



The relationship between consumer characteristics and mortgage preferences

Mortgage
preferences

A case study from Sweden

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Abstract

Purpose – The purpose of this paper is to investigate consumer characteristics that influence Swedish consumers' mortgage rate decisions, such as the choice between an adjustable rate mortgage (ARM) and a fixed rate mortgage (FRM).

Design/methodology/approach – Data were collected in a randomised survey of the Swedish population in 2010. Through binary logistic regression, the effects of education, income and risk aversion on household mortgage decisions are investigated. In addition, consumers' financial literacy and self-reported ability to handle sudden mortgage rate increases are examined. A test of gender effects is also performed.

Findings – The results show that a lower level of education, lower income, lower financial literacy, and trouble handling interest rate increases influence Swedish consumers to choose ARMs. Gender does not significantly affect the overall results. However, a gender-divided regression shows that age, a low level of education and risk averseness significantly affect men's mortgage choices, whereas income, trouble handling interest rate increases and low financial literacy significantly affect women's mortgage choices.

Practical implications – The most vulnerable Swedish consumers choose FRMs to a greater extent and, thereby, make future expenditures more predictable for the single household by reducing liquidity risks.

Originality/value – This paper tests a number of characteristics in predicting consumers' mortgage choices, emphasises the importance of loan takers' ability to cope with sudden mortgage rate increases, highlights the importance of financial literacy in understanding consumers' financial choices and elucidates the Swedish case.

Keywords Mortgage, FRM, ARM, Personal finance, Sweden, Household

Paper type Research paper

1. Introduction

The turbulence of financial markets, the subprime mortgage crisis of 2008 and recent threats of bankruptcy to whole European nations are several good reasons to examine the smallest decision-making units – that is, single households – and their financial choices, amongst which the mortgage rate choice represents perhaps one of the most important credit decisions. The choice of mortgage interest rate may have a great impact on a household's standard of living/financial situation (Campbell and Cocco, 2003), and household mortgage decisions leading to higher costs have been reported



(Campbell, 2006; Agarwal *et al.*, 2009). A number of international studies have investigated factors influencing households' mortgage interest rate choice, and these findings can be divided into two categories of factors that influence this choice: price and other contract factors (Statman, 1982; Dhillon *et al.*, 1987; Smith, 1987; Brueckner and Follain, 1988; Sa-Aadu and Sirmans, 1995) and borrower characteristics (Alm and Follain, 1984, 1987; Brueckner, 1986; Coulibaly and Li, 2009).

This paper centres on borrower characteristics and how they may influence the choice between an adjustable rate mortgage (ARM) and a fixed rate mortgage (FRM) in a Swedish context. Apart from an interest in typical background variables, such as income and education, a special focus is given to consumers' risk aversion, ability to handle sudden mortgage rate increases and level of financial literacy.

The present study is based on data from a national randomised survey conducted in Sweden in 2010. Logistic regressions are performed in two models: an initial model and an extended model. These models are tested by binary logistic regression, and a special gender check is also performed. The objective of this study is to contribute to previous findings in four separate ways. First, the test of the proposed models and the special gender-related check are performed to examine the driving forces behind consumers' mortgage choices and to provide new tools for more developed studies. Second, the impact of loan takers' ability to handle sudden increases in mortgage (AHSIM) costs is investigated. Third, the idea that financial literacy is a factor of importance when predicting consumer mortgage choices is explored. Finally, the understanding of the Swedish case is expanded in such a way that it has importance for the development of consumer education programmes and a better assessment of national resources for furthering the knowledge of citizens and the banking industry.

This introduction is followed by a brief literature review and a presentation of the study hypotheses. The context of the study – that is, the Swedish housing market – is then discussed, followed by a section on our data and the methods used. A description of the two logistic regressions, which are performed step-wise (an initial model and an extended model) and a final step in which the extended model is controlled for gender effects, are then provided. Finally, a discussion of the results and implications for research and practice concludes the paper.

2. Literature review and hypotheses

Before the recent subprime mortgage crisis, borrower characteristics and their effects on mortgage choice were not the main focus of research studies.

However, in the aftermath of the recent global financial crisis, we have decided to take a different approach and make this the focus of the present study. This brief review of the literature highlights a number of variables that are likely to contribute to the understanding of how consumers decide between ARMs and FRMs. These variables are described and modeled in the following paragraphs.

There is rich literature available on subprime mortgages and federally guaranteed mortgages (Federal Housing Administration (FHA)-insured mortgages). When we conducted a brief review of the effects of borrower characteristics, we found that younger, less educated households with low income were more likely to obtain a federally guaranteed mortgage (Baeck and DeVaney, 2003). Age was also an important factor in determining whether individuals apply for FHA loans (LaCour-Little, 2004) and for loans with a lower initial payment (LIP), which have similar features to popular

subprime mortgage products (Ghent, 2011). With the exception of the aforementioned findings, previous research studies on subprime mortgages have been excluded to a great extent from this study because they have primarily focused on features that are specific to the US market and, thus, lack relevance for the Swedish context studied here.

Age

Dhillon *et al.* (1987) found that age has an insignificant effect on consumers' choice of mortgage contract. However, Sa-Aadu and Sirmans (1995) showed that younger borrowers tend to use short-term mortgages, and Sa-Aadu and Megbolugbe (1995) predicted that higher age has a negative impact on the probability of choosing an ARM. Leece (2000), using British data, found the opposite to be true: higher age increases the probability of choosing an ARM. According to an Italian study (Paiella and Pozzolo, 2007), the only borrower characteristics that affect the choice of interest rate are age and the number of children in the household: the more children and the higher the age, the less likely it is for the household to choose an ARM. In our opinion, these findings might show that individuals with fewer resources prefer to lock in their interest payments. Because the earlier findings are contradictive and seem to differ between countries, the age factor becomes an interesting topic to study also in a Swedish context, where the older borrowers not necessarily are scarce in resources. We hypothesise that older Swedish borrowers would not prefer FRMs.

