Journal of Banking and Finance 000 (2016) 1–17

Contents lists available at ScienceDirect

Journal of Banking and Finance

journal homepage: www.elsevier.com/locate/jbf

Mortgage risks, debt literacy and financial advice

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ARTICLE INFO

Article history:
Received 8 January 2015
Accepted 10 May 2016
Available online xxx

JEL classification:
G21
D83
D12
D14

Keywords:
Mortgage choice
Risk-taking
Financial literacy
Financial advice

ABSTRACT

A limited understanding of mortgage contracts and the risks involved may have contributed to the outbreak of the 2007–2008 financial crisis. We developed a special questionnaire relating mortgage loan decisions to financial knowledge and financial advice. Our results demonstrate that homeowners appear to be well aware of mortgage risks. Large loans relative to home value are perceived as riskier, as are loans with large mortgage payments relative to income and loans linked to investment vehicles. Homeowners with riskier mortgages indicated that they could encounter financial problems should house prices or their income decline. Homeowners with relatively low debt literacy are more likely to take out traditional mortgages with principal repayments over the maturity of the loan. Riskier mortgages are more prevalent among homeowners with a better understanding of loan contracts. Financially less sophisticated homeowners consulting mortgage brokers, too, hold riskier mortgages.

1. Introduction

The 2007–2008 financial crisis has demonstrated that mortgage loan decisions can have a significant impact on the financial situation and wellbeing of households. However, taking out a mortgage loan is not an easy decision. In fact, households are faced with an extensive range of mortgage types, often with complicated features. As mortgage loans are taken out infrequently, there is little scope to learn from past experiences. Yet, mortgage loans may entail risk characteristics that can lead to serious financial problems and may lead to bankruptcy. Moreover, this stressful financial situation may have consequences beyond the financial domain, including depression or other health problems (see Currie and Tekin, 2015). Against this background, it is important to investigate whether borrowers are aware of the risks of a mortgage loan.

This paper analyses the relation between financial literacy and mortgage choice, and the role of financial advice. More specifically, we examine whether financially sophisticated and financially less sophisticated households have different perceptions of the risks posed by their mortgage loans and by specific mortgage attributes. In addition, we examine whether households that seek advice from mortgage brokers take out mortgages with different features.[1]

Given the complexity of mortgages, households taking out mortgage loans need to possess adequate financial knowledge or have access to financial advice to be able to understand the risk characteristics. However, several studies have demonstrated that households display much heterogeneity in financial literacy (see Lusardi and Mitchell, 2007; Van Rooij et al., 2011). In fact, many households have levels of financial knowledge which are, arguably, insufficient to take out a mortgage loan without proper guidance. These households may in particular benefit from financial advice provided by a mortgage broker.

In light of the US subprime mortgage crisis, several recent studies have examined the relation between mortgage outcomes and financial sophistication of households. For example, Gerardi et al. (2013) have demonstrated that financially illiterate borrowers are more likely to default on their mortgage loans. However, they have found no evidence of higher default rates resulting from riskier mortgage terms, such as high loan values relative to

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[1] When we use the term mortgage broker, we refer to traditional mortgage brokers and other financial intermediaries who bring together borrowers and lenders in the mortgage market and provide financial advice to households.

http://dx.doi.org/10.1016/j.jbankfin.2016.05.001
0378-4266/

income and house value or adjustable rate mortgages. Gerardi et al. (2013) have suggested that borrowers with a lower level of financial literacy default more often after taking out the loan because of their inability to accumulate sufficient wealth to absorb income shocks, for example when macroeconomic shocks give rise to involuntary unemployment. Indeed, Klapper et al. (2013) have documented that individuals with relatively low financial literacy are less able to deal with macroeconomic shocks.

Another potential channel through which financial literacy affects default is the inability to assess the affordability of the mortgage over the life of the loan, for example because of having incorrect expectations about income growth, investment returns or house price appreciation. Stafford et al. (2012) have shown that US households allocate too much of their household income to mortgage payments in times when the labor market is performing well and house prices appreciate. On the other hand, Amromin et al. (2011) argue that a lower level of financial literacy might also increase the likelihood of default, because less sophisticated households may underestimate the costs of default such as reputation loss, penalty charges, or a lower credit rating.

By contrast, Amromin et al. (2011) have found that more sophisticated borrowers, based on credit scores and income, are more likely to hold non-repayment (i.e. complex) mortgages and are also more likely to default on these mortgage loans, possibly due to strategic reasons.[2] Indeed, defaulting could be beneficial for homeowners with negative equity who own a non-recourse loan and are therefore not liable for any deficiency in the event of default (see also Ghent and Kudlyak, 2011). However, negative equity, in itself, is not a sufficient condition to default on non-recourse loans because of the high costs of moving, the reduced credit rating and the risk of being sued; see Guiso et al. (2013) for the determinants of strategic defaults. Bhutta et al. (2010) have documented that in US non-recourse states, defaults are mostly related to a double trigger, a combination of payment problems and negative equity (see also Elul et al., 2010; Gerardi et al., 2015). According to Bhutta et al. (2010), the median borrower does not strategically default before the negative equity falls below 62% of the home value.

Note that, while having risky characteristics, complex mortgages may be beneficial for sophisticated borrowers. Interest-only mortgages, for instance, allow borrowers to better match future higher labor income (Cocco, 2013). Similarly, no down-payment mortgage loans may increase household welfare as they enable young households to smooth consumption over the life cycle (Ghent, 2015). Furthermore, mortgage contracts that allow negative amortization may even be superior because they better match borrowers' income and debt flows (Piskorski and Tchistyi, 2010). Indeed, in the run-up to the financial crisis, easier access to mortgage loans with low down-payments enabled many households to raise mortgage finance, including less sophisticated borrowers, who may not have been fully aware of the risks. Thereby, the loosening of mortgage standards contributed considerably to the rise in defaults after the onset of the crisis (see Mayer et al., 2009; Demyanyk and Van Hemert, 2011; Corbae and Quintin, 2015).

Households who feel incapable of taking mortgage decisions on their own may turn to mortgage brokers for financial advice. According to Conklin (2015) financial illiterate households who receive face-to-face advice have a lower probability of default. Conklin (2015) concluded that this positive correlation is due to mortgage brokers advising borrowers on their broad financial situation and explaining the features and consequences of mortgage loans. However, there is also an alternative view according to which mortgage brokers extract additional income from illiterate consumers by advising suboptimal loans (see the literature overview in Conklin, 2015). This concern is not limited to the advice given by brokers. Foà et al. (2015) argue that households turning to the bank for advice when choosing between mortgages with adjustable versus fixed interest rates are prone to receive biased advice.

Concerns about the quality of financial advice may be fed by brokers receiving commission fees from the lender.[3] If commission fees are linked to mortgage size and mortgage type, brokers may face financial incentives to recommend mortgage loans that are not in the best interest of households. Households with limited financial sophistication, in particular if they are unaware of the commission structure, are prone to biased financial advice. While the theoretical implications of broker's financial advice to unsophisticated households are well understood (see Inderst and Ottaviani, 2012), there is relatively little empirical evidence about the impact, if any, of broker's financial advice on mortgage choices and the association with borrowers financial literacy.[4]

To this end, we designed a special questionnaire for the CentERpanel, a panel comprising more than 2,000 Dutch households that complete weekly Internet-based household surveys. Our survey was set up to collect information on mortgage risks, debt literacy and the role of financial advice in selecting a mortgage. More specifically, we explicitly measured the risks of a mortgage loan and the riskiness of different mortgage attributes as perceived by the borrower. These debt literacy questions in our survey focus on the understanding of characteristics of debt contracts such as mortgage loans. The debt literacy questions designed by Lusardi and Tufano (2015) are more specific and detailed than the 'basic' financial literacy questions formulated by Lusardi and Mitchell (2007), measuring the knowledge about basic financial principles which are important to day-to-day financial decision-making. The basic financial literacy questions are important determinants of, for instance, retirement planning (as highlighted by Alessie et al., 2011) and stock market investments (as demonstrated by Van Rooij et al., 2011). However, adequate basic financial literacy in itself may be insufficient to make infrequent debt decisions, including decisions about mortgage loans. Using both sets of literacy questions enabled us to assess which component of financial literacy influences mortgage choice.

There are several reasons why it is especially informative to examine these questions for the Netherlands. First, the mortgage market in the Netherlands is well-developed and innovative, with a wide range of non-traditional mortgage products on offer. Interest-only mortgages and endowment mortgages linked to a life insurance policy are very popular. Second, there is no requirement to make a down payment upon the purchase of a home. It is common practice, in particular among first-time buyers, to raise the loan amount to include transaction costs. Third, Dutch mortgage loans are recourse loans, as is the case in most European countries, which transfers the default risk in the mortgage contract to the borrower. Fourth, before the start of the financial crisis, with house prices continuing to rise, many Dutch households bought houses financed with large mortgage loans. Falling house prices and deteriorating labor market conditions in the aftermath of the financial crisis put these households at great financial risk.

[2] Cox et al. (2014) also find that financially sophisticated households are more likely to hold interest-only mortgages. They studied the link between mortgage type choice and self-assessed financial knowledge among households in the Netherlands. Our results confirm that individuals who report a higher self-assessed financial knowledge own an interest-only mortgage more often. However, we were able to analyze the relation with objective knowledge and we do not find that having an interest-only mortgage is related to the actual level of financial literacy.

[3] Cox (2013) documents evidence of a typical fee structure in the Netherlands displaying higher fees for complex mortgages and larger loan amounts.

[4] Woodward and Hall (2012) have provided suggestive empirical evidence that offering complex mortgages to unsophisticated households is profitable for mortgage brokers.

We contribute to the literature by explicitly measuring the riskiness of the mortgage loan and risk perception instead of analyzing default behavior which might be unrelated to the actual riskiness of the mortgage loan. In addition, we examine the role of financial advice in mortgage choice. There is limited empirical literature on the role of financial advice in shaping consumer decisions, and it mainly focusses on investment decisions. Finally, we measure both the understanding of basic financial concepts, as well as the understanding of complex loan contracts.

Our main findings are: first, households demonstrate less knowledge of loan contracts than of basic financial concepts, suggesting that loans are complex products for consumers. Moreover, the debt literacy measure is better able to explain the variation in mortgage risks than the more general basic financial literacy measure. Second, homeowners associate the following loan characteristics with risky mortgages: high loan-to-value ratios, high loan-to-income ratios and complex features such as linked life insurance policies investing part of the loan payments in the stock market. Third, home owners with higher levels of debt literacy typically hold riskier mortgages. Financially less sophisticated homeowners are more likely to have traditional mortgages, including annuity-based and linear mortgages, with homeowners gradually repaying the loan principal. Fourth, homeowners considering themselves incapable of taking out a mortgage consult mortgage brokers more often. However, households with a limited objective understanding of loan contracts – and therefore potentially benefiting most from advice – did not seek financial advice from a mortgage broker more often. Fifth, homeowners who had consulted mortgage brokers held riskier mortgages. This effect is more pronounced for homeowners with low levels of debt literacy.

