Fixed or adjustable - mortgage choice in Australia

Author:
Lindsay, Michael

Publication Date:
2017

DOI:
https://doi.org/10.26190/unsworks/20557

Fixed or Adjustable - Mortgage choice in Australia*

Michael Lindsay

A thesis in fulfilment of the requirements for the degree of

Master of Philosophy

School of Banking and Finance

UNSW Business School

Revised

December 2017

* This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the author and should not be attributed to either FaHCSIA or the Melbourne Institute.

UNSW SYDNEY | Australia's Global University

Thesis/Dissertation Sheet

Surname/Family Name	:	**LINDSAY**
Given Name/s	:	**Michael Craig**
Abbreviation for degree as give in the University calendar	:	**MPhil**
Faculty	:	**UNSW Business School**
School	:	**School of Banking and Finance**
Thesis Title	:	**Fixed or adjustable – mortgage choice in Australia**

Abstract 350 words maximum: (PLEASE TYPE)

This study considers factors linked to household preference for fixed rate mortgages (FRMs) or adjustable rate mortgages (ARMs). It does so examining mortgage choice in Australia, a market where price differences between FRMs and ARMs are relatively muted compared to the United States, enabling a greater role for household characteristics in mortgage choice. Unlike much of the existing literature, which identifies price as the dominant factor, it finds household characteristics matter, mostly by influencing household ability to manage the interest expense risk of an ARM.

A household's level of buffer-stock savings is found relevant for mortgage choice, affirming the view it has a major influence on household ability to manage the interest expense risk of an ARM. Also relevant is whether a household has spare cash for savings or investment. Both are positively linked with the probability of a household choosing an ARM. Households with less capacity to manage the interest expense risk of an ARM are found to be more likely to choose a FRM.

This study tests the relevance of home equity for mortgage choice, finding it less important, despite high expectations and robust rationale for it to be among the key factors for mortgage choice. Tests on different submarkets reveal differences in approaches to mortgage choice. Significant factors mostly act in the anticipated manner. When this is not the case this may be interpreted as evidence of greater likelihood of making an investment mistake.

FOR OFFICE USE ONLY Date of completion of requirements for Award:

COPYRIGHT STATEMENT

'I hereby grant the University of New South Wales or its agents the right to archive and to make available my thesis or dissertation in whole or part in the University libraries in all forms of media, now or here after known, subject to the provisions of the Copyright Act 1968. I retain all proprietary rights, such as patent rights. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.
I also authorise University Microfilms to use the 350 word abstract of my thesis in Dissertation Abstract International (this is applicable to doctoral theses only).
I have either used no substantial portions of copyright material in my thesis or I have obtained permission to use copyright material; where permission has not been granted I have applied/will apply for a partial restriction of the digital copy of my thesis or dissertation.'

Signed .....

Date 18/5/2018

AUTHENTICITY STATEMENT

'I certify that the Library deposit digital copy is a direct equivalent of the final officially approved version of my thesis. No emendation of content has occurred and if there are any minor variations in formatting, they are the result of the conversion to

Signed .....

Date 18/5/2018

ORIGINALITY STATEMENT

'I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person, or substantial proportions of material which have been accepted for the award of any other degree or diploma at UNSW or any other educational institution, except where due acknowledgement is made in the thesis. Any contribution made to the research by others, with whom I have worked at UNSW or elsewhere, is explicitly acknowledged in the thesis. I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.'

Signed .. ..

Date 18/5/2018

Fixed or Adjustable - Mortgage choice in Australia

Michael Lindsay

A thesis in fulfilment of the requirements for the degree of

Master of Philosophy

Abstract

This study considers factors linked to household preference for fixed rate mortgages (FRMs) or adjustable rate mortgages (ARMs). It does so examining mortgage choice in Australia, a market where price differences between FRMs and ARMs are relatively muted compared to the United States, enabling a greater role for household characteristics in mortgage choice. Unlike much of the existing literature, which identifies price as the dominant factor, it finds household characteristics matter, mostly by influencing household ability to manage the interest expense risk of an ARM.

A household's level of buffer-stock savings is found relevant for mortgage choice, affirming the view it has a major influence on household ability to manage the interest expense risk of an ARM. Also relevant is whether a household has spare cash for savings or investment. Both are positively linked with the probability of a household choosing an ARM. Households with less capacity to manage the interest expense risk of an ARM are found to be more likely to choose a FRM.

This study tests the relevance of home equity for mortgage choice, finding it less important, despite high expectations and robust rationale for it to be among the key factors for mortgage choice. Tests on different submarkets reveal differences in approaches to mortgage choice. Significant factors mostly act in the anticipated manner. When this is not the case this may be interpreted as evidence of greater likelihood of making an investment mistake.

School of Banking and Finance

UNSW Business School

Revised

December 2017

Table of Contents Page

Acknowledgement

This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the author and should not be attributed to either FaHCSIA or the Melbourne Institute.'

1. Introduction

The decision to own a home is a critical one for most households. Among its many consequences is the major change it usually brings to a household balance sheet in the form of a dominant asset, the home, and a dominant liability, the mortgage. Like the home choice, the choice of mortgage is not straightforward and represents an important financial decision for a household. A key element of the mortgage choice is whether the interest rate charged is adjustable or fixed.

The choice between an adjustable rate mortgage (ARM) and a fixed rate mortgage (FRM) can have a major impact on loan life cash-flows and utility for a household. Finance theory suggests that, under generally accepted assumptions, the optimal choice in the vast majority of instances is an ARM. One reason is the higher interest cost usually incurred on a FRM compared to an ARM. Another is that changes in market interest rates could generate significant shocks to net worth for those households that have a FRM. Despite this the FRM accounts for a substantial portion of mortgages sold and in some markets is the predominant form. In the United States for example FRMs accounted for 72% of new mortgages issued from 1985 to 2005.[†]

Campbell and Cocco (2003) declare the ARM optimal for the vast majority of households. Campbell (2006) goes further, considering the majority of FRMs investment mistakes. He grants a minority may be rationalized in a model incorporating financial market frictions such as an inability for a household to borrow to meet mortgage payments at times of high interest rates. Campbell finds that only risk averse borrowing constrained households, especially those that have high mortgage debt relative to their incomes, should find FRMs preferable.[‡] The reasoning is that these households, were they to have an ARM, would be unable to increase their borrowings to fund any increased interest expense in high interest rate environments. Given the apparent complexity of the task it may seem surprising that much of the existing research points to price at the time of purchase being

[†] As reported in Campbell (2006).
[‡] This replicates findings in Campbell and Cocco (2003)

the key, or in many cases only, concern for households when deciding between an ARM and a FRM (Nothaft and Wang (1992), Brueckner and Follain (1988)). Scholars have long thought the choice would be more considered than that, seeking to identify the household characteristics associated with mortgage choice, often with limited success (Dhillon, Shilling and Sirmans (1987), Gardner, Kang and Mills (1987)).

This study continues in this vein, though does so by considering mortgage choice in Australia, where price differences between ARMs and FRMs are relatively muted compared to the United States.[§] As such a study of the Australian market may more readily reveal non-price influences on mortgage choice. This study benefits by accessing a high-quality Australian dataset which contains a broad range of information relevant for a detailed study of household mortgage choice, thereby avoiding some of the shortcomings prevalent in the data studied in the some of the existing literature.

According to Campbell and Cocco (2003) mortgage choice is a problem in household risk management. They classify it as a trade-off between the interest expense risk of an ARM and the liability risk of a FRM. They also suggest, given the ARM is the optimal mortgage type, that mortgage choice should primarily be driven by a household's ability to manage the interest expense risk of an ARM. This points to household characteristics rather than price at time of purchase being more relevant to the mortgage decision process.

Motivated by the above characterization of mortgage choice as a problem in household risk management this study selects proxies for home equity and buffer-stock savings,[**] qualities identified by Campbell and Cocco as key to determining household ability to manage the interest expense risk of an ARM. As such its focus is on household characteristics associated with mortgage choice. It then directly tests the effect these measures have on mortgage choice. It finds buffer-stock savings

[§] Much of the spread between FRM and ARM rates in the United States is made up of the cost of the prepayment option which is incorporated into FRM rates. Unlike in the United States, FRMs in Australia do not come with prepayment options.

[**] Buffer-stock savings are akin to precautionary savings, which are savings that arise as a precaution against future uncertainty.

significant for mortgage choice in Australia in tests on the full sample, though not home equity. Also significant is if a household has no spare cash for savings or investments (labelled NOCASH below).

Both relevant factors act according to expectations, in that greater buffer-stock savings increase the likelihood of a household selecting an ARM, and NOCASH reduces this likelihood. The interpretation is that households with greater buffer-stock savings are better able to manage the interest expense risk of an ARM, and therefore are more likely to choose an ARM. NOCASH households are less able to manage the interest expense risk of an ARM, and therefore are more likely to choose a FRM. The result demonstrates the importance of risk considerations for mortgage choice, and indicates that household ability to manage the interest expense risk of an ARM is the main driver of mortgage choice in Australia, as suggested by Campbell and Cocco (2003). It supports the view that household characteristics play an important role in mortgage choice.

Tests on submarkets, using partitions motivated by the literature, reveal key differences in characteristics and drivers of mortgage choice among different household types. For example buffer-stock savings is the only significant factor for less risk averse households, but not significant at all for those that are more risk averse. This may be because more risk averse households, who are on average older, prefer to conserve their buffer-stock savings for retirement, at least in part. Or perhaps they prefer to consider other means for managing the interest expense risk of an ARM, such as home equity, which is significant and positive for more risk averse households.

Tests on submarkets also reveal the prominence of marital status for mortgage choice. Couple led households (labelled COUPLE below) appear to be associated with lower levels of financial stress, in that the submarkets with the greatest proportion of couple led households are those where disposable income is high, net wealth is high, and mortgage to income ratio is low. COUPLE is also significant in regressions on two of these submarkets, acting to increase the likelihood of selecting an ARM.

The contribution of this paper is twofold. In a market where the price difference between ARMs and FRMs is relatively muted it enables identification of the household characteristics that matter for mortgage choice. In doing so it confirms the importance of variation in household characteristics when it comes to choice between an ARM and a FRM.

Secondly, in identifying specific household characteristics this study contributes to the literature by shedding some light on how households make their mortgage choices. In revealing the importance of buffer-stock savings and whether or not a household is a NOCASH household this study suggests that the relevant household characteristics mostly matter by influencing household ability to manage the interest expense risk of an ARM. In doing so it provides strong support for the inference in Campbell and Cocco (2003) that household ability to manage this risk should be the key driver of mortgage choice.

2. Literature Review

Research into mortgage choice first appeared in the mid-1980s shortly after widespread restrictions on ARMs began to be lifted in the United States and their popularity rose dramatically in an environment of high inflation and high inflation volatility. Gardner, Kang and Mills (1987) characterised the choice between an ARM and FRM as a trade-off between cost and risk. They focused solely on investigating possible links between mortgage choice and age, income and wealth characteristics of the household. No meaningful results were generated other than a slightly greater preference among younger borrowers for ARMs. The authors interpreted this preference to be motivated by a lower initial repayment for an ARM compared to a FRM and greater expectations of income growth for younger borrowers.

Price variables were added to household characteristics by Dhillon, Shilling and Sirmans (1987) as possible factors influencing mortgage choice. Only price factors were found to be significant. Like Gardner, Kang and Mills (1987) they found no significant impact from the borrower characteristics

considered, which among others included proxies covering age, education, wealth and whether households have co-borrowers or not. The only non-price factor found to be significant for mortgage choice was housing tenure, with shorter time at current address being associated with higher likelihood of a household choosing an ARM.

Brueckner and Follain (1988) also considered household characteristics along with price variables. They too found pricing factors the most influential for mortgage choice. The specific price measures they employed were the spread between FRM and ARM interest rates and the general level of mortgage interest rates, both of which were positively linked to the probability of choosing an ARM. Income was the only household characteristic, among several considered, found to be linked to mortgage choice, with higher income found to increase the likelihood of a household choosing an ARM, though this was contrary to the authors' expectations.

Boyd (1988) considered price measures similar to those studied by Brueckner and Follain (1988), obtaining similar results. Like Brueckner and Follain (1988), Boyd (1988) also found income significant, though less important than price factors for mortgage choice. He found that the significant factors varied depending on the wealth of the household, which he proxied by age and whether the household owned its prior residence or not. He found income was less relevant for the mortgage choice of households with higher wealth. The marital status of the borrower was an additional household characteristic found to be significant for mortgage choice, with single households more inclined to choose an ARM, which the author interpreted as being due to their greater financial flexibility.

Nothaft and Wang (1992) found both the spread between the FRM and ARM interest rates and affordability significant factors driving variation in the market share of ARMs. They explicitly excluded household characteristics from their study given their view that previous research had shown these to have little measurable effect on aggregate ARM choice.

A study by Sa-Aadu and Sirmans (1995) found price relevant for mortgage choice but was also among the first to produce meaningful evidence of the importance of household characteristics for mortgage choice. The significant characteristics being age and household mobility. They found that younger borrowers and those most likely to move are more likely to choose ARMs. They also found borrower wealth to be significant, as measured by the size of their stock, bond and savings portfolio, or liquid assets. Interestingly the more of these assets a household has the less likely they are to choose an ARM, in line with the authors' logic that the more wealth a borrower has the less need they have to choose the 'more-affordable' ARM. Borrower income was also tested but found to be insignificant.

A common theme in the studies cited above is the greater influence of price over other factors in the mortgage choices of households. Though the inability to identify clear association between household characteristics and mortgage choice among these studies may have had more to do with data limitations than a lack of meaningful links. Three of the above studies used local data sets with small samples (Gardner, Kang and Mills (1987), Dhillon, Shilling and Sirmans (1987) and Sa-Aadu and Sirmans (1995)) while the other three used national data sets with no or little information on household characteristics.

Much of the recent research on mortgage choice was led by Campbell and Cocco (2003) whose theoretical study asks how a household should choose between an ARM and FRM, and focusses on identifying the household characteristics that matter. The authors' life-cycle model of mortgage choice finds the ARM is the optimal mortgage for most households. An important inference in Campbell and Cocco (2003) is that the key driver of mortgage choice for a household should be its ability to manage the cash-flow risk of an ARM. They point out that this cash-flow risk would not matter if the household could borrow against future income, but does if the household faces binding borrowing constraints where buffer-stock savings are exhausted. As such the mortgage choice should be more about household characteristics and less about price.

Campbell and Cocco also make the point that different mortgages generate different risks for households. As such the mortgage choice could also be classified as a trade-off between these different risk types. They identify the chief risk of the FRM as the high sensitivity of its real capital value to inflation. In contrast the ARM offers stability in capital value, but comes with the risk to household cash-flows from the possibility that interest payments might increase suddenly. At times the authors refer to these risk types as 'wealth risk' and 'income risk' respectively. Given these labels may be associated in the literature with other concepts, to avoid ambiguity in the discussion that follows I apply alternate labels. These are 'liability risk' and 'interest expense risk' respectively.

Campbell and Cocco conclude that households with smaller houses relative to income, more stable income, lower risk aversion, more lenient treatment in bankruptcy, and a higher probability of moving should be the households that find ARMs most attractive.

In a further theoretical study Campbell (2006) considers mortgage choice in the context of a broader examination of household finance. He says the mortgage form is among the most important decisions in household finance, and likens the ARM to a floating-rate note issued by a household, and the FRM to a long-term nominal bond. He notes the value of the floating-rate note is stable in the face of movements in interest rates, while the value of a long-term bond is highly sensitive to interest rates. When it comes to cash-flow risk the opposite is true, with the key risk of the ARM being that increases in interest rates increase monthly payments for an ARM. Campbell points out that this has no effect for a household that can borrow, but reduces consumption for borrowing constrained households. The 'simplified' model of mortgage choice presented by Campbell implies that a FRM should be preferable to households that are more risk averse, have volatile income, or have a large mortgage relative to income.

A later theoretical study by Van Hemert (2010) also finds an ARM preferable for most investors given it enables them to save on the bond risk premium contained in FRMs. He concludes that an investor who sub-optimally chooses to finance his or her house with a FRM incurs large utility losses.

One particular aspect of household finance of interest to Campbell (2006) is the discrepancies that often exist between observed and ideal behaviour. Most of the time the consequences are relatively trivial, but for some discrepancies the consequences can be serious, and Campbell calls them investment mistakes. These investment mistakes can have large welfare costs, and are more common among poorer and less well educated households. Given the complexity of the task, and the stakes involved, there is high potential for investment mistakes in mortgage choice.

Campbell laments the lack of research into mortgage decisions from the household point of view, and was followed by a flurry of mostly empirical papers researching household mortgage choice.[††] Most consider mortgage choice in the US, as is the case in Coulibaly and Li (2009) who like authors of earlier studies group the key factors influencing mortgage choice as being either about household characteristics or relative pricing (and mortgage contract terms more broadly). One innovation in their study is the use of data from the Survey of Consumer Finances, enabling them to overcome some of the data limitations in previous studies. As well as confirming the importance of pricing Coulibaly and Li confirm household characteristics as being significant for mortgage choice. A key finding providing empirical support for the conclusions of Campbell and Cocco (2003) relates to the importance of risk factors in shaping the mortgage decision. Coulibaly and Li find that borrowers that are more risk averse, have risky income or that are less likely to move in the near term tend to prefer FRMs. Another of their findings, that more financially constrained households (which the authors proxy with the ratio of mortgage balance to income) tend to choose ARMs, appears however to contradict Campbell and Cocco (2003) and the notion that the choice of an ARM is dependent on a household's ability to take on the associated interest expense risk.

This apparent inconsistency may be interpreted as reinforcing the importance of price considerations, and furthering our understanding of the role price plays in mortgage choice. A key finding by Coulibaly

[††] Campbell (2006) was presented as the author's Presidential Address to the American Finance Association conference in 2006.

and Li in relation to price is that higher FRM–ARM interest rate spread is linked to higher probability of choosing an ARM. The higher the spread the lower the repayments for an ARM compared to a FRM, in the near term at least. The financially constrained, as well as being less able to manage the interest expense risk associated with an ARM, could also be expected to be more price sensitive. Thus the finding that more financially constrained households tend to choose ARMs might best be understood in the context of a wide FRM–ARM interest rate spread. A decision process for the financially constrained that takes all factors into consideration could be that borrower risk characteristics dominate up to a point where the FRM-ARM spread becomes large enough, after which relative pricing factors dominate. As such when borrower risk characteristics dominate the financially constrained will choose a FRM, and when relative pricing factors dominate they will choose an ARM. In other words, while Coulibaly and Li (2009) confirm that household characteristics do matter for mortgage choice, they also show that pricing factors are just as important, or more important in some circumstances. In subsequent research I hope to be able to compare results of separate tests of sub-samples split between households whose loans were originated when the FRM-ARM spread is high, and when it is low. Insufficient variation in FRM-ARM spread in the dataset used in this study precludes this test currently (see Appendix A under FRM-ARM spread).

The significance of relative pricing in the mortgage decision is examined in greater detail in Koijen, Van Hemert and Van Nieuwerburgh (2009) who ask which interest rate measure best determines mortgage choice. They find that the long term bond risk premium is more powerful compared to the yield spread and the long yield.[‡‡] They posit that households use a simple decision rule to gauge the extent of the long term bond risk premium by comparing the average of recent short term interest rates with the prevailing long yield. The authors find that this decision rule moves in lock-step with mortgage choice.

[‡‡] The authors define the long yield as the current five-year Treasury yield and the yield spread as the difference between the long yield and current one-year Treasury yield.

