A TALE OF TWO SURVEYS: HOUSEHOLD DEBT AND FINANCIAL CONSTRAINTS IN AUSTRALIA

Gianni La Cava and John Simon

Research Discussion Paper
2003-08

July 2003

Economic Research
Reserve Bank of Australia

Abstract

Over the past decade, household debt (as a share of household income) has reached historically high levels. This has raised concerns about whether, as a result of the rise in debt, households are now more financially 'fragile'.

Using data from the 1998/99 Household Expenditure Survey (HES), a logit model is constructed to examine the relationship between the probability of being financially constrained and the economic and demographic characteristics of households in Australia. We find that the probability of a household being constrained is significantly affected by demographic and economic variables such as age, marital status, home ownership, weekly household income, the proportion of income earned from interest, and the share of income going to repayments on mortgage debt. Unfortunately, however, we cannot separately identify households with investor housing debt and so cannot examine the relationship between this component of household debt and the probability of being financially constrained.

We also apply the model to data from the 1993/94 HES and the 2001 Household, Income and Labour Dynamics in Australia (HILDA) Survey. Our results imply that the overall proportion of households who are financially constrained in the economy has fallen or, at worst, remained unchanged between 1994 and 2001. Separating households into financially constrained and unconstrained groups, we find that much of the rise in debt appears to have been due to unconstrained households taking on more debt. As such, the rise in the aggregate debt to income ratio associated with owner-occupier mortgages appears to be the result of voluntary household choice rather than a result of increased household financial distress. Hence, the increase in owner-occupier mortgage debt has not been associated with an increase in the proportion of households who are financially constrained.

Table of Contents

A TALE OF TWO SURVEYS: HOUSEHOLD DEBT AND FINANCIAL CONSTRAINTS IN AUSTRALIA

Gianni La Cava and John Simon

1.   Introduction

Over the past decade, household debt (as a share of household income) has reached historically high levels. Between December 1990 and September 2002 the ratio of household debt to disposable income more than doubled from 50.5 per cent to 122 per cent (Figure 1).

Figure 1: Household Debt[a]

Per cent of household disposable income
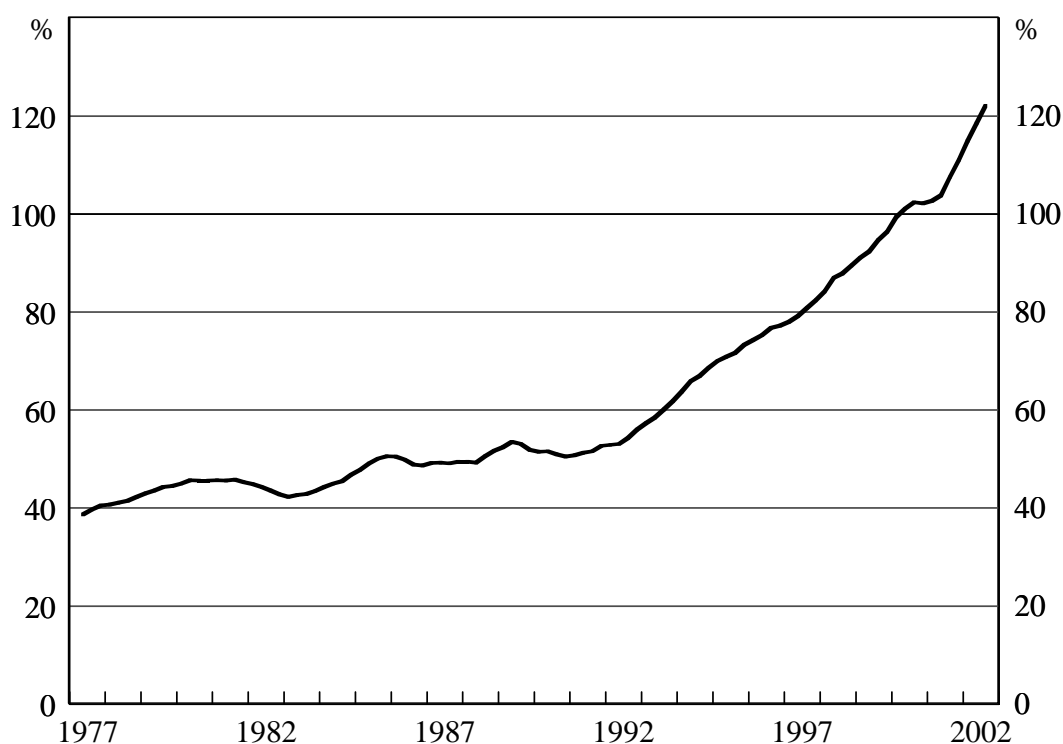
Note: (a) Excludes unincorporated businesses
Sources: ABS; RBA

