics are reported in brackets. \*\*\*, \*\*, \* denotes significant at 1, 5 and 10 % level respectively. Data is from the DNB Household Survey

## Conclusions

This paper demonstrates that financial literacy and risk aversion have an impact on the choice for alternative mortgage products. Households that are more risk averse and less literate are significantly less likely to choose interest-only mortgage but the results are insignificant for deferred amortization contracts.

We also find that both direct (self-reported knowledge) and indirect (financial market participation) proxies for financial knowledge help in explaining the mortgage-type choice by households and that these results hold against a variety of alternative explanations, such as financial advice, the effects of peers, prior home-ownership, and price expectations.

As we document that households who choose AMP contracts are in general more financially sophisticated and more willing to take financial risks, it seems that they are also more likely to have at least basic understanding of the product characteristics and to take on risk exposure consistent with their preferences. The finding that households with limited literacy levels tend to rely more on public media when choosing their mortgage, shows the importance of a clear exposition of the contract-features and risks in these media channels. Transparency is warranted as it can prevent households from choosing mortgage-types that are unsuitable for them especially among those with limited capability to evaluate this information.

With respect to policy recommendations, we do not want to over-interpret our results for two reasons. First, self-assessments of financial literacy are noisy and might also capture other factors such as overconfidence which would alter the nature of any recommendation that can be derived from our results. Second, financial literacy is not the only factor at work in financial decision making and as such it is unclear if for example increasing financial education is effective in assisting households in their decision making process.

This also brings us to a discussion of generalizability to other markets and institutional contexts. First, we want to note that institutional differences and the array of mortgage products on offer is time varying and different across countries. The dynamic nature of the mortgage market potentially limits the generalizability of a study irrespective of the market where it is conducted. However, our results are less depending on the specific institutional context that one might expect. If we assume that there is no significant difference in relative financial literacy levels and underlying attitudes between countries – as opposed to the within-country variation which is used in this paper – then our results should generalize to other markets as well because one studies the effect of literacy and risk aversion on products with different degrees of financial complexity and riskiness, irrespective of how that exact product looks like and given the relevant institutional context in which that product is offered.

Moreover, the acquisition of financial literacy is also path-dependent, i.e. households in countries individually and collectively gain knowledge about the optimal mortgage for them given the relevant institutional context. The channel through which this knowledge is acquired varies; brokers, professional advisors, friends, family, and media attention all play an important role in this process. Although we spend time to analyze the impact of these factors on decision making, the knowledge gaining process itself is probably universal, albeit with different weights for certain factors. This adds to the generalizability of our results. However, variables (including financial literacy) might

exhibit different variation or impact on mortgages and other financial product choices, because the institutional context can act as an intermediating variable, thereby altering their observed relation. For example, hourly-billing versus commission-based compensation for intermediaries alters the incentives provided in the origination process and the subsequent impact on the intermediary's advice and the decision made by households.

Keeping this in mind, shows once more that mortgage choice by households is a complex phenomenon. Apart from the institutional context that has a profound impact on observed lending patterns across markets, there are other factors, such as financial literacy, that impact the decision process. Additional research is needed in order to understand to what extent these factors drive decision making in others contexts and which policies are effective to ensure households obtain the optimal product given their personal circumstances.

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## Appendix

### Mortgage products in the Netherlands

This appendix discusses the differences between available mortgage types in the Netherlands in detail as well as the distribution of origination over time. Mortgage interest payments are fully deductible at the marginal income tax-rate (typically 42 or 52 %), but amortization payments are not a tax-deductible item. Maximization of tax-benefits therefore requires that any amortization charges are not directly deducted from the outstanding principal as this lowers the deductibility of interest-rate payments as well. The two mortgage categories that cater to this tax-arrangement are deferred amortization – where a household saves in a separate account for a balloon payment at maturity – and interest-only products, where no amortization payments prior to maturity are made.<sup>8</sup> Although hybrid mortgages are available in the Netherlands (e.g., a combination of an annuity and endowment mortgage), they constituted only a minor part of the sample (less than 5 %) and they are classified here as one type based on the size of the principal of the individual mortgage relative to total outstanding mortgage debt. Our classification of the different available contracts in the dataset is shown in Table 10.

To illustrate how the affordability and amortization develops, we compare after-tax payments in year one and after 15 years for three different mortgage types in Table 11.<sup>9</sup> A traditional amortizing annuity contract immediately starts repaying, and this amortization

<sup>8</sup> Negative amortization contracts and 'subprime' mortgages (e.g. 2/28 ARM's) are not available in the Netherlands.

<sup>9</sup> We have chosen an endowment mortgage as an example of a deferred amortization-type. Life-annuity and investment mortgages work in a similar way.

constitutes an increasing proportion of the total mortgage expenses. The outstanding balance decreases steadily until the mortgage is completely paid off at maturity. Consequently, the tax-benefit of interest payments decreases as they fall in tandem with the lowered outstanding principal, while amortization payments are not tax-deductible.