Badarinza, Campbell and Ramadoria (2013) challenge the power of the household decision rule in a 'bake-off' against the current FRM-ARM spread in the only cross-country study of time variation in ARM share. They use data from nine countries and declare current FRM-ARM spread the hands-down winner. The authors identify country effects as playing a major role in mortgage choice. This indicates that the impact of institutional settings on mortgage markets and household mortgage choice could be fertile ground for further study.

While the research focusing on relative pricing is mostly United States based, a key non- United States study is Zocchi (2013) who asks why Italian borrowers prefer ARMs. It concludes that the preference for ARMs appears to be solely price driven. Similarly Damen and Buyst (2013) generate results indicating that the FRM-ARM interest rate spread explains almost all the variation of the ARM share in Flanders.

As mentioned previously, Campbell and Cocco (2003) relate moving probability with a household's choice of an ARM. This relationship is found to be significant by Coulibaly and Li (2009) and is the only factor other than price factors found to be significant in Dhillon, Shilling and Sirmans (1987). It is a relationship I interpret as reinforcing the role that relative pricing plays in mortgage decisions. A large portion of ARMs offered in the United States come with interest rate discounts in the initial years of the loan, similarly there are limits to adjustments to the interest rate payable for many ARMs, which often prevent changes in the first years of the mortgage. As such the more likely the household is to move, and hence payoff its mortgage, the more likely it is that the household will be able to enjoy the pricing benefit of an ARM through the life of the loan, and none of the potential costs. Or as stated by Sa-Aadu and Sirmans (1995), the greater the likelihood of a household moving, the less need it has of the prepayment option included in a FRM.

Despite evidence that borrower characteristics play an important role in mortgage choice some of the research cited above does not consider borrower characteristics in a meaningful way or only does so as an afterthought. This may be a reflection of the sway pricing holds over mortgage decision making,

or alternatively a function of data availability. Similarly some studies focusing on the link between borrower characteristics and mortgage choice can be said to ignore pricing factors. This is the case in Hullgren and Soderberg (2010) who study the relationship between borrower characteristics and mortgage choice in Sweden. The authors find that a higher level of risk aversion is associated with greater propensity to choose a FRM, as are less education and less ability to handle an increased interest rate on their mortgage. However their study considers no price variables.

Bergstresser and Beshears (2010) conducted a study of the characteristics of households taking out ARMs in the United States in the period 2004-2007. They found that households exhibiting lower comprehension and less suspicion were more likely to choose ARMs. It is however doubtful that these findings can be generalized given the abnormal nature of the US mortgage market during that time. Indeed the authors find that this relationship is not significant outside of the 2004-2007 period. Their study also contained no consideration of pricing variables.

Several studies link borrower characteristics with mortgage outcomes other than mortgage choice. For example Gerardi, Goette and Meier (2010) identify a relationship between numerical ability and mortgage delinquency. They find that the incidence of mortgage foreclosure is much lower for households with the highest levels of numerical ability compared to those households with the lowest levels of numerical ability.

Bucks and Pence (2008) compare loan information provided by lenders and borrowers. They find that ARM borrowers tend to underestimate the extent of possible rate increases, and that the ARM borrowers most likely to show this tendency are those with less income, less education, who are older, or from a minority group.

The idea of differentiation among ARM borrowers is explored in Schwartz (2009), who finds that the ARM market is best characterized as two submarkets; a high income wealthy submarket, and a low income credit constrained submarket. A similar split is also identified in Damen and Buyst (2013), who

consider the determinants of choice between FRMs and ARMs in Flanders. The authors find that high income households choose an ARM if they can afford changes in interest payments, with affordability proxied by the ratio of mortgage payments to income. Low income households prefer an ARM if they are financially constrained, which is proxied by the loan-to-value ratio. Coulibaly and Li (2009) find less risk averse households less sensitive to pricing variables.

3. Hypothesis and Methodology

This study considers mortgage choice in the Australian market where interest rates for FRMs do not implicitly include a premium for a prepayment option. As such, differences between ARM and FRM rates in Australia are muted compared to those that typically exist in the United States. This logically allows greater scope for factors other than price, including household characteristics, to play a role in the mortgage decisions of Australian households. If household characteristics do matter for mortgage choice they should do so in the context of the Australian market. A secondary reason for studying mortgage choice in the Australian market is the availability of a high-quality dataset which provides scope for examining a broad range of factors that may influence household mortgage choice (see Section 4. Data below).

The first aim of this study is to test the hypothesis that household characteristics play a significant and important role in mortgage choice.

One possible concern arising from considering mortgage choice in Australia, and not the United States where the majority of studies have been conducted, is that institutional factors may be the primary source of difference in mortgage choice between these two countries. The vast difference between FRM usage in the United States, typically over 70%, and Australia, typically under 30%, suggests that the key determinant of a households' choice of mortgage may well be country of residence. There are certainly key differences between these mortgage markets that make households in the United States

relatively more predisposed to choose a FRM than Australian households,[§§] however these differences are not the focus of this study. This study is focused on identifying the household characteristics that can be associated with households being more inclined to choose one type of mortgage over another. Its findings are relevant to all mortgage markets where households can choose between a FRM or ARM.

In designing its tests this study takes a lead from Campbell and Cocco (2003) who describe mortgage choice as a trade-off between the different risks embodied in the ARM and FRM. They also identify the ARM as the optimal choice for most households. If the choice is a trade-off a household's mortgage decision should reflect its relative preference for one risk type over another. If a household accepts the ARM as optimal then its ability to manage the interest expense risk of an ARM should be the key driver of its mortgage choice. But which is the more feasible approach for households to employ? Test design in this study would benefit from selecting between these alternatives based on an assessment of which is more feasible, a task to which I now turn.[***]

3.1. The Nature of Mortgage Choice – Risk trade-off or Ability to manage interest expense risk of ARM?

3.1.1. Risk trade-off

Under the risk trade-off approach to mortgage choice a household would choose between two risk types. They being the interest expense risk associated with an ARM and the liability risk associated with a FRM. The decision-making process under this approach to mortgage choice would require households to recognize these different risks and understand the relative amounts of each type of risk

[§§] See Appendix B for a brief discussion of the differences.

[***] This task would likely benefit from applying the concept of mental accounting, which describes the heuristics households employ to tackle complex financial decisions by breaking them into smaller parts (see for example Thaler 1999). However I leave this to a later study, undertaking a simpler assessment below.

they could absorb. This may in turn depend on the amount of each type of risk (or its equivalent) they are currently carrying.

While it seems safe to assume that a majority of households would be able to recognize the interest expense risk of an ARM, and assess their ability to absorb this risk, it seems much less safe to assume that most households could recognise the liability risk of a FRM and apply this understanding to mortgage choice in the context of their broader portfolios. It is reasonable to accept that most households might regularly mark-to-market some components of their balance sheet (e.g. residential property, listed equities), it is however less reasonable to accept they would, or could, do the same with fixed rate debt obligations.[†††] Therefore the feasibility of households applying the risk trade-off approach to mortgage choice is doubtful.

3.1.2. Ability to manage interest expense risk of ARM

Under the alternative approach, where a household's ability to manage the interest expense risk of an ARM should be the key driver of mortgage choice, households are initially required to recognize the primacy of the ARM. This seems straightforward given the clear price signal offered in the spread that usually exists between the ARM and FRM rates, in favour of the ARM. This spread is primarily driven by the term premium[‡‡‡], and in the United States the implicit cost of the prepayment option

[†††] The nature of the Australian FRM means Australian households might be closer to this than most. Given the typical FRM in Australia does not come with a prepayment option, the only way Australian borrowers can prepay their FRM is by paying the higher of the outstanding loan principal and the present value of the mortgage to their bank. As such most Australian borrowers considering a FRM might at least comprehend that they would be exposed to this liability risk, even if they do not know the mechanics of its valuation.

[‡‡‡] The According to the Expectations Theory the term structure of interest rates reflects expectations for short term interest rates. In broad terms the short rate is expected to vary so the average of the short rate over the life of any longer dated debt instrument equates to the fixed rate on that longer dated instrument. If this holds then on average the term premium is zero.

The validity of the Expectations Theory is however far from certain. Most empirical studies reject it, though some have found it holds over short time periods. Market yields show the average term premium is positive over time. Campbell and Cocco (2003) assume a term premium in their study of 1%, which is the average of the yield spread between ten-year and one-year US Treasury Bonds from 1986 to 2001. The situation is similar in Australia, where the average yield spread between the ten-year Australian Government Bond and the

that comes with the typical FRM. The latter does not apply in Australia where the typical FRM does not include a prepayment option. However the 'payoff' from choosing an ARM in Australia not only includes avoidance of the term premium, but also the greater flexibility of an ARM over a FRM, which is mainly associated with prepayment restrictions (and potentially high prepayment penalties) that apply to the typical FRM.

This approach then requires households to recognize the interest expense risk associated with an ARM. I assume households are capable of this even if only through an understanding that the interest payment on an ARM has the potential to increase, and the recognition that this could have negative consequences for household consumption.

Perhaps the most challenging task for the household in applying this approach is assessing its ability to manage the interest expense risk of an ARM. Campbell and Cocco (2003) point out that this risk would not matter if the household is able to borrow against future income. They say this ability is limited when income and house prices are low, where buffer-stock savings are exhausted and home equity is unable to be tapped. Therefore under this approach to mortgage choice a household's level of home equity is key to its ability to manage the interest expense risk of an ARM. Also critical is the extent of its buffer-stock savings.

3.1.2.1. The importance of buffer-stock savings and home equity

These measures make up the lion's share of average wealth for households. Buffer-stock savings have been found to account for the majority of household savings (for example, Skinner (1988), Dardanoni (1991)). Dardanoni (1991) tells us that buffer-stock savings primarily serve as a precaution against future uncertainty. This could include uncertainty associated with the interest expense risk of an ARM. Buffer-stock savings should be easily understood by households, even if the term is not one they

Reserve Bank of Australia Cash Rate between 1991 and 2010 is 0.95%. The average spread (partly derived) between reported rates for three year FRMs and ARMs in Australia between 1996 and 2010 is 0.41%.

recognise. As such it is a small step to assume households could integrate the level of their buffer-stock savings into their mortgage decision making. Households should be equally familiar with home equity, the extent of their ability to tap this if required, and its relevance to mortgage choice.

Given households' likely greater understanding of their ability to manage the interest expense risk of an ARM, as opposed to choosing between liability risk and interest expense risk, the former approach it is applied in this study to guide test design and subsequent interpretation of results.[§§§]

Under the chosen approach key to a household's ability to manage the interest expense risk of an ARM is its levels of home equity and buffer-stock savings. As such proxies for these measures are included as the main variables of interest in this study.

The home equity measure adopted for this study is the housing collateral ratio (HCR) of Lustig and Van Nieuwerburgh (2005). It is the ratio of (collateralisable) housing wealth to (noncollateralisable) human wealth. Simply put, human wealth is the present value of all future after tax wage and salary income of a household (see Appendix A for as more detailed description). The HCR is found by Lustig and Van Nieuwerburgh to shift the conditional distribution of asset prices and consumption growth.

In Lustig and Van Nieuwerburgh the HCR determines a household's ability to insulate its consumption from labour income shocks. In the same way the HCR can also be said to determine a household's ability to insulate its consumption from shocks driven by changes in the interest expense of an ARM. As such it is an appropriate measure for home equity in this study.

The second aim of this study is to test the hypothesis that home equity is negatively associated with the likelihood of a household choosing a FRM.

[§§§] This conclusion could likely be justified using mental accounting, a concept which describes the heuristics households apply to tackle complex financial decisions by breaking them into smaller parts (see for example Thaler 1999). However I leave this task to a later study and provide only the simpler justification above.

The measure of buffer-stock savings adopted for this study is the investment-wealth ratio (IWR), which in untransformed mode is the complement to the consumption-wealth ratio (CWR) (see Lettau and Ludvigson (2001) for derivation of CWR for a representative agent). Lettau and Ludvigson (2001) find fluctuation in the CWR a strong predictor of stock returns.

Insofar as the wealth of a household can either be consumed or reinvested the IWR is the complement of the CWR and is a measure of wealth relative to consumption. It is the ratio of household net worth plus human wealth to household net worth plus human wealth plus consumption. Household net worth is a household's total assets less its total debt. Human wealth is the present value of future wage and salary income for the household. Consumption is a household's regular non-durable consumption over a year (see Appendix A for more detailed descriptions). The inclusion of human wealth in the measure of buffer-stock savings is warranted as future income would likely be the primary source of repayment funds for households taking out mortgages, especially for younger households. This is consistent with expectations regarding future income being relevant for mortgage decisions, especially those of younger households, as identified in the literature (Sa-Aadu and Sirmans (1995), Gardner, Kang and Mills (1987)). For the households included in this study average human wealth exceeds average household net worth, and as such is the most substantial component of the IWR. This makes sense given the median age for households in the study is 38 years, when households are normally in the early period of wealth accumulation.

The IWR indicates a household's ability to insulate consumption against fluctuations in income, and in the same way insulate consumption against fluctuations in the interest expense risk of an ARM. As such it is an appropriate proxy for buffer-stock savings in this study.

The third aim of this study is to test the hypothesis that buffer-stock savings, like home equity, is negatively associated with the likelihood of a household choosing a FRM.

Other variables are included as suggested in the literature. Key among them are RISKAVERS, NOCASH and COUPLE. This study uses logistic regression to identify which household characteristics, if any, can be associated with the decision to take out a FRM. The dependent variable in all models is a dummy variable indicating whether or not the household has a FRM. Appendix A provides detailed description of HCR and IWR and all other independent variables used in the following regression analysis.[****]

The fully specified regression model will be along the following lines.

$$FRM_i = \alpha + \beta_1(HOME\ EQUITY_i) + \beta_2(BUFFER - STOCK\ SAVINGS_i) + \beta_3(RISK\ AVERSION_i) + \beta_4(NOCASH_i) + \beta_5(MISTAKE_i) + \beta_6(SPREAD) + \beta_7(AFFORDABILITY_i) + \beta_8(COUPLE_i) + \beta_9(GENDER_i) + APPROPRIATE\ ADDITIONAL\ CONTROL\ VARIABLES_i + \epsilon_i$$

FRM_i is an indicator variable that equals one if the household has a FRM and zero otherwise. Where indicated, fixed effects are further incorporated for state, industry and occupation. All regressions are clustered by industry.

After conducting tests on the full data set subsamples are generated by dividing the full sample on various household characteristics identified as suitable splits in the literature, these being level of risk aversion, mortgage to income ratio, income and wealth. Tests are then conducted separately on each of these submarkets.

The fourth and final aim of this study is to test the hypothesis that different submarkets make different mortgage choices, or make them differently, as found in the literature.

[****] Also see Table A1 for a brief description of all variables used in this study, including those included in tables only.

4. Data

This study uses data generated by the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The availability of high quality data for studies of this kind has generally been limited. While the HILDA dataset cannot claim panacea status in this regard it arguably offers some improvement on the alternatives, a point that forms part of the motivation for this study.

Campbell (2006) identifies five characteristics required of an "ideal dataset for positive household finance." They being that the data cover a representative sample of the entire population; that total wealth for each household be broken down into relevant categories; that these categories be sufficiently disaggregated to distinguish between asset classes; that the data be highly accurate; and that the dataset follows households over time.

Campbell (2006) utilises two sources of household level mortgage data, neither of which meet his requirements of an ideal dataset. Indeed the author points out that both have major weaknesses. The main weaknesses of the American Housing Survey (AHS), which is sponsored biennially by the US Department of Housing and Urban Development, and conducted by the US Census Bureau, have to do with quality of data. The main weakness of the Residential Finance Survey (RFS), which is conducted every 10 years as part of the US Census, is that it has very little information on home owners, including regarding their education. That Campbell uses these datasets despite their limitations speaks to the lack of available alternatives.

The alternative dataset most commonly used in the US studies cited above is the Survey of Consumer Finances (SCF), a triennial cross-sectional survey conducted by the Federal Reserve Board over several thousand households (more than 4,000 in recent waves). It contains data on mortgages and broader household finances and demographics. As is the case for the AHS and RFS, the shortcomings of the SCF are identified in Campbell. These include that it meets only the first two of Campbell's five criteria.

A large portion of the other datasets used in the US studies cited above are industry sourced (e.g. datasets of mortgage loans made by a lender) and arguably not representative of the entire population, and do not contain a broad enough set of information. Studies conducted outside the United States generally might be considered representative samples, though arguably suffer from other shortcomings such as small sample size, or inadequate breadth of information.

The HILDA dataset overcomes some of the abovementioned shortcomings and its usefulness extends to the study of household mortgage choice. The survey that generates the data has been conducted every year since 2001 by the Australian Government through the Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA). As such there are currently 14 waves of data available. A key differentiating feature of the HILDA survey is its longitudinal nature. It has been conducted on mostly the same 7,000-8,000 households each year since its inception.

The HILDA dataset contains extensive information about each household, including about their consumption, education, employment situation, and income and wealth. These are variables on which decision makers are commonly divided for the purposes of studying household finance choice, including mortgage choice. Information about household mortgages is also collected, including outstanding balances and size of regular repayments. Some detail, including whether any mortgage is ARM or FRM, information critical to this study, has been sought only once to date, in 2010. This point drives this study's focus on data from 2010 only.

A consequence of limiting this study to 2010 data only it that it does not directly exploit the principal value to be derived from the longitudinal nature of the HILDA Survey. Despite this the study arguably still benefits in terms of data quality. The 2010 version was the HILDA Survey's 10th wave, by which time participants were highly familiar with the survey, a point particularly relevant given HILDA's high retention of both interviewees and interviewers. Familiarity with the survey, its processes, and possibly even the interviewer, would presumably make interviewees less suspicious, more cooperative and more truthful, lifting the quality of their responses. Experience conducting the survey

would presumably improve interviewer ability to elicit better quality responses. HILDA reports respondent wave-on-wave attrition rates below 6% from Wave 5 (below 4% from Wave 9). It reports wave-on-wave attrition rates for face-to-face interviewers, who have conducted at least 90% of interviews in each wave, averaging 17% from Wave 3 (excluding Wave 9 when a new fieldwork provider was appointed and the attrition rate was 34%) and 11% for Waves 8 and 10. Face-to-face interviewing, which is by far the majority interview type for the HILDA Survey, is thought to better encourage respondent cooperation and generate higher response quality, though HILDA is not significantly distinguished from similar surveys globally in this regard. All face-to-face interviews for the HILDA Survey are conducted by a representative of a professional research organization.

Of the US datasets identified above the HILDA dataset arguably most closely resembles the SCF in its breadth of information. Each covers similar topics, though HILDA appears to disaggregate household consumption more thoroughly than the SCF. Conversely, the SCF gathers detailed information on household mortgages in each wave, whereas HILDA does so only infrequently. Distinguishing the HILDA Survey from the SCF is its longitudinal nature and high wave-to-wave retention which may generate relatively higher quality data as argued above. Not being a longitudinal study drastically reduces the potential of the SCF.

There were 7,317 households participating in the 2010 HILDA survey, 4,667 of which owned their homes. Of these 3,435 took out a mortgage to help pay for their home, 2,321 of which continued to have outstanding debt at the time they were surveyed. Of those with outstanding mortgages, 76% had interest rates that were adjustable, 14% had interest rates that were fixed, and 10% had interest rates that were a combination of the two.