This rise has been commented upon widely, including by *The Economist*, which remarked:

> The profligacy of American and British households is legendary, but Australians have been even more reckless, pushing their borrowing to around 125 per cent of disposable income…there are now concerns that unsustainable rates of borrowing will sooner or later end in tears. ('Living in never-never land', *The Economist*, 9 January 2003).

Despite the intuitive appeal of a link between a rise in aggregate household debt to income ratios and financial fragility, there are a number of important considerations. For example, it matters who is holding the additional debt. If the run-up in debt is caused by lending to people with above-average capacity to service the additional debt at conservative loan-to-house valuation ratios there would be relatively little cause for concern.

This paper seeks to shed light on this issue by referring to household level surveys that provide detailed information on household debt and financial constraints. As alluded to above, it may be that the rise in the aggregate debt to income ratio has been accompanied by an increase in the proportion of financially constrained households. Alternatively, it may be that rising debt levels reflect a rise in people's capacity to borrow and, as such, are a reflection of good economic outcomes rather than a signal of greater fragility.

The remainder of this paper is organised as follows. In Section 2 we begin with a brief discussion of previous research in the area. Sections 3 and 4 discuss the data we will use in this project and provide an initial picture of constrained and unconstrained households in Australia. To better understand the relationships involved we then estimate a model in Section 5 to examine the demographic and economic characteristics of households that help explain cash flow constraints in Australia. We then use this model to look at how changes in these characteristics over time may have influenced the prevalence of cash flow constraints for Australian households. In Section 6 we turn our attention to the related question of what factors might help explain the rise in the aggregate debt to income ratio. This allows us to answer our motivating question: has the increase in the aggregate debt

to income ratio also been associated with an increase in the financial 'fragility' of households? Section 7 concludes.

2.   Previous Research

There has been little previous work linking debt levels to household financial constraints. However, there has been substantial work focusing on the closely related link between consumption behaviour and constraints. This work infers the level of household constraints from macroeconomic consumption behaviour. Other work of a more microeconomic nature looks directly at what factors affect people's access to credit.

Most of the macroeconomic work considers the effect of household constraints in the context of testing the Rational Expectations Permanent Income Hypothesis (REPIH).[1] This theory holds that households choose the path of consumption that maximises their expected lifetime utility. When households are forward-looking in this way, changes in current income should have little effect on their consumption patterns: it is lifetime income that matters. The seminal work in this area was done by Hall (1978). In Hall and in subsequent work, empirical tests have consistently rejected the hypothesis, showing that consumption is 'excessively sensitive' to changes in current income.[2] One explanation for this excess sensitivity is the possible existence of liquidity constraints. If households are denied access to credit they will be unable to borrow against future income to optimally smooth their consumption. Instead, these households must resort to consuming solely out of current income.[3] The extent to which aggregate consumption follows aggregate income can then be used to infer the proportion of households who are credit-constrained. The emerging consensus is that about 20 per cent of the population are credit-constrained. However, these estimates do vary significantly, both across countries and across time. This is likely to reflect both structural and cyclical factors. For example, the deregulation of the financial system over the 1980s and

---

[1]   The literature on the effect of liquidity constraints on consumption is extensive and well summarised by Deaton (1992), Muelbauer (1994), and Attanasio (1998).

[2]   Studies that are particularly relevant to the current paper are summarised in Appendix A.

[3]   For liquidity constraints to affect consumption behaviour, households must be unable to borrow as much as they want, face an increasing income path and be impatient enough to want to bring resources from the future to the present.

1990s is expected to have made it easier for households to access credit in most industrialised countries. It follows that liquidity constraints are now less likely to affect consumption.