Education

In the late 1980s, research showed that the education level of borrowers had no influence on the choice of mortgage contract (Dhillon *et al.*, 1987). However, more recent research has found that education is indeed an important factor in understanding consumers' choice of mortgage loans and the broad terms connected to it (Bucks and Pence, 2008). Households that will experience the greatest changes if the adjustable interest rates increase are often also those with less income and less education (Bucks and Pence, 2008); these same households underestimate – or know very little about – how much the interest rate may actually change (Bucks and Pence, 2008). In addition, research has revealed that mortgage refinancing is less effectively performed by households with a lower level of education (Campbell, 2006). This finding is consistent with our predictions of mortgage choice: individuals with a low level of education are more likely to choose an FRM.

Income

Higher income makes the choice of an ARM more probable (Brueckner and Follain, 1988; Fortowsky *et al.*, 2009). Dhillon *et al.* (1987) suggested that households with co-borrowers, married couples and short expected housing tenures have the greatest probability of taking out ARMs, which could be interpreted as co-borrowers/married couples together have better incomes and a better financial safety net should something unforeseen happen. However, Finke *et al.* (2005) found that borrower categories that increasingly prefer ARMs to FRMs are low-income earners with small wealth and low creditworthiness who live in single-parent households (i.e. relatively exposed households). A study performed in a Swedish context (Hullgren, 2010) found that high-income households prefer ARMs. Because the purpose of this study is to find factors predicting the choice of an FRM or an ARM, we hypothesise that individuals with a low income have a greater tendency to choose an FRM.

Risk aversion

Risk averseness also seems to have an impact on borrowers' choice of mortgage rate, with those who are more risk averse tending to prefer FRMs (Coulibaly and Li, 2009). In a recent study, Cox *et al.* (2011) analysed the impact of risk aversion and financial literacy (see subsequent subsection titled "Financial literacy") on mortgage choice and found that households that are less literate and more risk averse tend to choose less risky alternatives; that is, they are less likely to choose an ARM. This finding supports previous results showing that high risk aversion predicts the choice of an FRM (Campbell and Cocco, 2003). This tendency is also tested in our model. Risk is a multifaceted concept in literature, entailing for instance framing and gains and losses, and we therefore point out that the concept is here understood as the borrower's attitudes towards risk taking in a general financial setting.

Based on the literature review conducted here, this paper argues that the following borrower characteristics are important determinants of consumers' mortgage choices: age, education, income and self-reported risk aversion. The following basic model is created:

$$\begin{aligned} \text{Mortgage choice} = & B_0 + B_1(\text{Age}) + B_2(\text{Education}) + B_3(\text{Income}) \\ & + B_4(\text{Self-reported risk aversion}) + e \end{aligned}$$

Some other factors have recently been highlighted in connection to mortgage choice. An extended model is consequently constructed here to test the importance of the following consumer characteristics: age, education, income, self-reported risk aversion, AHSIM costs and financial literacy.

Ability to handle sudden increases in mortgage costs

There does not seem to be much literature on how the choice of mortgage loan interest rates might be influenced by loan takers' tolerance of sudden increases in mortgage costs. However, in a study conducted in Sweden, Kulander and Lind (2009) found significant differences between groups that experienced worry and those who felt more secure in their ability to manage their monthly costs concerning principal and interest: Those who had taken a 0-40 per cent ARM were significantly more worried than those with a 40-80 per cent or more than 80-per cent ARM[1]. Coulibaly and Li (2009) found that financial stress plays an important role in the choice of mortgage rate, with more financially constrained households tending to choose ARMs. In the US context, ARMs initially entail lower payments than FRM contracts (Coulibaly and Li, 2009). However, with the terms of the Swedish loan market in mind, we empirically generate a hypothesis stating that individuals who perceive themselves as having a low level of AHSIM costs are more likely to choose FRMs.

Financial literacy

The financial crises of the past decade have brought attention to the concept of financial literacy; that is, the ability of individuals to make informed financial decisions based on the possession of sufficient information about financial concepts and instruments (Agarwal *et al.*, 2010). Recent official reports (The Australian Law Reform Commission, 2005; OECD, 2009; Almenberg and Finicchiario, 2011) have emphasised financial illiteracy amongst citizens and pinpointed the need for further financial education. Research has revealed a widespread lack of basic financial literacy in populations of subprime borrowers (Gerardi *et al.*, 2009), which gives reason to believe that this factor is

of greater interest than previously portrayed. Some scholars have even argued that the subprime crisis happened because so many of the borrowers did not know the significance of the risk in their mortgages, thus concluding that there is a need for compulsory financial education for everyone (Shiller, 2008). The effects of different programmes promoting increased financial literacy are being discussed (Bernheim *et al.*, 2001; Cole and Shastry, 2009; Lusardi, 2008). Evidence exists that financial literacy has some importance when determining the financial decisions of households. A positive link between financial knowledge and financial behaviour has also been documented (Hilgert *et al.*, 2003). Some examples of the implications of financial illiteracy for economic behaviour include experiencing difficulties with debt (Lusardi and Tufano, 2008), borrowing more and becoming less wealthy (Stango and Zinman, 2008), paying more for credit (Stango and Zinman, 2011), selecting mutual funds with less favourable fees (Hastings and Tejada-Ashton, 2008), being less likely to invest in stocks (Christelis *et al.*, 2010; van Rooij *et al.*, 2011) and having lower retirement savings (Banks and Oldfield, 2007; Lusardi and Mitchell, 2011). Only a few studies have considered the effects of financial literacy on mortgage decisions. A study by Moore (2003) showed that a high number of financial illiterates existed in a group of borrowers. Campbell (2006) found that consumers with low financial literacy failed to refinance their mortgages when interest rates were falling. Of great interest to this study, Gerardi *et al.* (2009) showed that financial literacy also has some importance for mortgage market choices; that is, the less literate seemed ill-informed about the terms and other aspects of their mortgages (e.g. they did not know if their rates were fixed or adjustable). In addition, Bergstresser and Beshears (2010) found that mortgage borrowers who chose ARMs exhibited a low comprehension on a battery of financial questions. Contrary to these findings about the ARM choice, a recent Swedish study found that individuals with ARMs had a somewhat higher level of financial literacy than those with FRMs (Almenberg, 2011). Here, in line with Almenberg, we hypothesise that individuals with a low level of financial literacy are more likely to choose an FRM.

