Research Discussion Paper

RDP 2017-05

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Figures in this publication were generated using Mathematica.

ISSN 1448-5109 (Online)

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September 2017

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Reserve Bank of Australia

We would like to thank Gianni La Cava, Bernadette Donovan, Luci Ellis, Matthew Read and Trent Saunders for helpful comments and discussions. The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Reserve Bank of Australia. The authors are solely responsible for any errors.

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Abstract

The global financial crisis (GFC) focused attention on household debt in dramatic fashion. While Australia escaped much of the immediate fallout, concerns over the level of household debt have become more entwined in policy deliberations in recent years. Parallel concerns, flowing from the rapid growth in housing prices in Australia and focusing on first home buyers, have also emerged. Some are concerned that this rapid growth is shutting a generation out of the home ownership market. Others are worried that those who do manage to buy a first home are taking on inadvisable levels of debt to do so.

This paper investigates how things have changed since the GFC for those stepping onto the property ladder. Is 'generation rent' an important trend? Are people buying first homes taking on 'too much' debt? And what implications does this have for our understanding of the growing level of aggregate household debt?

We find that fewer people are making the transition from renters to owners than prior to the crisis. Those that do, however, are more financially stable than earlier cohorts. Thus, 'generation rent' is an important trend but a consequence is that those who do step onto the property ladder are, on average, better placed to pay off their loans. We attribute much of this change to the increase in housing prices and the associated hurdle that deposit requirements represent. While saving a deposit is a stretch, it is also a sign of financial discipline that is associated with fewer subsequent difficulties.

JEL Classification Numbers: D10, R21

Keywords: home ownership, first home buyers, household debt, housing prices, housing affordability, housing accessibility

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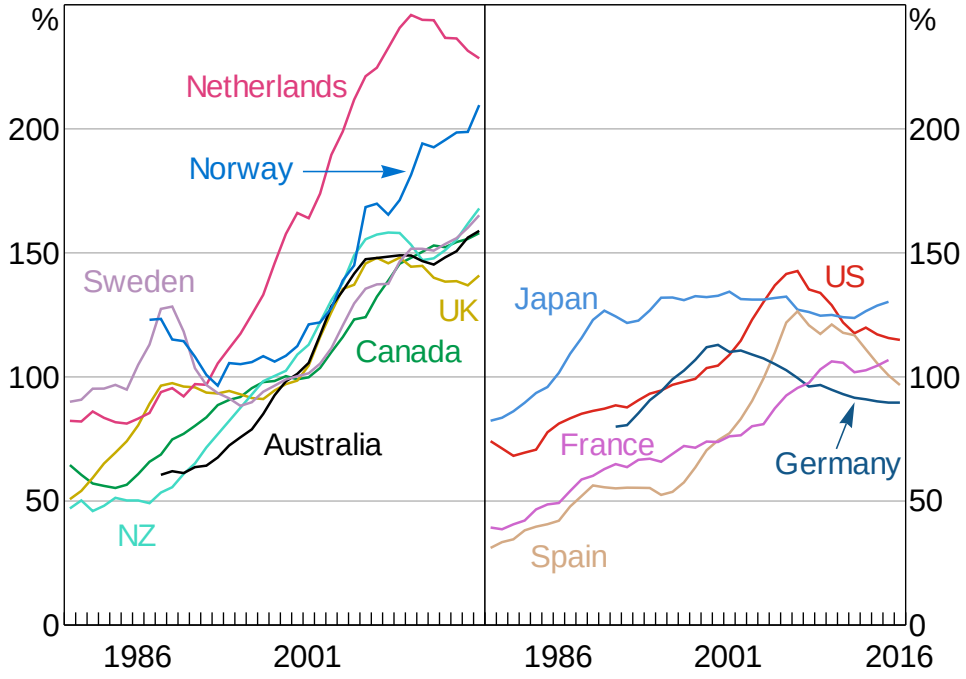
1. Introduction

In recent years there has been an increasing focus on both the levels of household debt and the levels of housing prices in Australia. This focus is enlivened by both the experience of the financial crisis, particularly in the United States, and historical highs for both debt and housing prices. On the one hand, given increasing housing prices, there are concerns that households are taking on unsustainable levels of debt in the pursuit of home ownership. On the other hand, given that home ownership is seen as an important path to prosperity in Australia and 'at the core of the Australian dream' (House of Representatives 2015), declining home ownership is also viewed with alarm. Work on income inequality, for example, has highlighted a link between the increase in inequality over recent decades and patterns of home ownership.[1] These two conflicting concerns: that households might be taking on too much debt in the pursuit of home ownership, and that falling home ownership rates might be undermining the Australian dream, highlight how difficult it is to reach conclusions about the likely macroeconomic consequences of recent trends in housing prices and household debt. This paper is an effort to better understand these consequences.

Concerns over the level of debt have most commonly been expressed by reference to aggregate household debt-to-income ratios. In Australia, this ratio has risen from approximately 100 per cent of household income in 2000 to around 160 per cent as of December 2016. The general trend in other countries is similar (Figure 1).[2]

Figure 1: Aggregate Household Debt-to-income Ratios
Cross-country estimates



Sources: National sources; OECD; RBA; Thomson Reuters

1 See La Cava (2016) for a discussion of the effect of home ownership on wealth and income.

2 While Australian debt levels are towards the upper end of these cross-country comparisons, cross-country comparisons are unreliable. For example, countries in which the government provides more services through higher taxation will tend to have higher debt-to-disposable income ratios than otherwise similar countries where these services are purchased on the private market. Similarly, different property tax regimes or urban structure can also affect the comparisons. As such, it is more important to focus on the trends in these comparisons than the levels.

Notwithstanding this statistic's frequent use, it has a number of drawbacks. First, it compares a stock of debt with a flow of income rather than, say, a stock of debt against a stock of assets or a flow of repayments against a flow of income. This mixing of concepts means that it is not clear what a reasonable benchmark for the level of debt to income might be. There are also important distributional considerations that affect what meaning can be attached to the aggregate values. At heart these issues stem from the fact that, while it is tempting to interpret higher aggregate debt-to-income ratios through a representative consumer lens, it is misleading. Of particular note is that the aggregate ratio places more weight on high-income households, which can be misleading. Higher-income households can support higher debt-to-income ratios than lower-income households. This is primarily because a smaller fraction of a higher-income household's expenditure needs to be devoted to necessities leaving more available to spend on other things. There are also other dimensions in which borrowers may differ, such as their risk of unemployment and their ability to obtain funds in an emergency, that would affect the inherent riskiness of any given debt level. To overcome these problems, this paper uses household-level data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey to better interpret the aggregate trends in household debt and better understand the forces driving household home ownership and debt decisions.[3]

We focus our analysis by looking at the first step on the property ladder – the transition from being a renter to a first home buyer (FHB) and the years immediately following this event. The reason for this focus is twofold. First, this is the step that is perceived as being one of the riskiest. FHBs typically have higher loan-to-valuation ratios and higher debt-servicing burdens than more established borrowers. Second, it allows us to focus on the life cycle of a household's debt and how the individual experience may differ from the aggregate. In this respect, the fact that FHBs tend to be at the start of their career means they might also expect stronger income growth in the future, which will affect their post-purchase experience. This is important because it is not possible to understand aggregate debt statistics without knowing what is happening to the individuals who make up that aggregate and their expectations for the future.

We also look at changes in FHB behaviour since the financial crisis. This is motivated by the possibility that the experience of the financial crisis has changed household risk tolerance and behaviour. For example, households may be more wary of taking on any new debt and this might be one explanation for declining rates of home ownership. Similarly, households may be more risk averse and more focused on paying down existing debt; as such, any given change in interest rates may have less of an effect on consumption and activity than it did prior to the crisis.

To address these questions we split our analysis into three stages: first we look at the factors that explain the initial decision to become an FHB; then we consider the amount of debt that FHBs take on; and, finally, we document the experience of FHBs in the years after they buy their first home. To provide some context for this analysis, however, we start with a summary of the public debate and previous research in this area.

3 A more detailed description of the data used in this paper is contained in Appendix A.

2. Literature Review

2.1 Declining FHB Housing Accessibility

Several previous studies have examined the falling rate at which households have been transitioning into home ownership. This trend has not been confined to Australia and has also been observed in other advanced economies. It has also occurred despite increased mortgage opportunities through financial deregulation.

In separate submissions to the Standing Committee on Economics Inquiry into Home Ownership, RBA (2015) and Yates (2015) discuss the long-term structural drivers of the decline in home ownership among younger Australian households. The interrelated factors highlighted by these papers include social, demographic, and economic and institutional factors.

Demographic drivers identified include the trend towards later marriage and family formation, and also an increase in single-adult households.[4] Several studies have examined the growing disconnect between key life-cycle events such as exiting the family home, marriage and having children. For instance, Fisher and Gervias (2011) attribute the majority of the decline in home ownership among younger cohorts in the United States to delays in the average age of first marriage.[5]

Economic and institutional factors include the relative cost of renting and owning, the level and distribution of current and expected income, the taxation of housing and the provision of public housing. Among economic factors, both RBA (2015) and Yates (2015) recognise that the sharp rise in housing prices in Australia since the mid 1990s has significantly reduced housing affordability, although this has been partially offset by changes in interest rates.

Relatedly, previous research in both Australia (Bourassa 1995; Wood, Watson and Flatau 2006) and overseas (see Gyourko (2003) for a review) find that borrowing constraints, such as the deposit requirement, are important barriers delaying transition into home ownership.[6] Indeed, existing studies have found that the savings required for a deposit seems to be more important for the transition to home ownership than the ability to service a mortgage from current income thereafter. For example, Wood *et al* (2006) find that the deposit constraint is binding for around one-third of potential home buyers (or renter households) in Australia, while the repayment constraint is only binding for around 5 per cent of these households.

Other studies find that rising housing prices have increasingly raised the effective deposit requirement. For the United States, Laeven and Popov (2016) exploit spatial variation in housing price growth during the 2001–06 housing boom and show that younger households in 2006 were considerably less likely to have purchased a home in areas where the effective deposit constraint

4 Although the change in the age of family formation represents a return to a longer-run trend that was interrupted by the post-WWII baby boom.

5 Some studies also study the reverse effect of home ownership and housing prices on social events such as fertility choices, marital stability and labour supply. See, for example, Farnham, Schmidt and Sevak (2011), Lovenheim and Mumford (2013), Dettling and Kearney (2014) and Atalay, Barrett and Edwards (2015).

6 The deposit requirement is the minimum initial upfront payment that mortgage lenders require from buyers when issuing a loan, usually expressed as a share of the total amount due.

had increased substantially over this period. In other words, they find that higher housing prices have significantly reduced the probability of becoming an FHB.

Larrimore, Schuetz and Dodini (2016) also examine individual housing choices, and the stated motivations for these choices, to try and understand why home ownership has fallen among young households in the United States since the financial crisis. Similar to Laeven and Popov (2016), they find that higher housing prices are associated with lower home ownership among younger households.

2.2 Rising Housing Prices, Household Indebtedness and Financial Stability

As noted in the introduction, concerns have been expressed about both the declining accessibility of home ownership and the level of debt that home owners are taking on if they do manage to make the transition.

Studies examining the drivers of, but more often the consequences of, household leverage have increased significantly since the global financial crisis (GFC).[7] The literature on rising household indebtedness has proceeded more or less in parallel to the discussion of accessibility.

Dynan and Kohn (2007), for example, finds that rising leverage in households' balance sheets has been driven mainly by higher housing prices, rather than a change in household risk preferences, interest rates or households' expected income. The majority of papers, however, have focused on the consequences of higher leverage. For instance, Mian and Sufi (2010) highlight the role of household leverage in initiating and intensifying periods of economic downturn, focusing on the unprecedented rise in the US household debt-to-income ratio in the years leading up to the GFC. By exploiting cross-sectional variation across different counties, they show that pre-crisis household leverage is a powerful statistical predictor of household default, unemployment, large housing price falls, and a decline in residential investment and durable consumption in the post-financial crisis period.