There are a number of Australian studies in this area. Debelle and Preston (1995) suggest that the proportion of liquidity-constrained (current income) consumers has fallen significantly from 40–45 per cent in the 1970s to 20–25 per cent in the 1980s–1990s – as expected given financial deregulation. Blundell-Wignall, Browne and Tarditi (1995) examine similar sub-periods and find a similar decline in the sensitivity of consumption to current income for a large number of countries. However, unlike Debelle and Preston (1995) they do not find support for declining constraints in Australia, a result upheld by de Brouwer (1996).[4]

Household level studies have also tested the REPIH. The main advantage of micro studies is that, in their data sets, they are generally able to directly observe constrained consumers rather than having to infer the presence of liquidity constraints. For example, Jappelli (1990) and Cox and Jappelli (1993) use the Survey of Consumer Finances (SCF) to study the characteristics of liquidity-constrained consumers in the US. Credit constraints can be directly observed in their micro data as the SCF provides information on which consumers had their request for credit rejected by financial institutions. Jappelli (1990) shows that economic characteristics (such as current income, wealth and unemployment) are important determinants of whether a household is credit-constrained. However, Jappelli (1990) also shows that demographic characteristics (such as age, marital status and household type) are highly significant. As such, macro studies that ignore demographic change may not capture changes in the true distribution of liquidity constraints across time.

Cox and Jappelli (1993) estimate the extent to which borrowing constraints reduce the levels of debt held by credit-constrained households. They find that desired debt exhibits a pronounced life-cycle pattern, increasing until the age of the

---

4   The disparity between the results of Blundell-Wignall *et al* (1995) and Debelle and Preston (1995) may be due to the latter's sample period extending into a more deregulated financial environment during the mid 1990s. de Brouwer's (1996) results may not be directly comparable as he uses a different range of proxies for liquidity constraints, none of which prove to be significant for Australia. Moreover, he uses annual data where Debelle and Preston (1995) use quarterly data.

household head reaches the mid-30s, and then declining. Also, the gap between desired and actual debt is highest for younger households, indicating that they would benefit most from the easing of liquidity constraints. The probability of being constrained falls with age and is negatively related to permanent earnings and net worth. Duca and Rosenthal (1993) extend their work by also examining the manner in which lenders vary debt limits across borrowers. They find that debt limits are affected by household income, wealth, credit history and ethnic background.

3.   The Data

The primary sources of data used in this paper are the Household Expenditure Survey (HES) for 1993/94 and 1998/99 and the Household, Income and Labour Dynamics in Australia (HILDA) Survey for 2001. These surveys contain detailed information on expenditure, income and demographic characteristics for households resident in private dwellings throughout Australia.[5] Both surveys collect information from all persons aged 15 years and over. This is mainly done through individual face-to-face interviews.

The surveys differ in a number of ways. The HES collects more detailed expenditure data, requiring survey participants to record in a diary all their expenditure over a 2-week period. HILDA focuses more on economic welfare, labour market dynamics, family dynamics and subjective well-being. The HES is a cross-sectional survey that is repeated every 4 or 5 years. On the other hand, HILDA is a household 'panel' or 'longitudinal' survey. This means that it is also cross-sectional in that it surveys many households *at a particular point in time*, but it also follows these households *across time*. This is the first time such a large-scale household panel survey has been undertaken in Australia. However, at this stage, only the first wave of the data has become available so that HILDA is effectively a cross-sectional survey too. The 1993/94 HES covered 8 389 households and nearly 23 000 people with the interviews being equally spread over the period July 1993 to June 1994. The 1998/99 HES was undertaken between July 1998 and June 1999, covering 6 892 households and 13 964 people.

---

5   Both surveys exclude special dwellings (such as hospitals, institutions, nursing homes, hotels, and hostels) and dwellings in remote and sparsely settled parts of Australia.

The HILDA Survey covered 7 682 households and 13 969 people, with the majority of the Wave 1 data being collected between 24 August 2001 and 21 December 2001.