The remainder of the paper is organized as follows. Section 2 explains the features of the Dutch mortgage market. Section 3 describes the survey design. Section 4 and 5 discuss our measures of mortgage risks and financial literacy. Section 6 investigates the relation between financial literacy, mortgage choice, mortgage risks and financial advice. The final section concludes and discusses implications.

2. An outline of the Dutch mortgage market

The Netherlands has an extensive menu of residential mortgage types available compared with other countries. Over the years, several innovative mortgage types have been developed to optimally exploit the tax deductibility of mortgage interest payments. The combination of generous mortgage interest tax relief and relaxation of lending criteria by financial institutions in the second half of the 1990s encouraged households to take out large mortgage loans (see DNB, 2000). Mortgage lenders required no down payment and transaction costs were typically included in the loan amount. Mortgage loans exceeding the property, with a loan-to-value (LTV) ratio between 110% and 115%, were very common until fairly recently (AFM, 2009). Thus, borrowers were exposed to significant risk if house prices declined, which has been the case in recent years. In 2012, the Dutch government has implemented a series of new measures to prevent disproportionately large mortgage loans.[5] Many other countries with mortgage interest deduction changed their rules at an earlier stage; either by abolishing or significantly reducing mortgage interest tax relief.

The most common mortgage loan is an interest-only loan, on which the borrower pays interest without making principal repayments. The principal has to be repaid when the loan matures, usually after 30 years. As the outstanding mortgage balance does not change over the life of the mortgage, borrowers make maximum use of the tax deductibility of interest payments over the whole period. Another widely available mortgage type is the endowment mortgage, consisting of an interest-only mortgage which is linked to a savings account in the form of a universal life insurance policy. The borrower pays both interest and an insurance premium (part of) which is set aside to repay the principal after 30 years. The cash value of the savings accumulated under the life insurance policy is exempted from wealth taxation. A related mortgage type concerns the investment-based mortgage, whose premium is invested in the stock market. Borrowers with investment-based mortgages run the risk of ending up with insufficient funds to repay the mortgage at maturity in the event of poor investment returns. Endowment and investment mortgages are also common in the United Kingdom, but they are rare in other countries (see Devereux and Lanot, 2003). Until, 2013, traditional fully amortizing mortgages, whose principal is gradually repaid based on a linear or annuity-based repayment scheme, were uncommon in the Netherlands because they do not take full advantage of the tax relief. The majority of mortgages are fixed rate mortgages (FRMs) with fixed terms ranging between five and ten years. A small fraction of the purchased mortgages have an adjustable rate (ARMs) closely linked to the market interest rate.[6]

Some borrowers have the option to take out a mortgage loan under the Dutch national mortgage guarantee (NMG) scheme. NMG mortgage loans have similarities with FHA insured mortgages in the United States, which insure the lender against default risk. Though, the NMG scheme protects both lenders and borrowers against residual debt upon involuntary default, for example owing to divorce or involuntary unemployment. However, there is no full coverage. The insured amount decreases as if the original mortgage is paid off as a fully amortizing mortgage. The NMG scheme insures mortgages for houses up to a ceiling amount of approximately the average house price. After paying a modest one-off premium to buy NMG insurance, borrowers pay a lower mortgage interest rate because the lender bears less risk.

3. Data

3.1. The mortgage risks questionnaire

We designed a detailed questionnaire on mortgage risks, debt literacy and financial advice. The questionnaire was fielded in the CentERpanel in the weekend of 18 June 2010. The CentERpanel is an Internet-based panel of over 2000 households administered by CentERdata at Tilburg University and sponsored by De Nederlandsche Bank. The panel is representative of the Dutch population. Panel members without Internet access receive a set-top box and equipment that enables them to participate through their television sets. Within each household, both the head and the partner aged 20 or older were interviewed. The questionnaire was presented to 2184 household members, of which 1464 members (1185 households) completed the survey; a response rate of 67% at the individual level. This response rate is comparable to those of the annual DNB Household Survey (DHS) modules, i.e. the main CentERpanel-based survey (see Teppa and Vis, 2012).

The rate of homeownership in our sample was 73.8% (874 households), with 85.6% of homeowners (748 households) having a residential mortgage loan on their property. This is somewhat higher than the ownership rate among Dutch households. We used sample weights to ensure that the reported statistics are repre-

[5] For example, the government introduced a statutory LTV cap, which will be gradually reduced from 106% in 2012 to 100% in 2018. Also, the possibility to deduct interest payments from income will be reduced from a maximum deduction of 52% (the highest marginal tax rate) in 2013 to 38% in 2041.

[6] DNB Statistics, available from: http://www.statistics.dnb.nl.

sentative of the Dutch population. The sample weights were based on the joint distribution of net household income, homeownership status and age of the head of the household as reported by Statistics Netherlands.[7]

The questionnaire on mortgage choice was combined with background information from the 2010 DHS, including self-assessed financial literacy. The DHS is an annual panel study which collects detailed information to study the determinants of saving behavior. The DHS module on accommodation and mortgages was completed in the same weekend as our questionnaire. This module had to be completed by the household member in charge of household finances. Combining our survey with the annual mortgage information resulted in an 80.4% match rate for households with a mortgage.[8] The combined sample included 592 households with a mortgage loan. For these households financial statistics about the mortgage loan were constructed, as described in the next section. We excluded from our analysis of mortgage choice all households with missing values or obvious reporting errors on important mortgage loan characteristics, reducing the sample size to 531 households (680 individuals).

We used two sets of literacy questions; one set measuring basic financial literacy and the other debt literacy. The basic financial literacy questions were fielded in a separate questionnaire one week before the questionnaire on mortgage risks which included the debt literacy questions. The financial literacy questions were answered by 91.1% of respondents in the mortgage risks survey.[9] The final sample which we used for the empirical analysis, containing both literacy questions, included 459 households owning a mortgage.

3.2. Mortgage characteristics

In line with the literature on mortgage default, we constructed several financial measures related to payment problems and mortgage default, as demonstrated by Cocco (2013). The original loan-to-value ratio (OLTV) was defined as the ratio of the original loan amount to the purchase price of the house. The current loan-to-value ratio (CLTV) was defined as the ratio of the outstanding mortgage loan balance to the current self-reported house value.[10] For endowment mortgages and investment-based mortgages, we took into account the cash value of the savings account linked to the mortgage to repay the principal at maturity.

To measure the financial burden of the loan, we computed the current payment-to-income ratio (CPTI); the ratio of gross mortgage payments to net household income. We defined the current loan-to-income ratio (CLTI) as the ratio of the current loan amount to net household income. We were able to retrieve net household income data for the year of home purchase only for households participating in the DHS in the year the house was purchased. This information was available for about 60% of the households in our sample that had purchased a house after 1993 when the DHS started. For those households, we calculated the original loan-to-income ratio (OLTI).

Table 1 presents financial characteristics of the mortgage loans by age and by year of house purchase and year of mortgage origination. The data show an increasingly large share of property values being funded by mortgage loans over the last decade. For house purchases after 2007, the majority of the households took out mortgage loans exceeding the value of their properties. The number of households with original LTV ratios greater than 100% rose from 25.0% in the early 1990s to 67.3% for house purchases after 2007, with an average original LTV ratio of 103% for house purchases after 2007. Over the same period, the loan amount relative to the net household income (at time of purchase of the house) also increased sharply. The average original LTI ratio increased from 6.2 between 1996 and 1999 to 9.1 after 2007. Large mortgage loans imply that homeowners have to allocate a large share of their household income to mortgage payments. The gross current payment-to-net income (PTI) ratio of mortgages taken out after 2007 stood at about 50%. The net current PTI ratio was lower owing to the impact of mortgage interest tax relief.

Mortgages with high LTV and LTI ratios were taken out principally by younger households. Households aged under 40 on average had an original LTV ratio of 103%; about 62% had original LTV ratios of more than 100%. Households currently aged 70 and older had an average original LTV ratio of 75%; only 11.8% had purchased their homes with a mortgage loan exceeding the property value. Note that homeowners in these older age cohort most likely have moved up the housing ladder. Tax treatment of owner-occupied housing provides incentives for movers to use positive home equity for new house purchases resulting in lower LTVs. Moreover, older homeowners are better able to make a down payment if they have accumulated financial assets over the course of their lives. In addition, when older cohorts still live in their first home, they probably bought this home many years ago when down payments were much more common (see Panel A of the table and Verbruggen et al., 2015).

In many cases, the average current LTV ratio was lower than the original LTV ratio because of principal repayments or property price increases over the life of the loan. Nevertheless, about 23% of the households younger than 40 had negative equity in 2010. Households in this group also made large mortgage payments in proportion to total household income. It is doubtful whether they would be able to continue repaying their mortgage loans if household income fell, for instance because of job loss or divorce. The combination of negative equity and a significant payment burden puts these young households in a risky position. Negative equity is very rare among households above age 50.

Table 2 shows the percentage of mortgage types by age and by year of house purchase and year of mortgage origination. Interest-only mortgages and endowment montages are the most popular of all mortgages taken out after 2007; endowment mortgage accounted for about 35% and interest-only mortgages for about 55%. Endowment mortgages were often taken out by younger households, with older households more often holding interest-only mortgages. The relative high prevalence of repayment mortgages among younger households limits their risk of building up excessive debt. Around the year 2000, many mortgages taken out were linked to investment vehicles because stock prices were soaring in those days, and expected stock market returns were high. Investment-based mortgages became less popular after 2000 due to poor realized investment returns contributing to shortfalls in investment mortgages. After 2007, new investment-based mortgages declined to fewer than 3% of all new mortgage loans. More traditional repayment mortgages, such as fully amortizing mortgages, account for only a small fraction of mortgage types.

[7] For individual household members, the weighted sample statistics match the joint distribution of gross personal income, age and gender.

[8] We were able to retain some additional households by using information from adjacent years.

[9] There were 1,080 households (1,324 individuals) with non-missing information on financial literacy. We excluded from our sample six households that consistently answered 'do not know' to all basic financial literacy and debt literacy questions, as well as to other questions in the questionnaire. We established that this did not affect the empirical results.

[10] Some households have mortgages consisting of a combination of loans. A typical combination of loans is a mortgage with an interest-only component and a component in the form of an endowment mortgage or investment-based mortgage. In addition, some households take out second mortgages to extract equity, for example to finance home improvements. Our analysis was based on the combined loan amount. As regards the other characteristics, such as mortgage type, we used the characteristics of the first mortgage.