An extended model is formulated, where the impact of the AHSIM costs variable and the financial literacy variable are tested:

$$\begin{aligned} \text{Mortgage choice} = & B_0 + B_1(\text{Age}) + B_2(\text{Education}) + B_3(\text{Income}) \\ & + B_4(\text{Self-reported risk aversion}) \\ & + B_5(\text{Ability to handle sudden increases in mortgage costs}) \\ & + B_6(\text{Financial literacy}) + e \end{aligned}$$

We hypothesise that having low education, low income, high risk aversion, low AHSIM costs and low financial literacy influence Swedish home loan borrowers to choose FRMs and that having high age would predict a choice of ARM.

Gender also plays a role in consumers' decision making. There is a substantial amount of literature on gender differences in risk assessment that concludes that women tend to be more risk averse than men in many domains, such as financial decisions (Byrnes *et al.*, 1999; Weber *et al.*, 2002; Dohmen *et al.*, 2005; Harris *et al.*, 2006; Borghans *et al.*, 2009). Theory, with strong support of empirical findings, also suggests that men are more overconfident than women (Barber and Odean, 2001), which in turn implies that gender is a factor that merits further investigation when studying mortgage choices. Tests of gender as a determining factor of mortgage choice are, however, scarce in the literature. Cox *et al.* (2011) examined this variable but found no significant

contribution of gender. However, research has revealed that women tend to pay more than men on average for their mortgages (Cheng *et al.*, 2011) and are less likely to understand mortgage-specific vocabulary (Worthington, 2009). As a contribution to the literature on mortgage choice, we include gender differences in our investigation.

3. Our case: the Swedish context

The latter part of the 1980s was a period characterised by rapid price increases in the Swedish housing market. The economic crisis at the beginning of the 1990s put a stop to this development, and the price level sank in the three years following the crisis.

From the second half of the 1990s onwards prices have once again risen rapidly. The real estate price index of Statistics Sweden (SCB) shows, for example, that the price index for single- or two-family housing units in the whole of Sweden rose from approximately 86 in 1993 to almost 264 in 2010 (Index 1990 = 100).

During the period from 2000 to 2010, housing prices in Sweden changed in absolute terms. At the start of 2000, the average price for a single- or two-family housing unit in Sweden was approximately SEK[2] 0.95 million. By 2010, the average price exceeded SEK 2 million, an increase of 113 per cent. For cooperative apartments (the most common way in which to own an apartment in Sweden), the price of an apartment increased 235 per cent on average during the same period (Table I).

This increase in housing prices has also led to an increase in the indebtedness of households. The debt ratio of households increased from approximately 100 per cent in 2000 to about 155 per cent in the shift 2009/2010.

As for the Swedish mortgage market it consists of banks and mortgage institutes as lenders on a competitive, dominantly domestic, market. It could be of interest to know that there is no subprime loan market or in other ways subsidised mortgages in Sweden. When households apply for a housing loan on the regular market, they are generally approved if having at least one regular job, an income considered to sufficiently cover costs and no payment defaults. The amount approved is based on income in comparison to costs. If a household is approved for a loan, there are no financial regulations on which mortgage type the lender should offer. It is up to the household to choose between ARM and FRM and whether to have one loan or divide it in parts with different maturity. The Swedish loan taker has a personal responsibility for paying off the loan and when in financial trouble the house or apartment has to be sold on the open market. Any remaining loans continue to be the loan takers liability. This differentiates the Swedish housing market from for instance the US market.

The bank has the possibility of negotiating the mortgage rate level if they see fit, and the discount is generally up to 20 per cent points irrespective of if the lender chooses ARM or FRM, and therefore is considered to have a negligible impact of the choice of mortgage.

Table I.

Average prices for cooperative

apartments/single- or two-family housing units (for year-round living) per unit according to Statistics Sweden (SCB)

	2000 aver. price SEK	2010 aver. price SEK
Single or two-family housing units, Sweden	951,000	2,022,000 (+113%)
Single or two-family housing units, Stockholm County	1,968,000	3,783,000 (+92%)
Cooperative apartments, Sweden	390,000	1,306,000 (+235%)
Cooperative apartments, Stockholm County	926,000	2,165,000 (+134%)

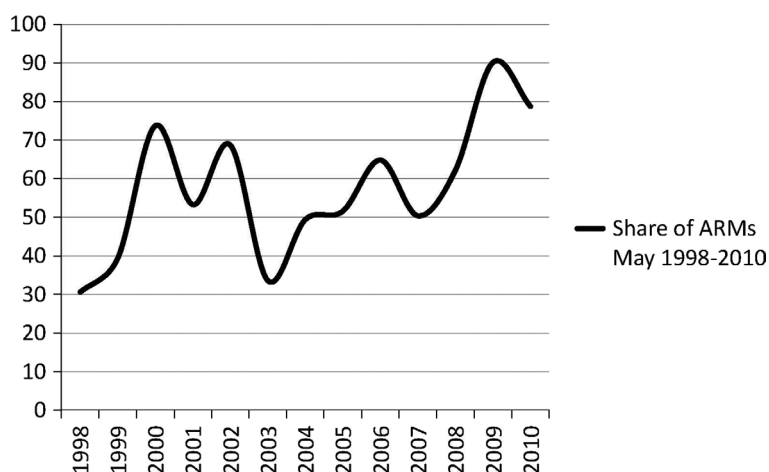
In Sweden, contrary to, e.g. the US, ARMs have a three-month maturity and the maturity of FRMs are most commonly between one and five years. FRMs are not prepayable and cannot be refinanced without penalty fees. The ARM has historically been linked to the Swedish national bank's, Riksbanken, repo rate and the FRM to the bond market. As an illustration it can be mentioned that out of ten years the ARM has been higher than the FRM for 317 days (SBAB). It should also be noted that there are no tax-related differences between FRMs and ARMs in Sweden.