In using large cross-sectional household data sets to examine the characteristics of financially constrained households we closely follow the approach of several US studies (e.g., Jappelli (1990); Cox and Jappelli (1993); Duca and Rosenthal (1994)). However, these studies focus on households who have been denied access to credit. This kind of micro data is currently unavailable in Australia. Instead, we focus on measures that indicate whether households have difficulty paying their bills, and, by inference, are cash-constrained. In 1998/99 the HES introduced several ways of measuring financial fragility in households. In particular, the survey collected information on whether individuals:

1. Could not pay their utility bills due to a shortage of money.

2. Could not pay their registration or insurance on time (rent and mortgage in HILDA).

3. Pawned or sold something due to a shortage of money.

4. Went without meals due to a shortage of money.

5. Were unable to heat their home due to a shortage of money.

6. Sought assistance from welfare organisations due to a shortage of money.

7. Sought financial help from friends or family due to a shortage of money.

If a person answers 'yes' to any of these questions we define them as having had cash flow problems. Throughout the paper we will interchangeably refer to these people as being 'cash flow constrained', 'cash constrained', 'financially constrained', and 'financially stressed'.[6] Because the questions on financial stress were only asked in this form in 1998/99 we use econometric techniques to infer the

---

[6]   However, these concepts are not quite the same as 'credit constraints' in the other literature.

proportion of constrained households in 1993/94 and 2001.[7] However, we defer discussion of the econometrics until we have introduced the data.

4. Features of the Data

Before undertaking any formal modelling, it is useful to look at some of the features of the data to be used in the model. The data presented in this section come from the HES for 1998/99. Firstly, given the importance of the cash flow variable in our analysis, it is of interest to look at its composition. As has already been stated, our proxy for cash constraints is whether a household reports having problems on at least one of seven dimensions of financial stress (e.g., could not pay their bills, had to pawn something, went without meals) – 22 per cent of households report being constrained on at least one of these measures. However, some of these measures were more common than others.

Figure 2 shows the relative contributions of each measure of financial stress. For example, the first column shows that around 72 per cent of cash-constrained households fell into this category because they could not pay their utility bills due to a shortage of money. Most of the other cash flow problems can be explained by households being unable to pay registration or insurance on time (29 per cent) or because they had to ask family or friends for assistance (44 per cent).[8] One other possible measure of cash flow problems is whether the household could raise $2 000 in a week as emergency money. However, around 51 per cent of households reporting cash flow problems on our preferred measure also reported being unable to raise $2 000 in a week. Furthermore, only 10 per cent of unconstrained households reported being unable to raise the emergency money. So

---

[7] HILDA asked very similar questions but differences in sampling technique lead to a large difference in the raw number of households that we would call cash constrained. This is why we use econometric techniques for 2001 as well as 1993/94. However, we are able to use the HILDA answers to verify our results and are thus fairly confident about our findings for 2001.

[8] Some of the other components, such as whether the household pawned or sold something (19 per cent), whether they were unable to heat their home (10 per cent) and whether they went without meals (12 per cent) may be better indicators of financial hardship rather than cash flow problems *per se* (see Bray (2001)). We experimented with different combinations of the various components in the model as proxies for cash flow problems, without significantly altering the results.

there is significant overlap in these measures. Finally, using the emergency money variable in the model does not appreciably affect the results.