The starting point for compiling the dataset for this study is the 2,321 households that have outstanding mortgage debt at the time of the HILDA survey. As this is a study about choice between an ARM and FRM I limit the dataset to households that have either an ARM or FRM (that is, households with both are excluded). Given that much of the data on households is specific to 2010 and this study

asks how household characteristics relate to mortgage choice the further in time this choice is from 2010 the weaker the link between household characteristics (essentially as at 2010) and mortgage choice. As such this study follows the approach in Coulibaly and Li (2009) and limits the dataset to households that made their mortgage choice in 2008, 2009 and 2010 only. An assumption inherent in this approach is that household characteristics do not change substantially over the period between mortgage choice and 2010. I believe limiting the dataset to this period appropriately balances the need to have a meaningful sample size against the need to have a clear link between household characteristics and mortgage choice. Following the further exclusion of some households for whom values of one or more key financial variables are obviously in error (for example where usual mortgage repayments are equal to zero) or were top-coded the final dataset for this study comprises 810 households.

5. Results

5.1. Summary statistics

Summary statistics for key variables of interest are shown in Table 1 (all tables are located at the end of this paper). Noteworthy observations include that the average value of property assets for households included in the study is around $575,000 in 2010. The average value of the home for these households is around $486,000. Given the exclusion from this study of observations where house price (or other property value related variables) has been top-coded this is broadly in line with the 2010 mean value of residential dwellings in Australia of around $505,000 based on data published by the Australian Bureau of Statistics. In this regard the sample used in this study can be considered representative of the Australian population. The median value of the home for households included in the study is $425,000 in 2010. The median value of outstanding mortgages on their homes is $260,000. Of the 810 households in the study around 15% had a FRM, which is consistent with expectations and in-line with the average for all households with mortgages in the HILDA dataset.

The median net worth of the households in the study is around $327,000, with median net property wealth of $190,000, reflecting a concentration of wealth in housing as is commonly found in studies of household finance. The median human wealth for households is $739,000 which shows the relative importance of human wealth in total household wealth. A little over 3% of households have greater business human wealth than human wealth based on wage and salary income only.

Around 14% of households report no spare cash for savings or investment, while around one-third own shares. Median household regular consumption is around $26,000, which is roughly 30% of median household disposable income of around $88,000. Median property repayments at around $23,000 are slightly more than 25% of median disposable income.

Three-quarters of households are owned by couples, the average number of owners of each household is 1.6 and the median is two. The average proportion of female owners in each household is 53%, the median is precisely half. The median of the average age of the owners of each household is 38, and the average spread throughout the 2008 to 2010 period when these households chose mortgages was almost 80 basis points.

5.2. Regression analysis

Results of regression analysis on the full sample are shown in Table 2. The dependent variable in all tests is FRM dummy indicating whether or not the household has a FRM. The number of independent variables in the regressions shown increases from left to right across Table 2. Two of the tests incorporate fixed effects for state, industry and occupation. Column 1 shows the results of a regression on the two main variables of interest only. These are the housing collateral ratio (HCR), which is the proxy for home equity used in this study, and the investment-wealth ratio (IWR), which is the proxy for buffer-stock savings. The results of a fully specified test, which includes all variables of interest, controls and fixed effects, are shown in the rightmost column.

5.2.1. Primary results

The most persistent significant result among all variables shown is for IWR. Its coefficient is negative and significant at the 10% level or better in almost all tests shown. This result supports the idea that a household's level of buffer-stock savings is a determinant of mortgage choice in Australia. The negative sign on the coefficient for IWR aligns with expectations that the more buffer-stock savings a household has, the greater its ability to manage the interest expense risk of an ARM, and the less likely it is to choose a FRM.

The next most persistent significant result in Table 2 is for NOCASH, which identifies households that declare they have no spare cash for savings or investments. It is the only variable of interest other than IWR that is significant in the fully specified model. Its coefficient is positive and significant at the 10% level in most instances where it is shown in Table 2. It shows that those households with no spare cash are more inclined to choose a FRM (or less inclined to choose an ARM).

If a household has no spare cash for savings or investments it must by definition be utilising all of its income to meet ongoing needs, including consumption needs and financial obligations. This would limit its ability to manage the interest expense risk of an ARM, making it more inclined to choose an FRM. The result for NOCASH suggests this is an important consideration for household mortgage choice, and provides additional support for the view that mortgage choice should be primarily driven by a household's ability to manage the interest expense risk of an ARM.

The result for NOCASH is consistent with the findings of Hullgren and Soderberg (2010) whose Swedish study found that households less able to handle increases in their mortgage interest rate are more inclined to choose a FRM. It is however contrary to the findings of Coulibaly and Li (2009) who find financially constrained households (proxied by the mortgage balance to income ratio) more likely to choose an ARM. The inconsistency with this United States study may be associated with the higher spread that usually exists between FRM and ARM interest rates in the United States compared to Australia, making the near-term cost savings associated with an ARM more attractive, especially for financially constrained households.

A puzzling outcome is the lack of significance for HCR in any of the tests shown. This is counter to a central idea in both Campbell and Cocco (2003) and Campbell (2006) that the interest expense risk of an ARM would not matter if a household could borrow against future income. Housing provides a key source of collateral facilitating household borrowing. As such the HCR should reflect a household's borrowing capacity and ability to insulate consumption from the interest expense risk of an ARM. The coefficient for HCR in these tests is expected to be negative, which it is for some results shown, though not all. This suggested lack of relevance of HCR for Australian households in mortgage choice is a surprise.

The lack of significance for HCR could be linked to potential measurement error for human wealth. Alternatively it may simply mean that households consider other factors when assessing their ability to manage the interest expense risk of an ARM. Indeed the relevance of HCR for mortgage choice arguably relies on the existence of effective mechanisms to release home equity as required. It may be the case that this is more challenging in Australia, possibly because the necessary products are not widely available. Home equity loans per se, as exist in other markets, notably the United States, are not widely utilised in the Australian market. However mortgage refinancing is relatively inexpensive in Australia and widely utilised. Available survey data suggests the vast majority of refinanced mortgages increase their loan balance, releasing home equity.[††††] Perhaps disruption in mortgage markets worldwide following the onset of the Global Financial Crisis (GFC) limited households' ability to withdraw home equity, or possibly more importantly, their confidence in the ongoing availability of such mechanisms. This may be the more pertinent point as the mortgage choices of the households in this study were made from 2008 to 2010, a period coinciding with the worst of the GFC. Another point worth remembering is that the ability of a household to increase their mortgage not only relies

[††††] RBA. 2007: Loan approvals, repayments and housing credit growth. *Reserve Bank of Australia Bulletin*, July, 1-7

on them having the required home equity, but also the income necessary to service a higher loan amount.

The results of the full specification model shown in the rightmost column of Table 2 suggest that a household's level of buffer-stock savings and whether it has spare cash for savings and investment are the main factors households consider when deciding between a FRM and ARM. These are factors that relate directly to a household's ability to manage the interest expense risk of an ARM. This result suggests Australian households choose mortgages exactly as Campbell and Cocco (2003) suggest they should.

In terms of the aims of this study these results indicate that the null hypothesis that household characteristics do not play a significant and important role in mortgage choice can be rejected, as can the null hypothesis that buffer-stock savings is not negatively associated with the likelihood of a household choosing a FRM. However not capable of rejection is the null hypothesis that the level of home equity is not negatively associated with the likelihood of a household choosing a FRM.

5.2.2. Secondary results

The only other variable with a coefficient that is significant in at least one iteration of the model shown in Table 2 is EDUCATION. The coefficient is negative, which can be interpreted as indicating that households with more education are less likely to make an investment mistake (that is choosing a FRM, see for example Campbell (2006)). Coulibaly and Li (2009) and Hullgren and Soderberg (2010) both generated similar results, showing that households with higher education are more likely to choose an ARM. As shown in column nine, the significance of the result for EDUCATION falls substantially on the introduction of fixed effects for state, industry and occupation. This reflects the impact that these fixed effect factors have on mortgage choice.

The only other independent variable that generates a coefficient that is significant in any of the tests is SPREAD. As stated in Appendix A lack of variation of SPREAD in this study means it is included for

control only rather than as a genuine variable of interest. It is included in the majority of model iterations represented in Table 2 given its absence from any model could invite claims of missing variable bias. This study does not venture conclusions relating to SPREAD, despite the fact that the coefficient for SPREAD is almost always consistently negative, as expected, and significant.

None of the other variables are significant in any of the regressions conducted on the full sample. Among the more noteworthy of these results is that for risk aversion (RISKAVERS), which other studies have found to be a key determinant of mortgage choice (for example Coulibaly and Li, 2009; and Hullgren and Soderberg, 2010), with more risk averse households being more inclined to choose a FRM. The coefficient for RISKAVERS in this study's tests on the full sample is consistently positive, concurring with the findings in the literature (see for example Coulibaly and Li (2009) and Hullgren and Soderberg (2010), and the theoretical studies by Campbell and Cocco (2003) and Campbell (2006)), but never significant. Perhaps the influence of risk factors on mortgage choice is better articulated in this study through households' actual risk characteristics as reflected through variables such as IWR and NOCASH rather than through their stated attitudes to risk as reflected in RISKAVERS.

The coefficient for INCOME is negative, though with p-values just beyond 10% in most test iterations, never significant. The negative sign is as expected given the literature suggests those on higher income are less likely to make an investment mistake (that is choosing a FRM, see for example Campbell (2006)). The sign could also be interpreted as indicating that higher income alone is associated with households being better able to manage the interest expense risk of an ARM, which is consistent with the findings of Brueckner and Follain (1988), and Boyd (1988) who found income positively linked to probability of choosing an ARM in their United States studies, and Hullgren and Soderberg (2010) who generated similar results in their study of the Swedish mortgage market.

Another noteworthy result is that for IDS, a variable which might be considered as indicating a household's ability to manage the interest expense risk of an ARM. The coefficient for IDS in the tests on the full sample is consistently negative, supporting the above reasoning, but never significant.

BHWDUMMY identifies households that derive most of their income from business. Coulibaly and Li (2009) suggest that households with more risky income are more likely to choose a FRM. Households with a greater reliance on business income could be considered such households. As shown in Table 2 the coefficient for BHWDUMMY suggests that these households do favour FRMs, but the result is not significant. Perhaps the lack of significance reflects the fact that this segment of the market uses mortgage funding less frequently than other households, and when they do they rely on it less to fund their home purchases (as shown by lower LVRs). As such exposure derived from mortgage risk may not be as critical for these households as for other households, which may explain why no significant mortgage preference can be gauged among them. Perhaps the most value from having BHWDUMMY in the models in this study is to control for the unknown factors that drive portfolio choice (including mortgage choice) for these households.

Also warranting comment is the mostly negative coefficient for SHAREOWN, the proxy for financial literacy used in this study. A negative result is expected given the financially literate should be less likely to make the investment mistake of choosing a FRM, though the result is neither significant, nor consistently negative. The contrasts with the findings of Coulibaly and Li (2009) whose study found stock ownership (which they used to proxy for financial sophistication) positively linked to likelihood of choosing an ARM, and Hullgren and Soderberg (2010) who found the least financially literate households more likely to choose a FRM.

A group of variables that reflect non-financial characteristics (FEMALE, AGE, COUPLE, OWNNUMS) are also not significant in the tests on the full sample, despite there being sounds reasons why it might be otherwise. The coefficients generated for COUPLE and OWNNUMS both suggest these characteristics give households greater ability to manage the interest expense risk of an ARM but neither result is significant. This corresponds with results in Dhillon, Shilling and Sirmans (1987) suggesting households with co-borrowers and married couples are more likely to choose an ARM, though their result was similarly not significant in tests. The signs generated for COUPLE and OWNNUMS contrast with the

findings of Boyd (1988) that singles prefer ARMs, and Bacon and Moffat (2012), whose UK study found that groups are more likely to choose FRMs. Perhaps the lack of a clear result for COUPLE and OWNNUMS in this study appropriately reflects the diversity of the views expressed in the literature.

The negative coefficient for FEMALE suggests greater female presence in a household leads to improved mortgage outcomes insofar as a FRM is considered an investment mistake, though again the result is not significant. The changing sign on the coefficient for AGE makes conclusions difficult to draw. This is despite findings in both Gardner, Kang and Mills (1987) and Sa-Aadu and Sirmans (1995) that younger borrowers are more likely to choose ARMs.

6. Dividing the Sample

Having generated results identifying two primary factors driving mortgage choice in Australia I run tests on numerous submarkets to see if there is variation in the relevance of these factors for different households. This follows findings in some studies that mortgage choices of different submarkets are driven by different factors. It may also reveal that some factors found not relevant for the full sample are important for one or more submarkets.

I perform separate divisions of the market into two submarkets on a range of measures, drawing motivation from several sources. One is findings common to both Campbell and Cocco (2003) and Campbell (2006) that FRMs should be preferred by households that are more risk averse, or have a large mortgage relative to income. Another is studies that find income and wealth key characteristics that divide the mortgage market (for example Schwartz, 2009; and Damen and Buyst, 2013).

I analyse each submarket independently to identify differences in their mortgage choices and decision making. One key finding is that there are major differences in the characteristics of households in the different submarkets. There are also major differences in the factors driving mortgage choice across different household types. The latter is highlighted by the result that no submarket shares a common significant factor with the submarket on the other side of its partition. The null hypothesis that

different submarkets do not make different mortgage choices or make them differently is rejected. The different partitioning measures and the results of the analysis on the submarkets are discussed below.

I also divide the market according to share ownership and age, characteristics the general finance literature commonly associates with variation in household finance decision making (for example Mankiw and Zeldes, 1991; Attanasio, Banks and Tanner, 2002; Vissing-Jorgensen, 2002; Falvin and Yamashita, 2002; and Fischer and Stamos, 2013). These results are not discussed below but are included in Tables A2 to A4 in the appendices.

6.1. Risk Aversion

Risk is a defining factor for mortgage choice in both Campbell and Cocco (2003) and Campbell (2006). Both find that FRMs should be preferred by households that are more risk averse. Further, measures of risk are central to this study in that it characterizes the choice between an ARM and FRM as being primarily driven by a household's capacity to bear the interest expense risk of an ARM. Coulibaly and Li (2009) split their sample between the more risk-averse and less risk-averse households, finding some differences in the factors relevant for mortgage choice.

The measure of household risk aversion used to split the sample in this study is RISKAVERS which is adapted from households' declared attitudes to risk. Valid measures of RISKAVERS range from one to four, with a higher number representing greater risk aversion. In the full sample the median measure for RISKAVERS is three. The households in the Low Risk Averse submarket (n=440) are those with a RISKAVERS score of three or under, with the remaining households (n=364) in the High Risk Averse submarket.[‡‡‡‡]

[‡‡‡‡] There are six households in the full sample which do not return a score for RISKAVERS, mainly because an underlying component of the score is missing from the HILDA dataset.

6.1.1. Difference in Means

Table 3 displays the differences in means for a range of variables across the two submarkets. It shows that 16.5% of High Risk Averse households have FRMs, compared to 12.7% for Low Risk Averse households. This aligns with the findings of Campbell and Cocco (2003) and Campbell (2006) that FRMs should be preferred by households that are more risk averse, though the difference is not statistically significant.

One difference that might be associated with their different attitudes to risk is in share ownership. The proportion of households that own shares is more than 60% greater for Low Risk Averse households than for High Risk Averse households. The average portfolio size for Low Risk Averse households that own shares is around six times greater than the average portfolio size for High Risk Averse households that own shares.

Another difference is in average mortgage size, which is 20% higher for Low Risk Averse households compared to High Risk Averse households. The proportion of households that declare they have no spare cash for savings and investments, as reflected by NOCASH, is 18% of High Risk Averse households, versus 10% for Low Risk Averse households. This is despite there being no significant difference between their respective averages of surplus income, which is a similar measure to NOCASH though more objective, and I define as disposable income less consumption less property repayments.

Significant differences exist in household characteristics which may be associated with their differences in risk aversion. These include level of female ownership and average age, both of which are higher for High Risk Averse households, and education, which is lower for High Risk Averse households.

6.1.2. Regression Analysis

Separate tests on the submarkets divided on risk aversion show marked difference in the prime factors motivating their mortgage decisions (see Table 4). This demonstrates how attitudes to risk can shape mortgage decision making and reinforces the importance of risk in mortgage choice.

The contrasting outcomes are reflected in the different results for IWR, which is negative and significant for Low Risk Averse households, though not significant for High Risk Averse households, for whom the sign on the coefficient is in fact positive, which is counter to expectations. This result may be because interest expense is something that High Risk Averse households are less inclined to countenance in light of their buffer-stock savings. They may be accumulating buffer-stock savings for insulation against other, less avoidable, sources of uncertainty, or for retirement. Cagetti (2003) finds that saving for retirement is an increasingly important motive for wealth accumulation as retirement approaches. Both average age and proportion of retirees are significantly higher for High Risk Averse than Low Risk Averse households. Alternatively, the less liquid nature of their buffer-stock savings may make them less accessible for managing any increased interest expense should it arise. Cash and equities combined average less than $14,000 for High Risk Averse households, which is equivalent to 3.3% of average net wealth and 5.6% of average home mortgage value. This is less than one third of the average for Low Risk Averse households, for whom average cash and equities holdings equate to 7.3% of average net wealth, and 14.4% of average home mortgage value.

The irrelevance of buffer-stock savings for High Risk Averse households may in part be related to the relevance of housing collateral. HCR is negative, in line with suggestions in the literature, and significant for this submarket of mortgagees. This may be a source of wealth these households would be more willing to access if increased interest expenses start to bite. Interestingly High Risk Averse is the only submarket for which HCR is found to be significant in this study. It provides some support for the argument of Campbell and Cocco (2003) that interest expense risk should not matter if the household could borrow against future income. It also provides some support for the previously

rejected hypothesis that home equity is negatively associated with the likelihood of a household choosing a FRM.

Also influencing the mortgage choices of High Risk Averse households is whether they have spare cash for savings and investment, as reflected in the NOCASH variable, which is positive and significant for this submarket, as it is for the sample as a whole. Heightened sensitivity to NOCASH makes sense for a submarket that appears less inclined to muster their buffer-stock savings to manage higher interest expenses should they arise.

It could be argued that the differences highlighted above show that High Risk Averse households are behaving exactly as expected, if as inferred in Campbell and Cocco (2003), a household's ability to take on the interest expense risk of the ARM should be the main driver of mortgage choice. It is a submarket that appears to be less inclined to consider buffer-stock savings as insulation against the risks of an ARM. If a High Risk Averse household also has no spare cash for savings and investment the result suggests it leans further from choosing an ARM, though this position may be softened somewhat if it has home equity against which it can increase its mortgage in times of need.

A final difference to be considered is the significance of loan to valuation ratio (LVR) for High Risk Averse households. The negative sign on the coefficient might be regarded as contrary to expectations in that LVR may proxy for borrowing constraint, as suggested by Damen and Buyst (2013), which is associated with less preference for ARM (Campbell (2006)). However the LVR of a loan is subject to the assessment of the lending bank, with higher LVR households being assessed as having higher capacity to service their debt. If LVR is more a proxy for debt servicing capacity than borrowing constraint, the negative sign on its coefficient is logical. This interpretation is supported by a comparison of the debt to income ratios for these submarkets. This ratio may be considered another indicator of debt serviceability, and is significantly lower for High Risk Averse households.

The only other independent variable that is significant in any of the tests is NEGEQUITY, which is included in this study for control only rather than being a genuine variable of interest. See APPENDIX A for information on NEGEQUITY.