Other studies that use household-level data also find that household consumption is more affected during periods of economic downturn when households have high initial levels of indebtedness. Such studies include Bunn and Rostom (2015) for the United Kingdom, Andersen, Duus and Jensen (2016) for Denmark, and Dynan (2012) and Mian, Rao and Sufi (2013) for the United States.

There are, however, critics of the view that rising household leverage always has negative effects on an economy. A report by Evidens (2015) argues that a rising household debt-to-income ratio in Sweden is not unsustainable and does not pose a threat to financial stability.[8] Instead, the paper highlights that the observed increase in housing prices in Sweden has been due to fundamental

7 Examples include Mian and Sufi (2010) for the United States; Winstrand and Ölcer (2014) and Alfelt and Winstrand (2015) for Sweden; Cateau, Roberts and Zhou (2015) for Canada; and Hendersen and Scobie (2009) and Hunt (2015) for New Zealand.

8 A great deal of attention has been paid to Swedish debt levels in recent years. Sweden's central bank, the Riksbank, currently has a dedicated 'About household debt' section on their website at <http://www.riksbank.se/en/Press-and-published/Published-from-the-Riksbank/About-household-debt-/>.

factors, such as metropolitan growth, rising income and wealth and falling interest rates.[9] Despite this, the paper does acknowledge that strong housing price growth is problematic from other perspectives. In particular, it excludes groups outside the housing market (such as first home buyers) from purchasing a home.

2.3 The 'Riskiness' of FHBs, Particularly after the GFC

There are, to date, few studies that have considered the effect of the declining accessibility of home ownership on financial stability. Indeed, much of the discussion of the GFC was focused on the negative effects of increased accessibility to mortgages in the run up to the crisis. While a number of studies have focused on how rising housing prices have affected the tenure choice decision of potential FHBs, only a few, such as Dynan and Kohn (2007) have examined the effect of rising housing prices on the level of first home buyer debt. And even fewer have looked at whether rising housing prices have resulted in FHBs taking on an unstainable level of debt that affects their financial security in the years after they purchase their first home. Research in this area is particularly limited and this work, therefore, will be one of the first to address this gap in the literature.

3. 'Generation Rent' and the First Step on the Property Ladder

'Generation rent' is a tag that is often used in media discussion about the cohort of young Australian households who have either been shut out of home ownership or have had to wait longer to buy their own home (e.g. Duke 2016). A number of theories have been advanced to explain this phenomenon. One is that higher housing prices have shut a significant segment of young Australians out of the home ownership market. Others are that increased risk aversion or changing demographics since the financial crisis have led to households being less willing to take on debt. Importantly, whichever explanation is true, it has implications for our understanding of aggregate debt levels. This section examines how the probability of becoming an indebted FHB and the characteristics of realised FHBs have changed over time in Australia. A detailed explanation of how indebted FHBs are identified in the HILDA Survey is provided in Appendix A.

We test three different hypotheses for what has been driving decreased FHB participation in the housing market in recent years:[10]

1. *A shift in preferences:* FHBs have become less comfortable with taking on debt and entering the market since the financial crisis due to increased economic uncertainty and risk aversion. There may also have been a change in preferences over owning versus renting.

2. *Higher housing prices:* FHBs have been priced out of the market; likely due to increased demand from existing owners and investors although we do not specifically test that in this paper.

3. *Demographic change:* households have delayed becoming FHBs as life-cycle events, such as entering into a couple relationship and having children, are occurring later in life.

9 It goes on to argue that policies aimed at rationing credit could be counterproductive as restricted market mobility and housing construction may lead to upward price pressure on the existing housing stock.

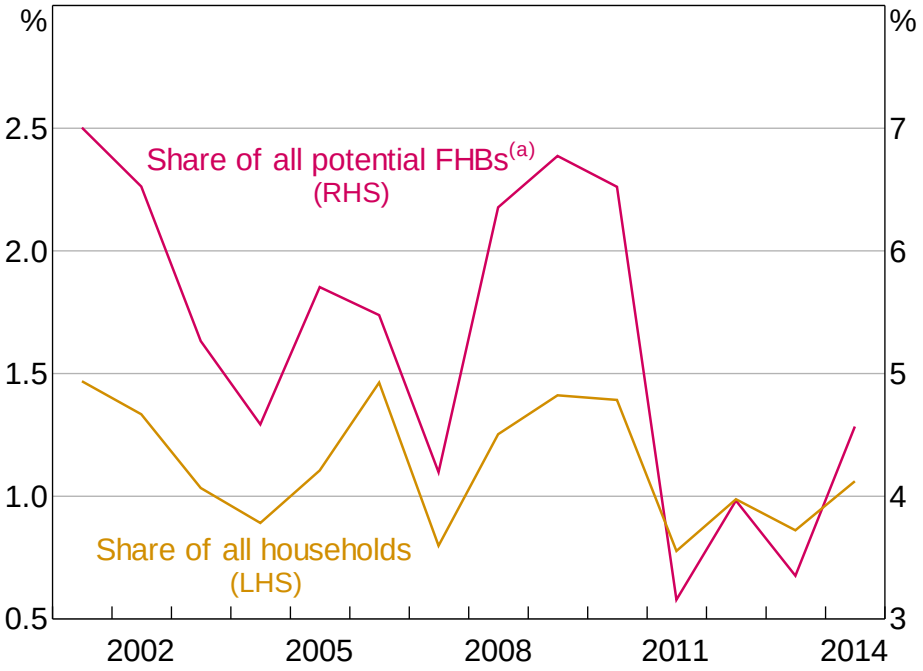
10 For a discussion on the longer-term trends in home ownership see RBA (2015).

Using regression analysis we assess the relative importance of these different factors on the decision to become an indebted FHB. Our results support the hypothesis that higher housing prices have crowded out potential FHBs from the market. We find no evidence that the observed demographic characteristics of indebted FHBs changed noticeably over the 2000s, and when we test for a level shift in household behaviour that captures increased risk aversion following the financial crisis, we find that controlling for housing prices accounts for almost all of the change in FHB ownership since 2008. As such, we conclude that 'generation rent' is a reflection of higher housing prices rather than a shift in preferences – households still have a similar desire to become home owners, however, fewer potential FHBs are actually able to enter the housing market and purchase a home than before.

3.1 Who are FHBs and How Have They Been Changing?

FHBs make up approximately 1 to 2 per cent of households in any given year (Figure 2). The pool from which they are drawn, however, is smaller than the set of all households. It is the pool of 'potential FHBs' who are renters who have never owned a home before.[11] FHBs are around 5 per cent of all potential FHB households.

Figure 2: Indebted FHB Households



Note: (a) Potential FHB households are defined as all renter households who are under the age of 60 years and have never owned a property

Sources: Authors' calculations; HILDA Survey Release 14.0

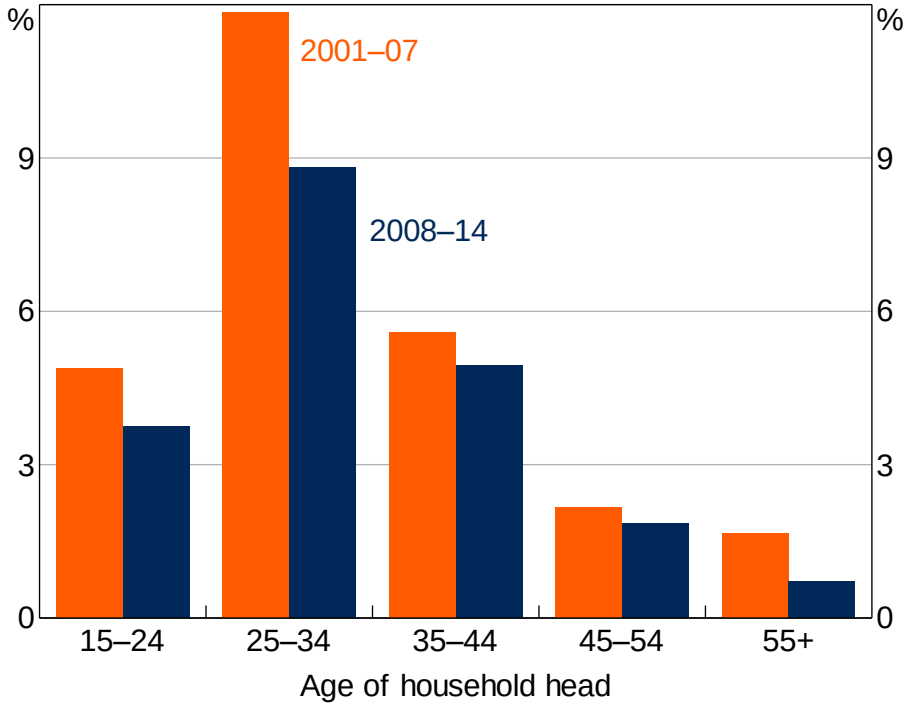
As can be seen in Figure 2, the share of indebted FHBs has been decreasing since the early 2000s (apart from the sharp increase between 2008 and 2009, which was most likely due to a temporary boost in FHB incentives during the financial crisis[12]). Overall, the proportion of indebted FHBs is lower than prior to the financial crisis. This decline has occurred across all age groups, but has

11 Potential FHB households are defined as all renter households who are under the age of 60 years and have never owned a property. They account for around 20 per cent of all households in any given year.

12 Dungey, Wells and Thompson (2011) provide an overview of FHB incentives in the 2000s.

been most pronounced for households aged 25 to 34 years – the group that typically has the highest propensity to become an indebted FHB (Figure 3).

Figure 3: Indebted FHB Households
Share of potential FHB households, by age group



Note: Potential FHB households are defined as all renter households who are under the age of 60 years and have never owned a property
Sources: Authors' calculations; HILDA Survey Release 14.0

Comparing indebted FHB households to the pool of potential FHBs shows that indebted FHBs are economically better off relative to this group of renter households (Table 1). While they tend to be younger, a higher share of indebted FHBs are in couple households, with tertiary education, full-time employment and have higher incomes. Further, we see that this relative pattern does not appear to have changed over time.

The only substantial changes we see for indebted FHBs between the two periods are that both the proportion of FHBs with tertiary education and full-time employment have increased, and real household disposable incomes have risen. These changes are, however, common to both FHB and potential FHB households, and the population more generally. Most Australian households benefited from strong income growth and improved access to education during the 2000s. This relative stability is also reflected in the steady share of FHBs in the top two quintiles of the income distribution.

The fact that the difference between indebted FHBs and potential FHBs has not changed much over the two periods suggests that the decline in FHBs is likely due to external factors rather than due to a change in demographic or risk preferences since the financial crisis. But to test this properly we will have to look at econometric results that allow us to control for multiple factors.

Table 1: Demographic Characteristics of Indebted and Potential FHB Households

	Indebted FHBs		Potential FHBs (renters)	
	2001–07	2008–14	2001–07	2008–14
Median age (years)	30	30	37	36
Couple household (%)	74	70	36	42
Tertiary education (%)	42	50	22	28
Full-time employee (%)	84	90	43	51
Major urban area (%)	68	68	72	71
Median real household disposable income ($)[(a)]	77 000	92 000	42 000	54 000
Share in top two disposable income quintiles (%)	59	57	23	24
Observations	572	630	7 745	11 752

Notes: Potential FHBs include only renter households who are under the age of 60 years and have never owned a property
(a) Reported in September 2014 dollars
Sources: Authors' calculations; HILDA Survey Release 14.0

3.2 What Explains the Decision to Become an FHB?

We use regression analysis to understand how the decision to become an indebted FHB household has changed over time. This will also allow us to identify if there has been any change in household behaviour that might be attributed to unobserved risk aversion or preferences.