Figure 2: Measures of Financial Stress

Per cent of constrained households reporting each problem[a]
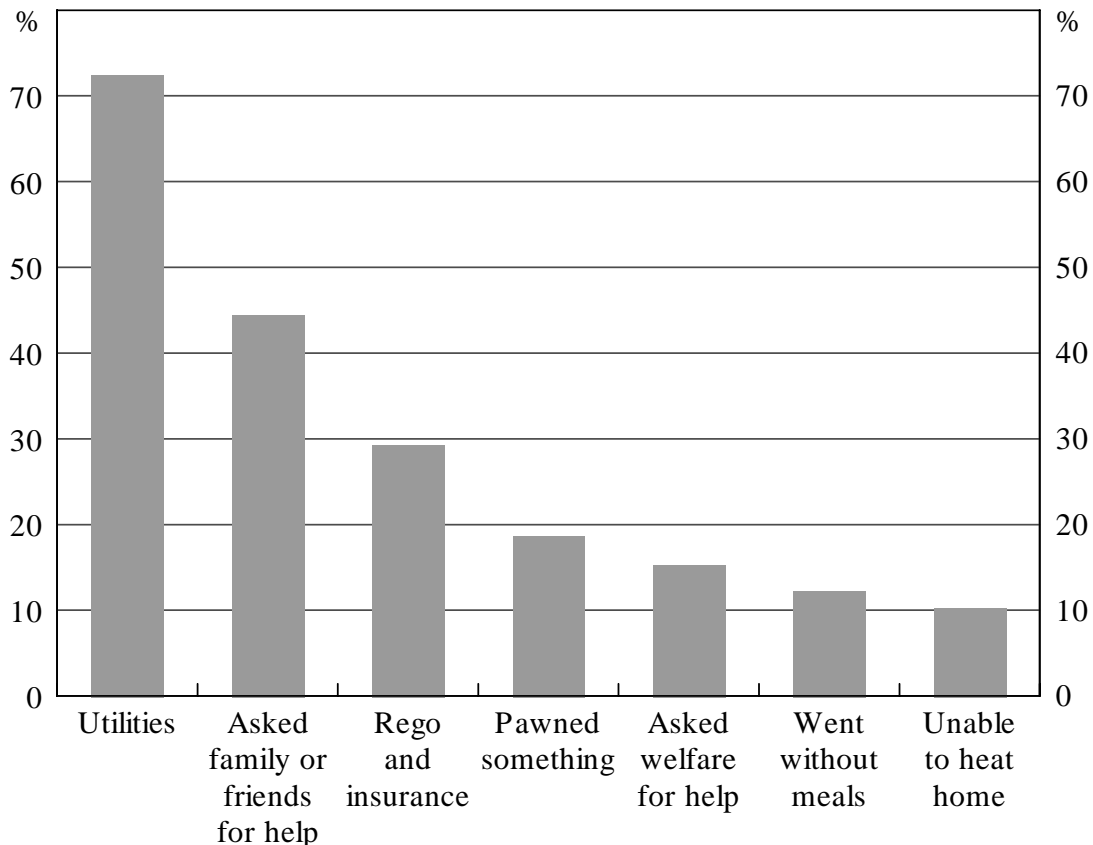
Note: (a) The relative contributions do not sum to 100 per cent as households may report being constrained on more than one measure (e.g., a household may have been unable to pay their bills on time and had to pawn something).

Source: ABS Household Expenditure Survey 1998/99

Given our motivating question, it is of interest to see whether household debt and financial stress are related in a simple bi-variate analysis. An important limitation of the survey data in this regard is relevant. Debt for investment purposes is not directly measured by the surveys. The HES excludes debt used to purchase a dwelling that is rented out for more than three months in the previous year. The HILDA Survey asks only about debt secured against the principal place of residence of the household. To the extent that some investment loans may be secured against people's principal place of residence, they would be captured by HILDA.

It should also be noted that, given we have access to unit record file data, we measure debt to income ratios by dividing the outstanding stock of debt for each household by the level of income for each household – effectively weighting all households equally. Aggregate measures of debt to income ratios divide the sum of the total debt stock across all households by the sum of total incomes across all households – effectively giving more weight to higher-income households. We measure the debt-service ratio (mortgage repayments as a share of disposable income) the same way. Differences in the weighting schemes can account for differences in both the level and growth rates of these ratios. For instance, our measure of the level of the debt-service ratio (for households with debt) will tend to be higher than the aggregate measure because higher-income households (with debt) generally have lower relative debt burdens. Also, changes in the distribution of the debt will show up in our measures but are unlikely to affect aggregate measures in the same way.

Figure 3 shows that, across all households, individuals living in lower-income households are more likely to suffer cash flow problems. Around 25–30 per cent of households in the two lowest income quintiles are cash-constrained. This falls to around 10 per cent for households in the highest income quintile. So while cash flow problems are more frequent in lower income groups, they still remain prominent for some households at all income levels. And while low-income households appear more likely to have cash flow problems, they also appear less likely to have debt. As a share of income, household debt stands at around 10–30 per cent in the two lowest quintiles. It peaks at around 60–70 per cent in the third and fourth quintiles. On the surface, this suggests that the households holding debt are less likely to be financially stressed.

However, if we focus on households *with* debt we can see a possible positive correlation between debt levels and the degree of financial stress. For households with debt, debt to income ratios peak in the lowest income quintiles at around 240 per cent. Debt to income falls to around 130 per cent in the highest income group. For households with debt, financial stress peaks in the second quintile as 42 per cent of households with debt in this quintile report having problems.