6.2. Mortgage to Income

In addition to the more risk averse, both Campbell and Cocco (2003) and Campbell (2006) find that FRMs should be preferred by households whose mortgage is large relative to their income. As such the discussion now moves to a comparison of submarkets partitioned according to mortgage to income ratio, which I calculate by dividing outstanding home mortgage debt by household disposable income. The average of this ratio for the full sample is 3.5 and the median is three. The households in the Low Mortgage to Income submarket (n=401) are those with a ratio under three, with the remaining households in the High Mortgage to Income submarket (n=402).[§§§§]

6.2.1. Difference in Means

The differences in means for the two submarkets across a range of variables are displayed in Table 5. It shows that 14.2% of Low Mortgage to Income households have FRMs, compared to 14.9% for High Mortgage to Income households. This difference is not statistically significant and is arguably inconsistent with the view expressed in Campbell and Cocco (2003) and Campbell (2006) that FRMs should be preferred by households whose mortgage is large relative to their income. This small difference appears more puzzling considering the average ratio for the High Mortgage to Income households is, at 5.1, more than 2.5 times that for the Low Mortgage to Income households.

Possible explanations for this lack of difference in FRM use might be found in other differences between these two groups. One noticeable difference is in LVR, which is almost 50% higher for High

[§§§§] There are seven households in the full sample who have a mortgage to income ratio that is either missing or negative. These observations have been excluded from these submarkets. This explanation also applies for partitions that follow for which the combined number of submarket observations is less than 810.

Mortgage to Income households compared to Low Mortgage to Income. As noted above, LVR may be more a proxy for debt servicing capacity than borrowing constraint. If so High Mortgage to Income households may be judged as having high debt servicing capacity and capable of managing the interest expense risk of an ARM.

Despite having average disposable income more than a quarter below that for Low Mortgage to Income households, High Mortgage to Income households have homes of higher average value (almost 10% higher) and much larger average mortgages (almost 70% higher). This may indicate a greater willingness to assume financial responsibility, which may be associated with other differences. These include those showing that High Mortgage to Income households are less risk averse and less inclined to declare they have no spare cash for savings and investment than their Low Mortgage to Income counterparts, though these differences are not significant.

Fewer High Mortgage to Income households are run by couples, which could be linked with their lower average income, and possibly also their lower consumption. They are also significantly younger, which aligns with the view of Campbell (2006) that older households don't face the stresses faced by younger households. Younger households may be more willing to accept a High Mortgage to Income ratio because they expect it to fall over time, through income growth for example.

6.2.2. Regression Analysis

Separate tests on the submarkets divided on mortgage to income ratio show difference in the factors motivating their mortgage decisions, but also similarity in the small number of factors found to be significant for each (see Table 4). On this latter point, IWR is not significant in mortgage choice for either of these submarkets, though the sign on the coefficient is negative, as expected, in both instances. NOCASH is significant for High Mortgage to Income households only, though it is positive for both submarkets.

NOCASH is the only factor found to be significant for High Mortgage to Income households, pushing those that declare having no spare cash for savings or investment away from the interest expense risk that comes with an ARM. These households also have significantly lower average net wealth than Low Mortgage to Income households, suggesting they have less buffer-stock savings, on average, to manage the interest expense risk of an ARM. It is understandable that such households take more heed of the level of their spare cash for savings or investment, as revealed by the NOCASH indicator, when choosing between differing mortgage commitments.

The tests similarly show only one factor significant in mortgage choice for Low Mortgage to Income households. That is COUPLE, which acts in the expected fashion, increasing the likelihood of households led by couples selecting an ARM, the reasoning being they are better able to manage the associated interest expense risk. Or perhaps it is more a matter of single led households within this submarket being more inclined to avoid the interest expense risk of an ARM, even if their mortgage is small relative to their income compared to most households. Either way it is a result that aligns with the finding of Dhillon, Shilling, and Sirmans (1987) that households with co-borrowers and married couples are more likely to use ARMs. It is however contrary to the conclusion in Boyd (1988) whose United States study found single person households more likely to choose an ARM, which was interpreted as being due to the greater financial flexibility of households that have no dependents. An alternate explanation for the result in Boyd (1988) might be that these households were more attracted to the near-term price advantage of the ARM, which is greater in the United States compared to Australia, despite the associated interest rate risk.

6.3. Income

Submarkets divided on income and wealth have been found to differ significantly in their determinants of mortgage choice (see Schwartz, 2009; and Damen and Buyst, 2013). As such the next partition of the sample is on household disposable income, the average of which for the full sample is $91,511, the median is $88,156. The households in the Low Income submarket (n=405) are those with

disposable income less than $88,156, with the remaining households in the High Income submarket (n=405).

6.3.1. Difference in Means

Table 6 below displays the differences in means for a range of variables across the two submarkets. It shows that 18.5% of Low Income households have FRMs, compared to 10.6% for High Income households. This difference is statistically significant at the 1% level and is the largest between any of the submarket pairs considered in this study. This points to a role for income in managing the interest expense risk of an ARM and is a result that is consistent with the findings of Brueckner and Follain (1988), Boyd (1988) and Hullgren and Soderberg (2010) who all found income positively linked to the likelihood of choosing an ARM.

The sharp difference in average disposable income between these two submarkets, which for High Income households is more than double that of Low Income households, is almost mirrored in the difference in average wealth, which is more than 60% higher for High Income households. This is not unexpected and these differences alone may explain much of the difference in FRM use.

There is a major difference between these groups in the proportion of couple run households, which is 60% for Low Income households, the lowest for all the submarkets considered in this study, and over one third less than for High Income households. While this measure is clearly associated with household income, it implies that couple status may be linked with mortgage decision making. The results for regressions on the Low Mortgage to Income submarket, as previously discussed, suggests this is the case in some circumstances at least.

6.3.2. Regression Analysis

As is the case for submarkets divided on other measures, submarkets partitioned on income have differences in the factors driving their mortgage decisions (see Table 7). A key similarity, both between

these submarkets and others partitioned on other factors, exists in the lack of significance for the main variables considered in this study. IWR is not significant in mortgage choice for either of these submarkets, though the sign on the coefficient is negative for Low Income households. It is significant in some specifications of the model containing fewer variables (not shown here). NOCASH is not significant for either of the submarkets, though it is positive for both.

COUPLE and INCOME are both negative and significant at the 1% level for High Income households. The significance of COUPLE supports the view that this factor is important for mortgage choice in Australia under some circumstances. Its significance for High Income households and Low Mortgage to Income households, suggests its relevance may be heightened for households whose income, either outright or relative to their mortgage, may already provide some protection against the risks of an ARM. In these circumstances couple status becomes an important focus when deciding whether or not to take on the interest expense risk of an ARM, with single led households appearing to be less inclined to do so.

INCOME acts in the expected fashion for High Income households, increasingly the likelihood of them choosing an ARM. High Income is the only submarket for which INCOME is significant despite its relevance being demonstrated in several previous studies. The lack of relevance of INCOME for Low Income households may be driven by the greater call on their income for more pressing purposes, limiting their ability to consider income as a pivotal point when deciding whether or not they can manage the interest expense risk of an ARM. This may be reflected in the 17% of Low Income households that declare they have no spare cash for savings or investments, compared to 10% for High Income households. The average of income after consumption and property repayments (i.e. SURPLUSINC) for Low Income households is $12,749, which contrasts with over $60,000 for High Income households.

The only factor that is significant for Low Income households is RISKAVERS, which as expected acts to increase the likelihood of selecting a FRM. This submarket is the only one identified in this study for

which RISKAVERS is relevant in mortgage choice. This lack of relevance in most submarkets is somewhat surprising given risk aversion is one of the differentiating characteristics highlighted by Campbell and Cocco (2003) and Campbell (2006) as driving household mortgage choice. It might be because a household's willingness or ability to take on interest expense risk is more ably represented in the alternative measures of capacity for risk applied in this study, such as IWR and NOCASH. As shown previously both these measures are significant in tests on the full dataset, and various of the submarkets considered in this study.

6.4. Wealth

The next partition of the sample is on household net wealth, the average of which for the full sample is over $500,000. The median is $327,104, which is the dividing point between the Low Wealth (n=405) and High Wealth (n=405) submarkets compared below.

6.4.1. Difference in Means

Table 8 displays the differences in means for a range of variables across the two submarkets and shows that 18.3% of Low Wealth households have FRMs, compared to 10.9% for High Wealth households. This size of this statistically significant difference (at the 1% level) is second only in this study to that of the submarkets divided on disposable income. It arguably reinforces the role of wealth in helping households manage the interest expense risk of an ARM. Sa-Aadu and Sirmans (1995) found more wealthy households less likely to choose an ARM, thought theirs was a localized study whose conclusions may not be applicable to the wider population.

The sharp difference in average disposable income between submarkets partitioned on income, which for High Income households is more than double that of Low Income households, is dwarfed by the difference in average net wealth between the High and Low Wealth households, which is almost five times for High Wealth households. Median net wealth for High Wealth households is three and half times that for Low Wealth households. This massive difference does not appear to be fully reflected

by differences in disposable income (around one third higher for High Wealth households) or proportion of couple led households (around one fifth higher for High Wealth households), both of which are significant at the 1% level. An additional relevant difference is in average age, which at almost eight years is the highest of all such differences between the submarket pairs considered in this study (other than for submarkets split on average age itself). It aligns with the comment in Campbell (2006) that borrowing constraints are likely to be more important for young than older households that have built up some retirement savings.

Another difference reflecting the relative financial conditions, and stresses, of these households is in the average mortgage to average net wealth ratios for these two submarkets. This ratio is around 1.5 for Low Wealth households and around one third for High Wealth households. The Low Wealth submarket is the only one in this study which has an average mortgage to average net wealth ratio above one. This difference could also be associated with the difference in average age for these two groups.

6.4.2. Regression Analysis

Perhaps the most notable point about the results of separate regression analysis run on the submarkets divided on net wealth is the lack of any significant factor in tests of Low Wealth households (see Table 7). The coefficient for IWR is negative, as expected, and almost significant, though not quite (its p-value is 11.5%). The coefficient for NOCASH is positive, also in line with expectations, but not close to significant. One possible reason for this lack of significance is that their relative lower wealth may be the predominant influence when it comes to mortgage choice for these households, to the point where no other factor has a meaningful bearing on their decisions.

Two factors are found to be significant in the mortgage decisions of High Wealth households, they being NOCASH and SHAREOWN, both of which have coefficients with positive signs. This makes sense for the former in that households that declare themselves as having no spare cash for savings or

investments are more likely to avoid the interest expense risk of an ARM. Though given their higher average wealth, any choice for a FRM among households in this submarket is more likely to be an investment mistake. The result for SHAREOWN is puzzling. It suggests households that own shares are more likely to have a FRM, or stated alternatively, more likely than other wealthier households to make this investment mistake. This is especially puzzling as share ownership is often thought to be a proxy for financial literacy, which is the basis of its use in this study, and in Coulibaly and Li (2009). The result potentially undermines the validity of SHAREOWN as a proxy for financial literacy.[*****]

7. Conclusion

This study considers mortgage choice in the Australian market where relatively muted differences between ARM and FRM rates offer greater scope for household characteristics to play a role. It follows a body of mostly United States based empirical research which finds mortgage choice mostly driven by price, and theoretical research by Campbell and Cocco (2003) suggesting the decision should be driven by a household's ability to manage the interest expense risk of the ARM, which in turn depends on household characteristics. The main aim of the study is to test the hypothesis that household characteristics play a significant and important role in mortgage choice.

To do so it takes a lead from Campbell and Cocco (2003) and identifies characteristics that represent a household's ability to manage the interest expense risk of the ARM. Those being its levels of buffer-stock savings and home equity. It finds both relevant for mortgage choice, though the latter in only limited circumstances. Where relevant both measures are positively associated with the likelihood of a household choosing an ARM, as the literature suggests. Another characteristic found to be important for mortgage choice is whether a household identifies itself as having no spare cash for savings or investments, labelled 'NOCASH', which is found to reduce the likelihood of a household choosing an

[*****] Which is additionally undermined by the positive and significant coefficient for SHAREOWN also found in tests on the submarket of older households (see Table A3)

ARM. The result for NOCASH echoes the other key findings insofar as it can be said to represent a household's ability to manage the interest expense risk of the ARM.

Tests on submarkets reveal variation in the relevance of different factors for mortgage choice in different households. The level of buffer-stock savings is only found to be relevant for low risk averse households, where it is significant at the 1% level in a fully specified model. NOCASH is relevant for high risk averse households, also at the 1% level, and is also found to be relevant for households with higher ratios of mortgage to income, and those with higher wealth. Home equity is only found to be relevant for high risk averse households. Among other factors found to be significant in tests on submarkets the most frequent is whether the household is run by a couple, labelled 'COUPLE', which is found to be positively associated with the likelihood of a household choosing an ARM for households with lower ratios of mortgage to income, and those with higher wealth. COUPLE can be interpreted as further reflecting a household's ability to manage the interest expense risk of the ARM.

One result that appears inconsistent with the notion that the mortgage decision should be driven by a household's ability to manage the interest expense risk of the ARM is that for SHAREOWN, which is found to be positively associated with the likelihood of choosing a FRM for higher wealth households. It is a puzzling outcome which suggests that share owning households are more likely than other wealthier households to make an investment mistake. Less education is also associated with a higher propensity to make a mistake, in line with suggestions in the literature.

This study addresses the hypotheses put, and in doing so confirms a role for household characteristics in mortgage choice. It specifically finds buffer-stock savings negatively associated with the likelihood of a household choosing a FRM, as is a household's level of home equity, though in more limited circumstances only. It also finds differences in mortgage decision-making in different sections of the market.

These findings provide support for the view implied in Campbell and Cocco (2003) that a household's ability to manage the interest expense risk of an ARM should be the main driver of mortgage choice. Additional support for this view is provided in findings for NOCASH and COUPLE. These findings, along with identified differences in mortgage decision-making for High and Low Risk Averse households, additionally demonstrate the important role of household risk characteristics in mortgage choice.

References

Adams, Renee and Daniel Ferreira, 2009, Women in the boardroom and their impact on governance and performance, *Journal of Financial Economics* 94, 291-309.

Adams, Renee and Patricia Funk, 2012, Beyond the glass ceiling: Does gender matter? *Management Science* 58, 219-235.

Attanasio, Orazio, James Banks and Sarah Tanner, 2002, Asset holding and consumption volatility, *Journal of Political Economy* 110, 771-792.

Bacon, Philomena, and Peter Moffatt, 2012, Mortgage choice as a natural field experiment on choice under risk, *Journal of Money, Credit and Banking* 44, 1401-1426.

Badarinza, Cristian, John Campbell, and Tarun Ramadoria, 2013, What calls to ARMs? International evidence on interest rates and the choice of adjustable-rate mortgages, Working paper, University of Oxford and Harvard University.

Bergstresser, Daniel, and John Beshears, 2010, Who selected adjustable-rate mortgages? Evidence from the 1989-2007 Surveys of Consumer Finances, Harvard Business School, Working paper 10-083.

Boyd, James, 1988, Asset-status proxies and consumer preference for ARMs: An empirical investigation using probit analysis, *The Journal of Real Estate Research* 3, 37-49.

Brueckner, Jan, and James Follain, 1988. The rise and fall of the ARM: An econometric analysis of mortgage choice. *Review of Economics and Statistics* 70, 93–102.

Bucks, Brian, and Karen Pence, 2008, Do borrowers know their mortgage terms? *Journal of Urban Economics* 64, 218-233.

Byrnes, James, David Miller and William Schafer, (1999), Gender differences in risk taking: A meta-analysis, *Psychological Bulletin*, 125, 367-383.

Cagetti, Marco, 2003, Wealth Accumulation over the Life Cycle and Precautionary Savings, *Journal of Business & Economic Statistics* 21, 339-353.

Calvet, Laurent, John Campbell, and Paolo Sodini, 2007, Down or out: Assessing the welfare costs of household investment mistakes, *Journal of Political Economy* 115, 707-747.

Campbell, John, 2006, Household finance, *Journal of Finance* 61, 1553–1604.

Campbell, John, and Joao Cocco, 2003, Household risk management and optimal mortgage choice, *Quarterly Journal of Economics* 118, 1449-1494.

Campbell, John, Howell Jackson, Brigitte Madrian, and Peter Tufano, 2011, Consumer financial protection, *Journal of Economic Perspectives* 25, 91-114.

Carroll, Christopher, and Andrew Samwick, 1997, The Nature of Precautionary Wealth, *Journal of Monetary Economics* 40, 41-71.

Cobb-Clark, Deborah, and Steven Stillman, 2009, The retirement expectations of middle-aged Australians, *Economic Record* 85, 146-163.

Coulibaly, Brahima, and Geng Li, 2009, Choice of mortgage contracts: Evidence from the Survey of Consumer Finances, *Real Estate Economics* 37, 659-673.

Damen, Sven, and Erik Buyst, 2013, The myopic choice between fixed and adjustable rate mortgages in Flanders, KU Leuven Centre for Economic Studies Discussion Paper Series DPS13.15.

Dardanoni, Valentino, 1991, Precautionary savings under income uncertainty: a cross-sectional analysis, *Applied Economics* 23, 153-160.

Dhillon, Upinder, James Shilling, and C. F. Sirmans, 1987, Choosing between fixed and adjustable rate mortgages, *Journal of Money, Credit and Banking* 19, 260-267.

Fischer, Marcel, and Michael Stamos, 2013, Optimal life cycle portfolio choice with housing market cycles, *Review of Financial Studies* 26, 2311-2352.

Flavin, Marjorie, and Takashi Yamashita, 2002, Owner-occupied housing and the composition of the household portfolio, *American Economic Review* 92, 345-362.

Fannie Mae, Annual Report, 2016.

Fannie Mae, Selling Guide, April 2017.

Gardner, Mona, Han Bin Kang, and Dixie Mills, 1987, Consumer profiles and acceptance of ARM features: An application of logit regression, *Journal of Real Estate Research* 2, 63- 74.

Gerardi, Kristopher, Lorenz Goette, and Stephan Meier, 2010, Financial literacy and subprime mortgage delinquency: Evidence from a survey matched to administrative data, Federal Reserve Bank of Atlanta, Working Paper 2010-10.

Ginnie Mae, Global Markets Analysis Report, April 2017.

Green, Richard, and Susan Wachter, The american mortgage in historical and international context, 2005, *Journal of Economic Perspectives* 19, 93-114.

Harris, Christine, Michael Jenkins and Dale Glaser, 2006, Gender differences in risk assessment: Why do women take fewer risks than men? *Judgment and Decision Making* 1, 48-63.

Harrison, David, and Thomas Noordewier, 2011, Empirical evidence on mortgage choice as a screening mechanism for default risk, *Journal of Housing Research* 20, 1-18.

Heaton, John, and Deborah Lucas, 2000, Portfolio choice and asset prices: The importance of entrepreneurial risk, *Journal of Finance* 55, 1163–1198.

Hullgren, Maria, and Inga-Lill Soderberg, 2013, The relationship between consumer characteristics and mortgage preferences - A case study from Sweden, *International Journal of Housing Markets and Analysis* 6, 209-230.

Koijen, Ralph, Otto Van Hemert, and Stijn Van Nieuwerburgh, 2009, Mortgage timing, *Journal of Financial Economics* 93, 292-324.

Lettau, Martin, and Sydney Ludvigson, 2001, consumption, aggregate wealth, and expected stock returns, *Journal of Finance* 56, 815-849.

Lustig, Hanno, and Stijn Van Nieuwerburgh, 2005, Housing collateral, consumption insurance, and risk premia: An empirical perspective, *Journal of Finance* 60, 1167-1219.

Mankiw, N. Gregory, and Stephen Zeldes, 1991, The consumption of stockholders and nonstockholders, *Journal of Financial Economics* 29, 97-112.

Masclet, David, Nathalie Colombiera, Laurent Denant-Boemonta, and Youenn Lohéaca, 2009, Group and individual risk preferences: A lottery-choice experiment with self-employed and salaried workers, *Journal of Economic Behavior and Organization* 70, 470-484.