We specify a probit model of the form:[13]

$$P\left(FHB_{it}=1\,|\,\mathbf{X}_{it},D_{it}\right)=\Phi\left(\mathbf{X}_{it}'\beta+\delta D_{it}+\varepsilon_{it}\right) \tag{1}$$

where the dependent variable FHB_{it} is binary and equal to one if household i took out a mortgage to purchase their first home between survey years $t-1$ and t.[14] Φ is the standard normal cumulative distribution function. The term D_{it} is a *post-2007 dummy* equal to one if the year household i became an FHB is greater than 2007. This variable is added to test for any change in household behaviour since the financial crisis. The vector of controls $\mathbf{X}_{it}$ includes *household* (age and age squared, household disposable income, couple household, household size, education, migrant status, employment status and unemployment expectations) and *aggregate* (state housing price index, state first home buyer government incentives, variable mortgage rates, urban area and state fixed effects) variables.

Results from estimating three versions of Equation (1) are reported in Table 2.[15] Model 1 – which includes the *post-2007 dummy* and *household* variables only – indicates that households in the post-2007 period are around 3 percentage points less likely to become an indebted FHB than households early in the 2000s.

13 This model is similar to the one used by Kohler and Rossiter (2005).

14 As before, all renter households who are under the age of 60 years and have never owned a property are classed as 'potential FHBs' and remain in the sample as our reference group (i.e. $FHB_{it}=0$).

15 The estimated marginal effects from our preferred probit model are robust to the choice of error distribution (i.e. they are similar to those estimated using a logit model).

Table 2: Determinants of Being an Indebted FHB Household

Average marginal effects, percentage points

	Model 1	Model 2	Model 3
Post-2007 dummy	–3.17***	–0.01	0.00
Age	1.01***	1.00***	1.00***
Age squared	–0.02***	–0.02***	–0.02***
Household disposable income ($'000)	0.03***	0.03***	0.03***
Couple household	6.88***	6.95***	6.88***
Household size	–1.29***	–1.29***	–1.38***
Tertiary education	2.80***	2.80***	3.52***
Migrant household	–1.13***	–1.25	–0.68
Full-time employee	4.79***	4.78***	4.83***
Unemployment expectations (> 50%)	–3.31***	–3.31***	–3.47***
State housing price index (log)	na	–0.07***	–0.08***
First home buyer incentives ($'000)	na	0.08***	0.12***
Variable mortgage rate	na	na	0.04
Major urban area	na	na	–2.34***
State fixed effects	No	No	Yes
Observations	20 699	20 699	20 699
Pseudo R-squared	0.18	0.20	0.21

Notes: Average marginal effects are calculated for each household based on the observed values of the explanatory variables for that household and are then averaged across all households; *, ** and *** indicate statistical significance at the 10, 5 and 1 per cent levels, respectively; the combined marginal effect of age and age squared are shown in Figure 4 as it is not possible to interpret the magnitude of these effects in isolation

Sources: APM; Authors' calculations; HILDA Survey Release 14.0; RBA

Although this model identifies that there has been a change in the probability of becoming an indebted FHB, it does not allow us to examine the drivers of this change – a change in preferences, an increase in housing prices or a change in demographic factors.

To explore the relative role of these drivers, we re-estimate Equation (1) and include the state housing price index and first home buyer incentives in Model 2.[16] These variables are added as a way of separating some exogenous preference change from factors related to the generally higher housing prices experienced in recent years. Once we include these variables we find that the *post-2007 dummy* is no longer significant and that the other *household*-level effects remain stable.

When we add the remaining *aggregate* variables in Model 3 to control for other changes in economic conditions between the two periods (such as higher unemployment and lower interest rates), we find largely similar results to Model 2. These results suggest that higher housing prices have accounted for most of the change in the probability of FHB ownership pre and post the financial crisis period. If there had been a shift in preferences or a change in the relationship between demographic factors and FHBs over the periods this should show up in a significant *post-2007 dummy* variable. Notwithstanding this, we also run the model with interactions between the

16 We include FHB incentives to control for any state-level changes in policy that may have altered the 'effective' prices of housing for FHBs over time, particularly in 2008 and 2009.

main demographic variables and the *post-2007 dummy* and do not detect any significant difference in the coefficients between periods.[17]

3.3 Analysis and Discussion

In this section we consider the economic significance of the variables identified as being statistically significant in Table 2 and what this tells us about the factors affecting FHBs.

3.3.1 Demographic factors and their economic significance

Looking at the *household*-level variables, we see that couple households and households with higher potential lifetime income, as proxied by tertiary education and full-time employment, are more likely to become indebted FHBs. On the other hand, households with high unemployment expectations have a lower probability of taking on FHB mortgage debt, providing initial evidence that households consider their future when making debt decisions. The magnitudes of these effects are relatively large, with full-time employment being associated with a 5 percentage point increase in the likelihood of becoming a home buyer – that is, it doubles the likelihood of someone becoming a first home buyer.[18] The effect of being in a couple is even larger at almost 7 percentage points.

Age and, even more so, household income have a smaller effect on the probability of becoming an indebted FHB. For example, a 30-year old is 2 percentage points more likely to become an FHB than an otherwise similar 25-year old (Figure 4). A $10 000 (or 17 per cent) increase in income for a household with the mean disposable income of $60 000 only increases the probability by 0.3 per cent (Figure 5).

Overall, these findings suggest the most powerful drivers of becoming an FHB appear to be life cycle-related rather than economic factors. People do not decide to become FHBs because they get a promotion, but because they get older and enter into married and de facto relationships.

As mentioned above, other than the overall level shift, we find no significant differences in the relationship between these variables and FHB ownership between the pre- and post-2007 periods (Table C1). Being in a couple household or having tertiary education does not change the likelihood of becoming an FHB across the two periods. Also of note is that the age of becoming a couple household has not changed appreciably between the two periods. While the split between married and de facto has changed between the periods, this has not been associated with any significant change in the likelihood of couples purchasing a house. Similarly, households at all points of the age and income distributions have a lower predicted probability of becoming an indebted FHB in the 2008–14 period (Figures 4 and 5).[19]

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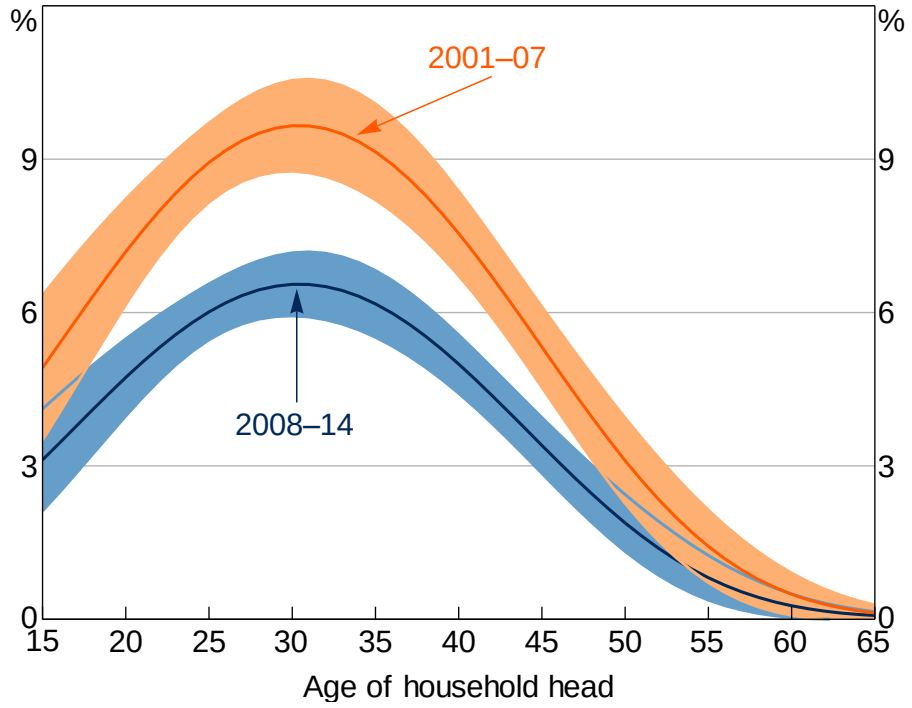
17 Results of this exercise are shown in Table C1. For robustness, we also estimate Equation (1) with time fixed effects instead of the *post-2007 dummy* and a local government area-level rather than a state-level housing price index. Results from these sensitivity analyses are reported in Table C2 and are largely similar to those reported in Model 3.

18 As shown by Figure 2, the unconditional probability of transitioning into FHB ownership is around 5 per cent over the entire sample period.

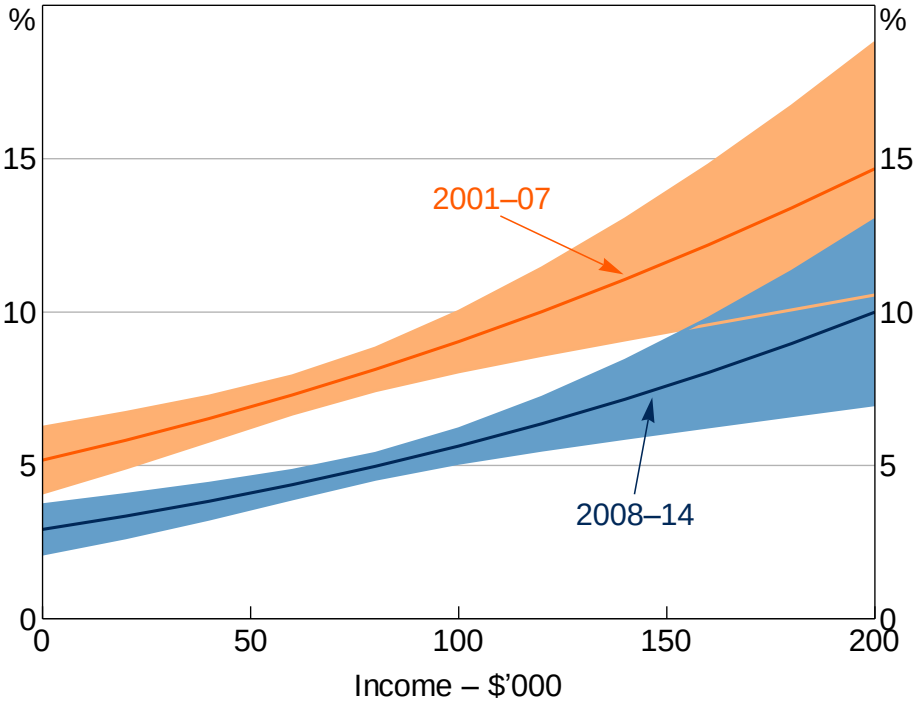
19 If there had been a change in the relationship between becoming an FHB and these variables across the two periods, we would expect to see a change in the peak or the shape of the age and income distributions rather than a level shift down.

Figure 4: Marginal Effect of Age on FHB Status



Note: Shaded areas show 95 per cent confidence intervals
Sources: APM; Authors' calculations; HILDA Survey Release 14.0; RBA

Figure 5: Marginal Effect of Income on FHB Status



Note: Shaded areas show 95 per cent confidence intervals
Sources: APM; Authors' calculations; HILDA Survey Release 14.0; RBA

3.3.2 Preference shifts or housing prices?

Given the unchanged effect of demographic factors, and the fact that the period dummy is insignificant in Model 3, we see that housing prices appear to be playing a central role and that a preference shift is unlikely to have been important. When you take into account the change in the housing price index between the 2001–07 and 2008–14 periods, the marginal effect of higher housing prices lowers the probability of households becoming an indebted FHB by around 4 percentage points.[20] This is larger than the observed decline in FHB ownership between periods because of some offsetting effects from other variables such as income and FHB incentives.

These findings suggest that the underlying desire to become an FHB has not changed since the financial crisis. However, people's ability to, or comfort with doing so, has been affected.

3.4 Summary

We find that potential FHBs today are less likely to take on a mortgage and purchase a home than those earlier in the 2000s. Our results provide evidence that FHBs are being crowded out of the market by higher housing prices. It seems likely that this is related to external factors, such as investor demand and supply constraints in some cities, although we have not examined that channel here. While demographic factors are important determinants of home buying, they have not been changing significantly since the financial crisis. That is, people do not appear to be merely delaying the age at which they purchase their first home. In short, 'generation rent' appears to be an important phenomenon that is related to the rise in housing prices rather than a shift in preferences or changing demographics.[21] The effect that the hurdle of higher housing prices has on those buying first homes and the debt they take on is examined next.