Around 1998 less than a third of all new lending in Sweden had adjustable interest rates, while in 2005, the share was approximately 50 per cent. In 2008, this share had risen to approximately 62 per cent, in 2009 to 88 per cent and in May 2010, when the questionnaire was sent out, the share of new mortgages granted in Sweden at adjustable rates was 78.7 per cent (Statistics Sweden) (Figure 1).

During the period from 1998 to 2010, home loan interest rates substantially fluctuated (Figure 2). However, the net present value of the ARM has with few exceptions been more favorable to lenders seen over the period 1989-2006 (Aminoff and Gusterman, 2006).

All in all, this trend shows that households have become more sensitive to changes in the interest rate and the situation in the real-estate market. Because ARMs should be considered a higher liquidity risk to households, a likely assumption is that the most vulnerable households are taking greater risks should they have higher levels of ARMs.

It is worth to mention that contrary to borrowers in many other countries, older borrowers in Sweden are not *per se* financially more vulnerable than other age groups. Decades of increasing property values and maybe also amortization have led to a situation where they have the lowest LTVs compared to other age groups (Finansinspektionen, 2012). In a Swedish study Lindbergh *et al.* (2008) also point out that the large Baby Boomer generation from the 1940s has had the advantage of high lifetime earnings because of good macroeconomic times. They have also had generous pension plans and advantageous loan opportunities.



Source: Statistics Sweden – SCB

Figure 1.
Share of ARMs, 1998-2010

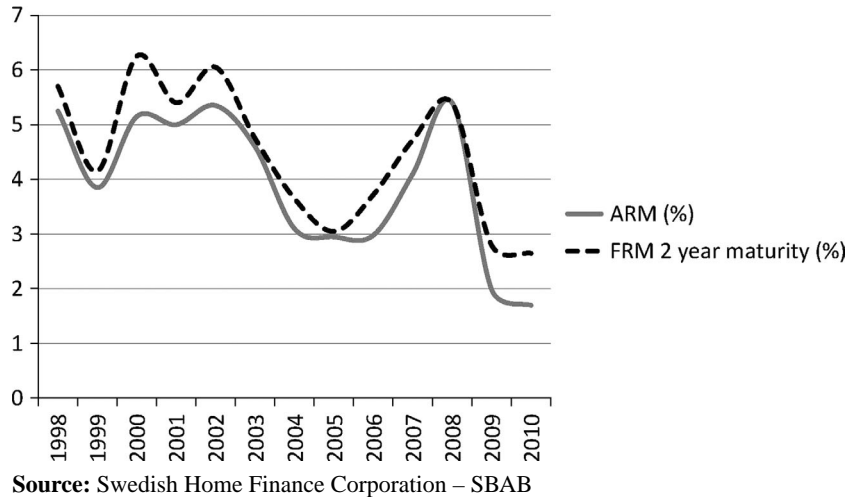


Figure 2.
Interest rate levels,
1998-2010

4. Data and method

The data used in the present paper were collected by an independent market research institute (EDB Business Partner, on behalf of Svenskt Kvalitetsindex) (Svenskt Kvalitetsindex, 2009). A survey was conducted in May-June 2010 by commission of the Swedish Financial Supervisory Authority. An independent random sample representative of the Swedish population was drawn and the telephone survey was answered by 1,302 individuals between 18 and 79 years, giving a response rate of 49 per cent. The distribution of the respondents is similar to that of the Swedish population with the exception of age. There is an overrepresentation of younger respondents in the study (Almenberg and Widmark, 2011) However, since the main focus of this study is on the respondents' choice of mortgage interest rates, only respondents who stated that they had mortgages were selected for further analysis. Of the whole sample of 1,302 individuals, 623 reported they had mortgage loans, and of them, 505 individuals answered all of the questions, as shown in Appendix 1. The distribution of respondents with mortgage loans (623 individuals) is similar to that of the total sample (1,302 individuals) in terms of gender and risk aversion. The mortgagees are slightly better educated and have a higher level of income, which could be explained by the fact that households that acquire loans – namely, households that are approved by banks – are generally those at the higher end of the income scale. The average Swedish household income was approximately SEK 20,300 per month in 2009[3]. The mortgagee sample shows, not surprisingly, smaller proportions of the youngest and oldest groups. The sample used in this study consists of the 505 respondents who answered all the relevant questions. There are no major differences between the groups of 623 and 505 mortgagees (Appendix 1).

A binary logistic regression was performed to assess the correlation of a number of consumer characteristics on the mortgage choice. From the questionnaire, 13 questions about financial literacy and eight questions concerning mortgages, risk perception, and background information (Appendix 2) were selected for further analysis. The constructs used in the regressions are presented in Table II.

Variable	Definition	Proportion of value 1 of variable sample (%)
MChoice	A binary variable indicating whether a loan taker has chosen mostly ARM or FRM ≤ 1/3 ARM = 1 (mostly FRM) > 1/3 ARM = 0 (mostly ARM)	37
AGEhigh	A binary variable separating age groups The highest age group (65 +) = 1 All others = 0	11.3
EDUlow	A binary variable indicating level of education and separating low education from others Primary and secondary school and vocational training = 1 All higher education = 0	52.3
EDUhigh	A binary variable indicating level of education and separating high education from others Master's degree and Lic/PhD = 1 All lower education = 0	2.6
INC	A binary variable indicating level of income < 25,000 SEK/month (before taxes) = 1 ≥ 25,000 SEK/month (before taxes) = 0	40.2
RISKav	A binary variable indicating self-reported risk aversion 1-5 = 1 (more risk avert: do not like to take risks) 6-10 = 0 (less risk avert: like to take risks)	64
AHSIMnop	A binary variable indicating ability to handle sudden increases in mortgage costs (no problem) Would manage mortgage payments if mortgage rates increased by 5 percentage points = 1 All others = 0	59.4
AHSIMprob	A binary variable indicating low ability to handle sudden increases in mortgage costs (problematic) Would not manage mortgage payments if mortgage rates increased by 5 percentage points = 1 All others = 0	3.2
SUMLIThigh	A binary variable indicating financial literacy, an index constructed from 13 questions 12-13 right answers = 1 0-11 right answers = 0	24.6
SUMLITlowest	A binary variable indicating financial literacy, an index constructed from 13 questions 1-6 right answers = 1 7-13 right answers = 0	7.5
Gender	A binary variable showing Men = 1 Women = 0	55.4

Note: $n = 505$

Table II.
Variables used in the regressions

The dependent variable mortgage choice (MChoice) is derived from a multiple-choice question in which the respondents were asked how large a part of the total amount of their mortgage loan was an ARM. The answers were categorised as either less than one-third ARM (i.e. mostly FRM, 1) or more than one-third ARM (i.e. mostly ARM, 0).