Nothaft, Frank, and George Wang, 1992, Determinants of the ARM share of national and regional lending, *The Journal of Real Estate Finance and Economics* 5, 219–234.

Sa-Aadu, J, and C.F. Sirmans. 1995, Differentiated contracts, heterogeneous borrowers, and the mortgage choice decision, *Journal of Money, Credit and Banking* 27, 498–510.

Schwartz, Allie, 2009, Who takes out adjustable rate mortgages? Working paper, Harvard University.

Sinai, Todd, and Nicholas Souleles, 2005, Owner-occupied housing as a hedge against rent risk, *Quarterly Journal of Economics* 120, 763-789.

Skinner, Jonathan, 1998, Risky income, life cycle consumption, and precautionary savings, *Journal of Monetary Economics* 22, 237-255.

Thaler, Richard, 1999, Mental accounting matters, *Journal of Behavioral Decision Making* 12, 183-206.

Van Hemert, Otto, 2010, Household interest rate risk management, *Real Estate Economics* 38, 467-505.

van Rooij, Martin, Annamaria Lusardi, and Rob Alessie, 2011, Financial literacy and stock market participation, *Journal of Financial Economics* 101, 449–472.

Vissing-Jorgensen, 2002, Limited asset market participation and the elasticity of intertemporal substitution, NBER Working Paper, No. 8896.

Zocchi, Paola, 2013, Why do Italian households prefer adjustable rate mortgages? *Journal of European Real Estate Research* 6, 90-110.

TABLE 1. Summary statistics for mortgagee households

This table presents summary statistics for households on a range of variables of interest when studying their choice between a FRM and an ARM. The sample consists of 810 households surveyed for the HILDA Survey of Australian households in 2010. All households included in the sample own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded) and who made their mortgage choice in the period 2008 to 2010. All data is sourced from HILDA, except SPREAD, which is derived from data sourced from the Reserve Bank of Australia. FRMDUMMY is an indicator variable that is 1 for a household that has a FRM and zero otherwise. For all other variable definitions please see Table A1. For detailed description of key variables see Appendix A.

VARIABLES	N	MEAN	MEDIAN	SD	MIN	MAX
FRMDUMMY	810	0.146	0	0.353	0	1
HOMEVALUE ($)	810	485,732	425,000	262,716	35,000	2,200,000
MORTGAGEVALUE ($)	810	269,224	260,000	146,424	0	733,000
NETHOMEWEALTH ($)	810	216,509	150,000	235,792	-400,000	1,940,000
LVR	810	0.61	0.62	0.29	0	2.67
NEGEQUITY	810	0.02	0	0.14	0	1
TOTALPROPERTYASSETS ($)	810	575,348	460,000	380,397	35,000	3,300,000
NETPROPERTYWEALTH ($)	810	275,683	190,000	305,877	-170,500	2,780,000
SUPERANNUATION ($)	810	121,941	64,611	173,096	0	1,430,000
BUSINESSASSETS ($)	810	37,727	0	245,734	0	4,199,537
VEHICLES ($)	810	30,200	20,000	43,303	0	678,443
LIFEINSURANCE ($)	810	28,664	0	189,787	0	1,528,170
BANKACCOUNTS ($)	810	14,949	6,100	29,109	0	320,000
LISTEDEQUITY ($)	810	14,087	0	82,770	0	1,175,142
TOTALASSETS ($)	810	831,918	641,480	674,840	107,700	5,809,000
NETWEALTH ($)	810	502,737	327,104	591,013	-190,448	5,737,000
HUMANWEALTH ($)	810	773,120	738,586	492,174	0	2,962,253
BUSINESSHUMANWEALTH ($)	810	39,302	0	182,434	0	1,908,747
BHWDUMMY	810	0.03	0	0.18	0	1
SHAREOWN	810	0.32	0	0.47	0	1
HCR	810	0.24	0.19	0.19	0.00	0.69
IWR	810	0.68	0.68	0.01	0.58	0.74
IDS	808	1.56	1.54	0.49	0.00	4.65
REFI	810	0.40	0.000	0.49	0	1
SPREAD %	810	0.78	0.91	0.47	0.10	1.21
DISPOSABLEINCOME ($)	810	91,511	88,156	46,401	-146,515	324,624
GOVERNMENTTRANSFERS ($)	810	4,928	0	8,442	0	66,712
CONSUMPTION ($)	810	27,749	26,414	11,689	3,847	95,721
PROPERTYREPAYMENTS ($)	810	26,453	23,460	15,931	744	170,760
NOCASH	804	0.14	0	0.31	0	1
SURPLUSINC ($)	810	36,815	33,640	39,356	-237,971	254,973
MORTGAGE2INC	808	3.48	2.97	3.68	-2.93	56.41
RISKAVERS	804	2.96	3	1.17	0	4
EDUCATION	804	4.85	5	2.27	1	9
FEMALE	804	0.53	0.5	0.33	0	1
AVERAGEAGE (years)	804	39.15	38	11.07	20	87
COUPLE	810	0.76	1	0.43	0	1
OWNNUMS	810	1.61	2	0.49	1	3
RETIRED	804	0.03	0	0.15	0	1

TABLE 2. Logit regressions of household mortgage choice

This table presents results of regressions of FRMDUMMY on a range of variables with potential to influence household choice between a FRM and an ARM. The dataset is drawn from the HILDA survey of Australian households which has been conducted on mostly the same households every year since 2001. The exception is SPREAD, which is derived from data sourced from the Reserve Bank of Australia. This study uses 2010 data for households that entered into a mortgage in the period 2008 to 2010. The sample consists of 810 households, all of whom own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded). Please see Table A1 for variable definitions. For detailed descriptions of key variables see Appendix A. The predicted sign appears in italics directly under key variables. Standard errors are clustered at industry level. p-values are in parentheses. Significance levels are indicated: *<10%; **<5%; ***<1%.

	Dependent Variable = FRMDUMMY								
	Full Sample								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HCR	0.074	0.152	0.083	-0.018	-0.145	-0.202	-0.137	-0.402	-0.209
negative	(0.872)	(0.820)	(0.856)	(0.968)	(0.780)	(0.701)	(0.786)	(0.484)	(0.811)
IWR	-20.444***	-18.30**	-19.84***	-16.66***	-11.38**	-10.440*	-9.825*	-9.126	-12.006*
negative	(0.000)	(0.011)	(0.000)	(0.003)	(0.048)	(0.061)	(0.085)	(0.131)	(0.059)
SPREAD			-0.385**	-0.421**	-0.408**	-0.411**	-0.416**	-0.419**	-0.344**
negative			(0.026)	(0.017)	(0.026)	(0.023)	(0.022)	(0.020)	(0.040)
RISKAVERS				0.079	0.073	0.074	0.079	0.079	0.063
positive				(0.318)	(0.389)	(0.384)	(0.347)	(0.349)	(0.491)
NOCASH				0.467*	0.405	0.401	0.394	0.417	0.531*
positive				(0.067)	(0.128)	(0.135)	(0.136)	(0.113)	(0.057)
EDUCATION					-0.083*	-0.083*	-0.079*	-0.083*	-0.008
negative					(0.060)	(0.063)	(0.072)	(0.077)	(0.895)
INCOME					-0.047	-0.055	-0.047	-0.058	-0.046
negative					(0.128)	(0.112)	(0.119)	(0.113)	(0.257)
AGE					-0.024	-0.015	-0.024	-0.008	-0.066
unknown					(0.854)	(0.909)	(0.858)	(0.955)	(0.680)
SHAREOWN					-0.031	-0.021	-0.026	-0.008	0.168
negative					(0.874)	(0.913)	(0.896)	(0.970)	(0.474)
IDS						-0.098	-0.059	-0.071	-0.043
negative						(0.448)	(0.648)	(0.658)	(0.847)
COUPLE							-0.196	-0.171	-0.199
negative							(0.469)	(0.533)	(0.533)
OWNNUMS							-0.034	-0.059	-0.024
negative							(0.885)	(0.811)	(0.934)
FEMALE							-0.112	-0.082	-0.250
unknown							(0.583)	(0.702)	(0.405)
LVR								-0.032	-0.242
								(0.946)	(0.623)
NEGEQUITY								-0.207	-0.035
								(0.738)	(0.953)
REFI								-0.079	-0.056
								(0.723)	(0.812)
BHWDUMMY								0.344	0.238
								(0.520)	(0.708)
Constant	12.068***	10.607**	11.94***	9.525**	6.980*	6.565*	6.245*	5.982	7.598*
	(0.002)	(0.030)	(0.002)	(0.012)	(0.061)	(0.069)	(0.091)	(0.158)	(0.080)
Observations	810	791	810	804	804	802	802	802	783
STATE FE	NO	YES	NO	NO	NO	NO	NO	NO	YES
INDUSTRY FE	NO	YES	NO	NO	NO	NO	NO	NO	YES
OCCUPATION FE	NO	YES	NO	NO	NO	NO	NO	NO	YES
Adjusted R^2	0.0126	0.0846	0.0176	0.0223	0.0289	0.0296	0.0311	0.0320	0.0986

TABLE 3. Summary statistics: difference in means for low and high risk averse households

This table presents the means and differences in means of two sub-samples for a range of variables of interest when studying the choice between a FRM and an ARM. The sub-samples result from a partition of the full sample included in this study according to their relative attitudes to risk. The measure used to split the sample is RISKAVERS which is adapted from households' declared attitudes to risk. Valid measures of RISKAVERS range from one to four, with a higher number representing greater risk aversion. In the full sample the median measure for RISKAVERS is three. The households in the Low Risk Averse submarket (n=440) are those with a RISKAVERS score of three or under, with the remaining households (n=364) in the High Risk Averse submarket. All households included in the sample own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded) and who made their mortgage choice in the period 2008 to 2010. All data is sourced from HILDA, except SPREAD, which is derived from data sourced from the Reserve Bank of Australia. FRMDUMMY is an indicator variable that is 1 for a household that has a FRM and zero otherwise. For all other variable definitions please see Table A1. For detailed description of key variables see Appendix A. Significance levels are indicated: *<10%; **<5%; ***<1%.

RISK AVERSION	LOW		HIGH		COMPARISON	
	N	MEAN	N	MEAN	DIFFERENCE	t-stat
FRMDUMMY	440	0.127	364	0.165	-0.038	-1.51
HOMEVALUE ($)	440	525,059	364	437,479	87,580	4.81***
MORTGAGEVALUE ($)	440	291,386	364	242,737	48,649	4.75***
NETHOMEWEALTH ($)	440	233,673	364	194,742	38,931	2.35**
LVR	440	0.61	364	0.61	0.00	0.02
NEGEQUITY	440	0.02	364	0.02	-0.01	-0.64
TOTALPROPERTYASSETS ($)	440	646,762	364	489,730	157,032	5.96***
NETPROPERTYWEALTH ($)	440	312,970	364	230,512	82,459	3.85***
SUPERANNUATION ($)	440	121,179	364	121,519	-340	-0.03
BUSINESSASSETS ($)	440	58,083	364	13,729	44,354	2.55**
VEHICLES ($)	440	30,849	364	28,887	1,961	0.64
LIFEINSURANCE ($)	440	35,089	364	21,370	13,719	1.02
BANKACCOUNTS ($)	440	18,189	364	11,134	7,055	3.43***
LISTEDEQUITY ($)	440	23,838	364	2,519	21,320	3.65***
TOTALASSETS ($)	440	946,131	364	694,126	252,005	5.35***
NETWEALTH ($)	440	572,053	364	418,244	153,809	3.69***
HUMANWEALTH ($)	440	827,506	364	720,121	107,385	3.11***
BUSINESSHUMANWEALTH ($)	440	43,768	364	34,552	9,217	0.71
BHWDUMMY	440	0.03	364	0.03	0.00	0.09
SHAREOWN	440	0.39	364	0.24	0.15	4.64***
HCR	440	0.25	364	0.23	0.01	0.86
IWR	440	0.68	364	0.68	0.00	1.43
IDS	438	1.54	364	1.59	-0.05	-1.35
REFI	440	0.37	364	0.44	-0.07	-2**
SPREAD %	440	0.75	364	0.83	-0.08	-2.44**
DISPOSABLEINCOME ($)	440	96,216	364	85,432	10,783	3.3***
GOVERNMENTTRANSFERS ($)	440	4,313	364	5,638	-1,325	-2.23**
CONSUMPTION ($)	440	28,678	364	26,531	2,147	2.61***
PROPERTYREPAYMENTS ($)	440	29,204	364	23,208	5,997	5.39***
NOCASH	440	0.10	364	0.18	-0.07	-3.36***
SURPLUSINC ($)	440	37,659	364	35,408	2,251	0.81
MORTGAGE2INC	438	3.72	364	3.21	0.51	1.96**
RISKAVERS	440	2.22	364	3.85	-1.64	-
EDUCATION	440	5.15	364	4.47	0.68	4.27***
FEMALE	440	0.50	364	0.56	-0.05	-2.29**
AVERAGEAGE (years)	440	38.01	364	40.52	-2.51	-3.22***
COUPLE	440	0.77	364	0.76	0.01	0.42
OWNNUMS	440	1.59	364	1.65	-0.06	-1.8*
RETIRED	440	0.02	364	0.04	-0.03	-2.45**

TABLE 4. Logit regressions of household mortgage choice for various submarkets, includes low and high risk averse submarkets and low and high mortgage to income ratio submarkets

This table presents results of regressions for several submarkets of FRMDUMMY on a range of variables with potential to influence household choice between a FRM and an ARM. The submarkets represented are those split on their relative attitudes to risk and those separately split according to household ratios of their mortgages to their incomes. The measure used to split the sample on relative attitudes to risk is RISKAVERS which is adapted from households' declared attitudes to risk. Valid measures of RISKAVERS range from one to four, with a higher number representing greater risk aversion. In the full sample the median measure for RISKAVERS is three. The households in the Low Risk Averse submarket (n=440) are those with a RISKAVERS score of three or under, with the remaining households (n=364) in the High Risk Averse submarket. The Mortgage to Income ratio is calculated by dividing outstanding home mortgage debt by household disposable income. The average of this ratio for the full sample is 3.5 and the median is three. The households in the Low Mortgage to Income submarket (n=401) are those with a ratio under three, with the remaining households in the High Mortgage to Income submarket (n=402). Data is drawn from the HILDA survey of Australian households which has been conducted on mostly the same households every year since 2001. The exception is SPREAD, which is derived from data sourced from the Reserve Bank of Australia. This study uses 2010 data for households that entered into a mortgage in the period 2008 to 2010. The full sample consists of 810 households, all of whom own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded). Please see Table A1 for variable definitions. For detailed descriptions of key variables see Appendix A. Standard errors are clustered at industry level. p-values are in parentheses. Significance levels are indicated: *<10%; **<5%; ***<1%.

	Dependent Variable = FRMDUMMY			
	RISK AVERSION		MORTGAGE TO INCOME RATIO	
	LOW	HIGH	LOW	HIGH
HCR	1.416	-1.863*	-0.837	0.416
	(0.483)	(0.061)	(0.664)	(0.816)
IWR	-39.326***	6.725	-13.614	-6.840
	(0.001)	(0.568)	(0.408)	(0.433)
SPREAD	-0.242	-0.731***	0.030	-0.895*
	(0.557)	(0.002)	(0.924)	(0.078)
RISKAVERS	0.027	-1.310	0.196	-0.023
	(0.795)	(0.343)	(0.131)	(0.838)
NOCASH	-0.679	1.282***	0.271	1.416***
	(0.354)	(0.000)	(0.548)	(0.006)
EDUCATION	0.057	-0.082	-0.013	-0.035
	(0.510)	(0.535)	(0.884)	(0.772)
INCOME	0.022	-0.013	-0.013	-0.079
	(0.836)	(0.791)	(0.883)	(0.137)
AGE	-0.076	-0.072	-0.192	0.065
	(0.748)	(0.716)	(0.372)	(0.810)
SHAREOWN	0.130	0.356	0.212	0.249
	(0.623)	(0.373)	(0.597)	(0.513)
IDS	0.403	-0.394	0.128	0.184
	(0.195)	(0.394)	(0.718)	(0.711)
COUPLE	-0.495	0.119	-0.943**	0.065
	(0.470)	(0.887)	(0.018)	(0.934)
OWNNUMS	0.283	-0.420	-0.173	0.295
	(0.624)	(0.717)	(0.624)	(0.664)
FEMALE	-0.660	0.048	-0.514	-0.226
	(0.267)	(0.918)	(0.393)	(0.729)
LVR	1.618	-1.698**	0.121	-0.995
	(0.195)	(0.028)	(0.923)	(0.292)
NEGEQUITY	-2.321*	0.869	0.305	0.084
	(0.075)	(0.198)	(0.857)	(0.932)

(continued)

TABLE 4. (**continued**) Logit regressions of household mortgage choice for various submarkets, includes low and high risk averse submarkets and low and high mortgage to income ratio submarkets

This table presents results of regressions for several submarkets of FRMDUMMY on a range of variables with potential to influence household choice between a FRM and an ARM. The submarkets represented are those split on their relative attitudes to risk and those separately split according to household ratios of their mortgages to their incomes. The measure used to split the sample on relative attitudes to risk is RISKAVERS which is adapted from households' declared attitudes to risk. Valid measures of RISKAVERS range from one to four, with a higher number representing greater risk aversion. In the full sample the median measure for RISKAVERS is three. The households in the Low Risk Averse submarket (n=440) are those with a RISKAVERS score of three or under, with the remaining households (n=364) in the High Risk Averse submarket. The Mortgage to Income ratio is calculated by dividing outstanding home mortgage debt by household disposable income. The average of this ratio for the full sample is 3.5 and the median is three. The households in the Low Mortgage to Income submarket (n=401) are those with a ratio under three, with the remaining households in the High Mortgage to Income submarket (n=402). Data is drawn from the HILDA survey of Australian households which has been conducted on mostly the same households every year since 2001. The exception is SPREAD, which is derived from data sourced from the Reserve Bank of Australia. This study uses 2010 data for households that entered into a mortgage in the period 2008 to 2010. The full sample consists of 810 households, all of whom own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded). Please see Table A1 for variable definitions. For detailed descriptions of key variables see Appendix A. Standard errors are clustered at industry level. p-values are in parentheses. Significance levels are indicated: *<10%; **<5%; ***<1%.

	Dependent Variable = FRMDUMMY			
	RISK AVERSION		MORTGAGE TO INCOME RATIO	
	LOW	HIGH	LOW	HIGH
REFI	0.201	-0.050	0.386	-0.394
	(0.526)	(0.887)	(0.319)	(0.304)
BHWDUMMY	-0.288	0.845	1.218	-0.272
	(0.843)	(0.222)	(0.442)	(0.701)
Constant	21.712**	3.361	9.389	3.193
	(0.010)	(0.756)	(0.419)	(0.553)
Observations	418	334	387	369
STATE FE	YES	YES	YES	YES
INDUSTRY FE	YES	YES	YES	YES
OCCUPATION FE	YES	YES	YES	YES
Adjusted R^2	0.177	0.176	0.0965	0.196

TABLE 5. Summary statistics: difference in means for households with low and high mortgage to income ratios

This table presents the means and differences in means of two sub-samples for a range of variables of interest when studying the choice between a FRM and an ARM. The sub-samples result from a partition of the full sample included in this study according to household ratios of their mortgages to their incomes. The Mortgage to Income ratio is calculated by dividing outstanding home mortgage debt by household disposable income. The average of this ratio for the full sample is 3.5 and the median is three. The households in the Low Mortgage to Income submarket (n=401) are those with a ratio under three, with the remaining households in the High Mortgage to Income submarket (n=402). All households included in the sample own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded) and who made their mortgage choice in the period 2008 to 2010. All data is sourced from HILDA, except SPREAD, which is derived from data sourced from the Reserve Bank of Australia. FRMDUMMY is an indicator variable that is 1 for a household that has a FRM and zero otherwise. For all other variable definitions please see Table A1. For detailed description of key variables see Appendix A. Significance levels are indicated: *<10%; **<5%; ***<1%.