4. How Much Debt Do FHBs Take on?

In the previous section we found that the two strongest forces explaining whether a household becomes a first home buyer were demographics, particularly whether the household was headed by a couple, and housing prices. In this section we look at how much debt households have been taking on when they buy their first home to address the question of whether first home buyers have been taking on 'too much' debt given the increase in housing prices since the financial crisis.

Turning first to the aggregated data, we can see in Figure 6 that the debt-to-income ratio of FHBs is substantially higher than that of all other indebted owner-occupiers. This reflects the fact that FHBs are at the beginning of their loan life cycle. That is, before they have had the opportunity to pay down their loan. Comparing the pre- and post-GFC periods, we see that the median FHB debt-to-income ratio was around 330 per cent in 2014, up approximately 40 per cent from the ratio of 230 per cent in 2001. FHBs are taking on more debt than in the past.

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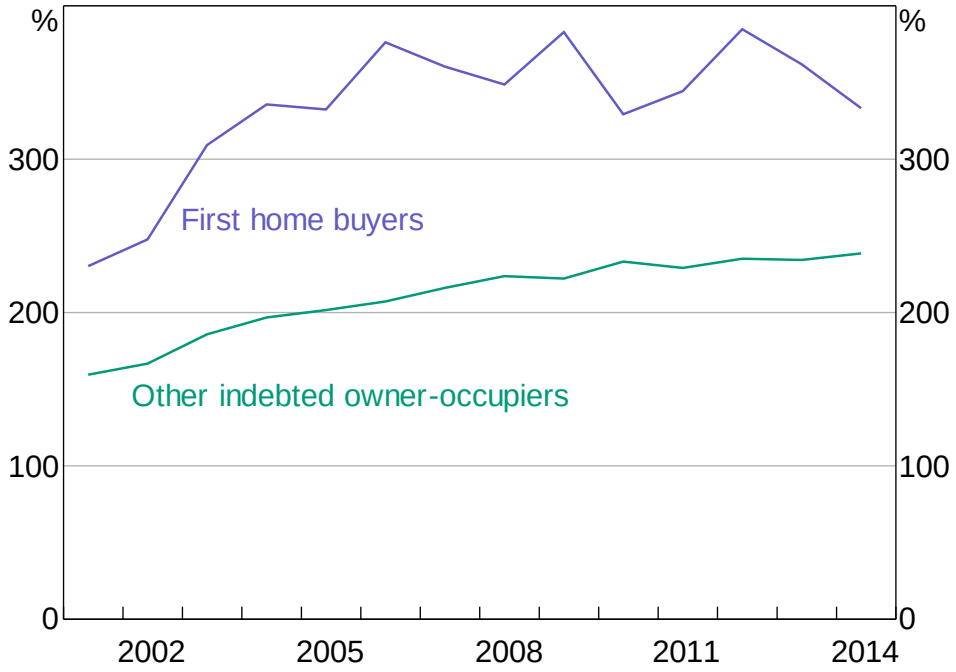
20 The average marginal effect on log housing prices is –0.08. We multiply this by the 48.6 percentage change in the housing price index between the two periods: $-0.08 \times 0.486 = -0.04$.

21 It is possible that people who are crowded out may, nonetheless, eventually purchase a house when they, say, receive an inheritance of money or the family home later in life. The sample period is not long enough to test whether this will turn out to be the case. We do, however, investigate the effect of assistance with home purchase from family and friends later in this paper.

Figure 6: Median Debt-to-income Ratios of Indebted Owner-occupier Households



Note: Potential FHB households are defined as all renter households who are under the age of 60 years and have never owned a property

Sources: Authors' calculations; HILDA Survey Release 14.0

Comparing FHB loan characteristics in the pre- and post-financial crisis periods shows that these higher debt-to-income ratios reflect the fact that purchase prices have risen faster than incomes (Table 3). The median real purchase price of FHB homes in the 2008–14 period was $387 000, which was almost $100 000 higher than the price paid by FHBs in the 2001–07 period.

A consequence of higher purchase prices is that FHBs have had to save a much larger deposit despite maintaining a similar median loan-to-valuation ratio (LVR) of around 83 per cent. The median deposit size increased by around $28 000 to almost $70 000 in the 2008–14 period.[22] As a share of disposable income, the deposit size increased from 52 to 75 per cent between the two periods. This increase, together with a rise in the debt-servicing ratio (from 20 to 26), suggests that FHBs might be facing a higher financial burden in the post-financial crisis period.

22 The deposit size is inferred from the difference between the reported purchase price and mortgage. Transaction costs, such as stamp duty, would add to the calculated deposit sizes reported in Table 3. To the extent that these have tended to increase as housing prices have increased, including these costs would increase the size of the required deposit and the change between periods.

Table 3: Loan Characteristics of Indebted FHB Households

Median

	2001–07	2008–14
Debt ($)[(a)]	242 000	325 000
Initial purchase price ($)[(a)]	291 000	387 000
Debt-to-disposable income ratio (%)	314	357
Loan-to-valuation ratio (%)	83	83
Size of deposit ($)[(a)]	40 000	68 000
Deposit as a share of disposable income (%)	52	75
Debt-servicing ratio (%)	20	26

Note: (a) Reported in September 2014 dollars

Sources: Authors' calculations; HILDA Survey Release 14.0

We next use regression analysis on a sample of FHBs only to better understand the factors that affect the level of debt-to-disposable income FHBs take on. In particular, given the suggestion that FHBs may now be overburdened in order to get on to the property ladder, we are interested in identifying if there has been any preference or behavioural change affecting the amount of debt FHBs take on since the financial crisis. To do this, we regress the initial debt-to-income ratio of FHBs on the log of state housing prices, an indicator variable for the post-2007 period, and controls for household- and aggregate-level characteristics. We specify the model:

$$DtY_i = \alpha + \beta D_i + \delta' \mathbf{X}_i + \varepsilon_i \tag{2}$$

where the dependent variable, DtY_i, is the initial debt-to-disposable income ratio of FHB household i. The term D_i is a *post-2007 dummy* variable that is equal to one if the year of purchase is greater than 2007. The vector of controls $\mathbf{X}_i$ includes *household* (age and age squared, household disposable income, couple household, household size, education, migrant status and employment status) and *aggregate* (state housing price index, state first home buyer government incentives, variable mortgage rates, urban area and state fixed effects) variables.

Table 4 shows the results of estimating Equation (2). Model 4 includes the post-2007 indicator and the set of household-level variables only. Model 5 adds in the state housing price index and the other aggregate-level variables. Model 6, our preferred model, corrects for the bias that can result in these regressions from the fact that the variables explaining the amount of debt taken on by FHBs also affect the probability of being an FHB.

We make this correction by using a two-stage Heckit procedure. This procedure introduces an additional variable, lambda (λ), that controls for the selection effect. A significant lambda is a sign that the selection effects are statistically significant. An additional aspect of the Heckit procedure is that it works best when at least one variable in the selection model is validly excluded from the second-stage regression. To improve the estimates we chose to exclude the age and age squared variables. More details on this procedure, including a discussion of the exclusion of the age variables, are provided in Appendix B.

Table 4: Determinants of Indebted FHB Debt-to-income Ratios

Coefficients

	Model 4	Model 5	Model 6
Post-2007 dummy	0.42***	–0.49***	–0.51***
Age	0.02	0.04	na
Age squared	0.00	–0.00	na
Household disposable income ($'000)	–0.00**	–0.00*	–0.00
Couple household	–0.28**	–0.35***	0.26
Household size	–0.12***	–0.10***	–0.20***
Tertiary education	0.15*	0.01	0.28**
Migrant household	0.12	–0.02	–0.11
Full-time employee	0.23*	0.22*	0.76***
State housing price index (log)	na	1.83***	1.41***
First home buyer incentives ($'000)	na	0.00	0.01
Variable mortgage rate	na	–0.01	–0.01
Major urban area	na	0.51***	0.37***
Lambda	na	na	0.78*
Constant	3.43***	–5.59***	–5.30***
State fixed effects	No	Yes	Yes
Observations	1 077	1 077	1 077
Adjusted R-squared	0.15	0.27	0.27

Notes: Due to missing values of the dependent variable, 125 FHB household observations were dropped from the estimation sample; *, ** and *** indicate statistical significance at the 10, 5 and 1 per cent levels, respectively

Sources: APM; Authors' calculations; HILDA Survey Release 14.0; RBA

Model 4 shows that, conditional on household-level characteristics, FHB debt-to-income ratios are on average higher than in the pre-2007 period. However, comparing Model 4 with Model 5 shows that adding in the aggregate-level variables accounts for much of the increase in the average FHB debt-to-income ratio between the two periods. Although the *post-2007 dummy* remains statistically significant, the sign on this variable is now negative. Housing prices appear to account for most of this change, suggesting they have driven the rise in the FHB debt-to-income ratio between the two periods.

Focusing on our preferred estimates in Model 6 confirms that housing prices have been the main determinant of the higher FHB debt-to-income ratio. Based on the coefficient on log state housing prices, a 10 per cent increase in housing prices raises the debt-to-income ratio of FHBs by around 14 percentage points. For the nation as a whole, housing prices increased by around 48.6 per cent between the two periods. This implies an increase in the average FHB debt-to-income ratio resulting from higher housing prices of around 56 percentage points ($\ln(1.486) \times 1.414$).

This increase, however, is larger than the observed rise in the debt-to-income ratio, which increased by 31 percentage points (period average on period average). This can partly be explained by the negative coefficient on the *post-2007 dummy*. This indicates that there has been a reduction in the debt levels of FHB households after controlling for all other included explanators. The two most obvious causes would be an exogenous change in the debt that financial institutions are willing to lend to households or a preference shift in the amount of debt

that these households are willing to take on. However, separating these two influences is difficult and not necessary for the purposes of this paper. We leave this question for others to consider.

One possible explanation for lower debt levels is that FHBs are buying homes that are cheaper, relative to average housing prices, than in the past. To check whether this has been happening we look at the median FHB home purchase price compared with the median for all housing. This has risen slightly from the 30th percentile to the 32nd percentile since the financial crisis. As such, there is no *prima facie* evidence that FHB households have been buying relatively cheaper homes since the financial crisis.

Finally, compositional change in the pool of FHBs accounts for some increase between the periods. For example, there has been a rise in the proportion of FHBs with tertiary education and full-time employment (see Table 1) and these are both strongly associated with higher debt-to-income borrowing ratios. On average, having tertiary education and being in full-time employment increase the debt-to-income ratio of FHBs by around 28 and 76 percentage points, respectively.

Interpreting the net effect of these changes on financial fragility is, however, difficult. While the apparent preference shift away from intermediated debt and the increase in FHBs with tertiary education and full-time employment appears positive for financial resilience, the fact that overall debt levels are higher leaves open the possibility that the net effect could still be negative. To get a better handle on the net effect we next look at the post-purchase behaviour and financial fragility of these households.