Table 1
Financial mortgage loan features across mortgage loan durations and age groups.

	N	LTV ratio		LTV ratio > 100%		LTI ratio		CPTI
		OLTV	CLTV	OLTV	CLTV	OLTI	CLTI	
Panel A. Year of house purchase								
After 2007	44	1.03	0.85	67.3	25.2	9.08	5.89	0.57
2004–2007	98	0.96	0.81	53.0	16.8	8.88	5.72	0.51
2000–2003	63	0.90	0.67	41.5	5.90	5.60	4.04	0.39
1996–1999	69	0.92	0.49	43.1	0	6.23	3.31	0.35
1990–1995	91	0.94	0.36	25.0	1.81	.	2.35	0.27
Before 1990	166	0.87	0.28	17.5	0.47	.	2.42	0.26
Panel B. Year the mortgage was taken out								
After 2007	61	1.00	0.77	57.1	19.6	9.18	5.21	0.49
2004–2007	167	0.97	0.72	47.6	12.6	8.63	5.07	0.46
2000–2003	82	0.90	0.55	35.5	3.34	4.93	3.60	0.34
1996–1999	82	0.89	0.43	34.6	0	6.64	3.03	0.34
1990–1995	61	0.91	0.28	19.4	0	.	1.78	0.25
Before 1990	78	0.82	0.21	15.6	1.06	.	1.88	0.24
Panel C. Age groups (household head)								
Above age 70	72	0.75	0.26	11.8	0	6.01	2.36	0.23
Age 60–69	126	0.87	0.40	22.9	0.59	6.39	3.10	0.32
Age 50–59	136	0.89	0.45	30.4	1.24	6.13	3.20	0.33
Age 40–49	107	0.97	0.61	45.4	6.65	9.06	4.14	0.43
Below age 40	90	1.03	0.82	62.1	22.6	8.81	5.23	0.47
Mean		0.93	0.55	38.1	7.30	7.97	3.80	0.38

Notes: (N=531). Panel A displays the average value of the mortgage measures by year of house purchase (for the head of the household). The construction and definition of these measures is described in Section 3.2. For the variable OLTI, the number of observations is lower because income data for the time period in which the mortgage was taken out were not available for all households ($N = 170$). Panel B provides the same statistics by year of purchase of the current (first) mortgage. This period is different from the year of house purchase if the original mortgage is refinanced. Panel C displays the mean value of financial characteristics of the mortgage loan for different age groups (where age refers to the age of the head of the household when answering the survey). The statistics are weighted averages.

4. Measuring perceived mortgage risks

We are interested in the borrower's mortgage risks affecting the likelihood of delinquency and mortgage default and, therefore, the quality of the lender's mortgage loan portfolio. The borrower's risks associated with a mortgage contract can be classified into two important types. First, there is an 'income risk' of being unable to meet mortgage payments, if household income declines or interest rates rise for ARMs. Second, there is a 'wealth risk' of having a mortgage which exceeds the property value, as a result of a decline in house prices, lending in excess of the property value, or a forced house sale after default. Having negative home equity is not necessarily problematic as long as there are no payment problems.

Different mortgage contracts might balance the two sources of risk differently. The trade-off between income risk and wealth risk is described by Campbell and Cocco (2003). In our survey we, therefore measured the borrower's perception of the 'overall' riskiness of his own mortgage contract by asking the respondents to assess the overall riskiness on a four-point scale from 1 'no risk' to 4 'very risky'.

In addition, we measured both sources of risk separately. The perceived income risk followed from a question relating to the respondent's ability to meet cost-of-living payments in the event of several adverse income shocks, such as temporary unemployment, divorce, or mortgage interest rate rises. The perceived wealth risk was measured by asking the respondents about their expectations regarding financial distress in the event of a 20% drop in their home value.

Table 3 presents the response frequency for the three questions on the perceived riskiness of the own mortgage contract. Only a few mortgage owners considered their mortgage very risky (1.8%). The majority of borrowers described their loans as having hardly any risks (46.3%), while about a quarter characterized their mortgage loan as somewhat risky (27.0%), with one in five considering the loan not risky at all (21.2%). About one-third of mortgage

Table 2
Mortgage types across mortgage loan durations and age groups.

	N	Mortgage type (percent)					ARM	Refinanced
		Full amortization	Endowment	Interest-only	Investment based	Other		
Panel A. Year of house purchase								
After 2007	44	1.15	41.5	45.8	3.32	8.21	6.97	4.73
2004–2007	98	4.77	32.4	45.8	8.66	8.35	1.60	6.21
2000–2003	63	4.85	22.5	45.7	22.1	4.86	12.2	30.8
1996–1999	69	1.27	45.4	34.8	17.6	0.82	4.78	28.3
1990–1995	91	11.6	36.5	40.9	11.1	0	11.7	38.5
Before 1990	166	18.4	18.2	56.9	5.88	0.71	15.0	65.4
Panel B. Year the mortgage was taken out								
After 2007	61	1.93	35.1	54.9	2.59	5.50	8.75	26.5
2004–2007	167	3.43	25.0	53.5	10.4	7.70	5.68	39.6
2000–2003	82	7.56	20.5	48.2	22.6	1.13	12.9	38.3
1996–1999	82	3.18	35.6	43.4	17.1	0.72	5.19	37.1
1990–1995	61	12.1	54.0	29.0	4.86	0	5.82	14.8
Before 1990	78	35.7	28.9	32.9	2.54	0	22.2	21.7
Panel C. Age groups (household head)								
Above age 70	72	19.7	2.34	77.2	0.78	0	13.1	45.1
Age 60–69	126	13.4	9.90	67.5	8.62	0.59	9.55	47.4
Age 50–59	136	7.72	29.4	47.7	12.8	2.40	15.1	37.6
Age 40–49	107	4.16	42.5	35.2	14.6	3.55	5.52	25.3
Below age 40	90	4.54	50.9	24.9	11.1	8.48	3.87	16.7
Mean		8.41	31.1	46.1	10.8	3.52	8.97	32.5

Notes: ($N = 531$). Panel A displays the percentage of households that took out a type of mortgage by year of house purchase (for the head of the household). The five mortgage types are mutually exclusive and refer to the first mortgage. A description of the different mortgage types is given in Section 2. The final two columns of panel A report the average share of households with adjustable rate mortgages (ARMs) and that of households with refinanced mortgages. 'Refinanced' is defined as households taking out a mortgage sometime after the house purchase. The same statistics are reported by year of origination of the current mortgage (panel B) and across five age groups (panel C). The statistics are weighted averages.

Table 3
Response frequency regarding the perceived riskiness of the own mortgage contract.

Overall riskiness (of the mortgage contract)	Very risky	Somewhat risky	Hardly any risk	No risk	Do not know
	1.8	27.0	46.3	21.2	3.7
Income risk – Difficult to pay mortgage expenses under adverse unforeseen circumstances?	Yes	No			Do not know
	64.6	31.4			4.1
Wealth risk – Financial problems after a large house price decline?	Yes	No			Do not know
	25.7	62.9			11.4
No financial problems after a large house price decline[a]					
Substantial equity in my house	86.2				
Sufficient net worth to absorb the losses	20.8				
Financial problems after a large house price decline[a]					
Insufficient funds to pay off the mortgage at maturity	57.4				
Results in inadequate savings to support retirement	11.2				
Results in financial strain	16.9				
Unable to move to another house	27.6				
Other	4.5				

Notes: ($N = 930$). The questions were asked to all household members with a residential mortgage on their property (748 households). There were 97 missing observations for the question regarding income risk, as these individuals did not participate in the DHS module on Accommodation and Mortgages. The statistics are weighted averages.
[a] Does not add up to 100%, because respondents may provide multiple answers.

Table 4
Perceived riskiness of the mortgage contract versus financial characteristics of the mortgage.

	Mean	Overall riskiness			Income risk		Wealth risk	
		Somewhat risky	Hardly any risk	No risk	Yes	No	Yes	No
Current LTV								
Low	0.16	9.6	45.9	44.5	36.3	63.7	6.9	93.1
Intermediate	0.46	29.7	49.3	21.0	67.0	33.0	14.2	85.8
High	0.91	42.4	48.1	9.5	87.7	12.3	52.2	47.8
Pearson χ^2 test:		p-value = 0.00			p-value = 0.00		p-value = 0.00	
Current LTI								
Low	1.25	8.2	50.1	41.7	41.6	58.4	7.8	92.2
Intermediate	3.24	32.4	46.7	20.9	64.8	35.2	17.5	82.5
High	6.57	42.0	47.4	10.7	87.0	13.0	51.8	48.2
Pearson χ^2 test:		p-value = 0.00			p-value = 0.00		p-value = 0.00	
Current PTI								
Low	0.14	12.1	50.6	37.3	44.5	55.5	10.3	89.7
Intermediate	0.32	25.7	52.2	22.2	67.5	32.5	26.3	73.7
High	0.63	44.4	42.6	13.0	82.7	17.3	41.5	58.5
Pearson χ^2 test:		p-value = 0.00			p-value = 0.00		p-value = 0.00	

Notes: ($N = 680$). The construction and definition of these measures is described in Section 3.2. The measures are reported for the members of the households for which all mortgage characteristics are available. The first column presents per quantile the average value of the financial measures of the mortgage. The other columns contain percentages. For every risk measure we considered the few 'do not know' answers as missing observations. The statistics are weighted averages.

owners stated their ability to meet their mortgage payments under any circumstances (31.4%), while almost two-thirds of borrowers expected to run into payment problems after an adverse income shock (64.6%). A significantly smaller group of borrowers were convinced that a drop in house prices would lead to serious financial problems (25.7%). This group's main concerns related to having insufficient funds to repay the mortgage at maturity and being unable to move because of negative home equity. A relatively small group of mortgage owners indicated that this would lead to immediate financial problems (16.9%).

Table 4 shows the relation between the perceived riskiness associated with the mortgage contract and the financial characteristics of the mortgage. The financial mortgage characteristics were divided into three quantiles; low, intermediate, and high. We first investigated the link between the overall riskiness of the mortgage contract and financial mortgage characteristics. Because of the small size, the 'very risky' group was combined with the 'somewhat risky' group. Our results show plausible correlations between perceived risk and actual mortgage characteristics related to the LTV and LTI ratios, suggesting that mortgage owners do recognize important risk characteristics of their mortgage. For example, 42.4% of mortgage owners with a high current LTV considered their loan as risky, while just 9.6% of mortgage owners with a low LTV perceived their loan as risky. Our results reveal the same pattern for the other financial mortgage loan characteristics. The association between the financial features of the mortgage loan and income risk and wealth risk is very similar.