MORTGAGE TO INCOME RATIO	LOW		HIGH		COMPARISON	
	N	MEAN	N	MEAN	DIFFERENCE	t-stat
FRMDUMMY	401	0.142	402	0.149	-0.007	-0.29
HOMEVALUE ($)	401	463,584	402	507,726	-44,143	-2.38**
MORTGAGEVALUE ($)	401	200,849	402	339,255	-138,406	-15.27***
NETHOMEWEALTH ($)	401	262,734	402	168,471	94,263	5.77***
LVR	401	0.49	402	0.72	-0.23	-12.11***
NEGEQUITY	401	0.01	402	0.03	-0.03	-2.7***
TOTALPROPERTYASSETS ($)	401	545,390	402	604,578	-59,188	-2.21**
NETPROPERTYWEALTH ($)	401	316,688	402	232,342	84,346	3.94***
SUPERANNUATION ($)	401	151,001	402	93,431	57,571	4.77***
BUSINESSASSETS ($)	401	12,329	402	63,334	-51,005	-2.94***
VEHICLES ($)	401	33,094	402	27,208	5,885	1.93*
LIFEINSURANCE ($)	401	20,269	402	37,538	-17,270	-1.28
BANKACCOUNTS ($)	401	18,665	402	11,145	7,520	3.68***
LISTEDEQUITY ($)	401	19,638	402	8,541	11,098	1.9*
TOTALASSETS ($)	401	815,701	402	848,636	-32,935	-0.69
NETWEALTH ($)	401	559,838	402	444,236	115,601	2.78***
HUMANWEALTH ($)	401	834,788	402	715,196	119,592	3.46***
BUSINESSHUMANWEALTH ($)	401	39,249	402	40,039	-790	-0.06
BHWDUMMY	401	0.01	402	0.05	-0.04	-2.94***
SHAREOWN	401	0.36	402	0.29	0.07	2.14**
HCR	401	0.25	402	0.24	0.01	0.96
IWR	401	0.68	402	0.68	0.00	1.79*
IDS	401	1.84	402	1.29	0.56	20.06***
REFI	401	0.47	402	0.34	0.14	4.02***
SPREAD %	401	0.76	402	0.81	-0.05	-1.46
DISPOSABLEINCOME ($)	401	106,402	402	78,199	28,204	9.38***
GOVERNMENTTRANSFERS ($)	401	4,608	402	5,198	-590	-0.99
CONSUMPTION ($)	401	29,495	402	25,989	3,505	4.29***
PROPERTYREPAYMENTS ($)	401	22,600	402	30,323	-7,724	-7.06***
NOCASH	396	0.15	401	0.13	0.02	0.76
SURPLUSINC ($)	401	53,772	402	21,424	32,348	13.64***
MORTGAGE2INC	401	1.90	402	5.11	-3.21	-13.73***
RISKAVERS	396	3.01	401	2.92	0.09	1.13
EDUCATION	396	4.86	401	4.82	0.04	0.26
FEMALE	396	0.53	401	0.53	0.00	-0.04
AVERAGEAGE (years)	396	41.23	401	37.18	4.05	5.24***
COUPLE	401	0.82	402	0.70	0.12	3.96***
OWNNUMS	401	1.64	402	1.58	0.06	1.77*
RETIRED	396	0.03	401	0.02	0.01	1.06

TABLE 6. Summary statistics: difference in means for low and high disposable income households

This table presents the means and differences in means of two sub-samples for a range of variables of interest when studying the choice between a FRM and an ARM. The sub-samples result from a partition of the full sample included in this study according to disposable income. The measure used to split the sample is household disposable income, the average of which for the full sample is $91,511, the median is $88,156. The households in the Low Income submarket (n=405) are those with disposable income less than $88,156, with the remaining households in the High Income submarket (n=405). All households included in the sample own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded) and who made their mortgage choice in the period 2008 to 2010. All data is sourced from HILDA, except SPREAD, which is derived from data sourced from the Reserve Bank of Australia. FRMDUMMY is an indicator variable that is 1 for a household that has a FRM and zero otherwise. For all other variable definitions please see Table A1. For detailed description of key variables see Appendix A. Significance levels are indicated: *<10%; **<5%; ***<1%.

DISPOSABLE INCOME	LOW		HIGH		COMPARISON	
	N	MEAN	N	MEAN	DIFFERENCE	t-stat
FRMDUMMY	405	0.185	405	0.106	0.079	3.2***
HOMEVALUE ($)	405	404,978	405	566,486	-161,508	-9.19***
MORTGAGEVALUE ($)	405	225,167	405	313,281	-88,114	-8.97***
NETHOMEWEALTH ($)	405	179,812	405	253,205	-73,394	-4.48***
LVR	405	0.61	405	0.60	0.00	0.06
NEGEQUITY	405	0.03	405	0.01	0.02	1.72*
TOTALPROPERTYASSETS ($)	405	466,404	405	684,292	-217,888	-8.5***
NETPROPERTYWEALTH ($)	405	224,588	405	326,778	-102,191	-4.82***
SUPERANNUATION ($)	405	75,027	405	168,854	-93,827	-8.01***
BUSINESSASSETS ($)	405	27,857	405	47,597	-19,740	-1.14
VEHICLES ($)	405	25,773	405	34,628	-8,855	-2.92***
LIFEINSURANCE ($)	405	16,500	405	40,828	-24,328	-1.83*
BANKACCOUNTS ($)	405	9,090	405	20,808	-11,717	-5.84***
LISTEDEQUITY ($)	405	6,951	405	21,223	-14,272	-2.46**
TOTALASSETS ($)	405	642,453	405	1,021,383	-378,930	-8.32***
NETWEALTH ($)	405	381,083	405	624,391	-243,307	-5.98***
HUMANWEALTH ($)	405	502,608	405	1,043,631	-541,023	-18.72***
BUSINESSHUMANWEALTH ($)	405	26,463	405	52,141	-25,678	-2.01**
BHWDUMMY	405	0.04	405	0.02	0.02	1.37
SHAREOWN	405	0.22	405	0.42	-0.21	-6.48***
HCR	405	0.28	405	0.21	0.07	5.31***
IWR	405	0.68	405	0.68	-0.01	-7.99***
IDS	403	1.42	405	1.71	-0.29	-8.94***
REFI	405	0.41	405	0.40	0.00	0.14
SPREAD %	405	0.78	405	0.78	0.00	0.04
DISPOSABLEINCOME ($)	405	58,279	405	124,743	-66,463	-29.21***
GOVERNMENTTRANSFERS ($)	405	6,746	405	3,110	3,635	6.27***
CONSUMPTION ($)	405	23,937	405	31,562	-7,625	-9.81***
PROPERTYREPAYMENTS ($)	405	21,404	405	31,501	-10,097	-9.5***
NOCASH	403	0.17	401	0.10	0.06	2.82***
SURPLUSINC ($)	405	12,749	405	60,880	-48,131	-21.99***
MORTGAGE2INC	403	4.37	405	2.59	1.78	7.09***
RISKAVERS	403	3.05	401	2.86	0.19	2.26**
EDUCATION	403	4.24	401	5.45	-1.21	-7.83***
FEMALE	403	0.54	401	0.51	0.03	1.17
AVERAGEAGE (years)	403	38.92	401	39.37	-0.46	-0.58
COUPLE	405	0.60	405	0.91	-0.30	-10.76***
OWNNUMS	405	1.50	405	1.73	-0.23	-6.98***
RETIRED	403	0.05	401	0.01	0.04	3.32***

TABLE 7. Logit regressions of household mortgage choice for various submarkets, includes low and high disposable income submarkets and low and high net wealth submarkets

This table presents results of regressions for several submarkets of FRMDUMMY on a range of variables with potential to influence household choice between a FRM and an ARM. The submarkets represented are those split according to disposable income and those separately split according to net wealth. The measure used to split the sample according to disposable income is household disposable income, the average of which for the full sample is $91,511, the median is $88,156. The households in the Low Disposable Income submarket (n=405) are those with disposable income less than $88,156, with the remaining households in the High Disposable Income submarket (n=405). The measure used to split the sample on net wealth is household net wealth, the average of which for the full sample is over $500,000. The median is $327,104, which is the dividing point between the Low Wealth (n=405) and High Wealth (n=405) submarkets. Data is drawn from the HILDA survey of Australian households which has been conducted on mostly the same households every year since 2001. The exception is SPREAD, which is derived from data sourced from the Reserve Bank of Australia. This study uses 2010 data for households that entered into a mortgage in the period 2008 to 2010. The full sample consists of 810 households, all of whom own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded). Please see Table A1 for variable definitions. For detailed descriptions of key variables see Appendix A. Standard errors are clustered at industry level. p-values are in parentheses. Significance levels are indicated: *<10%; **<5%; ***<1%.

	Dependent Variable = FRMDUMMY			
	DISPOSABLE INCOME		NET WEALTH	
	LOW	HIGH	LOW	HIGH
HCR	-0.967	1.873	0.923	-0.040
	(0.546)	(0.348)	(0.573)	(0.986)
IWR	-9.549	45.732	-14.694	2.497
	(0.172)	(0.343)	(0.115)	(0.960)
SPREAD	-0.424*	-0.441*	-0.591**	-0.018
	(0.073)	(0.084)	(0.015)	(0.968)
RISKAVERS	0.148**	-0.067	0.004	0.017
	(0.015)	(0.438)	(0.967)	(0.947)
NOCASH	0.516	0.704	0.196	1.713**
	(0.234)	(0.160)	(0.673)	(0.011)
EDUCATION	-0.046	0.120	0.095	-0.145
	(0.641)	(0.266)	(0.343)	(0.301)
INCOME	-0.033	-2.440**	0.068	-0.093
	(0.580)	(0.010)	(0.226)	(0.416)
AGE	-0.126	0.038	-0.221	0.299
	(0.469)	(0.889)	(0.324)	(0.218)
SHAREOWN	0.103	0.419	-0.473	0.900***
	(0.796)	(0.274)	(0.283)	(0.003)
IDS	-0.036	0.632	0.084	0.111
	(0.880)	(0.220)	(0.696)	(0.786)
COUPLE	-0.123	-1.330***	-0.363	0.254
	(0.813)	(0.007)	(0.384)	(0.685)
OWNNUMS	0.066	-0.201	0.099	-0.203
	(0.881)	(0.596)	(0.774)	(0.679)
FEMALE	-0.277	0.618	-0.286	-0.176
	(0.517)	(0.440)	(0.379)	(0.871)
LVR	-0.404	1.388	-1.302	0.379
	(0.657)	(0.379)	(0.127)	(0.757)
NEGEQUITY	-0.745	0.515	0.623	-0.817
	(0.554)	(0.736)	(0.467)	(0.624)

(*continued*)

TABLE 7. (**continued**) Logit regressions of household mortgage choice for various submarkets, includes low and high disposable income submarkets and low and high net wealth submarkets

This table presents results of regressions for several submarkets of FRMDUMMY on a range of variables with potential to influence household choice between a FRM and an ARM. The submarkets represented are those split according to disposable income and those separately split according to net wealth. The measure used to split the sample according to disposable income is household disposable income, the average of which for the full sample is $91,511, the median is $88,156. The households in the Low Disposable Income submarket (n=405) are those with disposable income less than $88,156, with the remaining households in the High Disposable Income submarket (n=405). The measure used to split the sample on net wealth is household net wealth, the average of which for the full sample is over $500,000. The median is $327,104, which is the dividing point between the Low Wealth (n=405) and High Wealth (n=405) submarkets. Data is drawn from the HILDA survey of Australian households which has been conducted on mostly the same households every year since 2001. The exception is SPREAD, which is derived from data sourced from the Reserve Bank of Australia. This study uses 2010 data for households that entered into a mortgage in the period 2008 to 2010. The full sample consists of 810 households, all of whom own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded). Please see Table A1 for variable definitions. For detailed descriptions of key variables see Appendix A. Standard errors are clustered at industry level. p-values are in parentheses. Significance levels are indicated: *<10%; **<5%; ***<1%.

	Dependent Variable = FRMDUMMY			
	DISPOSABLE INCOME		NET WEALTH	
	LOW	HIGH	LOW	HIGH
REFI	-0.009	-0.253	0.119	-0.020
	(0.978)	(0.462)	(0.717)	(0.960)
BHWDUMMY	0.900		-0.352	0.030
	(0.117)		(0.641)	(0.985)
Constant	6.524	-7.740	9.518	-4.942
	(0.198)	(0.791)	(0.148)	(0.884)
Observations	381	341	370	375
STATE FE	YES	YES	YES	YES
INDUSTRY FE	YES	YES	YES	YES
OCCUPATION FE	YES	YES	YES	NO
Adjusted R^2	0.141	0.163	0.129	0.207

TABLE 8. Summary statistics: difference in means for low and high wealth households

This table presents the means and differences in means of two sub-samples for a range of variables of interest when studying the choice between a FRM and an ARM. The sub-samples result from a partition of the full sample included in this study according to their wealth. The measure used to split the sample is household net wealth, the average of which for the full sample is over $500,000. The median is $327,104, which is the dividing point between the Low Wealth (n=405) and High Wealth (n=405) sub-samples. All households included in the sample own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded) and who made their mortgage choice in the period 2008 to 2010. All data is sourced from HILDA, except SPREAD, which is derived from data sourced from the Reserve Bank of Australia. FRMDUMMY is an indicator variable that is 1 for a household that has a FRM and zero otherwise. For all other variable definitions please see Table A1. For detailed description of key variables see Appendix A. Significance levels are indicated: *<10%; **<5%; ***<1%.

NET WEALTH	LOW		HIGH		COMPARISON	
	N	MEAN	N	MEAN	DIFFERENCE	t-stat
FRMDUMMY	405	0.183	405	0.109	0.074	3***
HOMEVALUE ($)	405	347,084	405	624,381	-277,297	-17.68***
MORTGAGEVALUE ($)	405	253,099	405	285,348	-32,248	-3.15***
NETHOMEWEALTH ($)	405	93,984	405	339,033	-245,049	-17.3***
LVR	405	0.72	405	0.49	0.23	12.46***
NEGEQUITY	405	0.04	405	0.00	0.04	3.7***
TOTALPROPERTYASSETS ($)	405	372,929	405	777,767	-404,838	-17.88***
NETPROPERTYWEALTH ($)	405	103,781	405	447,585	-343,804	-19.33***
SUPERANNUATION ($)	405	49,772	405	194,109	-144,337	-13.05***
BUSINESSASSETS ($)	405	4,373	405	71,081	-66,708	-3.9***
VEHICLES ($)	405	21,203	405	39,198	-17,994	-6.04***
LIFEINSURANCE ($)	405	800	405	56,528	-55,728	-4.22***
BANKACCOUNTS ($)	405	8,438	405	21,460	-13,022	-6.53***
LISTEDEQUITY ($)	405	2,125	405	26,050	-23,924	-4.15***
TOTALASSETS ($)	405	461,126	405	1,202,710	-741,584	-18.71***
NETWEALTH ($)	405	168,172	405	837,302	-669,130	-19.54***
HUMANWEALTH ($)	405	702,469	405	843,770	-141,300	-4.13***
BUSINESSHUMANWEALTH ($)	405	24,041	405	54,564	-30,523	-2.39**
BHWDUMMY	405	0.02	405	0.04	-0.02	-1.37
SHAREOWN	405	0.22	405	0.42	-0.19	-5.99***
HCR	405	0.18	405	0.31	-0.14	-10.72***
IWR	405	0.68	405	0.68	-0.01	-8.95***
IDS	405	1.51	403	1.62	-0.11	-3.23***
REFI	405	0.34	405	0.47	-0.13	-3.75***
SPREAD %	405	0.78	405	0.79	-0.01	-0.17
DISPOSABLEINCOME ($)	405	78,279	405	104,743	-26,465	-8.46***
GOVERNMENTTRANSFERS ($)	405	5,880	405	3,975	1,905	3.23***
CONSUMPTION ($)	405	24,789	405	30,710	-5,921	-7.45***
PROPERTYREPAYMENTS ($)	405	23,363	405	29,543	-6,179	-5.62***
NOCASH	402	0.17	402	0.10	0.08	3.54***
SURPLUSINC ($)	405	29,903	405	43,726	-13,822	-5.07***
MORTGAGE2INC	403	3.70	405	3.26	0.45	1.73*
RISKAVERS	402	3.01	402	2.91	0.10	1.19
EDUCATION	402	4.40	402	5.30	-0.90	-5.73***
FEMALE	402	0.51	402	0.54	-0.02	-0.96
AVERAGEAGE (years)	402	35.29	402	43.01	-7.72	-10.54***
COUPLE	405	0.69	405	0.82	-0.13	-4.39***
OWNNUMS	405	1.55	405	1.68	-0.13	-3.81***
RETIRED	402	0.03	402	0.03	0.00	-0.11

Appendix A: Variable definitions and rationale for inclusion

A.1. Home equity

The home equity measure adopted for this study is the housing collateral ratio (HCR) of Lustig and Van Nieuwerburgh (2005). It is the ratio of (collateralisable) housing wealth to (noncollateralisable) human wealth and is found by Lustig and Van Nieuwerburgh to shift the conditional distribution of asset prices and consumption growth.

In Lustig and Van Nieuwerburgh the HCR determines a household's ability to insulate its consumption from labour income shocks. In the same way the HCR can also be said to determine a household's ability to insulate its consumption from shocks driven by changes in the interest expense of an ARM. As such it is an appropriate measure for home equity in this study. The expectation is that HCR will be negatively associated with a household's likelihood of choosing a FRM.

A.1.1. Housing wealth

The measure of housing wealth applied in this study as an input for the HCR calculation is the household's net property wealth. This is the estimated value of the family home at the time of the survey less the amount outstanding on the mortgage, any second mortgage, and any other borrowing incurred (e.g. from a relative) to purchase the home. To this is added the value of other property (that is not business related) owned by the household less any debt outstanding on that property.

A.1.2. Human wealth measure

Measuring human wealth is less straightforward. From a theoretical perspective the present value of all future after tax wage and salary income would adequately represent human wealth. From a practical perspective however this is much easier said than done. A simplifying assumption applied in this study is that an individual's after-tax wage and salary income grows at a constant rate until they

retire, at which point it falls to zero. As such their human wealth can be estimated by applying the formula for the present value of a constantly growing annuity.

There are however challenges associated with this approach, including producing accurate estimates for the growth rate of income and an appropriate discount rate. These likely differ for each individual depending on a number of factors. Key among these could be expected to include the individual's age, their level of education, and the industry in which they work. All of this information, along with current income, are available in the HILDA database. However estimating growth rates and discount rates separately for each individual would necessitate the introduction of a range of assumptions which may or may not be justifiable. It would also come at the cost of parsimony and involve a level of complexity beyond the theoretical ambitions of this study.

This study instead assumes a common discount rate and growth rate to estimate human wealth for each individual. The approach is similar to that adopted in Heaton and Lucas (2000) who apply a common growth rate (zero real growth) and discount rate (5% real rate) to impute capitalized income in "the simplest possible way," as they put it. The factors identified above as being relevant for estimating individual level growth and discount rates, such as age, education, and industry, are directly incorporated in all fully specified regressions undertaken in this study, and thus provide a form of control for individual variation across these dimensions. The common discount rate applied in this study is estimated by adding the average yield on the 10-year Australian government bond (the longest maturity available, for which there is a deep liquid market) for the year in which the data is sourced (i.e. 2010) to the market risk premium, which is assumed to be 5%. The change in the consumer price index (CPI) for the same year is used to estimate the common growth rate. As such the common discount rate applied is 5.37%, and the common growth rate applied is 2.8%.