5. FHBs' Post-purchase Experience[23]

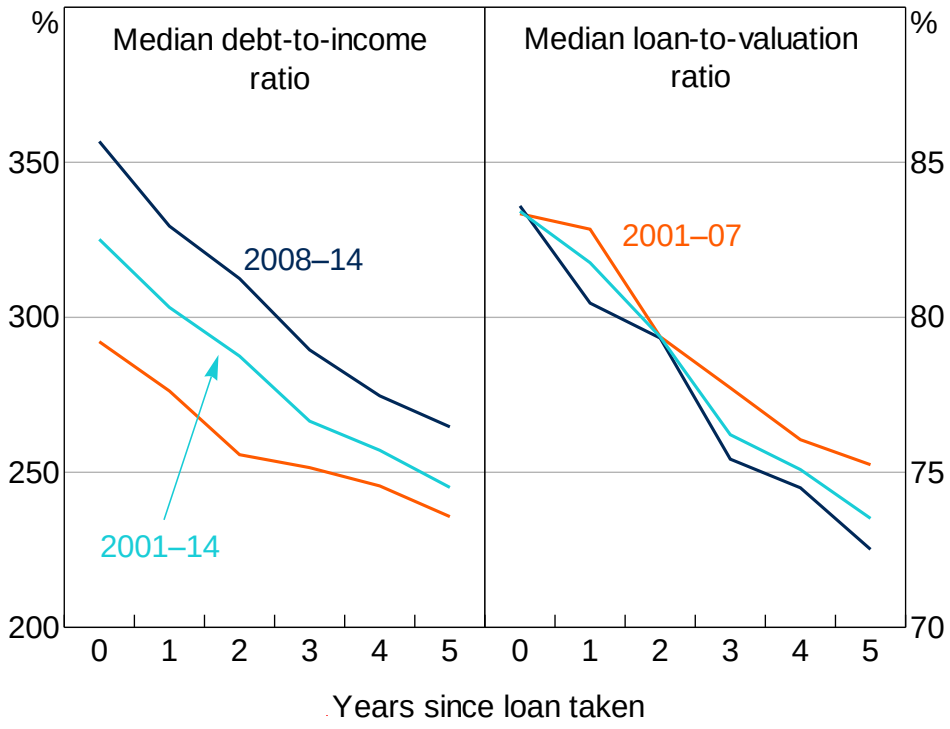
Having looked at the decision to purchase a home and the initial loan amount, we now look at the subsequent experience of first home buyers. How fast do they pay down their debt and has this behaviour changed since the financial crisis?

5.1 Repayment Behaviour

Using the panel dimension of the HILDA Survey, we can track the life cycle of a loan for indebted FHBs by looking at how FHBs' debt-to-income and loan-to-valuation ratios evolve after these households have taken on their first loan. We find that the debt-to-income ratio decreases considerably in the years after a mortgage is taken on. On average, FHBs reduced their debt-to-income ratio by around 25 per cent in the first five years after taking out a loan (Figure 7). Looking at the underlying data, we can see that this is mainly due to mortgage repayments amortising the debt, rather than increasing income, although income growth does contribute.

23 See Byrne *et al* (1981) for a discussion of a common experience.

Figure 7: Indebted FHB Debt Ratios



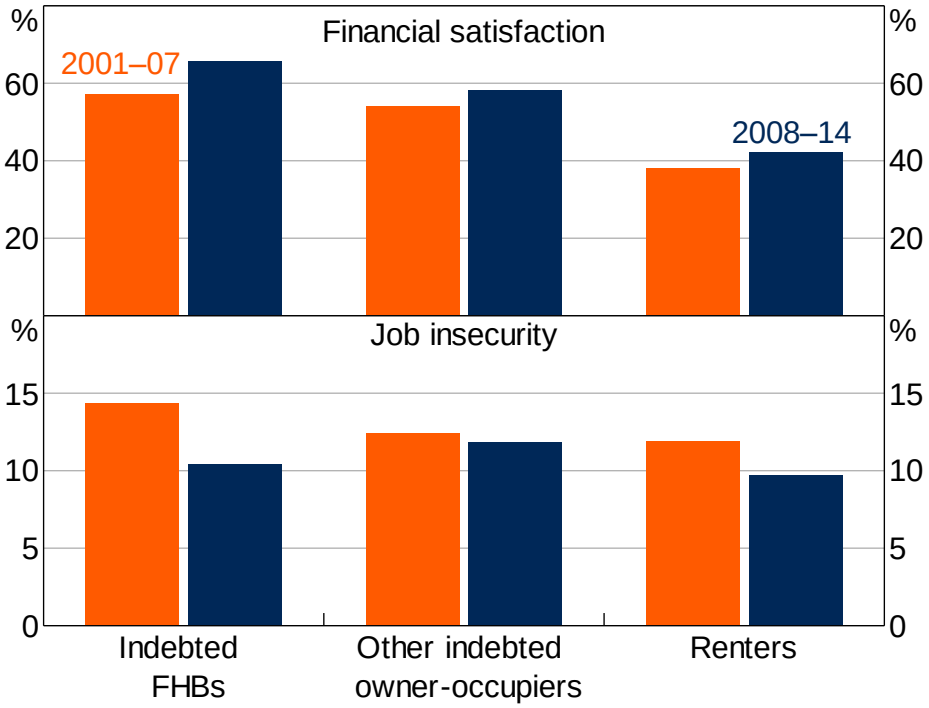
Sources: Authors' calculations; HILDA Survey Release 14.0

Despite higher debt levels, households who became indebted FHBs post-2007 appear to be paying down their mortgages and reducing their debt-to-income ratios at the same rate, or slightly faster, than households who took on a mortgage before 2007. In the year after taking out a loan, the reduction in the debt-to-income ratio for FHBs in the post-2007 period was around 8 per cent, compared to 5 per cent for the pre-2007 cohort. After three years, the debt-to-income ratio for FHBs in the pre- and post-2007 periods has decreased by 14 and 18 per cent, respectively. Given that these rates of amortisation are significantly higher than those associated with required repayments or interest rate changes over this period, it seems that these are voluntary choices rather than the consequence of changes to required repayment schedules. The median loan-to-valuation ratio of FHBs in the post-financial crisis period also decreases by more than for the previous cohort, although this is likely due to the rise in housing prices increasing the denominator of this ratio over time.

5.2 Actual and Perceived Levels of Risk

We next look at financial security indicators for FHBs and compare these to renters and other owner-occupiers. We find that financial satisfaction has improved for everyone, but more so for FHBs. The share of FHBs that reported being either moderately or totally satisfied with their financial situation in the 2008–14 period increased by 9 percentage points from 57 to 66 per cent; this share increased by around 4 percentage points for other indebted owner-occupiers and renter households (Figure 8). Similarly, job insecurity decreased more for FHBs than households with other types of housing tenure, from around 14 to 10 per cent in the 2008–14 period.

Figure 8: Financial Security
By housing tenure



Sources: Authors' calculations; HILDA Survey Release 14.0

Another way of assessing the financial security of FHBs is to look at a simple indicator for the realised income volatility of these households in the five years after they take on their loan. This indicator is measured as the number of subsequent years, on average, that FHBs report a disposable income that is at least 20 per cent lower than the income they received in their first year as an FHB at time t:[24]

$$\frac{1}{N}\sum_{i=1}^{N}\left(\sum_{k=1}^{5}\left(1\left[hhdy_{it+k} \leq 0.8hhdy_{it}\right]\right)\right) \tag{3}$$

Comparing this indicator across the pre- and post-financial crisis periods, we find that it has decreased from 0.60 to 0.55 years. While small, this decrease indicates that, on average, FHB households in the post-financial crisis period experienced fewer shocks to their disposable income in the years subsequent to taking on a loan and is consistent with the other indicators we look at.

Considering other financial vulnerability indicators that are more related to cash flow and mortgage-specific issues, we see that FHBs in the 2008–14 period are less likely to have ever reported being behind schedule on their loan, having made late mortgage repayments or asking for financial help than the previous FHB cohort (Table 5). While the financial situation appears to have also improved for the other indebted owner-occupiers, the improvement is more noticeable for FHBs. The fact that these indicators have improved more for FHBs than for other owner-occupiers suggests that we are not just capturing the effect of lower mortgage interest rates or

24 There are many different ways to measure income volatility. We choose this measure as being relevant to evaluating concerns that income volatility might undermine a household's ability to repay its mortgage. A review of the methods used by other studies is provided by Dynan, Elmendorf and Sichel (2007).

general improvements in economic conditions. Furthermore, over the sample period average mortgage interest rates are relatively constant.

On balance, we interpret all these indicators as showing that post-crisis FHBs are more financially secure than the pre-crisis cohort. Thus, despite higher levels of debt, the combination of both compositional and preference shifts appear to have contributed to a reduction in financial fragility for FHBs.

Table 5: Financial Vulnerability Indicators
Per cent of households

	2001–07	2008–14
Loan behind schedule		
Indebted FHBs	7	4
Other indebted owner-occupiers	11	11
Late mortgage repayments		
Indebted FHBs	17	13
Other indebted owner-occupiers	17	15
Asked for financial help		
Indebted FHBs	34	28
Other indebted owner-occupiers	22	18

Sources: Authors' calculations; HILDA Survey Release 14.0

6. The Role of the Deposit

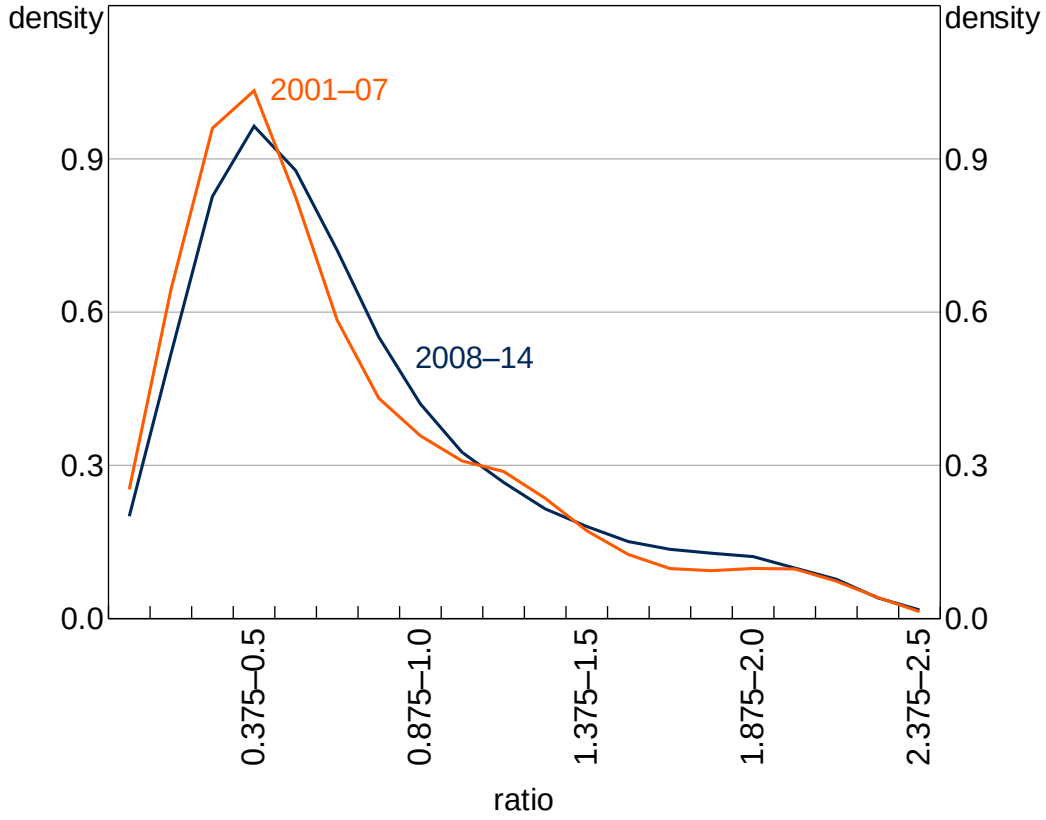
The previous two sections examined whether the debt levels FHBs have been taking on, and their post-purchase repayment behaviour and risk levels, have changed since the financial crisis. Although we find evidence that FHBs are having to save more of their income for a deposit, and are facing a higher debt-servicing burden, we do not find evidence that FHBs have taken on 'too much' debt or are more risky post-financial crisis.

Instead, our results suggest that FHBs are taking on less debt relative to their income than they otherwise would have if the same rise in housing prices had occurred in an earlier period. FHBs appear to be behaving more conservatively than prior to the crisis. We also find that, if anything, FHBs are paying down loans more quickly and on several financial fragility measures are more secure than FHBs earlier in the 2000s. A plausible explanation for this finding is that those FHBs who are able to save enough to meet the higher deposit requirement imposed by higher housing prices are also households who are less likely to experience subsequent financial difficulties after taking on a loan. We examine the link between deposit size and financial fragility in more detail in this section.