Table 5 shows that the majority of respondents with an investment-based mortgage viewed their mortgage as risky (71.7%), while only 10.9% of respondents with a traditional amortization mortgage viewed their mortgage as risky. More common types of mortgages, such as endowment and interest-only mortgages, were typically viewed as hardly or not at all risky by homeowners with such mortgages. It seems that borrowers whose mortgage interest rates can change quickly (ARMs) did not consider their mortgages to be riskier compared with fixed-rate mortgages (FRMs). Borrowers with a NMG-secured loan and borrowers with uninsured mortgages consider their mortgage mortgages equally risky. However, borrowers with a NMG-secured loan were less certain than others that they could meet mortgage payments under any circumstances. Finally, borrowers who consulted a mortgage broker were more likely to rate their mortgage as risky (not reported). We cannot infer a causal direction from this: consulting a mortgage broker might lead to higher risk awareness, and borrowers planning

Table 5
Perceived riskiness of the mortgage contract versus features of the mortgage.

	Mean	Overall riskiness			Income risk		Wealth risk	
		Somewhat risky	Hardly any risk	No risk	Yes	No	Yes	No
Mortgage type								
Full amortization	9.1	10.9	36.5	52.5	54.1	45.9	15.0	85.0
Endowment	30.9	22.5	60.2	17.3	77.7	22.3	31.3	68.7
Interest only	45.4	28.0	47.0	25.0	58.8	41.2	24.5	75.5
Investment	10.2	71.7	21.6	6.6	80.5	19.5	33.2	66.8
Other mortgage	4.5	35.7	53.1	11.2	80.5	19.5	53.8	46.2
Pearson χ^2 test:		p-value = 0.00			p-value = 0.00		p-value = 0.04	
Adjustable rate mortgage (ARM)								
No	91.9	29.2	48.5	22.3	67.9	32.1	28.0	72.0
Yes	8.2	34.0	41.0	25.0	61.7	38.3	26.9	73.1
Pearson χ^2 test:		p-value = 0.62			p-value = 0.38		p-value = 0.87	
National Mortgage Guarantee (NMG)								
No	66.8	30.1	45.3	24.6	64.6	35.4	26.0	74.0
Yes	33.2	28.6	53.1	18.4	73.2	26.8	31.9	68.1
Pearson χ^2 test:		p-value = 0.21			p-value = 0.05		p-value = 0.21	

Notes: ($N = 680$). The mortgage contract features are reported for the members of the households for which all mortgage characteristics are available. The first column presents the frequency for each mortgage type or category. The other columns contain percentages. A description of the different mortgage types is given in Section 2. For every risk measure we considered the few 'do not know' answers as missing observations. The statistics are weighted averages.

to take out a riskier mortgage may be more likely to ask advice from a mortgage broker.

5. Measuring financial literacy

5.1. Financial literacy

Do individuals who are financially less literate and may have a limited understanding of the features of a mortgage contract choose riskier mortgages? We assessed the respondents' understanding of basic economic principles such as interest rates, inflation and portfolio diversification using the three financial literacy questions developed by Lusardi and Mitchell (2007). These basic financial literacy questions have been extensively examined in a previous study on retirement planning by Alessie et al. (2011) using the same panel of households. We refer to these questions as '(basic) financial literacy' questions. The questions were worded as follows (with correct answers in bold):

1. Suppose you had EUR 100 in a savings account and the interest rate was 2% per year. After five years, how much do you think you would have in the account if you left the money to grow? **(i) More than EUR 102**, (ii) exactly EUR 102, (iii), less than EUR 102 or (iv) do not know.
2. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After one year, how much would you be able to buy with the money in this account? (i) More than today, (ii) exactly the same, **(iii) less than today** or (iv) do not know.
3. Buying a single company's stock usually provides a safer return than a stock mutual fund. True or false? (i) True, **(ii) false** or (iii) do not know.

Table 6 reports the responses to these questions. The first question was answered correctly by 90.7% of respondents, while 6.1% of respondents did not know the answer.[11] This score is higher than in the United States, where about 65% of respondents responded correctly and 13.5% did not know the answer (see Lusardi and Mitchell, 2011). However, we should be careful with comparisons between both sets of outcomes, because the questions were translated into a different language. Van Rooij et al. (2011) show that a small difference in the wording of literacy questions can have an influence on the answers by respondents. The second and third questions were answered correctly by 84.6% and 58.1% of respondents. The third question appeared the most difficult one, with 30.4% of respondents answering 'do not know'.

The bottom panel of Table 6 shows the distribution of the number of correct answers. More than half of the respondents answered all three questions correctly. It thus seems that the majority had a good understanding of basic financial principles. Zooming in on specific skills, almost all respondents were able to do simple interest rate calculations, but many found it difficult to understand the basic principles of portfolio diversification and risk reduction.

5.2. Debt literacy

Given that a good understanding of the basic economic principles may not be sufficient to comprehend complex mortgages, our survey included a number of more specific questions to determine the respondents' understanding of debt contracts such as mortgages. In particular, we asked our respondents to answer the three questions developed by Lusardi and Tufano (2015). The authors refer to these questions as 'debt literacy' questions since they measure knowledge about debt contracts, which is important when taking out a loan. Specifically, the debt literacy questions measure respondents' understanding of compound interest, the time value of money, and the ability to distinguish between different payment methods. The original questions focus mainly on credit card debt, which is common in the United States, but virtually non-existent in the Netherlands. We rephrased the questions slightly, referring to a personal loan extended by a bank rather than credit card debt. The questions were drafted as follows (with correct answers in bold):

1. Suppose you take out a EUR 1,000 personal loan from a bank and the interest rate you are charged is 20% per year compounded annually. If you did not pay anything off, at this interest rate, how many years would it take for the amount you owe to double? (i) 2 years, **(ii) less than 5 years**, (iii) 5 to 10 years, (iv) more than 10 years or (v) do not know.
2. Suppose you take out a EUR 3,000 personal loan from a bank. You repay a minimum amount of EUR 30 each month. At an annual percentage rate (APR) of 12% (or 1% per month), how many years would it take to clear your personal

[11] Respondents were also able to refuse answering the question, which they occasionally did. We considered these refusals as missing observations.

Table 6
Percentage of correct and incorrect basic financial literacy and debt literacy answers.

	Debt literacy questions			Basic financial literacy questions				
	1	2	3	1	2	3		
Panel A. Percentage of correct answers								
Correct	66.9	48.3	12.1	90.7	84.6	58.1		
Incorrect	21.0	35.7	76.7	3.2	6.0	11.5		
Do not know	12.1	16.0	11.2	6.1	9.4	30.4		
	None	1	2	3	4	5	6	Mean
Panel B. Number of correct answers								
Basic financial literacy	6.1	6.9	34.6	52.5	.	.	.	2.3
Debt literacy	24.6	32.1	34.7	8.6	.	.	.	1.3
Debt & basic financial literacy	4.9	4.2	12.7	19.9	25.8	25.2	7.3	3.6

Notes: The first part of Panel A shows weighted percentages of correct debt literacy answers for all questionnaire respondents ($N = 1465$). The final three columns report the distribution of answers to the basic financial literacy questions included in a separate module. This module was answered by more than 90 percent of our sample ($N = 1{,}324$). Panel B displays the weighted number of correct answers for both modules and all six questions combined ($N = 1{,}324$). The statistics are weighted averages.

loan debt if you made no additional new charges? (i) less than 5 years, (ii) between 5 and 10 years, (iii) between 10 and 15 years, **(iv) continue to be in debt** or (v) do not know.

3. You purchase an appliance which costs EUR 1,000. To pay for this appliance, you are given the following two options: (a) Pay twelve monthly installments of EUR 100 each or (b) borrow at a 20% annual interest rate and pay back EUR 1,200 a year from now. Which is the more advantageous offer? (i) option (a), **(ii) option (b)**, (iii) they are the same or (iv) do not know.

Panel A of Table 6 presents the frequency of correct responses to these questions. The first two questions invited the respondents to calculate the impact of compounded interest on the outstanding loan amount and any reduction therein. At first sight, these questions are somewhat similar to the first financial literacy question. The debt literacy questions, however, refer to loan contracts instead of savings accounts. The specific context of the questions and the more advanced skills needed to answer them make them more complex. The proportion of correct answers to both questions is much lower in comparison with the basic literacy question on compound interest. The first and second debt literacy questions were answered correctly by 66.9% and 48.3% of respondents. For the United States, Lusardi and Tufano (2015) document that the first and second questions are answered correctly by about one-third of the respondents. The lower score for the United States is notable in light of the much greater experience with consumer debt, in particular credit card debt, and suggests that one's understanding of loans does not automatically improve with experience. Disney and Gathergood (2013) have investigated the first two debt literacy questions in the United Kingdom, which results are comparable to those for the Netherlands.

The responses to the third debt literacy question show that the concept of the time value of money was poorly understood: only 12.1% of respondents answered correctly that it was advantageous to defer payment by one year. Insufficient knowledge to answer this question correctly has also been found by Lusardi and Tufano (2015) for the United States, with 7% providing the correct answer. Table A.15 in Appendix A provides the distribution of responses in the various answer categories for this question. A relatively large proportion of respondents (about one-third) mistook the most expensive option for the most attractive choice. Respondents appear to be quite confident about their answers, as the percentage of 'do not know' answers was relatively low (11.2% as shown in Table 6). Our empirical analysis included a sensitivity analysis in which we also attached weight to persons who had not given a completely wrong answer to the third debt literacy question, saying that both options were the same. This did not affect the results.

Only 8.6% of respondents answered all three debt literacy questions correctly, while 34.7% answered two questions correctly (Panel B of Table 6). The scores on the debt literacy questions indicate that while individuals may have been able to make simple interest calculations, they had difficulty in grasping more complex loan decisions. Comparing the results for debt literacy and financial literacy shows that the number of correct debt literacy questions is considerably lower than the number of correct financial literacy questions. We find a clearly positive but imperfect association between the two literacy measures (see Table A.15 in Appendix A).

5.3. Debt literacy and personal characteristics

Table 7 shows the distribution of the number of correct debt literacy questions across socio-economic characteristics, revealing higher debt literacy scores for younger, higher educated, male or home owning respondents. Alessie et al. (2011) have reported similar results for the financial literacy questions. The Pearson chi-squared test statistics show that debt literacy differences among gender, age, education and homeownership are highly significant. As regards the relation between age and debt literacy, we observed an inverted U-shaped pattern of the average number of correctly answered questions. This is consistent with the findings regarding actual credit loan decisions for the United States by Agarwal et al. (2009) and other studies on investment decisions. For example, Korniotis and Kumar (2011) have shown that the effect of cognitive decline on investment skills dominates the role of experience when age increases. While we cannot disentangle age and cohort effects based on these cross-sectional results, the typical interpretation of the higher literacy scores among middle-aged individuals (aged from 40 to 49 years) is that, compared with younger generations, they have greater debt experience, albeit with the number of correct answers falling as individuals grow older and cognition declines.