Figure 3: Housing Debt and Financial Stress by Income
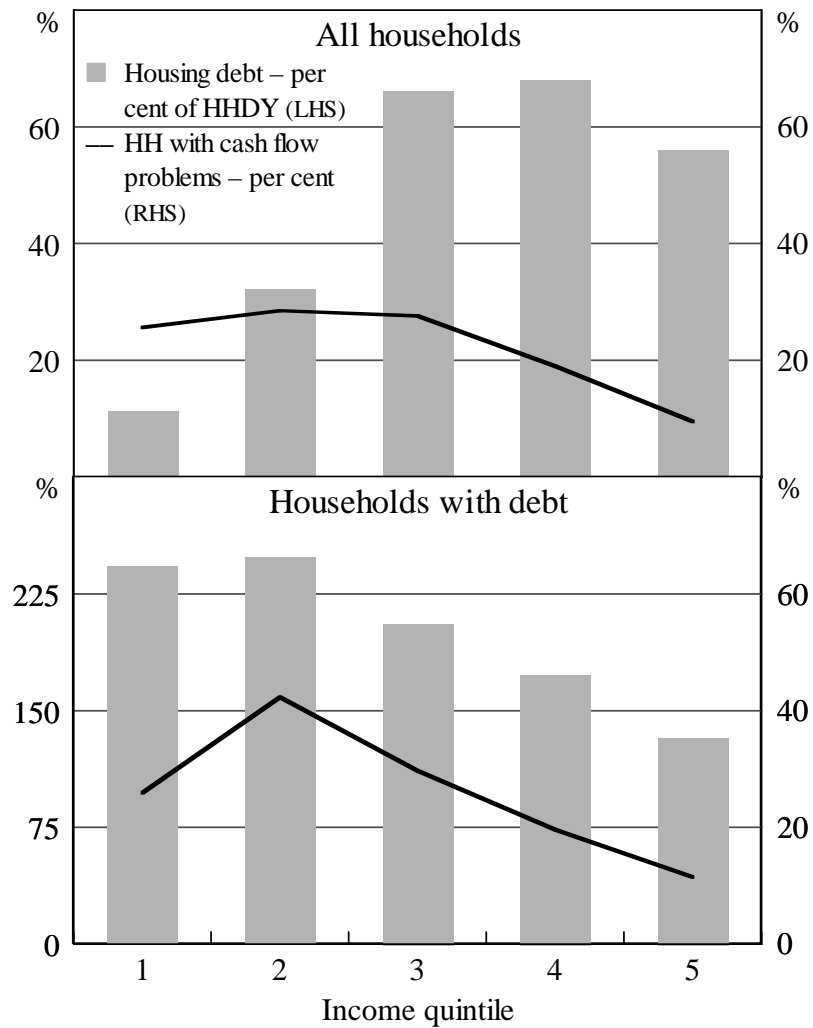
Source: ABS Household Expenditure Survey 1998/99

A different way to look at these data is across age groups rather than income groups. The life-cycle model of consumption posits that younger households should borrow to consume in advance of future income, repay their debt and save through the middle years, and draw down their savings after retirement. As younger households have had less time to build up assets than older households, they are more likely to report cash flow (and other) problems, as supported by Figure 4.