While Table 3 identified an increase in the median deposit size since the financial crisis, the full distribution can reveal if there are any obvious patterns in the data. Figure 9 compares the distribution of deposit sizes between the pre- and post-GFC periods. What is apparent is that, while the modal deposit hasn't changed since the GFC, there has been as shifting out or flattening of the overall distribution of FHB deposit-to-income ratios between the periods. This suggests that the change in deposits has not been driven solely by, for example, the elimination of particularly

small deposits that might have been associated with relatively risky high LVR lending. Instead the changes are throughout the distribution. This points towards a change in consumer behaviour more than the imposition of a regulatory or administrative floor by banks as being an important driver of the changes.

Figure 9: Deposit-to-income Ratio for Indebted FHBs
Distribution, adaptive kernel



Note: Estimated using an adaptive Epanechnikov kernel
Sources: Authors' calculations; HILDA Survey Release 14.0

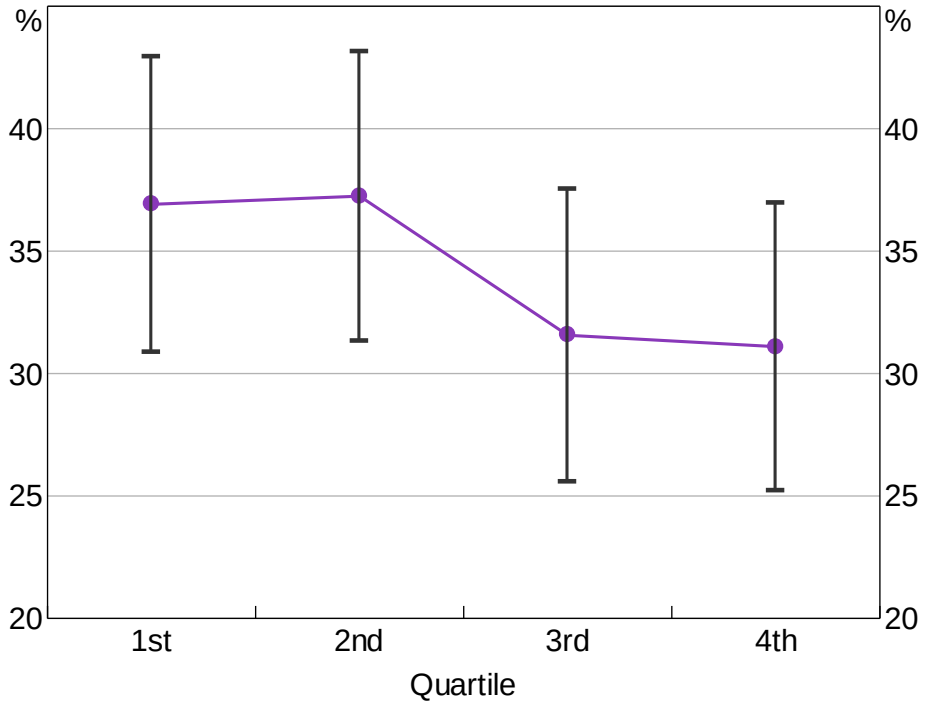
We next test our hypothesis that the deposit size is related to the likelihood of an FHB household experiencing financial stress (that is, experiencing any of the events listed in Table 5) in the years after purchasing a first home by running a simple regression.

Similar to the probit model specified by Equation (1), we specify a probit model of the form:

$$P\left(FD_i = 1 \mid \mathbf{X}_{it}, D_{it}\right) = \Phi\left(\mathbf{X}_{it}'\beta + \gamma_q \sum_{q=1}^{4} DEP_i^q + \varphi D_{it} + \varepsilon_{it}\right) \tag{4}$$

where the dependent variable FD_i is binary and equal to one if the household experienced financial distress in any year after purchasing a first home. Φ is the standard normal cumulative distribution function. The variables of interest are DEP_i^q, which are indicator variables equal to one if household i is in the qth quartile of the deposit-to-income distribution, and other variables are defined as in Equation (1). The predicted probability of experiencing financial distress by deposit-to-income quartile and the standard errors associated with the overall regression are shown in Figure 10.

Figure 10: Predicted Probability of Indebted FHB Financial Stress
By deposit-to-income ratio quartile



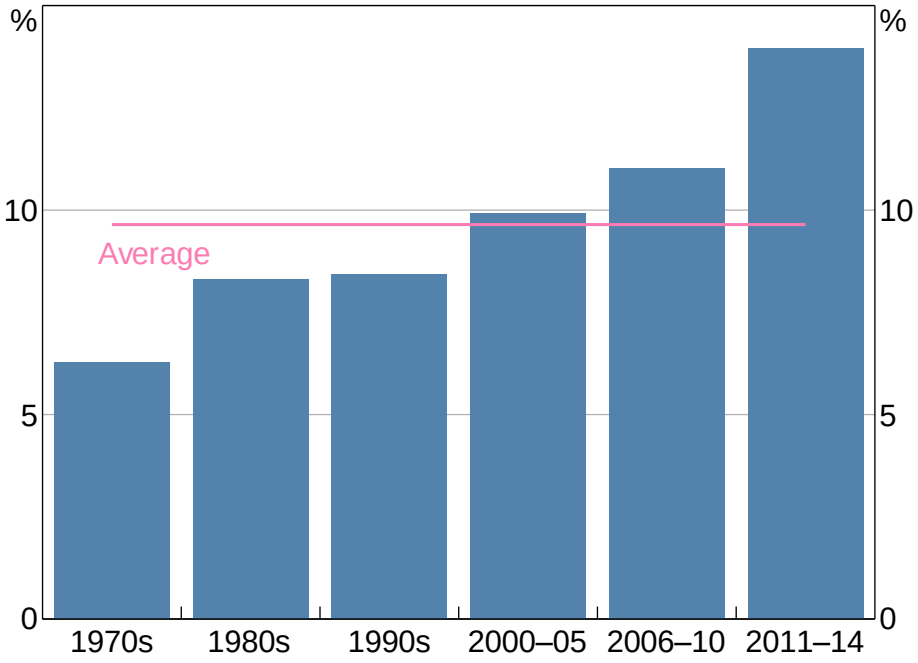
Sources: Authors' calculations; HILDA Survey Release 14.0; RBA

As can be seen, a higher deposit does decrease the probability of experiencing financial stress post-purchase, and the coefficients on the dummies for the 3rd and 4th quartiles are statistically significantly different from those of the 1st quartile at the 1 per cent level. This seems like pretty clear evidence that higher deposit requirements are serving to restrict first home buying to more financially stable households. Notably, there is a distinct break in the magnitude of the effect around the median, with those households that have an above-median deposit being substantially less likely to experience subsequent financial distress than those with a below-median deposit-to-income ratio.

A factor that would potentially confound the findings in Figure 10, and maybe account for the obvious break around the median, is the fact that a rising though still small share of FHBs are receiving financial assistance from family and friends (Figure 11).[25] It is possible that FHBs who have received help to meet the deposit requirement have less financial discipline than FHBs who have saved the entire sum independently. Nonetheless, if this was a significant confounding factor it would bolster the conclusion that the ability to save for a home deposit is a sign of financial discipline associated with fewer subsequent financial difficulties because this effect would serve to attenuate the strength of our findings in Figure 10.

25 As housing prices have risen, there have been increasing anecdotes and commentary on 'the bank of mum and dad' helping FHBs onto the property ladder. See, for example, Davey (2016) and Wade (2016).

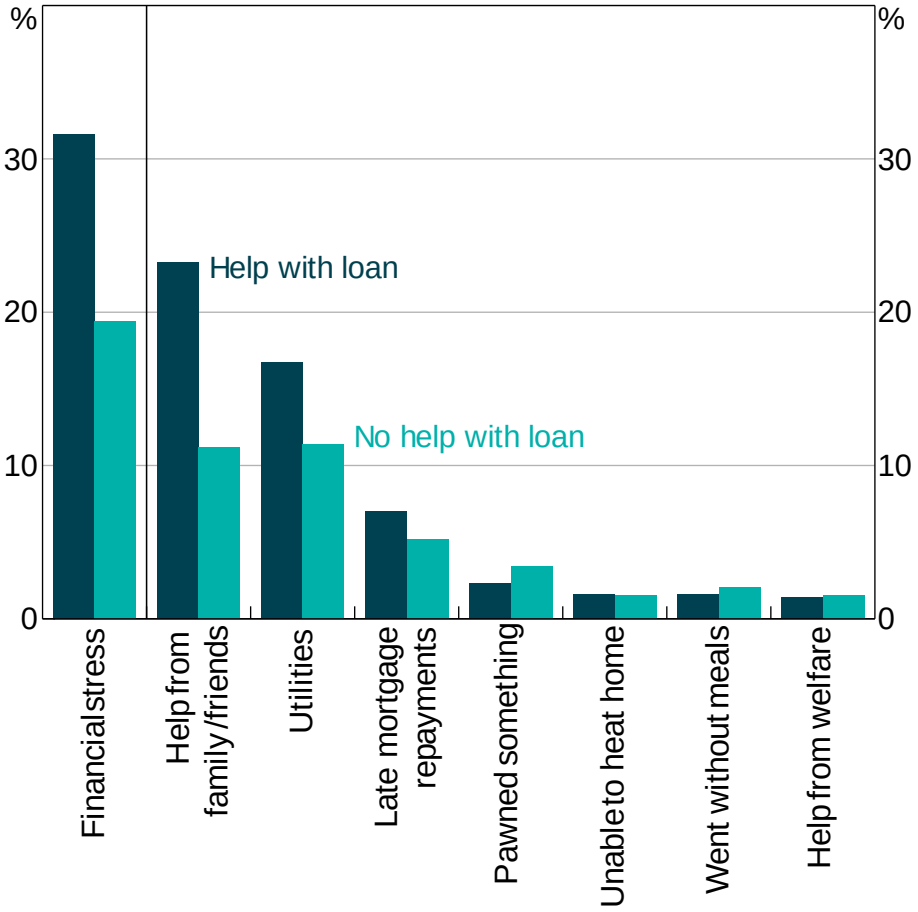
Figure 11: FHBs Who Received Help with Loan
Share of indebted FHB households



Sources: Authors' calculations; HILDA Survey Release 14.0

To assess whether financial assistance to FHBs is distorting these findings we compare FHBs who received financial assistance with their loan from family or friends to those that saved for their deposit independently. Looking at indicators for financial stress, we find that FHBs who received help with their loan are much more likely to have also received help from family and friends post-purchase. Around 23 per cent of these household received additional assistance in the years following their initial purchase, compared to 11 per cent of independent FHBs (Figure 12). In one respect, this is unsurprising. Parents willing and able to help their children are likely to continue to do so throughout their life. As such, it doesn't necessarily follow that these households are more likely to, say, default on their loans. However, FHB households who received help are also more likely to experience cash flow problems in the form of not being able to pay their utility bills or meet their mortgage repayments due to a shortage of money. This is more telling.

Figure 12: Post-purchase Financial Stress
Share of indebted FHB households

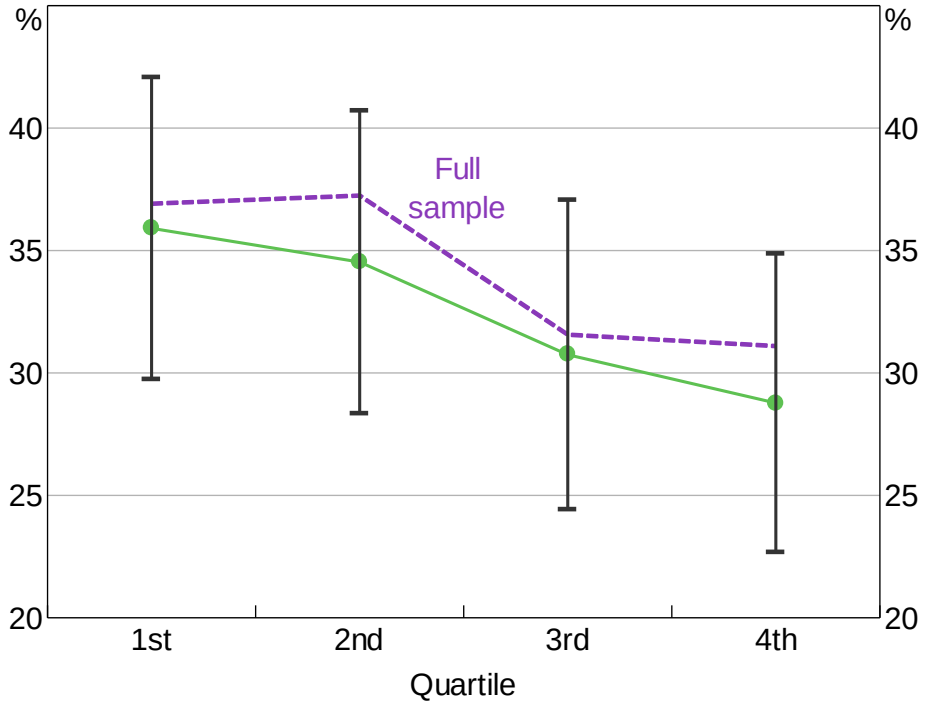


Sources: Authors' calculations; HILDA Survey Release 14.0

To control for the possible confounding of our results through the inclusion of households who have received help with their deposit, we re-run Equation (4) excluding those households that received deposit assistance. The results are shown in Figure 13. What we see is that the relationship between deposit size and subsequent financial distress is cleaner, with no obvious step around the median deposit. The relationship remains statistically significant. This feels like stronger evidence that deposits saved by the home buyers themselves matter.