In the case of an AMP the repayment of the principal is deferred towards the future. The example in the table assumes an endowment mortgage. Instead of directly subtracting the amortization-payments from the principal, the repayment of the principal is converted to an annuity and the endowment payment goes into an endowment fund. In this case the 200,000 euro liability due after 30 years is annuitized, assuming that the endowment-fund will yield an average return of 6 % over the term, with the yearly endowment in this case amounting to 2,530 euro, which is lower than the 3,278 euro amortization payment on an annuity-mortgage. As the outstanding balance is not repaid, the benefits of tax-deduction are not decreasing, but instead the mortgage is paid off at maturity with the proceeds of the endowment fund. Finally, the interest-only mortgage – as implied by its name – only features interest-expenses until maturity. At maturity the proceeds of a sale of the collateral, private savings, or a refinancing of the mortgage, should suffice to pay off the principal. Again, this construction maximizes the benefits of tax-deductibility. It can also be seen that the net-yearly charges in year one are highest for traditional amortizing contracts (8,498 euros), followed by endowment (7,750 euros) and interest-only mortgages (5,220 euros), hence the name ‘affordability’ mortgages.

The downside of the affordability is the increased repayment risk of AMP’s, assuming that households are able to honor their obligations till maturity. If the return on the endowment fund is lower than the anticipated 6 %, the terminal value of the fund will be insufficient to repay the mortgage at maturity (i.e. a 5.5 % return will lead to a shortfall of more than 16,000 euro at maturity). For interest-only mortgages the risk is – all else equal – even higher as the borrower is dependent on the value development of his property until maturity or his personal wealth.

Figure 1 plots the distribution of newly originated mortgages between 1994 and 2009. There is a substitution effect in newly originated mortgage types from traditional mortgages towards interest-only contracts similar to patterns observed in the U.K. The share of interest-only contracts in the total product mix rose from 3 % in 1994 to 45 % by 2009. This massive increase in popularity is primarily driven by the aforementioned tax-regime, rising house prices and low interest rates, as the demographic characteristics of new borrowers remained constant during the same period.

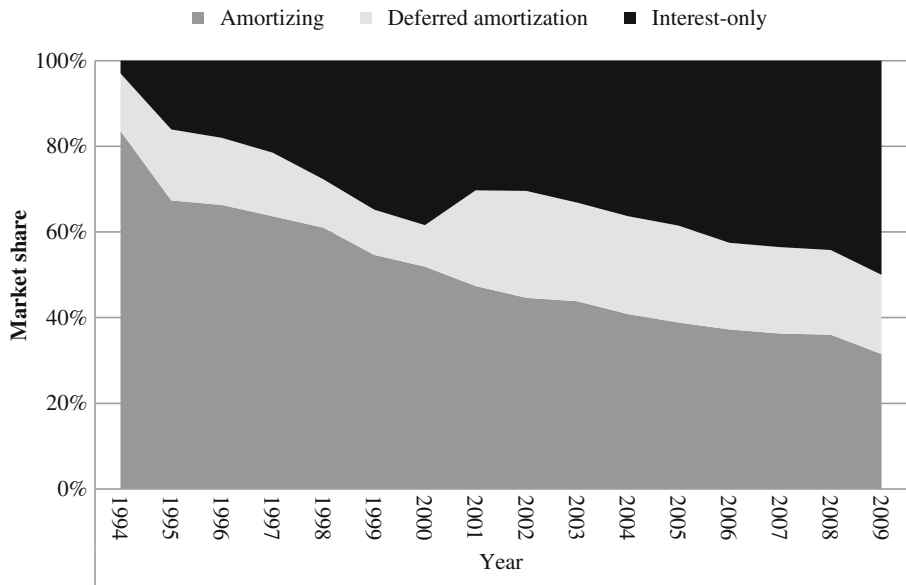
#### Measurement of Risk Aversion and Financial Literacy

For the analysis of the impact of financial literacy, risk aversion, and opinions about the current and future situation on mortgage choice, several questions from the DNB Household Survey were used. The exact wording of these questions is presented here.

#### Risk Aversion measures

All questions could be answered on a seven-point scale ranging from 1, totally disagree with the statement to 7, totally agree.

The resultant scale was constructed by recoding the responses on risk aversion measures 3, 5, and 6 and adding them up together, thereby creating one scale that can range from 6 (very risk tolerant) to 42 (very risk averse). Analysis of the scale using



**Fig. 1** Development of mortgage types and market shares in the total Dutch mortgage portfolio between 1994 and 2009. Source: DNB Household Survey

the Cronbach Alpha measure shows that the scale could not be improved by deleting items and the coefficient of 0.927 exceeds the 0.90 level that Nunnally (1978) suggested as a threshold for scales used in decision-making processes.