The explanatory variables in the two models were put into binary categories. Age (AGE), originally a continuous variable, was constructed into five categories (Appendix 1). Because the upper end category was of interest for this study, a variable was constructed – AGEhigh (65 + years) – and compared with all other age groups. The EDUlow and EDUhigh variables were constructed to single out individuals with 12 years of schooling or less and those with at least a Master’s degree, respectively. The self-reported risk aversion (RISKav) variable, is a classification based on a self-assessed ten-point scale, ranging from “not at all willing to take risks” to “very keen on taking risks”. Risk type is not specified in the material and the respondents are answering about their attitude towards risk taking in general. Here, a binary variable was constructed by dividing the sample into individuals who reported themselves as being risk averse (1-5) and those more willing to take risks (6-10). The AHSIM costs variable, is based on answers to a multiple-choice question on how an increase of 5 percent units in the mortgage interest rate would influence the ability to continue paying the mortgage. AHSIMnop singles out individuals who reported that they would have no problem handling a sudden increase in mortgage costs, whereas AHSIMprob singles out those reporting that they would not be able to pay. The variables concerning financial literacy are based on six numeracy[4] and seven literacy questions. The relevancy of these questions has previously been tested in international studies (Banks and Oldfield, 2007; Lusardi, 2008; Lusardi and Mitchell, 2009) as well as in a Swedish context[5] (Almenberg and Widmark, 2011). The total number of correctly answered questions was summed up and made into an index for each respondent, ranging from 0 to 13. The binary variable SUMLITlowest was assigned to individuals with a score of 6 or fewer correct answers, and SUMLIThigh to those with 12-13 correct answers (see also Appendix 1 for a table of the distribution of answers amongst all respondents).

Two binary logistic regressions were performed step-wise (an initial model and an extended model).

5. Results

The initial model contains five independent variables (AGEhigh, EDUlow, EDUhigh, INC and RISKav). This model, which contains all predictors, is statistically significant, $\chi^2(5, n = 505) = 30.836, p < 0.001$, indicating that the model as a whole is able to distinguish between the respondents who chose mostly FRMs and those who chose mostly ARMs. The model as a whole explains between 5.9 per cent (Cox and Snell R^2) and 8.1 per cent (Nagelkerke R^2) of the variance in mortgage rate choice.

As shown in Table III, only three of the independent variables make a unique contribution (statistically significant estimated parameters) to the model

	B	SE	Sig.	Odds ratio
AGEhigh	- 0.384	0.310	0.215	0.681
EDUlow	0.540	0.197	0.006***	1.715
EDUhigh	- 0.655	0.790	0.407	0.519
INC	0.469	0.201	0.019**	1.598
RISKav	0.538	0.209	0.010***	1.713
Constant	- 1.323	0.205	0.000	0.266

Table III.
Logistic regression
predicting likelihood
of choosing FRM:
initial model

Notes: Statistically significant at: * 0.10, ** 0.05, *** 0.01 levels (two-tailed); the dependent variable is MChoice; the number of observations is 505; the Cox and Snell R^2 is 0.059; the Nagelkerke R^2 is 0.081

(EDUlow, INC and RISKav). The strongest predictor of choosing an FRM is the EDUlow variable, with an odds ratio (OR) value of 1.715. This result indicates that respondents with low education levels are around 1.7 times more likely to choose FRMs than those with higher education levels, controlling for all other factors in the model. The OR value for the RISKav variable is 1.713, which indicates almost the same likelihood for the respondents to choose FRMs, whereas the OR value of the predictor INC is 1.598, which indicates a slightly less likelihood.

An extended model, which includes four more independent variables (AHSIMnop, AHSIMprob, SUMLIThigh and SUMLITlowest), is then introduced, and a logistic regression is performed to assess the impact of all nine variables on the likelihood that the respondents would report having chosen mostly FRMs.

The extended model is statistically significant, $\chi^2(9, n = 505) = 44.425, p < 0.001$, indicating that the model is able to distinguish between the respondents who chose mostly FRMs and those who chose mostly ARMs. The model as a whole explains between 8.4 per cent (Cox and Snell R^2) and 11.5 per cent (Nagelkerke R^2) of the variance in mortgage rate choice.

As shown in Table IV, six of the independent variables make a unique contribution to the model (EDUlow, INC, RISKav, AHSIMnop, AHSIMprob and SUMLITlowest). The strongest predictor of choosing an FRM is the AHSIMprob variable, with an OR value of 4.235. This result indicates that respondents who self-reported that they would have problems paying their mortgages if the interest rate rose by 5 percent units are approximately 4.2 times more likely to choose FRMs than those who reported that this rise would not be problematic for their personal finances, controlling for all other factors in the model. The OR value for the SUMLITlowest variable is 2.056, which indicates that respondents with the lowest levels of financial literacy (an answer rate of 0-6 correct answers of 13 questions) are 2.056 times more likely to choose FRMs.

To check the robustness of the results, we also controlled for the impact of the following factors on mortgage choice: loan-to-value ratio, average housing prices in the respondents' residential areas and the time since the loan was originally granted. None of these factors significantly influenced the results[6].