Overall these findings bolster our confidence in our hypothesis that higher deposit requirements are acting to filter out less financially secure households from home ownership. This is not, of course, particularly surprising. Banks already emphasise the need for borrowers to have 'genuine savings' as an important consideration when assessing loans. However, the amount of 'genuine savings' required is usually small (e.g. 5 per cent of the purchase price), only required for high LVR loans and only needs to be demonstrated over a relatively short period of time (e.g. three months). Our findings in Figure 13 suggest that more savings accumulated by the household themselves, rather than just the existence of savings however accumulated, is better. Thus, as housing prices have increased, there has been a *de facto* tightening of credit standards quite apart from any other changes in the market. We suspect this aspect has not been fully appreciated given the popular focus on the negative effects of the size of the debt households are taking on rather than the positive indirect effects flowing from the associated larger deposits.

Figure 13: Predicted Probability of Indebted FHB Financial Stress
By deposit-to-income ratio quartile (excluding households that received assistance with the deposit)



Sources: Authors' calculations; HILDA Survey Release 14.0; RBA

7. Conclusion

The results we find in this paper are very much bittersweet. On the one hand, we find that fewer people are making the transition from renters to home owners than prior to the crisis. Given research that links the rise in inequality to changes in home ownership patterns, this could have significant longer-term consequences for the distribution of wealth in Australia. On the other hand, those households that do make the transition are more financially secure than earlier cohorts. So the rise in aggregate and individual debt ratios do not appear to be associated with an increase in household financial vulnerability – at least as far as first home buyers are concerned.

We attribute much of this change to the increase in housing prices and the associated hurdle that deposit requirements represent. While saving a deposit is a stretch, it is also a sign of financial discipline that is associated with fewer subsequent difficulties. Thus, while the first step on the property ladder is more of a stretch than before the crisis, those who do make the step are, on average, better placed to pay off their loans than prior to the crisis.

Appendix A: Data

The primary data used to examine the dynamics of home ownership are annual household-level longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey that cover the period from 2001 to 2014. The survey tracks individuals over time and provides detailed information on various household characteristics.

A wealth module is conducted as part of the HILDA Survey every four years. This module asks detailed questions about household assets and debts, and has so far been included in the 2002, 2006, 2010 and 2014 surveys. The HILDA Survey does not explicitly identify households as FHBs. Instead, this information must be inferred from responses to previous wealth modules.

A.1 Identifying Indebted FHBs

The past three wealth modules of the survey (2006, 2010 and 2014) have included a variable, 'rpage', which asks the household reference person whether they have ever owned residential property and, if so, the age at which they first acquired, or started buying, this property.

Another variable, 'hspown', available in the 2001 and 2002 surveys only, asks households whether they still live in their first home. This variable allows us to identify FHBs directly for these years.

We combine the information from 'hspown' and 'rpage' into the one variable identifying indebted FHBs. For 2001 and 2002 we use the 'hspown' variable and the 'rpage' variable is used thereafter.

We compare the FHB age reported by households in the 'rpage' variable across the 2006, 2010 and 2014 wealth modules. Where households report their FHB age in more than one wealth module, we check for inconsistencies in the age they report across the different modules.

In doing so, we find several cases where the FHB age that households report varies by only one year across the wealth modules, but only four cases where the FHB age varies by more than one year, which suggests households are fairly good at recalling how old they were when they became home owners, give or take a year.

We drop the households for which the FHB year varies by more than one year from the sample. We then use the combined FHB age variable to calculate the year of FHB purchase:

$$Years\ since\ FHB\ Purchase = Age - Age\ of\ FHB\ Purchase$$
$$\therefore Years\ of\ FHB\ Purchase = Current\ Year - Years\ since\ FHB\ Purchase$$

A household is identified as an FHB if the current year matches the reported year of FHB purchase. We verify this by checking that the FHB year of purchase is also the first year the household reported being an owner-occupier and the first year they reported having a mortgage.

The percentage of owner-occupier households identified as FHBs in any given year is, on average, between 1 and 2 per cent over the course of the survey, which is broadly in line with aggregate measures. This corresponds to between 50 and 100 households each year.

As we are interested in how households' debt decisions have changed, we only focus on *indebted* FHBs for our analysis, which are FHBs who report having positive mortgage debt. It should be noted that around 11 per cent of FHBs have no debt, which may reflect things such as inheritances or bequests.

A total of 1 202 households are identified as indebted FHBs. The comparison group used in the analysis is 'potential FHBs', which are all renter households under the age of 60 years who have never owned a property before. This group consists of a further 19 497 households. In total, over the period 2001 to 2014 there are 20 699 household in our sample.

A.2 Variable Definitions

The definitions for other HILDA Survey data used in the regression analysis are shown below (with associated variable names):

Age: The age of the household head (where the age is restricted to be between 18 and 60 years of age) (HGAGE)

Household disposable income: Total annual household disposable income ($'000) (HIFDITP – HIFDITN)

FHB debt: Each household's estimate of their current holdings of owner-occupier housing debt ($'000) (HSMGOWE + HSSLOWE)

Couple household: A dummy variable equal to one if the household reference person reports being in a couple household (HHFTY)

Household size: Number of usual residents in the household (HH0_4 + HH5_9 + HH10_14 + HHADULT)

Tertiary education: A dummy variable equal to one if the household head's highest level of educational attainment is higher than Year 12 and equal to zero otherwise (EDHIGH1)

Migrant household: A dummy variable equal to one if the household head's country of birth was not Australia and equal to zero otherwise (ANCOB)

Full-time employee: A dummy variable equal to one if the household head's employment status is full-time employee and equal to zero otherwise (ESDTLI)

Unemployment expectations (> 50%): A dummy variable equal to one if the household head reports a 50 per cent or higher chance of losing their job in the next 12 months and zero otherwise (JBMPLOJ)

Major urban area: A dummy variable equal to one if the household reports living in a major urban area and equal to zero otherwise (HHSOS)

The definitions for non-HILDA Survey variables used in the regression analysis are:

State housing prices index (log): Weighted median state housing price data from Australian Property Monitors (APM)

FHB incentives ('000s): State FHB government incentives (internally constructed series)

Variable mortgage rate: Standard variable owner-occupier mortgage rates (RBA statistical table F5 Indicator Lending Rates)

Appendix B: Heckman Selection Model

In estimating the determinants of FHB indebtedness we are faced with the problem that we only observe debt for households who have chosen to become FHBs and taken on a mortgage. Since households become indebted FHBs in a non-random way, based on characteristics such as marriage, education and employment status, we need to account for the potential bias in our estimates induced by this non-random selection.

To address this issue, we adopt the standard approach of a sample selection correction model or Heckit method which was first proposed by Heckman (1976, 1979). A summary of this two-stage procedure is provided below.

B.1 Stage One: Selection Equation

We use a probit model for the 'selection' equation to estimate the probability of transitioning from being a renter to an FHB (using a sample of both renters and FHBs). We then compute an inverse Mills ratio for each observation.

The selection equation used is identical to Equation (1) and takes the form:

$$P\left(FHB_{it}=1\,|\,\mathbf{X}_{it},D_{it}\right)=\Phi\left(\mathbf{X}_{it}'\beta+\delta D_{it}+\varepsilon_{it}\right) \tag{B1}$$

where the dependent variable FHB_{it} is binary and equal to one if household i took out a mortgage to purchase their first home between survey years $t-1$ and t. The term D_{it} is a *post-2007 dummy* equal to one if the year household i became an FHB is greater than 2007 and $\mathbf{X}_{it}$ is a vector of *household* and *aggregate*-level controls. ϕ is the standard normal probability density function and Φ is the standard normal cumulative distribution function. The vector of controls used is identical to Model 3 in Table 2. Following Greene (2003), the inverse Mills ratio, λ, is calculated as:

$$\lambda=\frac{\phi\left(\mathbf{X}_{it}'\beta+\delta D_{it}+\varepsilon_{it}\right)}{\Phi\left(\mathbf{X}_{it}'\beta+\delta D_{it}+\varepsilon_{it}\right)}$$

B.2 Stage Two: Linear Regression Model

For the second-stage regression, we run a linear regression on a sample of FHBs only. We include all of the variables used in the selection equation above, except for age and age squared, and also the inverse Mills ratio from the first-stage regression as an additional variable.

A common assumption when using the Heckit method is that the vector of controls in the selection model contains all of the variables that are included in the second-stage regression. However, while the model is technically identified in this case, it is usually desirable to exclude at least one variable in the selection model from the second stage or the second-stage regression is likely to suffer from collinearity problems.

In this case, the criteria for a variable being excluded is that it is correlated with the decision to become an FHB but has no direct effect on the level of debt an FHB takes on. We select the variable age (and age squared) as the exclusion restriction here, as the age of the household

reference person is likely to have a direct bearing on when the household decides to purchase their first home, but unlikely to have a bearing on the level of debt they decide to take on. If our sample included all households taking on new mortgage debt, age would likely influence the amount of debt households are willing to take on. However, given the narrower age range of FHBs, age is less likely to play a role (i.e. a 25-year old FHB household is likely to face a similar decision of how much debt to acquire as a 35-year old FHB household, all else equal). In addition to this argument, we find that when age and age squared are included in the second-stage regression they are insignificant – although their inclusion affects the other coefficient estimates and their significance, likely reflecting collinearity problems.

This standard Heckman selection method is used for the mean regression model. For the median regression model shown in Table C3, we follow a similar approach to Buchinsky and Hahn (1998) and Atalay *et al* (2015) and include the inverse Mills ratio and its squared value.

Appendix C: Extensions and Robustness Tests

C.1 Interacting the Main Demographic Variables with the Post-2007 Dummy

To assess whether there has been a change in the relationship between demographic factors and FHBs between the pre- and post-2007 period we re-estimate Model 1 and include interaction terms between the main demographic variables and the *post-2007 dummy*. Results from this estimation are shown in Model 1a (Table C1) and indicate no significant difference in the coefficients between periods.

Table C1: Determinants of Being an Indebted FHB Household

Coefficients

	Model 1 Baseline model	**Model 1a** Interaction effects
Post-2007 dummy	–0.31***	–0.34***
Age	0.11***	0.10***
Age squared	–0.00***	–0.00***
Age × Post-2007 dummy	na	0.01
Age squared × Post-2007 dummy	na	–0.00
Household disposable income ($'000)	0.00***	0.00***
Couple household	0.70***	0.84***
Couple household × Post-2007 dummy	na	–0.27
Tertiary education	0.27***	0.26***
Tertiary education × Post-2007 dummy	na	0.02
Migrant household	–0.12**	–0.12**
Household size	–0.13***	–0.13***
Full-time employee	0.57***	0.57***
Unemployment expectations (> 50%)	–0.45**	–0.46**
Constant	–3.61**	–3.59**
Observations	20 699	20 699
Pseudo R-squared	0.18	0.21

Notes: The coefficients on the explanatory variables in a probit model indicate the sign and statistical significance of the relationship with the dependent variable only and do not provide information on the magnitude of these relationships; *, ** and *** indicate statistical significance at the 10, 5 and 1 per cent levels, respectively

Sources: Authors' calculations; HILDA Survey Release 14.0

C.2 Including Time Fixed Effects

Park and Phillips (2000) discuss the challenges of using non-stationary explanatory variables in discrete choice models. In particular, they argue that convergence is not guaranteed in binary choice models with integrated regressors.