### Financial Literacy measures

#### *Self-reported financial knowledge*

Respondents were asked to respond to the following statement:

“How knowledgeable do you consider yourself with respect to financial matters?”

With response categories:

1. Not knowledgeable
2. More or less knowledgeable
3. Knowledgeable
4. Very knowledgeable

#### *Financial active*

Financial activity is measured using the following seven questions:

1. “Did you, on 31 December [year], have investments with MUTUAL FUNDS? Do not include investments in growth funds, investments (shares, bonds) in companies, or insured saving (i.e., saving through a life-insurance) here.”
2. “Did you, on 31 December [year], have any BONDS and/or MORTGAGE BONDS? Do not include bonds through mutual funds here. These have already been reported on.”

**Table 10** Mortgage types in the Netherlands based on DNB Household Survey

Mortgage product	Tax benefits of interest payments	Repayment charges prior to maturity
<b>Amortizing mortgages</b>		
Annuity mortgage	Yes, tax benefits decrease over time	Yes, increasing principal repayments over time
Linear mortgage	Yes, tax benefits decrease over time	Yes, principal repayment in equal installments over maturity of the mortgage
Savings mortgage	Yes, tax benefits do not decrease over time	Yes, through life-insurance contract which equals mortgage balance at maturity
<b>Deferred amortization mortgages</b>		
Endowment mortgage	Yes, tax benefits do not decrease over time	Yes, at maturity through life insurance contract. Contract value depending on investment results
Traditional life mortgage	Yes, tax benefits do not decrease over time	Yes, at maturity through life-insurance contract. Contract value depending on investment results but a minimum is guaranteed
Mortgage with life-annuity	Yes, tax benefits for both interest payments and annuity premiums	Yes, at maturity through the life annuity. However the payments of the life annuity are taxed
Life mortgage with life cover	Yes, tax benefits do not decrease over time	Yes, at maturity through life insurance contract. Contract value depending on investment results
<b>Interest-only mortgages</b>		
Interest-only mortgage	Yes, tax benefits do not decrease over time, low payments because no provisions for principal repayment are included	No repayment facility
Credit mortgage	Yes, tax benefits do not decrease over time	No repayment facility, optional repayments can be made prior to maturity

3. “Did you, on 31 December [year], own any SHARES? Do not include shares of your own private limited company here, nor bonds through MUTUAL FUNDS. These have already been reported.”
4. “Did you, on 31 December [year], have one or more PUT-OPTIONS?”
5. “Did you have any written PUT-OPTIONS outstanding on 31 December [year]?”
6. “Had you, on 31 December [year], bought one or more CALL-OPTIONS, FALCONS, or WARRANTS?”
7. “Did you have any written CALL-OPTIONS, FALCONS<sup>10</sup> or WARRANTS outstanding on 31 December [year]?”

<sup>10</sup> Fixed term agreement for long term call option on existing securities, which is an option or warrant on an existing security with an extended maturity.

**Table 11** Payment schedule for different mortgage types

	Amortizing		Endowment		Interest-only	
After year 1						
Net interest payment	€	5.220	€	5.220	€	5.220
Amortization payment	€	3.278	€	-	€	-
Endowment payment	€	-	€	2.530	€	-
Outstanding balance	€	196.772	€	200.000	€	200.000
After year 15						
Net interest payment	€	3.442	€	5.220	€	5.220
Amortization payment	€	6.344	€	-	€	-
Endowment payment	€	-	€	2.530	€	-
Outstanding balance	€	125.519	€	200.000	€	200.000

This table compared the yearly charges for three different types of mortgages: a traditional amortizing mortgage, an endowment mortgage and an interest-only mortgage. Assumed are a 200.000 euro initial principal, a 4.5 % interest rate, a 6 % return on investments in the endowment fund and a tax-rate of 42 %

Responses are recorded as a dummy variable equaling 0 (= no) if the household did not hold the security at 31 December and 1 (= yes) if the household did hold the security. Final scores were obtained by counting the total number of yes-responses, resulting in a scale that ranges between 0 and 7, where 0 indicates that the household does not hold financial assets at all, while 7 indicates that the household holds all mentioned securities.

#### Risk Aversion 1:

“I think it is more important to have safe investments and guaranteed returns, than to take a risk to have a chance to get the highest possible returns”

#### Risk Aversion 2:

“I would never consider investments in shares because I find this too risky”

#### Risk Aversion 3:

“If I think an investment will be profitable, I am prepared to borrow money to make this investment”

#### Risk Aversion 4:

“I want to be certain that my investments are safe”

#### Risk Aversion 5:

“I get more and more convinced that I should take greater financial risks to improve my financial position”

#### Risk Aversion 6:

“I am prepared to take the risk to lose money, when there is also a chance to gain money”



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