Having answered the three debt literacy questions, respondents were asked how many of these questions they felt they had answered correctly. About 42% of respondents thought they had answered all three debt questions correctly. In fact, only 16% of this group provided a correct answer to all three questions (Table 8, top panel). While over 50% answered two questions correctly, three in ten answered no more than one question correctly. Thus, a sizeable group of respondents seem overconfident about their debt knowledge. At the same time, there is a smaller group of under-confident respondents, whose actual number of correct answers exceeds the perceived number of correct debt literacy answers.

Furthermore, we asked the survey participants to assess their capability to take out a mortgage without financial advice. The responses to the question 'How well do you feel able to take out

Table 7
Debt literacy and demographics.

	Number of correct debt literacy answers				
	None	1	2	All	Mean
Age classes					
Age 70 and older ($n = 249$)	42.4	35.5	18.8	3.3	0.83
Age 60–69 ($n = 362$)	27.1	32.9	33.0	7.0	1.20
Age 50–59 ($n = 353$)	21.2	30.0	41.0	7.7	1.35
Age 40–49 ($n = 261$)	19.2	30.2	37.1	13.5	1.45
Below age 40 ($n = 240$)	19.2	32.9	38.3	9.6	1.38
Pearson χ^2 statistic: $F(11.01, 16124.0) = 4.86$, p-value $= 0.00$					
Gender					
Male ($n = 788$)	18.7	29.3	37.9	14.0	1.47
Female ($n = 677$)	30.7	35.1	31.3	2.9	1.06
Pearson χ^2 statistic: $F(2.97, 4352.0) = 19.16$, p-value $= 0.00$					
Education level					
Master's degree ($n = 197$)	5.9	24.0	51.4	18.7	1.83
Bachelor's degree ($n = 408$)	18.3	29.2	41.2	11.3	1.45
Secondary school ($n = 404$)	26.2	36.5	32.0	5.3	1.16
Primary school ($n = 456$)	41.4	36.2	19.9	2.5	0.84
Pearson χ^2 statistic: $F(8.79, 12870.9) = 16.05$, p-value $= 0.00$					
Homeownership status					
Tenant ($n = 374$)	33.3	37.9	24.3	4.5	1.00
Homeowner ($n = 1{,}091$)	21.5	30.1	38.4	10.0	1.37
Pearson χ^2 statistic: $F(2.93, 4289.1) = 10.40$, p-value $= 0.00$					

Notes: ($N = 1{,}465$). The statistics are weighted averages. The Pearson chi-squared statistic were corrected for the use of sample weights via the correction of Rao and Scott (1984). The statistic was converted to an F statistic to get a valid p-value.

Table 8
Debt literacy versus self-assessed knowledge and experience.

	Number of correct debt literacy answers				
	None	1	2	All	Mean
Perceived number of correct debt literacy answers					
None ($n = 162$)	85.3	11.4	3.2	0.0	0.18
1 ($n = 223$)	42.6	47.8	8.7	0.8	0.68
2 ($n = 464$)	20.9	41.8	32.8	4.5	1.21
All ($n = 616$)	6.5	24.6	52.7	16.2	1.79
Pearson χ^2 statistic: $F(8.54, 12508.3) = 50.80$, p-value $= 0.00$					
Self-assessed financial knowledge					
Very knowledgeable ($n = 40$)	17.0	18.0	40.9	24.2	1.72
Knowledgeable ($n = 291$)	15.3	28.5	38.9	17.2	1.58
More or less knowledgeable ($n = 808$)	24.8	34.1	34.7	6.5	1.23
Not knowledgeable ($n = 268$)	33.1	32.5	31.5	2.8	1.04
Pearson χ^2 statistic: $F(11.61, 16998.9) = 4.97$, p-value $= 0.00$					
Self-assessed capability to take out a mortgage without advice					
Well able ($n = 171$)	13.4	18.4	46.5	21.7	1.76
Able ($n = 316$)	16.6	27.1	45.4	10.9	1.51
More or less able ($n = 298$)	18.9	37.1	34.1	9.9	1.35
Poorly able ($n = 314$)	24.5	33.5	37.5	4.5	1.22
Not able ($n = 133$)	34.2	37.5	25.3	3.0	0.97
Do not know ($n = 51$)	60.8	23.0	12.8	3.4	0.59
Pearson χ^2 statistic: $F(17.12, 25067.7) = 7.55$, p-value $= 0.00$					
Number of house moves to an owner-occupied house					
Never ($n = 346$)	33.5	37.1	24.5	4.8	1.01
1 time ($n = 561$)	24.1	34.1	32.6	9.3	1.27
2 times ($n = 364$)	21.1	26.7	42.0	10.2	1.41
3 times ($n = 129$)	16.8	31.5	39.7	12.0	1.47
4 times or more ($n = 65$)	13.8	20.3	59.0	6.9	1.59
Pearson χ^2 statistic: $F(11.59, 16961.8) = 3.93$, p-value $= 0.00$					

Notes: ($N = 1{,}465$). There were 182 missing observations for the capability to take out a mortgage without financial advice as this question was not asked of individuals who lived in rental homes and reported that buying a house was not being considered (i.e. they strictly preferred to rent). There were 58 missing observations for self-assessed financial knowledge as these individuals did not participate in the DHS module on Economic & Psychological concepts of saving. The statistics are weighted averages. The Pearson chi-squared statistic was corrected for the use of sample weights.

a mortgage loan without the help of a financial adviser' display quite some heterogeneity among respondents (Table 9). Four in ten homeowners feel 'well able' or 'able' to take out a mortgage by themselves. However, three in ten homeowners respond that they are 'not able' or 'poorly able' to take out a mortgage without the help of a financial adviser. Elderly, who are likely to be more experienced homeowners, and higher educated respondents have somewhat more trust in their capability to take out a mortgage without financial advice. Women have less confidence in their capabilities than men and the large majority of tenants feels incapable of taking out a mortgage without advice.

There is a strong correlation between the self-assessed knowledge and capability to take out a mortgage, on the one hand, and the number of correct debt literacy questions, on the other hand (Table 8). Thus, respondents seem, to a certain extent, to be aware of their general level of financial sophistication and skills in comparison with other people. More than 20% of the individuals who considered themselves well capable to arrange a mortgage loan without financial advice had three correct debt literacy answers, while only 3% of the persons who stated their inability to take out a mortgage without advice had perfect scores on the debt literacy questions. We found a similar pattern with respect to self-assessed financial knowledge. More experienced home buyers have a better understanding of debt contracts than first-time homeowners (Table 8, bottom panel). This is consistent with the increasing part of the inverted U-shaped relation of debt literacy with age.

5.4. Debt literacy and financial advice

Do less experienced homeowners or financially less sophisticated persons seek personal advice or do they use other sources of information to make a more informed mortgage choice? Table 10 presents the sources of information used by borrowers when purchasing a house. The majority of the sample considered the advice of the mortgage lender (49.4%) or an independent mortgage broker (54.4%) as the most important source of information when purchasing a house. Advice from family and friends (29.4%) or the Internet (27.4%) were other important sources of information. Individuals with more financial knowledge often used information from financial magazines and books (20.8%) or other published sources. Thus financially sophisticated borrowers typically gather additional information before deciding on the best option, and do not rely on financial advisers only. As a result, financially sophisticated borrowers are less prone to potential biased financial advice.

We did not find that individuals with lower debt literacy were more likely to consult a mortgage broker rather than buying a mortgage directly through a bank or lender.[12] Similarly, debt literate individuals showed no greater systematic tendency than less knowledgeable individuals to cite family or friends as an important source of information. Respondents who answered all debt literacy questions incorrectly mentioned family or friends the least often as an important source of advice, while respondents who answered one question correctly most often stated the importance of advice of family and friends.

These findings differ from findings for other financial decisions, such as stock market participation. For example, Van Rooij et al. (2011) have found that individuals with a lower level of financial literacy rely on family or friends more often as a source of information, while more sophisticated individuals more often rely on professional advice (the latter is also documented by Hackethal et al., 2012). Thus for mortgage choice, unlike other financial de-

[12] There is also no statistical evidence that borrowers with lower debt literacy more often originated a mortgage through a mortgage broker. Regardless of the level of literacy, somewhat fewer than half of the mortgage owners took out their mortgages directly from the lender without the intervention of a mortgage broker.

Table 9
Capability to originate a mortgage without advice versus demographics.

	Capability to originate a mortgage without advice				
	Not able	Poorly able	More or less able	Able	Well able
Age classes					
Above age 70 ($n = 177$)	7.5	18.3	20.7	33.7	19.8
Age 60–69 ($n = 302$)	11.1	23.4	20.0	31.0	14.5
Age 50–59 ($n = 300$)	9.3	23.9	29.5	22.6	14.7
Age 40–49 ($n = 225$)	9.8	27.6	32.0	21.3	9.3
Below age 40 ($n = 228$)	13.4	27.9	24.7	23.7	10.3
Pearson χ^2 statistic: $F(15.20, 18711.85) = 1.7922$, p-value $= 0.029$					
Gender					
Men ($n = 665$)	5.7	16.1	24.1	34.9	19.2
Women ($n = 567$)	16.0	34.6	27.9	15.4	6.1
Pearson χ^2 statistic: $F(3.99, 4910.7) = 28.6128$, p-value $= 0.00$					
Education level					
Master's degree ($n = 186$)	5.6	21.5	28.5	28.4	16.0
Bachelor's degree ($n = 374$)	10.1	18.9	25.6	30.3	15.1
Secondary school ($n = 339$)	14.3	33.2	25.5	18.1	9.0
Primary school ($n = 333$)	12.0	28.3	24.7	24.1	10.9
Pearson χ^2 statistic: $F(11.52, 14176.57) = 2.7829$, p-value $= 0.00$					
Homeownership status					
Tenant ($n = 171$)	32.4	37.6	14.0	11.5	4.4
Homeowner ($n = 1{,}061$)	7.0	23.0	28.0	27.8	14.2
Pearson χ^2 statistic: $F(3.99, 4913.35) = 25.4324$, p-value $= 0.00$					

Notes: ($N = 1{,}465$). There were 182 missing observations for the capability to take out a mortgage without financial advice as this question was not asked to tenants who reported that buying a house was not being considered (i.e. they strictly preferred to rent). The 51 'do not know' answers are coded as missing observations. The statistics are weighted averages. The Pearson chi-squared statistic were corrected for the use of sample weights via the correction of Rao and Scott (1984). The statistic was converted to an F statistic to get a valid p-value.