Because checking for gender effects is considered a complimentary objective of this study, we performed a gender-divided regression based on a performed correlation in

	B	SE	Sig.	Odds ratio
AGEhigh	-0.446	0.319	0.162	0.640
EDUlow	0.453	0.202	0.025**	1.573
EDUhigh	-0.627	0.793	0.429	0.534
INC	0.402	0.209	0.054*	1.494
RISKav	0.482	0.213	0.023**	1.620
AHSIMnop	0.381	0.205	0.063*	1.464
AHSIMprob	1.443	0.583	0.013**	4.235
SUMLIThigh	-0.268	0.243	0.270	0.765
SUMLITlowest	0.721	0.365	0.048*	2.056
Constant	-1.475	0.267	0.000	0.229

Notes: Statistically significant at: *0.10, **0.05, ***0.01 levels (two-tailed); the dependent variable is MChoice; the number of observations is 505; the Cox and Snell R^2 is 0.084; the Nagelkerke R^2 is 0.115

Table IV.
Logistic regression
predicting likelihood
of choosing FRM:
extended model

which GENDER correlates with the variables EDUlow, INC, RISKav, SUMLIThigh and SUMLITlowest but not with MChoice. To investigate the impact of GENDER, we performed another logistic regression in which women and men are separated (Table V).

The model with only women is statistically significant, $\chi^2(9, n = 225) = 22.136$, $p < 0.05$, indicating that the model is able to distinguish between the respondents who chose mostly FRMs and those who chose mostly ARMs. The model as a whole explains between 9.4 per cent (Cox and Snell R^2) and 12.7 per cent (Nagelkerke R^2) of the variance in mortgage rate choice.

The model with only men is statistically significant, $\chi^2(9, n = 280) = 37.272$, $p < 0.001$, indicating that the model is able to distinguish between the respondents who chose mostly FRMs and those who chose mostly ARMs. The model as a whole explains between 12.5 per cent (Cox and Snell R^2) and 17.1 per cent (Nagelkerke R^2) of the variance in mortgage rate choice.

As shown in Table V, the three independent variables that now make a statistically significant contribution to the model concerning women only are INC, AHSIMprob and SUMLITlowest. In the male-only group, the three variables, AGEhigh, EDUlow and RISKav, significantly contribute to the model.

In both groups, the strongest predictor of choosing an FRM is AHSIMprob, with an OR value of 6.585 for women and 3.275 for men. These results indicate that women who self-reported that they would have problems paying their mortgages if the interest rate rose by 5 percentage units are almost 6.6 times more likely to choose FRMs, whereas for men, it is almost 3.3 times, controlling for all other factors in the model.

6. Analysis

The initial model and the extended model show a relatively low degree of explanation with Cox and Snell R^2 -values of 0.059 and 0.084, respectively, and Nagelkerke R^2 -values of 0.081 and 0.115, respectively. This finding could suggest that factors other than borrower characteristics, such as pricing and contract terms, might influence mortgage choice (Dhillon *et al.*, 1987; Smith, 1987; Brueckner and Follain, 1988; Sa-Aadu and Sirmans, 1995).

	B		SE		Sig.		Odds ratio	
	W	M	W	M	W	M	W	M
AGEhigh	0.022	-0.925	0.478	0.458	0.963	0.043**	1.022	0.396
EDUlow	-0.125	0.880	0.311	0.299	0.689	0.003***	0.883	2.411
EDUhigh	0.663	-19.911	0.962	14,018.805	0.491	0.999	1.940	0.000
INC	0.803	0.135	0.328	0.305	0.014**	0.657	2.231	1.145
RISKav	0.345	0.599	0.353	0.280	0.328	0.032**	1.412	1.820
AHSIMnop	0.425	0.388	0.299	0.292	0.155	0.184	1.530	1.474
AHSIMprob	1.885	1.186	0.898	0.773	0.036**	0.125	6.585	3.275
SUMLIThigh	-0.443	-0.191	0.496	0.302	0.372	0.527	0.642	0.826
SUMLITlowest	0.867	0.739	0.443	0.676	0.051*	0.274	2.379	2.093
Constant	-1.522	-1.638	0.385	0.405	0.000	0.000	0.218	0.194

Table V. Logistic regression predicting likelihood of choosing FRM: extended model, gender separated

Notes: Correlation is significant at: *0.10, **0.05, *** 0.01 levels (two-tailed); the dependent variable is MChoice; the number of observations is W 225/M 280; the Cox and Snell R^2 is W 0.094/M 0.125; the Nagelkerke R^2 is W 0.127/M 0.171

The results of the extended model give evidence that certain borrower characteristics have an impact on mortgage choice. However, we find no evidence that age has an impact on mortgage choice, which supports findings by Dhillon *et al.* (1987) but contradicts those of Sa-Aadu and Megbolugbe (1995) and Paiella and Pozzolo (2007).

We also find that consumers' level of education seems to influence their mortgage rate choice – that is, consumers who are less educated have a preference for FRMs – which contradicts the findings of Dhillon *et al.* (1987). In addition, we find that consumers with lower income are more likely to choose FRMs, which is contrary to the findings of Finke *et al.* (2005) but in line with those of Brueckner and Follain (1988) and Fortowsky *et al.* (2009)[7].

In the present study, consumers who are more risk averse tend to prefer FRMs, which is in line with the findings of Coulibaly and Li (2009) and those of Campbell and Cocco (2003).

As hypothesised, we find that households reporting problems in managing their personal finances if mortgage interest rates were to increase substantially are more likely to choose FRMs. This hypothesis, which is tested in a Swedish setting and is based on the research of Kulander and Lind (2009), contradicts findings from a US context (Coulibaly and Li, 2009). Our study shows that consumers with low financial literacy are more likely to choose FRMs, which has also been recently noted by Almenberg (2011) in a study with a Swedish context. However, Bergstresser and Beshears (2010) found the opposite to be true in a study with a US setting. These findings indicate that the effects of financial literacy might differ between countries.

The coefficients of AHSIMprob, RISKav, EDUlow and SUMLITlowest are statistically significant ($p < 0.05$) for the whole population (INC and AHSIMnop are significant when $p < 0.10$). This finding, in line with what was hypothesised, indicates that borrowers with a lower level of education, a high level of risk aversion, perceived problems in handling rising mortgage rates and a lower level of financial literacy seem to have a higher probability for choosing FRMs. This finding might imply that the most vulnerable Swedish consumers choose FRMs to a greater extent than those who are less vulnerable and, in so doing, avoid obvious liquidity risks.