Figure 4: Housing Debt and Financial Stress by Age
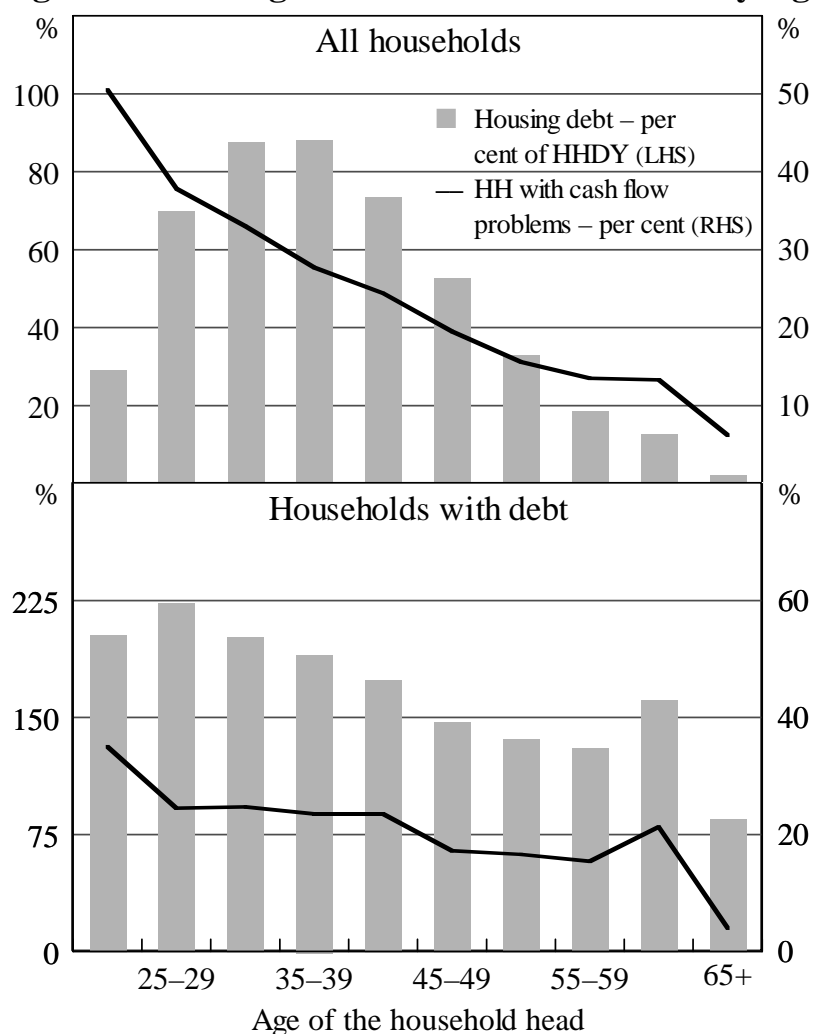
Source: ABS Household Expenditure Survey 1998/99

In keeping with the life-cycle model, the majority of household debt *across all households* appears to be concentrated in the middle-aged households rather than in young households. So, again, across all households there is only tentative evidence that financial fragility and the incurrence of debt are related. Reported cash flow problems generally fall as the household head gets older. In the case of the aged, the low incidence of cash flow problems may reflect prudent financial management, stable income flows and a capacity to draw upon assets.

But if we again just focus on households with debt, the youngest households appear to have the highest debt to income ratios, peaking at around 220 per cent in the 25–29 age group, reflecting the fact they are more likely to have recently taken out a loan. Younger households are also more likely to report having had cash flow problems with around 24 per cent of households in the 25–29 age group having suffered financial stress in the past year. For households with debt, reported cash flow problems also fall as the household head gets older.

So the overall picture we glean from this is that households with debt are generally less likely to be cash-constrained. However, *for those households that do hold mortgage debt*, the more debt they hold the more likely they are to be financially constrained. To better understand the relationship between financial constraints and debt, and to control for various other factors, we need to employ more sophisticated econometric techniques and it is this to which we now turn.

5. Understanding Constraints Better: A Model

5.1 Methodology

We construct a logit model and estimate it using the cross-sectional data from the 1998/99 HES. The results of this estimation are interesting in their own right in that they highlight what demographic and economic factors affect the likelihood that a household will be financially constrained. The model will also be used to predict the likely incidence of constraints using different underlying data in later sections.

The specification of the logit model includes variables which economic theory suggests will be related to cash flow problems or which previous empirical studies have shown to be important determinants. The estimated logit equation is:[9]

---

[9] Clearly, it is not feasible for the household surveys to actually cover the whole Australian population. Instead, they sample only a small selection of households. Because the estimates are based on a sample of households, the estimates may not be representative of the population as a whole. To minimise this type of bias, all estimates are adjusted using sampling weights provided by the ABS. The weights are equal to the inverse of the probability of each household being selected from the population.

$$\ln(\frac{P_i}{1 - P_i}) = \beta_0 + \sum_{k=1}^{N} \beta_k X_{ki} + \varepsilon_i \qquad (1)$$

where P_i is the probability of household i being financially constrained and $\{X_{ki}\}$ is the set of N independent (demographic and economic) variables for household i. We adopt the following modelling strategy:

- An equation including a large number of demographic, geographic and economic variables is initially estimated.