Table 10
Financial advice versus debt literacy.

	Number of correct answers				Total	p-value
	None	1	2	All		
What is your most important source of advice when purchasing a house?						
Parents, friends or acquaintances	22.5	33.2	31.4	25.4	29.4	0.24
Information from newspapers	2.1	2.8	3.4	9.3	3.5	0.00
Financial magazines, guides, books	6.9	9.3	16.0	20.8	12.3	0.00
Brochures from my bank or mortgage adviser	6.4	7.7	7.3	11.2	7.6	0.99
Bank or other institution that provides the mortgage loan	41.7	49.5	55.3	43.4	49.4	0.27
Mortgage broker	46.6	56.3	58.2	51.8	54.4	0.28
Advertisements on TV or in other media	0.7	0.4	0.5	0.0	0.5	0.50
Financial computer programs	4.0	4.0	5.5	10.4	5.1	0.08
Financial information on the Internet	15.2	22.7	36.3	36.6	27.4	0.00
Other sources	5.1	4.3	6.2	8.0	5.5	0.22
Do not know	13.4	3.8	0.7	1.4	4.5	0.00

Notes: ($N = 1283$). The table reports the percentage of individuals who attach importance to a specific source of information when purchasing a house stratified by the number of correct debt literacy answers. The percentages do not add up to 100%, because persons indicated multiple sources as important. The final column reports the p-values of a Pearson χ^2 test. The p-values have been adjusted to take into account that multiple tests are being conducted (Holm, 1979). This question was not asked to tenants without plans to purchase a house in the future (182 individuals).

cisions, there is no systematic relation between financial sophistication and advice sought from mortgage brokers or information obtained from family or friends. However, more sophisticated individuals use more sources of advice to make an informed decision.

By contrast, we found a strong relation between the source of advice and the self-assessed capability to take out a mortgage without financial advice. Only one-third of the respondents considering themselves well able to take out a mortgage without advice relied on mortgage brokers, versus more than two-thirds of respondents lacking confidence about their capability to take out a mortgage (not reported). Similarly, respondents with a low self-reported capability to take out a mortgage were more likely to consult family or friends. A similar finding is documented by Finney and Kempson (2008) for individuals in the United Kingdom who had recently purchased a financial product.

6. Results on financial literacy and mortgage risks

6.1. Financial literacy and perceived risk of different mortgage terms

Are borrowers well aware of their mortgage risks? The perceived risk associated with the mortgage loan might not be consistent with the true underlying risk. Financially more sophisticated individuals or individuals taking out a mortgage through a mortgage broker may characterize their mortgages as riskier, not because their mortgages are riskier but simply because they are better informed about the risks. To examine this question, we asked the homeowners in our sample to rate the riskiness of six different mortgage features on a seven-point scale from 1 'no risk at all' to 7 'very risky'. The six features comprise short-term fixed interest rate, high loan-to-value ratio, substantial mortgage expenses in re-

Table 11
Financial literacy and perceived riskiness of different mortgage loan features: regression results.

	Mean/ SD	Debt literacy	Basic financial literacy	Capability to originate a mortgage
Short fixed term	4.87	−0.029	−0.075	−0.068**
	(1.60)	(0.039)	(0.051)	(0.032)
High loan-to-value ratio	6.20	0.078*	0.129**	0.007
	(1.16)	(0.044)	(0.058)	(0.035)
High mortgage expenses	5.98	0.127***	0.074	−0.008
	(1.20)	(0.042)	(0.054)	(0.034)
Interest-only mortgage	4.18	−0.060	−0.059	−0.093***
	(1.59)	(0.038)	(0.046)	(0.031)
Investment-based mortgage	5.78	0.051	0.115**	−0.015
	(1.34)	(0.042)	(0.057)	(0.034)
Adjustable rate mortgage (ARM)	5.00	−0.051	−0.008	−0.066**
	(1.36)	(0.039)	(0.051)	(0.033)

Notes: ($N = 1100$). The first column shows the average perceived riskiness of different features of a mortgage loan. The perceived riskiness of a mortgage feature was answered on a response scale from 1 'no risk at all' to 7 'very risky'. The remaining columns of the table show the association between financial literacy and perceived riskiness of different features of the mortgage loan. The coefficient was derived from an ordered probit model using the perceived riskiness as the dependent variable and the financial literacy measure as the independent variable. The objective financial literacy measures are based on the number of correct answers. The capability to originate a mortgage measure is reported on a response scale from 1 to 5. The few 'do not know' answers are excluded. The control variables included: marital status, gender, age group, education level, monthly household income (quartiles), homeownership status, having children, employment status, risk and time preferences, and number of house moves to an owner-occupied house. Clustered standard errors (at the household level) are shown in parentheses. Significant at the *** 1%; ** 5%; * 10% level.

lation to household income, interest-only mortgage, investing part of the mortgage payments in the stock market and an adjustable rate mortgage (ARM).

The first column of Table 11 shows the average perceived riskiness of the different mortgage risk factors. Most mortgage owners perceived a high loan-to-value ratio, a high payment-to-income ratio and having an investment-based mortgage as risky. The relatively low perceived risk associated with short fixed term or adjustable rate mortgages is consistent with the findings by Bucks and Pence (2008), who have shown that households underestimate the extent to which ARM rates can rise. The risk associated with investment-based mortgages can be considered as common knowledge given the wide media coverage of these risks and the fact that many of these products incurred large investment losses after the dotcom bubble burst. It is remarkable that having an interest-only mortgage was considered the least risky feature out of the six mortgage features surveyed, given that Dutch authorities have frequently stressed that such mortgages are risky. On the other hand, survey responses concerning house price expectations reveal that most borrowers were expecting house price increases at the time of the survey. Moreover, the risk of an interest-only mortgage is limited if individuals have substantial home equity. Many households indeed indicated that a large drop in house prices would not lead to financial problems, because they had substantial home equity.

The next three columns of Table 11 show the association between financial literacy, as well as the self-assessed capability to take out a mortgage, and the perceived riskiness of the different mortgage features. The reported coefficients were derived from ordered probit models with perceived riskiness as the dependent variable and the literacy measures as the independent variable. Socio-economic characteristics, experience of the housing market, and risk and time preferences were included as control variables.[13] The results show that more debt literate individuals consider a large mortgage loan in relation to the house value (LTV) and high mortgage expenses as riskier. The same holds for individuals with higher basic financial literacy, though the association with high mortgage expenses is not significant. Moreover, individuals with higher debt or basic financial literacy consider investment-based mortgages to be riskier, though this association is insignificant for the debt literacy measure.

Table 12
Riskiness of mortgage loan: regression results.

	[1]	[2]
Current loan-to-value (LTV)	1.023***	1.020***
	(0.234)	(0.247)
Current payment-to-net income (PTI)	0.851***	0.804***
	(0.282)	(0.297)
Endowment mortgage		−0.007
		(0.133)
Other mortgage		−0.201
		(0.333)
Full amortization		−0.245
		(0.206)
Investment-based mortgage		1.090***
		(0.216)
Adjustable rate mortgage (ARM)		0.432**
		(0.198)
Threshold parameters		
μ_1 (no risk at all to hardly risky)	−0.387**	−0.548***
	(0.156)	(0.169)
μ_2 (hardly risky to somewhat (or very) risky)	1.082***	0.998***
	(0.160)	(0.172)
Pseudo R-squared	0.09	0.13

Notes: ($N = 459$). The table reports the regression coefficients from an ordered probit model with the perceived riskiness of the own mortgage loan as the dependent variable, using a three-point response scale: 0 'no risk at all', 1 'hardly risky' and 2 'somewhat (or very) risky'. The second column of the table includes indicators per type of mortgage (except for interest-only mortgages) and an indicator for having an ARM versus an FRM. The investment-based mortgage type was interacted with the financial characteristics of the mortgage (i.e. LTV ratio and PTI ratio). Both specifications include controls for the year in which the mortgage loan was taken out. Standard errors are shown in parentheses. Significant at the *** 1%; ** 5%.

Mortgage owners who feel capable to take out a mortgage without financial advice consider short term fixed interest rates, adjustable interest rates and interest-only mortgages to be less risky. Additional analysis shows that risk perception is related to the features of the mortgages held by these respondents (see Appendix B). For example, respondents feeling well capable to originate a mortgage without financial advice are more likely to have interest-only mortgages. In addition, there is some evidence that, taking into account a wide range of covariates, more literate respondents have mortgages with lower LTVs and LTIs.

[13] To proxy for risk preferences, persons were asked to rate from 1 'risk averse' to 7 'risk tolerant' the statement: 'I am prepared to take the risk of losing money, if there is also a chance to earn money.' As an indicator of time preference, persons were asked to answer the question: 'Which of the time horizons mentioned below does your household consider most important for planning expenditures and savings?' Answer category 1 corresponds to a short-term horizon and 5 corresponds to a long-term horizon of more than ten years from now.

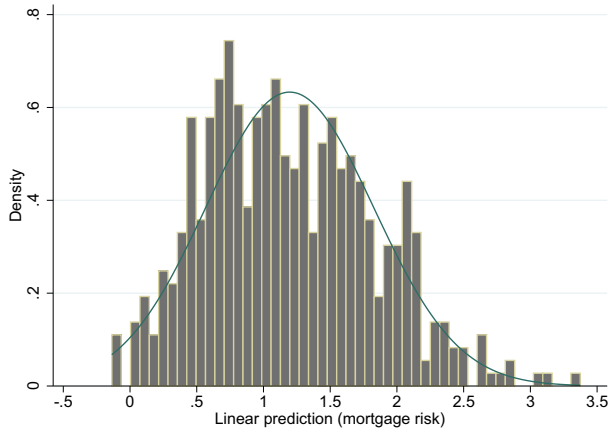

Fig. 1. Distribution of predicted mortgage risk on the basis of the mortgage loan features. The Figure shows a histogram describing the predicted mortgage risk. A normal density function is plotted in the graph.

6.2. Financial literacy, mortgage risks and financial advice

Do individuals with lower financial literacy have riskier mortgages? To better understand the relation between financial literacy and the riskiness of the mortgage, we used the measure of overall riskiness of the mortgage contract. We have shown that this measure is strongly correlated with the risky features of a mortgage loan, such as the LTV ratio and the LTI ratio. This measure may, however, lead to biased results if the judgments about the riskiness of the own mortgage loan is not comparable across respondents. A lack of comparability between respondents results in measurement error, which may result in underestimation of the association between financial literacy and mortgage risks. To address this issue, we followed a two-step procedure. We first estimated an ordered probit regression on the self-reported overall riskiness of the mortgage contract as a function of objective risky features associated with the mortgage loan. We used the predicted risk from this regression to create an objective measure of individual risk of the mortgage loan, which we related to several measures of financial literacy in the second step.