To evaluate if our results are influenced by the non-stationarity of the state housing price indices, we include time fixed effects instead of the *post-2007 dummy* in Model 3a (see Table C2 for results). Using this approach, we get quantitatively similar results to Model 3, suggesting that non-stationarity is not an issue here.

C.3 Local Government Area (LGA) Housing Prices

We also test whether the state housing price index is not capturing some other state-time fixed effect by also estimating the model using APM data on LGA-level housing prices.

It should be noted that these more disaggregated data are only available for the capital cities of Sydney, Melbourne and Brisbane, and only cover the period 2001 to 2012, which results in a smaller sample size for estimation of Model 3b. Despite these limitations, we find that using the alternative housing prices measure in Model 3b provides very similar results to Model 3 (Table C2).

Table C2: Determinants of Being an Indebted FHB Household
Average marginal effects, percentage points

	Model 3 Baseline model	**Model 3a** Time fixed effects	**Model 3b** LGA-level housing prices
Post-2007 dummy	0.00	na	–0.32
Age	1.00***	1.00***	1.00***
Age squared	–0.02***	–0.00***	–0.00***
Household disposable income ($'000)	0.03***	0.03***	0.06***
Couple household	6.88***	6.90***	6.34***
Household size	–1.38***	–1.36**	–1.92***
Tertiary education	3.52***	3.57***	4.63***
Migrant household	–0.68	–0.59	–0.48
Full-time employee	4.83***	4.82***	4.11***
Unemployment expectations (> 50%)	–3.47***	–3.49***	–1.94*
State housing price index (log)	–0.08***	–0.07***	na
LGA housing price index (log)	na	na	–0.08***
First home buyer incentives ($'000)	0.12***	0.04	0.17***
Variable mortgage rate	0.04	na	–0.78**
Major urban area	–2.34***	–2.38***	–1.11***
State fixed effects	Yes	Yes	Yes
Time fixed effects	No	Yes	No
Observations	20 699	20 699	7 871
Pseudo R-squared	0.21	0.20	0.23

Notes: Average marginal effects are calculated for each household based on the observed values of the explanatory variables for that household and are then averaged across all households; *, ** and *** indicate statistical significance at the 10, 5 and 1 per cent levels, respectively

Sources: APM; Authors' calculations; HILDA Survey Release 14.0; RBA

C.4 Alternative Models of Debt Levels for FHBs

It is not obvious which particular measure of household debt should be used as a dependent variable. Each choice implicitly embeds a particular functional relationship between debt, income and asset values. In this section, we vary the functional form of the dependent variable to test for the sensitivity of our results to this choice. Model 6 from Table 4 is re-estimated using log FHB mortgage debt and the FHB debt-to-assets ratio as alternative dependent variables. To test how sensitive the model is to extreme values of the FHB debt-to-income ratio we also estimate a

median, rather than a mean, regression. Results from these alternative specifications are largely in line with Model 6 (once allowance is made for changes in the coefficient restrictions implicit in the different specifications).

Table C3: Regression Results for Robustness Checks of Equation (2)

Coefficients

	Model 7 $\ln(Debt)$	**Model 8** Debt-to-assets ratio	**Model 9** Median regression
Post-2007 dummy	–0.058	0.004	–0.499***
Age	0.048**	–0.005	na
Age squared	–0.001***	0.000	na
Household disposable income ($'000)	0.001***	0.000	–0.010***
Couple household	0.206***	0.034**	–0.009
Household size	–0.042*	–0.007	–0.144***
Tertiary education	0.171***	0.005	0.255**
Migrant household	–0.036	–0.030**	–0.019
Full-time employee	0.204***	0.114***	0.481**
State housing price index (log)	0.843***	0.066**	1.992***
First home buyer incentives ($'000)	0.002	0.002	0.011
Variable mortgage rate	0.023	0.005	0.016
Major urban area	0.305***	–0.004	0.585***
Lambda	na	na	0.519
Lambda squared	na	na	–0.082
Constant	–0.069	0.413**	–6.838***
State fixed effects	Yes	Yes	Yes
Observations	1 100	1 149	1 048
Adjusted R-squared	0.319	0.115	0.217[(a)]

Notes: Due to missing values of the different dependent variables, sample sizes vary across Models 7 to 9; *, ** and *** indicate statistical significance at the 10, 5 and 1 per cent levels, respectively
(a) A pseudo R-squared is computed

Sources: APM; Authors' calculations; HILDA Survey Release 14.0; RBA

References

Alfelt G and J Winstrand (2015), 'The Indebtedness of Swedish Households – 2014 Update', Sveriges Riksbank Economic Commentaries No 1.

Andersen AL, C Duus and TL Jensen (2016), 'Household Debt and Spending during the Financial Crisis: Evidence from Danish Micro Data', *European Economic Review*, 89, pp 96–115.

Atalay K, G Barrett and R Edwards (2015), *House Prices, Mortgage Debt and Labour Supply: Evidence from Australian Households*, AHURI Positioning Paper No 167, Australian Housing and Urban Research Institute, Melbourne.

Bourasssa SC (1995), 'The Impacts of Borrowing Constraints on Home-Ownership in Australia', *Urban Studies*, 32(7), pp 1163–1173.

Buchinsky M and J Hahn (1998), 'An Alternative Estimator for the Censored Quantile Regression Model', *Econometrica*, 66(3), pp 653–671.

Bunn P and M Rostom (2015), 'Household Debt and Spending in the United Kingdom', Bank of England Staff Working Paper No 554.

Byrne D, B Eno, C Frantz, J Harrison and T Weymouth (1981), 'Once in a Lifetime', Warner/Chappell Music Inc., Universal Music Publishing Group.

Cateau G, T Roberts and J Zhou (2015), 'Indebted Households and Potential Vulnerabilities for the Canadian Financial System: A Microdata Analysis', Bank of Canada *Financial System Review*, December, pp 49–58.

Davey M (2016), 'Australian First-Home Buyers Face Higher Than Ever Loan Default Risk, Says Report', *The Guardian* (Australia) online, 31 March, viewed November 2016. Available at <https://www.theguardian.com/australia-news/2016/mar/31/australian-first-home-buyers-face-higher-than-ever-loan-default-risk-says-report>.

Dettling LJ and MS Kearney (2014), 'House Prices and Birth Rates: The Impact of the Real Estate Market on the Decision to Have a Baby', *Journal of Public Economics*, 110, pp 82–100.

Duke J (2016), 'Australian Dream "Out of Reach for 80 Per Cent of Millennials"', Domain, 19 May, viewed June 2016. Available at <https://www.domain.com.au/news/australian-dream-out-of-reach-for-80-per-cent-of-millennials-20160519-goxjog/>.

Dungey M, G Wells and S Thompson (2011), 'First Home Buyers' Support Schemes in Australia', *The Australian Economic Review*, 44(4), pp 468–479.

Dynan KE (2012), 'Is a Household Debt Overhang Holding Back Consumption?', *Brookings Papers on Economic Activity*, Spring, pp 299–344.

Dynan KE, DW Elmendorf and DE Sichel (2007), 'The Evolution of Household Income Volatility', Board of Governors of the Federal Reserve System Finance and Economics Discussion Series No 2007-61.

Dynan KE and DL Kohn (2007), 'The Rise in US Household Indebtedness: Causes and Consequences', in C Kent and J Lawson (eds), *The Structure and Resilience of the Financial System*, Proceedings of a Conference, Reserve Bank of Australia, Sydney, pp 84–113.

Evidens (2015), 'The Deceptive Debt Ratio', Report, 10 September. Available at <https://www.evidensgruppen.se/sites/default/files/Evidens_rapporten_ENG_web_high.pdf>.

Farnham M, L Schmidt and P Sevak (2011), 'House Prices and Marital Stability', *The American Economic Review*, 101(3), pp 615–619.

Fisher JDM and M Gervais (2011), 'Why Has Home Ownership Fallen Among the Young?', *International Economic Review*, 52(3), pp 883–912.

Greene WH (2003), *Econometric Analysis*, 5th edn, Prentice Hall, Upper Saddle River.

Gyourko J (2003), 'Access to Home Ownership in the United States: The Impact of Changing Perspectives on Constraints to Tenure Choice', in T O'Sullivan and K Gibb (eds), *Housing Economics and Public Policy*, Real Estate Issues, Blackwell Science Ltd, Oxford, pp 172–192.

Heckman JJ (1976), 'The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models', *Annals of Economic and Social Measurement*, 5(4), pp 475–492.

Heckman JJ (1979), 'Sample Selection Bias as a Specification Error', *Econometrica*, 47(1), pp 153–161.

Henderson K and GM Scobie (2009), 'Household Debt in New Zealand', New Zealand Treasury Working Paper 09/03.

House of Representatives (House of Representatives Standing Committee on Economics) (2015), 'Inquiry on Home Ownership', Media Alert, 13 May. Available at <http://www.aph.gov.au/DocumentStore.ashx?id=ce16f4db-f837-40d2-a715-9b9d173311d7>.

Hunt C (2015), 'Economic Implications of High and Rising Household Indebtedness', Reserve Bank of New Zealand *Bulletin*, 78(1).

Kohler M and A Rossiter (2005), 'Property Owners in Australia: A Snapshot', RBA Research Discussion Paper No 2005-03.

La Cava G (2016), 'Housing Prices, Mortgage Interest Rates and the Rising Share of Capital Income in the United States', RBA Research Discussion Paper No 2016-04.

Laeven L and A Popov (2016), 'Waking Up from the American Dream: On the Experience of Young Americans during the Housing Boom of the 2000s', European Central Bank Working Paper Series No 1910.

Larrimore J, J Schuetz and S Dodini (2016), 'What are the Perceived Barriers to Homeownership for Young Adults?', Board of Governors of the Federal Reserve System Finance and Economics Discussion Series No 2016-021.

Lovenheim MF and KJ Mumford (2013), 'Do Family Wealth Shocks Affect Fertility Choices? Evidence from the Housing Market', *The Review of Economics and Statistics*, 95(2), pp 464–475.

Mian A, K Rao and A Sufi (2013), 'Household Balance Sheets, Consumption, and the Economic Slump', *The Quarterly Journal of Economics*, 128(4), pp 1687–1726.

Mian A and A Sufi (2010), 'Household Leverage and the Recession of 2007–09', *IMF Economic Review*, 58(1), pp 74–117.

Park JY and PCB Phillips (2000), 'Nonstationary Binary Choice', *Econometrica*, 68(5), pp 1249–1280.

RBA (Reserve Bank of Australia) (2015), 'Submission to the Inquiry into Home Ownership', Submission to the House of Representatives Standing Committee on Economics Inquiry into Home Ownership, June.

Wade M (2016), 'The Economic Downside to the Bank of Mum and Dad', *The Sydney Morning Herald* online, 30 October, viewed November 2016. Available at <http://www.smh.com.au/comment/the-downside-to-the-bank-of-mum-and-dad-20161028-gsd5wc.html>.

Winstrand J and D Ölcer (2014), 'How Indebted are Swedish Households?', Sveriges Riksbank Economic Commentaries No 1.

Wood G, R Watson and P Flatau (2006), 'Microsimulation Modelling of Tenure Choice and Grants to Promote Home Ownership', *Australian Economic Review*, 39(1), pp 14–34.

Yates J (2015), 'Trends in Home Ownership: Causes, Consequences and Solutions', Submission to the House of Representatives Standing Committee on Economics Inquiry into Home Ownership, June.

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