We find no evidence that gender has an impact on mortgage choice. However, when the model is separately tested for gender effects, the most significant determinants for mortgage rate choice for women are INC, AHSIMprob and SUMLITlowest, whereas they are AGEhigh, EDUlow and RISKav for men. Comparing the two gender-divided models show a significant difference between them. These differences might indicate that the connection between education and income is stronger for women than for men. Higher education might be a requirement for higher income for women to a greater extent than it is for men. Contrary to what was found in the two earlier models high age seems to have an effect on the mortgage choice of men. This is interesting, since it contradicts the hypothesis made based on an assumption about the specific Swedish context. However, since there are no clear answers there is a need for further research.

The results of all models are analysed to determine whether certain factors, such as:

- loan-to-value;
- average housing prices in the respondents' residential areas; and
- time since the loan was originally granted, have an impact on mortgage choice.

None of these factors has significant effects on the results.

7. Conclusions

Since the global financial crisis of 2008, consumers' mortgage choices have been highlighted not only in public debate but also in a research context. Some topics of interest have included price and other contract factors as well as borrower characteristics. This empirical study investigates the effects of borrower characteristics on mortgage rate choice. We hypothesised that certain consumer characteristics – namely, low level of education, low income, high risk aversion, low AHSIM costs and low financial literacy – influence Swedish home loan borrowers to choose FRMs, whereas higher age incline borrowers not to choose FRMs. This empirical study of 505 mortgage holders, conducted in a Swedish context in 2010, gives support to the hypotheses, thereby rejecting the null hypotheses, that education, income, risk aversion, AHSIM costs and financial literacy do affect the mortgage choice of borrowers in the direction hypothesised. However, this study finds no evidence of high age being a determining factor for mortgage choice, except when checking for gender differences.

Gender does not have any direct effects on mortgage choice, and the possible multicollinearity with income and education is discussed. The results showing that risk aversion and high age has an impact on the mortgage rate choice of men but not on that of women indicate a need for further investigation. These gender differences could have implications for policy makers and the financial industry in identifying actions.

The effects of financial literacy seem to vary between countries. This variation might be caused by differences in mortgage terms in that different lock-in effects might be difficult for the lay consumer to evaluate and this is an issue that warrants further investigation. In conclusion, the results presented here give an indication that a more comprehensive model should be created that also includes price factors and contract terms.

Overall, the results of this study imply that the most vulnerable Swedish consumers choose FRMs to a greater extent than those who are less vulnerable and, in so doing, avoid obvious liquidity risks. Regarding policy implications it can be said that the market seems to function fairly well in Sweden. This might be due to the absence of a subprime market. It can also be mentioned that in October 2010 the Swedish Financial Authority decided on a general recommendation for Swedish banks and mortgage institutes not to allow mortgages exceeding 85 per cent of the market value of the property. The results shown in this paper does not indicate a need for further legislations or changes in public policy.

Notes

1. The study was initiated by the Department of Real Estate and Construction Management at the Royal Institute of Technology in Stockholm and the Association of Swedish Real Estate Agents' research fund. 977 questionnaires were sent to households that had received a land registration certificate from January to mid-May in 2008, which means that the home had been bought during the period from the end of 2007 to April 2008. The number of answered questionnaires was 367, giving a response rate of approximately 37 per cent.
2. 100 SEK = approximately 10 euro or approximately 15 USD (November 2011).
3. Statistics Sweden (SCB) mean income for the working population in 2009.
4. The six numeracy questions are taken from the English Longitudinal Study of Ageing (ELSA).
5. Johan Almenberg and Olof Widmark are recognised for constructing the Swedish questionnaire.

6. Tests were also performed where the dummy variables used in the regressions were constructed in different ways to test for significance. However, the results were not significantly altered and the conclusions are the same.
7. Generally, it can be argued that age might be reflected in income as well as in education but tests performed with interaction variables show no effect.

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All respondents		All mortgage holders		Mortgage holders (complete answers)	
	<i>n</i>	%		<i>n</i>	%
No ARM	121	9.3	No ARM	121	19.4
Less than 1/3 ARM	100	7.7	Less than 1/3 ARM	100	16.1
Between 1/3 and 2/3 ARM	107	8.2	Between 1/3 and 2/3 ARM	107	17.2
More than 2/3 ARM	262	20.1	More than 2/3 ARM	262	42.1
Do not know	33	2.5	Do not know	33	5.3
Missing	679	52.2	Missing	0	0
Total	1,302		Total	623	
			<i>Mortgage choice</i>		
Female	641	49.2	Female	287	46.1
Male	661	50.8	Male	336	53.9
Total	1,302		Total	623	
			<i>Gender</i>		
18-29	355	27.3	18-29	52	8.3
30-39	186	14.3	30-39	138	22.2
40-49	203	15.6	40-49	153	24.6
50-64	311	23.9	50-64	193	31.0
65 +	229	17.6	65 +	83	13.3
Missing	18	1.4	Missing	4	0.6
Total	1,302		Total	623	
			<i>Age</i>		
Primary school	133	10.2	Primary school	47	7.5
Secondary school	482	37.0	Secondary school	186	29.9
Vocational training	188	14.4	Vocational training	95	15.2
			<i>College studies up to bachelors degree</i>		
Masters degree	357	27.4	Masters degree	204	32.7
Licentiate or doctoral degree	106	8.1	Licentiate or doctoral degree	70	11.2
Missing	28	2.2	Missing	20	3.2
Total	1,302		Total	623	

(continued)

Table AI.

Table AI.