Table 13
Predicted mortgage risk and debt literacy: regression results.

	[1]	[2]	[3]	[4]	[5]
Debt literacy score	0.127***	0.078**	0.078**	0.072**	0.073**
	(0.032)	(0.031)	(0.032)	(0.034)	(0.032)
Socio-economic controls	No	Yes	Yes	Yes	Yes
Most important sources of information					
Mortgage broker			0.240***	0.257***	0.199***
			(0.059)	(0.059)	(0.058)
Lender			0.03	0.01	−0.012
			(0.058)	(0.058)	(0.056)
Family and friends			−0.108*	−0.103	−0.123**
			(0.065)	(0.064)	(0.062)
Published sources			−0.031	−0.039	−0.035
			(0.056)	(0.056)	(0.054)
Most important sources of information × debt literacy score					
Mortgage broker			−0.107*	−0.114*	−0.100*
			(0.062)	(0.061)	(0.059)
Lender			0.008	0.015	−0.022
			(0.062)	(0.062)	(0.060)
Family and friends			−0.152**	−0.131*	−0.088
			(0.075)	(0.074)	(0.072)
Published sources			−0.027	−0.037	−0.027
			(0.062)	(0.061)	(0.059)
Overconfidence, risk preferences, time preferences and experience					
Overconfidence				0.021	0.029
				(0.049)	(0.048)
Low perceived mortgage risk				0.096***	0.070**
				(0.033)	(0.033)
Risk averse				0.002	0.002
				(0.019)	(0.018)
Low time-preference				−0.023	−0.012
				(0.025)	(0.024)
Number of house moves				0.103***	0.085***
				(0.030)	(0.029)
Income risk					0.232***
					(0.058)
Wealth risk					0.247***
					(0.069)
Constant	0.02	0.674***	0.626***	0.513***	0.216
	(0.056)	(0.122)	(0.120)	(0.144)	(0.149)
Observations	459	459	459	459	459
Adjusted R-squared	0.03	0.22	0.25	0.28	0.33

Notes: ($N = 459$). The dependent variable is the predicted mortgage risk. The debt literacy score measure equals the number of correctly answered debt literacy questions. Socio-economic controls included: gender of the person managing the household finances, marital status, number of children, age dummies, indicators of the education level, income quantiles and a dummy for retirement status. The 'perceived risk' variable measures the perceived riskiness of the attributes of a mortgage contract and was derived from a factor analysis of the six different mortgage loan features. Standard errors are shown in parentheses. Significant at the *** 1%; ** 5%; * 10% level.

Table 14
Predicted mortgage risk and basic financial literacy: regression results.

	[1]	[2]	[3]	[4]	[5]
Basic financial literacy score	0.061	−0.005	−0.001	−0.01	−0.002
	(0.046)	(0.045)	(0.045)	(0.050)	(0.048)
Socio-economic controls	No	Yes	Yes	Yes	Yes
Most important sources of information					
Mortgage broker			0.203***	0.225***	0.162***
			(0.060)	(0.060)	(0.058)
Lender			0.002	−0.015	−0.036
			(0.059)	(0.059)	(0.056)
Family and friends			−0.117*	−0.106	−0.132**
			(0.065)	(0.065)	(0.063)
Published sources			0.008	−0.005	−0.006
			(0.057)	(0.057)	(0.054)
Most important sources of information × basic financial literacy score					
Mortgage broker			−0.01	−0.002	−0.016
			(0.093)	(0.091)	(0.088)
Lender			0.107	0.109	0.113
			(0.094)	(0.094)	(0.090)
Family and friends			0.019	0.027	0.133
			(0.106)	(0.104)	(0.101)
Published sources			−0.096	−0.09	−0.102
			(0.092)	(0.090)	(0.087)
Overconfidence, risk preferences, time preferences and experience					
Overconfidence				0.01	0.007
				(0.044)	(0.043)
Low perceived mortgage risk				0.103***	0.080**
				(0.034)	(0.033)
Risk averse				0.009	0.009
				(0.019)	(0.018)
Low time-preference				−0.028	−0.011
				(0.025)	(0.024)
Number of house moves				0.104***	0.083***
				(0.031)	(0.030)
Income risk					0.253***
					(0.059)
Wealth risk					0.267***
					(0.069)
Constant	0.046	0.795***	0.750***	0.652***	0.301*
	(0.124)	(0.160)	(0.159)	(0.173)	(0.176)
Observations	459	459	459	459	459
Adjusted R-squared	0.00	0.21	0.23	0.26	0.32

Notes: ($N = 459$). The dependent variable is the predicted mortgage risk. The basic financial literacy score measure equals the number of correctly answered basic financial literacy questions. Socio-economic controls included: gender of the person managing the household finances, marital status, number of children, age dummies, indicators of the education level, income quantiles and a dummy for retirement status. The 'perceived risk' variable measures the perceived riskiness of the attributes of a mortgage contract and was derived from a factor analysis of the six different mortgage loan features. Standard errors are shown in parentheses. Significant at the *** 1%; ** 5%; * 10% level.

Table 12 shows estimates of an ordered probit regression of the self-assessed risk of the mortgage loan. The dependent variable is coded 0 for 'no risk at all', 1 for 'hardly risky' and 2 for 'somewhat (or very) risky'. The first column shows the estimated coefficients for a specification which includes the financial features of the mortgage loan, but no information about the type of mortgage. Respondents with a higher current loan-to-value ratio or a higher mortgage payments to net-income ratio were more likely to consider their mortgage as risky. The second specification includes dummy variables for having an ARM and for the type of mortgage, with having an interest-only mortgage as the baseline. Respondents with an investment-based mortgage considered their mortgage riskier and respondents with traditional fully amortizing mortgages found their mortgages less risky (conditional on the financial features of the mortgage loan). Those with an ARM assessed their mortgages as riskier. We did not include a variable for having a mortgage which is insured under the NMG scheme, as this variable appeared to be insignificant in all specifications.

We used the estimates of the final specification to predict the mortgage risk based upon the features of the mortgage loan, which provides a more objective risk measure compared with homeowners' subjective risk perceptions of their own mortgages. Fig. 1 shows the distribution of predicted mortgage risk for every household. We used this measure of mortgage riskiness as the dependent variable in a multivariate regression to test whether financial literacy is related to mortgage risks. The first part of Table 13 shows the regression coefficients for debt literacy. The first column shows debt literacy being positively associated with mortgage risk at the 1% significance level. The positive coefficient implies that individuals with a higher debt literacy have riskier mortgages. We find that one additional correct answered debt literacy questions is associated with a 0.127 standard deviations higher mortgage risk.

The coefficient of debt literacy declined after controlling for socio-economic characteristics, such as educational level, age, gender, marital status and having children, but remains significant

(specification 2). Note that the significant debt literacy coefficients point to an association between literacy and having a risky mortgage. This finding does not necessarily imply a causal relation between literacy and risk taking. Indeed, this association could also stem from households becoming more literate as a result of taking out risky mortgages. However, regardless of the mechanism underlying this association, this finding suggests that owners of risky mortgages are not the most vulnerable households in terms of their debt literacy.

The next regression adds controls for mortgage advice (specification 3). Controlling for sources of information in taking a mortgage, the regression estimates show that borrowers who received advice from a mortgage broker had riskier mortgages. Indeed, it makes sense for those who plan to take out a riskier loan with perhaps more complex features to consult an independent mortgage adviser. On the other hand, the Netherlands Authority for the Financial Markets (AFM) has recently introduced a ban on lender-paid commission fees owing to concerns about commission structures in which advisers get paid by lenders based on the mortgage amount and type of mortgage taken out.

We interacted the dummy variables for financial advice with the debt literacy measure. A significant coefficient for the interaction term suggests a differential effect of financial advice for households with different levels of financial literacy. The interacted variables were centered such that the coefficients on these variables could be interpreted as partial effects. The results show that financial advice resulted in riskier mortgages for less debt literate households (see Table 13, specification 3). Similarly, less-debt literate borrowers who emphasized the importance of mortgage advice from family and friends had riskier mortgages.

Next, the regression was extended by including the perceived riskiness of different mortgage loan terms, past experience in the housing market and risk and time preferences, and a measure for confidence. Confidence was measured as the difference between the perceived and the actual number of correct debt literacy responses. A positive value denotes that respondents were overconfident about their debt knowledge, while a negative score reflects a lack of confidence. In the previous subsection, financially more sophisticated individuals appeared to perceive several features of the mortgage loan as riskier, which may influence mortgage choice. We derived the measure of the overall perceived risk of a mortgage loan by performing a factor analysis of the perceived riskiness of the six different features of a mortgage loan. We included the first factor in the regression model. The results in specification 4 show that perceived mortgage risk is an important determinant of the riskiness of the actual mortgage loan. The positive coefficient implies that individuals have less risky mortgages if they perceive various features of a mortgage loan, such as a high loan-to-value ratio or an investment-based mortgage, as riskier. Respondents took out riskier mortgages if they had already moved to an owner-occupied house and thus had gained experience in taking out mortgages. The coefficients for risk and time preferences and confidence were insignificant. The inclusion of all these controls lowered the debt literacy coefficient somewhat, while the interaction term between literacy and financial advice saw no change in qualitative terms.

The final specification incorporates controls for income risk and wealth risk. The regression estimates show that individuals with risky mortgages expected to encounter financial problems more often should house prices decline or earnings losses occur.

Table 14 shows the same set of estimation results for basic financial literacy. The first specification shows basic financial literacy also being positively correlated with mortgage risk. The effect of basic financial literacy on mortgage risk was not statistically significant. Thus, the literacy measure that explicitly zooms in on knowledge about debt appears to be a more accurate predictor of mortgage debt decisions than the overall measure of financial literacy. This is consistent with Gerardi et al. (2013), who have found that numerical ability, the ability to perform more advanced computations, affects default behavior among US homeowners, while basic financial literacy is less important to default. Similarly, Disney and Gathergood (2013) have found that individuals who provide correct answers to debt literacy questions are less confused by financial concepts and more confident about financial decisions. At the same time, they have not found a strong significant relation for the basic financial literacy question in their questionnaire.