A secondary challenge comes with estimating the term of the annuity. This could be defined as the number of years the individual will continue to earn wage and salary income, which is safe to assume will be the number of years between now and their retirement. The main uncertainty with this

approach is estimating when the individual will retire. One approach is to assume everyone retires at the same age, say 70. An alternative would be to assume that everyone retires at the age they expect to retire[18]. However given the propensity for individuals' retirement plans to change (usually delayed, see Cobb-Clark and Stillman, 2009) I make the assumption that everyone will retire at 70. This is above the current age at which Australian workers become eligible to receive the age pension (i.e. 65 years old) but this pension qualifying age is scheduled to be lifted gradually to 67, starting in 2017, and further increases are expected beyond that time[19].

The initial payment used in estimating human wealth for each individual is their after-tax wage and salary income. This is derived by applying individual income tax rates in Australia to estimate the tax paid on reported pre-tax wage and salary income.

A.1.3. Human wealth from small business

While this approach provides a robust measure of human wealth it does not take into account income earned outside of wages and salaries. To account for the possibility that human wealth can be realised in income earned through self-employment or small business this study also considers estimates of human wealth based on each individual's business income as reported in the HILDA survey. The same approach applied to estimate human wealth based on wage and salary income is applied to estimate human wealth based on business income, or business human wealth. The only difference is the initial payment. Given the validity of this calculation maybe more susceptible to scrutiny than a wage and salary calculation[20] I do not incorporate this number directly into calculations for HCR. Rather I

[18] HILDA asks respondents for their expected retirement age

[19] In its 2014 budget the Australian government announced an increase in the age pension qualifying age to 70 years by 2035. Challenges getting parliament to approve this change means it is not currently law in Australia. However given Australia's deteriorating demographics and the overall desire of Australian governments to address budget imbalance it is reasonable to assume this change, or something similar, will be adopted at some point over the medium term. Given the median age for household owners in the main sample is 38, most of them will not be contemplating retirement until at least 2035, by which time they will likely need to be 70 to claim the pension.

[20] For example, the assumptions about annuity term and constant growth rate would appear to be much more difficult to justify for a small business income stream than a wage and salary income stream.

compare business human wealth to human wealth for each household and use a dummy variable ('BHWDUMMY') to identify those households where business human wealth is greater than human wealth. The importance of business derived income for household financial choice is demonstrated in Heaton and Lucas (2000) who find that entrepreneurial income risk has an impact on portfolio choice. It is also shown in Harrison and Noordewier (2011) to be directly relevant for mortgage choice. Their self-employment dummy is significant at the 1% level in all their models examining the link between household characteristics and the choice of an ARM.

Interestingly only a very small number of households in the dataset employed in this study have business human wealth greater than wage and salary human wealth. Among all households in the HILDA survey that own their own home far fewer of them with greater business human wealth used a mortgage to finance their home purchase than other households. Among households with greater business human wealth that do have a mortgage, the average loan to valuation ratio tends to be lower than the average for other households. This may reflect the possibility that households that are more reliant on business income make different finance choices, including mortgage choices. It may reflect greater difficulty households with greater business human wealth have qualifying for a mortgage. Alternatively, there may be an underrepresentation of such households participating in the HILDA Survey overall, perhaps reflecting their unwillingness to reveal information, including about income and taxes, to anyone remotely connected with the government. Regardless of the causes of their relatively small representation in this study households that are more reliant of business than wage and salary income appear likely to make different financial decisions. BHWDUMMY appropriately controls for this.

The observations considered in this study are households. HCR is a household measure. The approach outlined above however generates estimates for individual human wealth. To translate individual human wealth to a household level measure this study aggregates the estimates for human wealth of all household members that are legal owners of the home. A similar approach is applied when

translating other individual level variables to the household level. A key difference being whether the individual level measures are aggregated, averaged or otherwise, which depends on the nature of each variable being translated.

When estimating HCR in practice a transformation is required to cope with the possibility that human wealth for some households is zero (for example households where no home owners are under the age of 70), in which case untransformed HCR would be undefined. The original calculation of HCR is as follows:

$$HCR_{original} = \frac{Housing\ Wealth}{Human\ Wealth}$$

The transformed calculation of HCR is as follows:

$$HCR_{transformed} = \frac{Housing\ Wealth}{Housing\ Wealth + \ Human\ Wealth}$$

This transformation also captures variability in the ratio of housing wealth to human wealth across households. As this transformation does not completely rule out the possibility of HCR being undefined one is added to the denominator. Given a log transformation is also warranted, the final version of HCR is as follows:

$$HCR_{final} = \log\left(1 + \frac{Housing\ Wealth}{(1 + \ Housing\ Wealth + \ Human\ Wealth)}\right)$$

This transformation retains the relationship between HCR and housing wealth. Discussion of HCR in the body of the text refers to this final version incorporating this log transformation.

A.2. Buffer-stock savings

The measure of buffer-stock savings adopted for this study is the investment-wealth ratio (IWR), which in untransformed mode is the complement to the consumption-wealth ratio (CWR) (see Lettau and Ludvigson (2001) for derivation of CWR for a representative agent).

Lettau and Ludvigson (2001) find fluctuation in the CWR a strong predictor of stock returns. Their study indicates that investors will adjust consumption in an attempt to 'smooth out' transitory movements in their asset wealth arising from time variation in expected returns. Investors do this in an effort to insulate future consumption from fluctuations in expected returns.

The link between consumption and wealth is well established, including in Carroll and Samwick (1997) who find that consumers hold wealth principally to insulate consumption against near-term fluctuations in income. The importance of this motive is also evident in the studies of Skinner (1988) and Dardanoni (1991), that find precautionary savings[21], or buffer-stock savings, account for the majority of household savings for their particular samples. Cagetti (2003) also finds household wealth accumulation to be driven by precautionary motives, especially earlier in the life-cycle.

Insofar as the wealth of a household can either be consumed or reinvested IWR is the complement of CWR and is a measure of wealth relative to consumption. It indicates a household's ability to insulate consumption against fluctuations in income. In the same way the IWR can also be said to indicate a household's ability to insulate consumption from the interest expense risk of an ARM. As such it is an appropriate proxy for buffer-stock savings in this study. As is the case for HCR, the expectation is that IWR will be negatively associated with a household's likelihood of choosing a FRM.

[21] Precautionary savings are savings that arise as a precaution against future uncertainty. The term is used interchangeably in this study with buffer-stock savings.

A.2.1. Household wealth

To measure a household's wealth this study combines household net worth with human wealth and household consumption. Household net worth is defined in the HILDA dataset as a household's total assets less its total debt. Total assets includes all financial assets and investments, property and business assets and vehicles. Total household debt includes that related to property, business and other investments, as well as personal debt. Human wealth is the same as is derived for estimating the HCR.

A.2.2. Household consumption

The measure of household consumption applied in this study is a household's regular consumption, and includes the items often incorporated into any standard non-durable consumption category, as well as costs associated with motor vehicle repair and running, public transport, utilities, telephony and internet, meals eaten out and holiday travel. It does not include medical, education or insurance costs, or any dwelling or durables costs. The original calculation of IWR is as follows.

$$IWR_{original} = \frac{Net\ Worth + \ Human\ Wealth}{Net\ Worth + \ Human\ Wealth + \ Consumption}$$

This study applies a similar transformation to IWR as applied for HCR. The final version of IWR is as follows.

$$IWR_{final} = \log\left(1 + \frac{Net\ Worth + \ Human\ Wealth}{(1 + Consumption + Net\ Worth + \ Human\ Wealth)}\right)$$

A.3. Risk aversion (and NOCASH)

Several studies cite a household's level of risk aversion as a key determinant in their mortgage choice (for example Campbell and Cocco, 2003; Coulibaly and Li, 2009; and Hullgren and Soderberg, 2013). While the home equity and buffer-stock savings measures adopted for this study may to some degree reflect household risk characteristics, they may not necessarily reflect household willingness to take

on risk. Whether household attitudes to risk are best reflected in their actual allocation decisions (HCR and IWR, for example) or their declared attitude to risk is not clear. As such a direct estimate for household risk aversion based on declared attitudes to risk is also incorporated in this study as an independent variable. This estimate is derived from respondents' answers to a question asking how much financial risk they are willing to take with savings or investments. Those who say they do not have any spare cash for savings or investments are asked how much risk they would take if they did have spare cash. As this is an individual level variable the results of each household member that is a legal owner of the home are averaged to obtain a measure for the household, called RISKAVERS. Valid measures of RISKAVERS range from one to four, with a higher number representing greater risk aversion. This study also employs a dummy variable called NOCASH equal to one if the respondent identifies themselves as not having spare cash for savings or investments. This is similarly averaged to obtain a measure for the household.

A.4. Likelihood of a mistake

In-line with the view that the majority of FRMs represent investment mistakes other variables that warrant inclusion are those that may be linked to the likelihood of making an 'investment mistake'. It is reported that financial mistakes are more common among consumers with lower levels of education and income, and lower financial literacy (see for example Campbell, Jackson, Madrian and Tufano, 2011; and Bergstresser and Beshears, 2010). It has also been noted that borrowers that are older, or with less income or education are more likely to say that they don't know their interest rate details (Bucks and Pence, 2008). As such variables called EDUCATION and INCOME are included in the regression models, with both expected to produce negative coefficients. INCOME might also proxy for a household's ability to manage the interest expense risk on an ARM, which could also explain a negative coefficient for this variable, if it eventuates. An AGE variable is also included though its likely impact is less clear given arguably conflicting evidence. As well as the above which suggests AGE should be positively linked with the likelihood of making a mistake, elsewhere it has been suggested

that older households make astute portfolio choices. For example Sinai and Souleles (2005) find that homeownership rates start declining when people are in their sixties and do so at a faster rate in areas with higher variance in rents.

Financial literacy has been positively associated with stock market participation (for example van Rooij, Lusardi and Alessie, 2011; and Calvet, Campbell, and Sodini, 2007). As such I include a dummy variable called SHAREOWN which is one if anyone in the household has direct investments in shares, managed funds or property trusts, and zero otherwise. Insofar as financial literacy limits the likelihood of investment mistakes, SHAREOWN is expected to have a negative coefficient.

A.5. FRM-ARM spread

Several of the studies I have cited identify the current FRM-ARM spread as a key driver, if not the key driver, of the choice between a FRM and ARM (for example Zocchi, 2013; Badarinza, Campbell and Ramadoria, 2013; Coulibaly and Li, 2009; as well as several others). Therefore spread is included in this study. Following Badarinza et al (2013) I use the ARM and FRM rates published by the Reserve Bank of Australia[22] to generate a monthly measure of the FRM-ARM spread, which I average to estimate SPREAD for each year. Given the mortgage choices of households are considered over a period of three years only, lack of variation makes it difficult to draw any meaningful conclusions about SPREAD in this study. It is therefore included in this study as a control rather than a genuine variable of interest.

A.6. Affordability

Some studies find that affordability plays a role in the choice between an ARM and FRM (for example Coulibaly and Li, 2009; and Hullgren and Soderberg, 2013). As such this study also includes a measure of home loan affordability. In assessing mortgage applications a key characteristic considered by

[22] each month the RBA publishes indicator rates for 3 year fixed rate mortgages offered by banks and 'standard' and discounted indicator rates for adjustable rate mortgages offered by banks. I use the discounted indicator rates for ARMs as this is the rate that most ARM borrowers pay.

lenders is the applicant's ability to service the loan out of current income. While there are several variants, a common measure used is the debt servicing ratio, which is the percentage of total debt servicing requirements to total income available to meet these requirements. This study uses the inverse of this, the ratio of a household's disposable income to its debt servicing requirements. It is akin to an interest coverage ratio and is calculated as follows.

$$IDS = \log\left(1 + \frac{Disposable\ Income}{(1 + Debt\ Servicing\ Requirements)}\right)$$

Disposable income is the after-tax total income for the household from all sources. Debt servicing requirements is the usual repayments made by the household on all property loans, including those covering the family home and those related to other property owned by the household. IDS could be considered as indicating a household's ability to manage the interest expense risk of an ARM, and as such is expected to be negatively associated with the likelihood of choosing a FRM.

A.7. Non-financial characteristics

Other characteristics on which households differ and which are commonly considered in finance studies are marital status and gender. Dhillon, Shilling, and Sirmans (1987) find that households with coborrowers and married couples are more likely to use ARMs. Several studies have shown that groups matter for financial decision making. Masclet, Colombiera, Denant-Boemonta, and Lohéaca (2009) conduct a lottery-choice experiment and show that groups are more likely than individuals to choose safe lotteries. Bacon and Moffat (2012) find that groups are more likely than individuals to choose fixed rate mortgages, which the authors interpret as indicating that groups are more risk averse. The result surprises them given the ability of groups to share risk. This study includes a dummy variable called COUPLE to reflect the marital status of the household. It is one where any of the legal owners of the house identify themselves as either legally married, or de-facto, and zero otherwise. To further cover the possibility that groups behave differently to individuals this study also incorporates

an additional variable called OWNNUMS, which is the number of legal owners of the home for each household.

Gender is shown to be meaningful in a range of financial contexts. Adams and Ferreira (2009) show that female directors have a significant impact on board inputs and firm outcomes. Adams and Funk (2012) find that female directors are more risk loving than male directors. Others have indicated that females are more risk averse (Byrnes, Miller and Schafer (1999)) though this depends on the context (Harris, Jenkins and Glaser (2006)). This study includes a variable called FEMALE to reflect the gender composition of the household. It ranges from zero to one and is the average of the gender score applied to each of the legal owners of the house. This gender score is one if the person is female, and zero otherwise.

A.8. Other mortgage characteristics

Lastly included are a small group of variables that reflect mortgage characteristics and may be associated with household mortgage preference, though there inclusion is mainly driven by a desire to control for any influence they may have. One is LVR, which is the loan to valuation ratio of the mortgage at the time of the HILDA survey. LVR is a key mortgage parameter. Damen and Buyst (2013) include it in their study, as a proxy for financial constraint, expecting a positive association between LVR and the probability of choosing a FRM. Their results indicate the opposite is true, for low income households only.

Related to LVR is NEGEQUITY which identifies households whose mortgage exceeds the value of their home (i.e. LVR greater than 100%). Given the dataset only includes households that take out a mortgage in 2008 to 2010, those that have negative equity in 2010 are arguably special cases. While a small number of local markets in Australia experienced modest falls in residential property prices over the 2008 to 2010 period (according to RP Data) it is unlikely that these would've been substantial enough to wipe out all home equity for any household in the dataset, unless their mortgage had an

LVR of 100%, or thereabouts, at origination, which seems unlikely (other than for special cases) given the market conditions at the time. As such I assume households which report negative equity in 2010 have gone into their loans with negative equity positions, possibly on the basis of providing their lenders with sufficient support sourced elsewhere (e.g. third-party guarantee such as the borrower's parents). As such NEGEQUITY identifies these houses as special cases and seeks to control for any distorting influence they may otherwise have on regression outcomes.

The final variable included under this category is REFI which indicates whether or not the household has refinanced its mortgage in the three years to 2010. Coulibaly and Li (2009) include a similar variable in their study of mortgage choice in the United States and find it positively associated with the probability of choosing a FRM. Its likely influence on mortgage choice in Australia is unclear.

Appendix B: United States and Australian mortgage markets, key differences relevant to FRM usage

Before discussing the methodology employed in this study it is valuable to briefly comment on intercountry differences in mortgage choice. Most of the relevant literature focusses on the United States market, while the focus of this study is the Australian mortgage market. The vast difference between FRM usage in the United States, typically over 70%, and Australia, typically under 30%, suggests that the key determinant of a households' choice of mortgage may well be country of residence. There are certainly key differences between these mortgage markets that make households in the United States relatively more predisposed to choose a FRM than Australian households, and some of these differences are identified below. However this study is equally relevant in both markets, and indeed in all mortgage markets where households can choose between a FRM and ARM.

As noted in Badarinza, Campbell and Ramadoria (2013) mortgage markets are remarkably heterogeneous across countries. While they all serve a similar purpose, each is a complex system having followed its own evolutionary path. In the United States much of this evolution occurred as government response to crises, starting with the Great Depression of the 1930s when the housing market had largely collapsed. Government action during that crisis included establishing the Home Owners Loan Corporation to purchase and reinstate mortgages that had defaulted, establishing the Federal Housing Administration (FHA) to insure these mortgages, and establishing the Federal National Mortgage Association (Fannie Mae) to foster a secondary market for FHA-insured mortgages.

Loan form was thought to have exacerbated the housing crisis during the Great Depression, and in stipulating the types of mortgages it would insure the FHA effectively became the standard setter for mortgages after that time. Most mortgages went from being short term, non-amortising and ARM prior to the Great Depression, to 20-year, amortising and FRM, with a lower required down-payment. The FRM also met the requirements of mortgage investors who had greater appetite for cash flows that would not vary over the life of their investment. In 1948 the FHA extended the maximum mortgage term to 30 years, and the 30-year FRM has been the most common mortgage in the United States ever since.

This institutional framework that predisposes households in the United States to choosing FRMs over ARMs, which was set in the aftermath of the Great Depression, largely exists to this day. The FHA and Fannie Mae continue to be key pillars of the United States mortgage market, and both can be said to favour FRMs over ARMs. While the importance of the FHA has diminished, its most popular mortgage currently is the 203(b), a fixed rate only loan. Fannie Mae's Standard Eligibility Requirements for conventional first mortgages shows that the loan-to-valuation ratio it is willing to accept on the FRMs it purchasers is 10% higher than it is willing to accept for ARMs (except for single-family houses that are principal residences where the difference is 7% higher).

The significance of Fannie Mae, and its sister agencies Freddie Mac and Ginnie Mae, has grown in importance over time. Two key catalysts for this growth were the savings and loan crisis in the 1980s when depositor funding of mortgages in the United States was severely tested, and securitization became a dominant mechanism for mortgage funding, and the GFC which saw non-agency mortgage securitization all but disappear. According to Ginnie Mae, household mortgage debt in the United States totalled $10.3trillion at the end of 2016. Outstanding agency mortgage-backed securities (MBS) at that time was $6.1trillion, $2.7trillion of which was issued by Fannie Mae, with Ginnie Mae and Freddie Mac having issued roughly equal portions of the remainder. Only 6% of Fannie Mae's outstanding single-family book of business, which makes up more than 90% of its total business, were ARMs at the end of 2016. This proportion is shrinking given only 2% of its mortgage acquisitions during 2016 were ARMs.

The distinguished place that FRMs have in the United States mortgage market is further illustrated in that savings and loans institutions, once key funders of mortgages in the United States, were not permitted to invest in ARMS until the 1980s.

The Australian mortgage market is very different, possibly in part a result of the differing nature of government involvement. While no less nurtured than its counterpart in the United States the hand of government has arguably had a lighter touch in Australia. One difference that may be linked to the marked difference in FRM usage is their different sources of mortgage funding. While mortgages in the United States market are predominantly investor funded, in Australia they are predominantly depositor funded. As such the dominant mortgage type in each market could be said to be a logical response to dominant funding type in each market. The United States market predominantly relies on long-term investments funding long duration assets (FRM), the Australian predominantly relies on short-term investments (deposits) funding short duration assets (ARM).