	All respondents		All mortgage holders		Mortgage holders (complete answers)		
	n	%	n	%	n	%	
			<i>Income (SEK per month before tax)</i>				
Below 15,000	325	25.0	60	9.6	50	9.9	
15,000-19,999	184	14.1	74	11.9	61	12.1	
20,000-24,999	200	15.4	104	16.7	92	18.2	
25,000-29,999	164	12.6	103	16.5	98	19.4	
30,000-34,999	120	9.2	86	13.8	82	16.2	
35,000-39,999	50	3.8	38	6.1	38	7.5	
40,000 or higher	105	8.1	84	13.5	84	16.6	
Missing	154	11.8	74	11.9	0	0	
Total	1,302		623		505		
			<i>Risk aversion</i>				
1 – extremely risk avert	240	18.4	96	15.4	71	14.1	
2	88	6.8	43	6.9	29	5.7	
3	137	10.5	58	9.3	45	8.9	
4	122	9.4	63	10.1	51	10.1	
5	296	22.7	148	23.8	127	25.1	
6	114	8.8	61	9.8	50	9.9	
7	150	11.5	87	14.0	72	14.3	
8	96	7.4	46	7.4	41	8.1	
9	18	1.4	9	1.4	9	1.8	
10 – likes taking risks	38	2.9	12	1.9	10	2.0	
Missing	3	0.2	0	0	0	0	
Total	1,302		623		505		
			<i>Ability to handle sudden increases in mortgage costs</i>				
No major problems	357	27.4	357	57.3	300	59.4	
Would have to struggle, but would manage mortgage payments	230	17.7	230	36.9	189	37.4	
Would not manage mortgage payments	21	1.6	21	3.4	16	3.2	
Do not know	17	1.3	15	2.4	0	0	
Missing (no mortgages)	677	52	0	0	0	0	
Total	1,302		623		505		

(continued)

	All respondents		All mortgage holders		Mortgage holders (complete answers)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
0	1	0.1	0	0	0	0
1	2	0.2	1	0.2	1	0.2
2	13	1.0	3	0.5	2	0.6
3	21	1.6	5	0.8	3	0.4
4	34	2.6	10	1.6	7	1.4
5	62	4.8	14	2.2	5	1.4
6	84	6.5	23	3.7	6	1.8
7	135	10.4	50	8.0	7	3.6
8	159	12.2	60	9.6	31	6.1
9	157	12.1	79	12.7	49	9.7
10	216	16.6	103	16.5	65	12.9
11	224	17.2	132	21.2	83	16.4
12	138	10.6	96	15.4	115	22.8
13	56	4.3	47	7.5	81	16.0
Total	1,302		623		505	

Financial literacy (correct answers)

Table AII.
Survey questions used
in the study

Swedish original questions	English translation
1. Anta att räntan på ditt sparkonto är 1% och inflationen är 2%. Om du låter dina pengar stå på kontot i ett år, kommer du kunna köpa mer, lika mycket, eller mindre för pengarna vid årets slut?	Imagine that the interest on your bank account is one per cent and inflation is two per cent. After one year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?
2. Att köpa aktier i ett enskilda företag är vanligtvis säkrare än att köpa andelar i en aktiefond?	Buying a single company stock usually provides a safer return than a stock mutual fund. True or false?
3. På lite längre sikt brukar rörliga bolåneräntor vara lägre än bundna bolåneräntor	In the long run, adjustable mortgages usually have lower interest rates than fixed mortgages. True or false?
4. Obligationer är värdepapper som löper med fast ränta under viss tid. Om räntan går ner, vad händer med obligationspriserna?	Bonds are securities that pay a fixed interest during a specified time period. If interest rates go down, what happens to prices of bonds?
5. Vilket har historiskt get högst avkastning på lång sikt, aktier eller obligationer?	Historically, which has had the higher return, stocks or bonds?
6. Aktier brukar gå upp och ner i värde mer än vad obligationer gör	Stocks tend to fluctuate more in value than bonds do. True or false?
7. En investering som ger högre avkastning än genomsnittet har sannolikt högre risk än genomsnittet	An investment that pays an above average return is likely to have above average risk. True or false?
8. Du köper en bok för 85 kronor och betalar med 100 kr. Hur mycket växel borde du få?	You buy a book for 85 SEK and pay with 100 SEK. How much change should you get back?
9. En butik har rea och erbjuder då alla sina varor till halva priset. En stol kostar 3000 kr innan rea. Hur mycket kostar den under rea?	A shop has a sale and offers all merchandise at half price. A chair costs 3,000 SEK before the sale. How much does it cost in the sale?
10. Om sannolikheten att få en sjukdom är 10%, hur många av 1000 personer kan förväntas få sjukdomen?	If the probability of catching an illness is 10 per cent. How many people out of 1,000 would be expected to get the illness?
11. En bilhandlare erbjuder en begagnad bil för 60,000 kr. Det är två tredjedelar av vad den kostade som ny. Hur mycket kostade bilen som ny?	A car dealer offers a second hand car for 60,000 SEK. This is two thirds of what it cost new. How much did the car cost when new?
12. Fem personer vinner ett lotteri och ska dela på vinsten. Om vinsten de ska dela på är 2 miljoner, hur mycket får var och en?	Five people win a lottery and are to share the prize. If the prize money is 2 million, how much does each of them receive?
13. Anta att du har 200 kr på ett sparkonto. Räntan är 10% om året och sätts in på samma konto. Hur mycket har du på kontot efter två år?	Assume you have 200 SEK in a savings account. The interest rate is 10 per cent a year and is paid into the same account. How much would you have in the account after two years?
14. Hur skulle du beskriva dig själv: är du en person som försöker undvika att ta risker eller är du beredd att ta risker?	How would you describe yourself: are you a person who tries to avoid risks or are you prepared to take risks?
15. Har du bolån för denna bostad idag?	Do you have mortgages?
16. Hur stor andel av dina bolån har rörlig ränta (3 månaders bindningstid eller kortare)	Which proportion of your mortgages are ARMs (3 months maturity or shorter)?
17. Vad tror du skulle hända om räntorna på ditt bolån ökar kraftigt, från dagens nivå upp till ca 7-8 procent?	What do you think would happen if the interest rates of your mortgages suddenly increased, from today's level (of approx. 3 per cent) up to approx. 7-8 per cent
18. Kön	Gender
19. Vilket år är du född?	What year were you born?
20. Vilken är din utbildningsnivå?	Your level of education?
21. Vilken är din ungefärliga månadsinkomst före skatt?	Your approx. monthly income before taxes?