7. Discussion

It is commonly known that a large group of households lack basic financial knowledge and do not possess the financial skills to take complex decisions (see Campbell, 2006). Our results highlight that the knowledge of basic financial concepts exceeds the level of knowledge of loan products, suggesting that debt decisions are particularly complex (see also Lusardi and Tufano, 2015). As basic financial knowledge alone is not sufficient to understand more complex products as loans, it is important that financial education initiatives set up by many governments include special modules or pay attention to the specifics of debt decisions.

A large number of countries witnessed housing busts in the aftermath of the financial crisis which has demonstrated how mortgage choices may result in a heavy financial burden. Our results show that, generally speaking, homeowners appear to be aware of the characteristics that increase the financial risks of a mortgage. Nevertheless, more knowledgeable households tend to take out riskier mortgages, being aware of their exposure to income and wealth risk. In fact, financial literacy seems to be a blessing as well as a curse. It helps individuals in entering the stock market and planning for retirement, but it also encourages households to choose mortgages with risky characteristics that have put a lot of households in distress. These developments negatively impacted macro consumption and deepened the economic downturn as households reduced their expenditure in the face of difficulties in meeting their mortgage payments or anxiety about negative home equity.

Given the complex nature of loan decisions, many households seek the help of a mortgage broker or base their decisions on other sources of information. Homeowners with more financial knowledge typically consult a larger number of information sources. While financially illiterate homeowners may be expected to consult a mortgage broker more often, this does not appear to be the case. This is consistent with the argument that financial advisers are used by those who need them the least (see Hackethal et al., 2012). However, our results show that homeowners who consult advisers have riskier mortgages, regardless of their level of literacy. Nevertheless, the impact of advisers on the riskiness of the mortgage loan is less pronounced for the more literate consumers. We are not able to address the issue of causality, given that those homeowners planning to take out a riskier mortgage may have been the ones seeking advice from an adviser. However, the results highlight the importance of independent financial advice and a commission structure without incentives to advise risky mortgages when they are less suitable.

That is why several countries have changed the legal rules for fee structures in the financial advice market. In the Netherlands, for instance, commission fee payments to intermediaries for the origination of mortgages have been banned since January 2013. Consumers now have to pay the adviser directly for all services. This type of commission structure reduces concerns about mortgage advisers having incentives to give advice that goes against the interest of the consumer; see also Inderst and Ottaviani (2012) and Gorter (2012). This may result in more conservative mortgages be-

ing recommended and taken out and, thus, fewer households with financial problems. On the other hand, high brokerage fees may discourage homeowners from obtaining financial advice.

As a remedy, policymakers may consider making financial advice mandatory for unsophisticated households or for households who plan to take out a risky mortgage product. While the empirical evidence shows that making financial advice mandatory discourages sophisticated households, willing to avoid mandatory advice, from taking out risky mortgages (Agarwal et al., 2014), it does not influence the financial behavior of less sophisticated households (Hung and Yoong, 2013). Although, overall, this would be helpful in reducing mortgage risks to homeowners, it would put a burden on those homeowners who are quite capable of taking a mortgage decision on their own.

Although it is not clear beforehand whether homeowners will display the same behavior in the new setting, it is somewhat comforting that the results suggest that consumers with low literacy levels who do not consult financial advisers tend to take out less complex and more conservative mortgages. An interesting question is whether mortgage choices by more literate homeowners, while being more complex and risky ex-ante are optimal ex-post. Unfortunately our data does not allow this analysis. We leave this for future research.

Acknowledgements

We are grateful to Rob Alessie, Johan Almenberg, Tabea Bucher-Koenen, Jakob de Haan, Arvid Hoffmann, Adriaan Kalwij, Arthur van Soest, Costanza Torricelli and seminar participants in the 2014 Netspar International Pension Workshop and the 2014 congress of the European Economic Association, the editor (Geert Bekaert) and two anonymous referees for their helpful comments and suggestions. We would also like to thank Mauro Mastrogiacomo for his comments and valuable recommendations concerning the construction of the questionnaire. Views expressed in this paper do not necessarily coincide with those of De Nederlandsche Bank.

Appendix A. Debt literacy and basic financial literacy

To get a better understanding of the relatively high number of incorrect responses to the debt literacy questions, we examined whether individuals with good scores on the basic financial literacy questions had performed well on the more specific debt literacy questions, and vice versa. First, we compared the distribution of correct debt literacy answers conditional on the number of correct answers to the basic financial literacy question. Panel A of Table A.15 shows that individuals with perfect scores on the basic literacy questions also performed much better on the debt literacy questions. More than half of the individuals with perfect scores on the basic financial literacy questions answered two or three debt literacy questions correctly, compared with only one-third for individuals with two correct basic financial literacy answers and 13.6% for respondents providing one correct basic literacy answer. The strong association between the number of correctly answered basic literacy questions and correctly answered debt literacy questions is confirmed by the Pearson chi-squared test statistic, which rejects the null hypothesis of no association between both variables.

Panel B of Table A.15 shows a cross tabulation of the number of correctly answered financial literacy questions and the answers provided to the third debt literacy question about the time value of money, which was poorly understood. This question was answered correctly by only 17.3% of respondents with a perfect score on the financial literacy questions. It thus seems that even individuals with a good understanding of basic financial concepts often overlook the fact that money earns interest. Financially literate persons are, however, less likely to give a completely wrong answer compared with individuals who are financially less capable. About 52.2% of individuals with a perfect basic financial literacy score indicated that both payment schemes were similar, and 27.8% mixed up the most favorable payment scheme and the most expensive scheme – which we considered to be a 'completely wrong' answer. The number of respondents giving a completely wrong answer was much higher for financially less capable individuals, and the same applies to the proportion of 'do not know' responses.

Appendix B. Financial literacy and features of the mortgage

Do differences in risk perception of mortgage features across different literacy levels go hand in hand with different mortgage products held by more and less literate mortgage owners? We performed regression analyses to investigate the relation between financial literacy and mortgage choices.

Table B.16 shows the estimated coefficients of a linear regression for a number of mortgage features as the dependent variable and the financial literacy measure as the independent variable, also controlling for marital status, gender, age, education, household income, home ownership, having children, employment status, risk and time preferences, and the number of house moves to an owner-occupied house. Borrowers with higher levels of debt

Table A.15
Debt literacy versus basic financial literacy.

	Number of correct basic financial literacy answers				
	None	1	2	All	Mean
Panel A. Number of correct debt literacy answers					
None ($n = 353$)	80.6	47.2	28.3	12.1	1.72
1 ($n = 442$)	15.3	39.2	36.4	29.7	2.35
2 ($n = 430$)	4.1	13.6	29.6	44.4	2.63
All ($n = 99$)	0.0	0.0	5.6	13.9	2.79
Pearson χ^2 statistic: $F(8.76, 11595.1) = 22.76$, p-value $= 0.00$					
Panel B. Answers to third debt literacy question					
Option (a) ($n = 407$)	13.8	41.4	31.9	27.8	2.34
Option (b) ($n = 145$)	0.0	1.4	9.5	17.3	2.72
They are the same ($n = 625$)	15.0	39.0	47.5	52.2	2.48
Do not know ($n = 147$)	71.2	18.2	11.0	2.7	1.21

Notes: ($N = 1{,}324$). The statistics are weighted averages. The Pearson chi-squared statistic were corrected for the use of sample weights via the correction of Rao and Scott (1984). The statistic is converted to an F statistic to get a valid p-value.

Table B.16
Financial literacy and financial mortgage attributes: regression results.

	Debt literacy	Basic financial literacy	Capability to originate a mortgage
Current LTV	0.007	−0.035**	−0.020*
	(0.013)	(0.015)	(0.010)
Current LTI	0.080	−0.247*	−0.019
	(0.105)	(0.141)	(0.079)
Current PTI	0.012	−0.014	0.011
	(0.010)	(0.014)	(0.008)
Original LTV	−0.033*	−0.019	0.000
	(0.017)	(0.021)	(0.013)
Original LTI	−0.647*	−0.217	−0.373
	(0.378)	(0.453)	(0.288)

Notes: $N = 517$.
The table shows the association between financial literacy and several mortgage loan features. The correlation coefficient was derived from an OLS regression using the mortgage feature as the dependent variable and the financial literacy measure as the independent variable. Controls: see Table 11. Standard errors are shown in parentheses. Significant at the ** 5%; * 10% level.

Table B.17
Financial literacy and mortgage type: regression results.

	Debt literacy	Basic financial literacy	Capability to originate a mortgage
Full amortization	−0.026*	−0.037**	−0.009
	(0.014)	(0.015)	(0.012)
Endowment	0.016	−0.008	−0.054***
	(0.021)	(0.026)	(0.017)
Interest-only	0.012	0.046	0.072***
	(0.024)	(0.030)	(0.019)
Investment-based	0.001	0.004	−0.003
	(0.014)	(0.019)	(0.012)
Adjustable rate mortgage	0.013	−0.025	0.005
	(0.015)	(0.021)	(0.012)

Notes: $N = 517$. The table shows the association between financial literacy and mortgage type. The correlation coefficient was derived from an OLS regression (ARM) and a multinomial logit regression (mortgage type) using the mortgage type as the dependent variable and the financial literacy measure as the independent variable (the marginal effects are reported). Controls: see Table 11. Standard errors are shown in parentheses. Significant at the *** 1%; ** 5%; * 10% level.

literacy took out mortgages with significant lower LTV and LTI ratios when they bought their homes. One additional correct answered debt literacy question is associated with a 3.3 percentage point lower LTV ratio at origination and a reduction in the original LTI ratio of around 0.65 (times an annual income) on average.

For basic financial literacy, we found that more literate borrowers have mortgages with significantly lower current LTV and current LTI values. Borrowers who felt capable to rake out a mortgage without financial advice are also more likely to have a mortgage with a lower LTV ratio (although only significant at the 10% significance level). Note that current LTV and LTI-ratio's are affected by exogenous events as well as personal decisions by mortgage owners. Events outside the control of mortgage owners include, for instance, job loss and overall changes in house prices. Personal choices that influence LTV and LTI ratio's after the moment of origination include decisions to redeem part of the mortgage, to increase the mortgage or changes in the job or the number of hours worked.

Table B.17 shows the marginal effects from a multinomial regression model of the mortgage type on financial literacy. After controlling for socio-economic characteristics, expectations and risk and time preferences, we found that respondents with higher debt or financial literacy were less likely to have traditional fully amortizing mortgages. One additional correct debt literacy answer is associated with a 2.6 percentage point lower incidence of having a fully amortizing mortgage on average. We did not find a relation between literacy and having an ARM versus a FRM.

Homeowners who feel capable to originate a mortgage without advice were more likely to have interest-only mortgages and were less likely to have endowment mortgages. Similarly, respondents with higher self-reported financial knowledge more often had interest-only mortgages, with traditional full amortization mortgages being less common among these respondents (results available upon request).

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