Another factor which may explain part of the difference in level of FRM usage in each market is the type of FRM product common to each. A key difference is in the penalty imposed for prepayment. In

Australia the borrower typically pays the lender the 'economic cost' of prepayment, which is akin to the difference between the net present value of the mortgage and its book value, if this difference is positive. In the United States there typically is no penalty for prepayment. This results in households with 30-year FRMs often prepaying their mortgage and refinancing when market rates are sufficiently below the rate on their existing mortgage. As such most FRMs in the United States can effectively be thought of as being fixed upwards, but adjustable downwards. This flexibility arguably makes the FRM available in the United States much more attractive than that available to Australian households.

While differences like these lead to variation in FRM usage between the United States and Australian mortgage markets they are not the focus of this study. This study is focused on identifying the household characteristics that can be associated with households choosing one type of mortgage over another. Its findings are relevant to all mortgage markets where households can choose between a FRM or ARM.

TABLE A1. Variable definitions

This table presents definitions of the variables used in this study. The source for all variables is HILDA unless stated otherwise.

VARIABLES	DEFINITION
FRMDUMMY	Indicator variable for a household that has a fixed rate mortgage
HOMEVALUE ($)	Self-estimated value of the family home at the time of the survey
MORTGAGEVALUE ($)	Amount outstanding at the time of the survey on the mortgage, any second mortgage, and any other borrowing incurred to purchase the home
NETHOMEWEALTH ($)	HOMEVALUE less MORTGAGEVALUE
LVR	Loan to valuation ratio of the mortgage at the time of the HILDA survey
NEGEQUITY	Indicator variable for a household that has negative housing wealth at the time of the survey
TOTALPROPERTYASSETS ($)	HOMEVALUE plus the value of any other property (not business related) owned by the household
NETPROPERTYWEALTH ($)	NETHOMEWEALTH plus the value of other property (not business related) owned by the household less any debt outstanding on that property
SUPERANNUATION ($)	Total estimated value of superannuation funds held by members of the household at the time of the survey
BUSINESSASSETS ($)	Total estimated value of business assets held by members of the household at the time of the survey
VEHICLES ($)	Total estimated value of vehicles owned by members of the household at the time of the survey
LIFEINSURANCE ($)	Total estimated cash value of life insurance policies held by members of the household if cashed in at the time of the survey
BANKACCOUNTS ($)	Total estimated value of accounts held by members of the household with banks (or similar) at the time of the survey
LISTEDEQUITY ($)	Total estimated value of investments in shares, managed funds or property funds (excluding investments held in superannuation)
TOTALASSETS ($)	Total estimated value of all assets held by members of the household at the time of the survey
NETWEALTH ($)	TOTALASSETS less Total estimated value of all debt held by members of the household at the time of the survey
HUMANWEALTH ($)	Estimated present value of future after tax wage and salary income summed for all legal owners of the home (*See Variables Definition section for more information*.)
BUSINESSHUMANWEALTH ($)	Estimated present value of future after tax business income summed for all legal owners of the home (*See Variables Definition section for more information*.)
BHWDUMMY	Indicator variable for a household where BUSINESSHUMANWEALTH is greater than HUMANWEALTH
SHAREOWN	Indicator variable for a household that has owns shares, managed funds or property funds
HCR	Housing Collateral Ratio (*See Variables Definition section for more information*.)
IWR	Investment Wealth Ratio (*See Variables Definition section for more information*.)
IDS	Income to Debt Servicing requirements. Ratio of DISPOSABLEINCOME to PROPERTYREPAYMENTS. (*See Variables Definition section for more information*.)
REFI	Indicator variable for a household that has refinanced its mortgage in the three years to 2010

(continued)

TABLE A1. Variable definitions (continued)

This table presents definitions of the variables used in this study. The source for all variables is HILDA unless stated otherwise.

VARIABLES	DEFINITION
SPREAD %	Average difference between FRM and ARM rates published monthly for the three calendar years to 2010 (*Source: RBA*) (*See Variables Definition section for more information*.)
DISPOSABLEINCOME ($)	Combined after tax income from private sources of all members of the household in the financial year prior to the survey
GOVERNMENTTRANSFERS ($)	Combined Australian public transfers to all members of the household in the financial year prior to the survey
CONSUMPTION ($)	Annual household regular consumption (*See Variables Definition section for more information*.)
PROPERTYREPAYMENTS ($)	Annual repayments made by the household on all property loans
NOCASH	The average for all owners of the home of an indicator variable for individual respondents that identify themselves as not having any spare cash for savings or investments (*See Variables Definition section for more information*.)
SURPLUSINC ($)	DISPOSABLEINCOME less CONSUMPTION less PROPERTYREPAYMENTS
MORTGAGE2INC	Ratio of MORTGAGEVALUE to DISPOSABLEINCOME
RISKAVERS	The average for all owners of the home of a risk aversion measure for individual respondents ranging from one (least risk averse) to four (most risk averse) (*See Variables Definition section for more information*.)
EDUCATION	The average for all owners of the home of the highest education level achieved ranging from one (did not complete high school) to nine (postgraduate qualification)
FEMALE	The average for all owners of the home of an indicator variable for female
AVERAGEAGE (years)	The average for all owners of the home of their age at 30 June 2010
COUPLE	Indicator variable for a household where any of the home owners identify themselves as either legally married or in a de-facto relationship
OWNNUMS	The number of legal owners of the home
RETIRED	The average for all owners of the home of an indicator variable for retired
STATE	The Australia state where the household is located
OCCUPATION	The 1-digit ANZSCO occupation code (2006) for the occupation of the owner of the household with the highest disposable income in the financial year prior to the survey
INDUSTRY	The ANZSIC industry division classification (2006) for the industry of the main job of the owner of the household with the highest disposable income in the financial year prior to the survey

TABLE A2. Summary statistics: difference in means for households that do and do not own shares

This table presents the means and differences in means of two sub-samples for a range of variables of interest when studying the choice between a FRM and an ARM. The sub-samples result from a partition of the full sample included in this study according to whether the household owns shares or not. The measure used to split the sample is a dummy variable called SHAREOWN which is one if anyone in the household has direct investments in shares, managed funds or property trusts, and zero otherwise. There are 550 households in the sample that do not own shares; the remaining households do own shares. All households included in the sample own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded) and who made their mortgage choice in the period 2008 to 2010. All data is sourced from HILDA, except SPREAD, which is derived from data sourced from the Reserve Bank of Australia. FRMDUMMY is an indicator variable that is 1 for a household that has a FRM and zero otherwise. For all other variable definitions please see Table A1. For detailed description of key variables see Appendix A. Significance levels are indicated: *<10%; **<5%; ***<1%.

SHAREOWNERSHIP	NO		YES		COMPARISON	
	N	MEAN	N	MEAN	DIFFERENCE	t-stat
FRMDUMMY	550	0.155	260	0.127	0.028	1.04
HOMEVALUE ($)	550	448,566	260	564,352	-115,786	-5.98***
MORTGAGEVALUE ($)	550	262,912	260	282,576	-19,664	-1.79*
NETHOMEWEALTH ($)	550	185,655	260	281,777	-96,122	-5.51***
LVR	550	0.62	260	0.57	0.05	2.23**
NEGEQUITY	550	0.02	260	0.03	-0.01	-0.81
TOTALPROPERTYASSETS ($)	550	515,451	260	702,054	-186,604	-6.69***
NETPROPERTYWEALTH ($)	550	227,499	260	377,610	-150,111	-6.69***
SUPERANNUATION ($)	550	94,992	260	178,946	-83,953	-6.61***
BUSINESSASSETS ($)	550	32,679	260	48,406	-15,726	-0.85
VEHICLES ($)	550	30,521	260	29,523	998	0.31
LIFEINSURANCE ($)	550	23,436	260	39,723	-16,287	-1.14
BANKACCOUNTS ($)	550	11,683	260	21,858	-10,175	-4.7***
LISTEDEQUITY ($)	550	0	260	43,888	-43,888	-7.27***
TOTALASSETS ($)	550	723,889	260	1,060,442	-336,553	-6.81***
NETWEALTH ($)	550	414,748	260	688,868	-274,120	-6.31***
HUMANWEALTH ($)	550	700,997	260	925,688	-224,691	-6.2***
BUSINESSHUMANWEALTH ($)	550	45,741	260	25,682	20,059	1.46
BHWDUMMY	550	0.04	260	0.03	0.01	0.7
SHAREOWN	550	0.00	260	1.00	-1.00	0
HCR	550	0.24	260	0.25	-0.01	-0.5
IWR	550	0.68	260	0.68	0.00	-5.16***
IDS	549	1.53	259	1.62	-0.09	-2.51**
REFI	550	0.39	260	0.44	-0.05	-1.34
SPREAD %	550	0.81	260	0.72	0.09	2.44**
DISPOSABLEINCOME ($)	550	84,585	260	106,162	-21,577	-6.33***
GOVERNMENTTRANSFERS ($)	550	5,604	260	3,497	2,107	3.34***
CONSUMPTION ($)	550	26,774	260	29,812	-3,037	-3.48***
PROPERTYREPAYMENTS ($)	550	25,147	260	29,215	-4,068	-3.42***
NOCASH	545	0.16	259	0.09	0.07	2.95***
SURPLUSINC ($)	550	32,281	260	46,405	-14,124	-4.83***
MORTGAGE2INC	548	3.76	260	2.88	0.88	3.19***
RISKAVERS	545	3.00	259	2.86	0.14	1.56
EDUCATION	545	4.58	259	5.41	-0.83	-4.94***
FEMALE	545	0.54	259	0.49	0.05	1.97**
AVERAGEAGE (years)	545	38.00	259	41.55	-3.55	-4.3***
COUPLE	550	0.74	260	0.80	-0.06	-1.97**
OWNNUMS	550	1.59	260	1.66	-0.06	-1.76*
RETIRED	545	0.03	259	0.03	0.00	-0.12

TABLE A3. Logit regressions of household mortgage choice for various submarkets, includes those for households that do not and do own shares and low and high average age submarkets

This table presents results of regressions for several submarkets of FRMDUMMY on a range of variables with potential to influence household choice between a FRM and an ARM. The submarkets represented are those split according to shareownership and those separately split according to household average age. The measure used to split the sample according to shareownership is a dummy variable called SHAREOWN which is one if anyone in the household has direct investments in shares, managed funds or property trusts, and zero otherwise. There are 550 households in the sample that do not own shares; the remaining households do own shares. The measure used to split the sample on household average age is AVERAGE AGE, which is the average of the ages of all owners of the home at 30 June 2010. In the full sample the average for AVERAGE AGE is 39.15 years. The median is 38 years. The households in the Low Average Age submarket (n=395) are those with an AVERAGE AGE below 38 years, with the remaining households (n=409) in the High Average Age submarket. Data is drawn from the HILDA survey of Australian households which has been conducted on mostly the same households every year since 2001. The exception is SPREAD, which is derived from data sourced from the Reserve Bank of Australia. This study uses 2010 data for households that entered into a mortgage in the period 2008 to 2010. The full sample consists of 810 households, all of whom own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded). Please see Table A1 for variable definitions. For detailed descriptions of key variables see Appendix A. Standard errors are clustered at industry level. p-values are in parentheses. Significance levels are indicated: *<10%; **<5%; ***<1%.

	Dependent Variable = FRMDUMMY			
	SHAREOWNERSHIP		AVERAGE AGE	
	NO	YES	LOW	HIGH
HCR	-1.681	2.274	-1.961	-0.760
	(0.201)	(0.390)	(0.218)	(0.575)
IWR	-16.868***	-46.533	-24.423	-20.857***
	(0.001)	(0.447)	(0.114)	(0.002)
SPREAD	-0.739***	1.112*	-0.578*	-0.156
	(0.000)	(0.062)	(0.090)	(0.615)
RISKAVERS	0.077	0.251	0.024	0.309
	(0.382)	(0.198)	(0.801)	(0.202)
NOCASH	0.625*	1.014	0.923	0.305
	(0.081)	(0.389)	(0.194)	(0.596)
EDUCATION	0.038	0.018	-0.054	0.073
	(0.705)	(0.865)	(0.572)	(0.328)
INCOME	-0.035	-0.163	-0.187	-0.018
	(0.410)	(0.477)	(0.298)	(0.678)
AGE	-0.295	0.356	0.218	0.298
	(0.122)	(0.487)	(0.552)	(0.248)
SHAREOWN	NA	NA	-0.427	0.791**
			(0.344)	(0.020)
IDS	-0.100	1.036**	-0.268	-0.057
	(0.554)	(0.025)	(0.470)	(0.886)
COUPLE	-0.393	1.091	-0.099	-0.467
	(0.199)	(0.440)	(0.869)	(0.539)
OWNNUMS	-0.049	-0.235	-0.019	0.209
	(0.863)	(0.855)	(0.968)	(0.777)
FEMALE	0.265	-3.558***	-0.196	-0.067
	(0.440)	(0.002)	(0.708)	(0.924)
LVR	-0.687	0.923	-1.262	-0.631
	(0.295)	(0.277)	(0.185)	(0.412)
NEGEQUITY	-0.570	1.167	-0.819	0.787
	(0.465)	(0.190)	(0.571)	(0.242)
REFI	-0.039	0.745	-0.118	0.059
	(0.900)	(0.187)	(0.759)	(0.842)

(*continued*)

TABLE A3. (**continued**) Logit regressions of household mortgage choice for various submarkets, includes those for households that do not and do own shares and low and high average age submarkets

This table presents results of regressions for several submarkets of FRMDUMMY on a range of variables with potential to influence household choice between a FRM and an ARM. The submarkets represented are those split according to shareownership and those separately split according to household average age. The measure used to split the sample according to shareownership is a dummy variable called SHAREOWN which is one if anyone in the household has direct investments in shares, managed funds or property trusts, and zero otherwise. There are 550 households in the sample that do not own shares; the remaining households do own shares. The measure used to split the sample on household average age is AVERAGE AGE, which is the average of the ages of all owners of the home at 30 June 2010. In the full sample the average for AVERAGE AGE is 39.15 years. The median is 38 years. The households in the Low Average Age submarket (n=395) are those with an AVERAGE AGE below 38 years, with the remaining households (n=409) in the High Average Age submarket. Data is drawn from the HILDA survey of Australian households which has been conducted on mostly the same households every year since 2001. The exception is SPREAD, which is derived from data sourced from the Reserve Bank of Australia. This study uses 2010 data for households that entered into a mortgage in the period 2008 to 2010. The full sample consists of 810 households, all of whom own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded). Please see Table A1 for variable definitions. For detailed descriptions of key variables see Appendix A. Standard errors are clustered at industry level. p-values are in parentheses. Significance levels are indicated: *<10%; **<5%; ***<1%.

	Dependent Variable = FRMDUMMY			
	SHAREOWNERSHIP		AVERAGE AGE	
	NO	YES	LOW	HIGH
BHWDUMMY	0.310	-0.213	0.558	0.460
	(0.608)	(0.911)	(0.438)	(0.703)
Constant	12.811***	24.113	19.297*	9.406*
	(0.001)	(0.549)	(0.070)	(0.050)
Observations	520	195	346	381
STATE FE	YES	YES	YES	YES
INDUSTRY FE	YES	YES	YES	YES
OCCUPATION FE	YES	YES	YES	YES
Adjusted R^2	0.135	0.287	0.18	0.172

TABLE A4. Summary statistics: difference in means for younger and older households

This table presents the means and differences in means of two sub-samples for a range of variables of interest when studying the choice between a FRM and an ARM. The sub-samples result from a partition of the full sample included in this study according to household average age. The measure used to split the sample is AVERAGE AGE, which is the average of the ages of all owners of the home at 30 June 2010. In the full sample the average for AVERAGE AGE is 39.15 years. The median is 38 years. The households in the Low Average Age submarket (n=395) are those with an AVERAGE AGE below 38 years, with the remaining households (n=409) in the High Average Age submarket. All households included in the sample own their own home, used a mortgage to help finance the purchase of the home, and were still in the process of repaying the mortgage at the time they were surveyed. The sample is limited to households that have either a FRM or an ARM (households with a combination of both are excluded) and who made their mortgage choice in the period 2008 to 2010. All data is sourced from HILDA, except SPREAD, which is derived from data sourced from the Reserve Bank of Australia. FRMDUMMY is an indicator variable that is 1 for a household that has a FRM and zero otherwise. For all other variable definitions please see Table A1. For detailed description of key variables see Appendix A. Significance levels are indicated: *<10%; **<5%; ***<1%.

AVERAGE AGE	LOW		HIGH		COMPARISON	
	N	MEAN	N	MEAN	DIFFERENCE	t-stat
FRMDUMMY	395	0.154	409	0.134	0.020	0.8
HOMEVALUE ($)	395	440,348	409	528,926	-88,578	-4.88***
MORTGAGEVALUE ($)	395	288,714	409	250,670	38,044	3.71***
NETHOMEWEALTH ($)	395	151,634	409	278,256	-126,622	-7.96***
LVR	395	0.69	409	0.52	0.18	8.98***
NEGEQUITY	395	0.02	409	0.02	-0.01	-0.66
TOTALPROPERTYASSETS ($)	395	510,353	409	638,748	-128,395	-4.86***
NETPROPERTYWEALTH ($)	395	191,503	409	356,893	-165,390	-7.98***
SUPERANNUATION ($)	395	66,023	409	174,749	-108,727	-9.36***
BUSINESSASSETS ($)	395	31,027	409	44,740	-13,713	-0.79
VEHICLES ($)	395	25,053	409	34,700	-9,648	-3.19***
LIFEINSURANCE ($)	395	19,697	409	37,745	-18,047	-1.34
BANKACCOUNTS ($)	395	14,846	409	15,138	-291	-0.14
LISTEDEQUITY ($)	395	8,203	409	19,965	-11,762	-2.01**
TOTALASSETS ($)	395	687,124	409	971,994	-284,869	-6.11***
NETWEALTH ($)	395	336,747	409	662,418	-325,672	-8.1***
HUMANWEALTH ($)	395	893,155	409	668,534	224,621	6.68***
BUSINESSHUMANWEALTH ($)	395	26,948	409	51,810	-24,863	-1.93*
BHWDUMMY	395	0.02	409	0.05	-0.04	-2.86***
SHAREOWN	395	0.27	409	0.37	-0.10	-2.92***
HCR	395	0.17	409	0.31	-0.14	-11.36***
IWR	395	0.68	409	0.68	0.00	0.83
IDS	395	1.49	407	1.63	-0.14	-4.14***
REFI	395	0.27	409	0.54	-0.27	-8.17***
SPREAD %	395	0.82	409	0.75	0.07	2.18**
DISPOSABLEINCOME ($)	395	89,854	409	92,763	-2,909	-0.89
GOVERNMENTTRANSFERS ($)	395	4,144	409	5,656	-1,512	-2.55**
CONSUMPTION ($)	395	26,932	409	28,453	-1,521	-1.86*
PROPERTYREPAYMENTS ($)	395	27,564	409	25,452	2,113	1.88*
NOCASH	395	0.09	409	0.18	-0.08	-3.78***
SURPLUSINC ($)	395	34,900	409	38,321	-3,421	-1.23
MORTGAGE2INC	393	3.64	409	3.35	0.29	1.13
RISKAVERS	395	2.81	409	3.10	-0.29	-3.5***
EDUCATION	395	4.98	409	4.72	0.26	1.63
FEMALE	395	0.52	409	0.53	-0.02	-0.71
AVERAGEAGE (years)	395	30.00	409	47.98	-17.98	-39.45***
COUPLE	395	0.79	409	0.74	0.05	1.63
OWNNUMS	395	1.60	409	1.64	-0.04	-1.1
RETIRED	395	0.00	409	0.06	-0.06	-5.13***