- Variables with coefficients not significant at the 5 per cent level are eliminated, starting with the least significant.

- As insignificant variables are excluded, the p-values of remaining variables are monitored in case of possible multi-collinearity.

- The final set of (mainly) significant explanatory variables forms the basis of the model.[10] We leave in some variables of particular interest even if they are insignificant.[11]

Variables were selected that best explain cash flow constraints in the 1998/99 model. However, we also compromised, to some extent, on the choice of variables in order to allow comparisons across time. For example, we have data on the outstanding stock of mortgage debt for 1999 and 2001, but not for 1994. This

---

[10] Definitions for the variables used are available in Appendix B.

[11] Before estimating the model we had to clean the data in a number of ways. We exclude households with 'unnatural' budget or income shares. All weekly expenditure items are divided by weekly household disposable income to generate budget shares. Households reporting negative expenditures (often due to refunds) or negative incomes (mainly due to losses from own businesses) imply negative budget shares and are excluded. Budget shares exceeding 100 per cent (i.e., expenditure exceeds income) are also excluded to remove the effect of lumpy expenditures. For example, a household reporting mortgage payments of 250 times their weekly income may be a data error or reflect them having paid off the whole loan during the survey week – in either case it is an unrepresentative observation that needs to be excluded. This means we exclude 99 households (1.3 per cent of the sample) in 1998/99 and 142 households (1.8 per cent) in 2001. Also, we imputed some income observations in the 2001 HILDA data, which are used in Section 6. Details of this procedure may be found in Appendix C.

prevented us from using a measure of home equity (the difference between reported dwelling value and the outstanding stock of mortgage debt), despite this variable being an important determinant of constraints in 1998/99. Instead, we simply use the reported dwelling value. We also cannot use interest payments on credit card and personal loan debt, despite these variables being statistically significant, as we do not have these data for 2001. However, tests that compared the models suggested that our choice of variables did not appreciably alter the results.

In making comparisons across time we also need to account for the effect of inflation on households' purchasing power. We do this by adjusting the household income and wealth figures for headline CPI inflation (which was approximately 10 per cent between 1993/94 and 1998/99 and 11 per cent between 1998/99 and 2001, including the effect of the GST).

5.2   Results

The results from the logit estimation, based on the HES 1998/99 data, are presented in Table 1. Since the estimated coefficients represent the effect of the independent variables on the logarithm of the odds of the probability rather than on the probability itself, we also report the partial derivatives or 'marginal effects', $\delta P/\delta X_k$, evaluated at the sample means in the last column. For continuous variables the marginal effect in the last column is calculated as:

$$\frac{\partial P}{\partial X_k} = \frac{\exp(\beta_k X_k)}{[1+\exp(\beta_k X_k)]^2} \beta_k \qquad (2)$$

For dummy variables the partial effect measures the estimated change in probability of a discrete change in the dummy from 0 to 1. The last column shows the estimated effect of a change in the variable equal to the 'selected unit' on the probability of the household being constrained. A positive sign indicates that the variable is estimated to increase the likelihood of the average household being cash-constrained.

Table 1: Estimation of the Logit Equation
Implied probabilities at sample means

| Variable	Coefficient	Sample mean	Selected unit	Marginal effect
Age	–0.05***	47.4 years	5 years	–3.1
Gender	0.14	38.9%	Female	1.3
Family size	0.26***	2.6 people	1 person	3.2
Disability	0.65***	51.2%	Disabled	5.6
Couple without children	–0.38***	24.6%	Compared to person living alone	–3.2
Couple with children	–0.25	33.3%	Compared to person living alone	–2.1
Single parent	0.32*	8.5%	Compared to person living alone	2.9
Mixed family	–0.18	9.4%	Compared to person living alone	–1.6
Home ownership	–0.68***	69.1%	Home owner	–6.2
Unemployment	0.40***	0.1 people	1 person	4.9
Weekly household disposable income	-9.8×10^{-4}***	$716	$100	–1.2
Dwelling value	-1.78×10^{-6}***	$136 500	$25 000	–0.6
Income from interest	–2.41***	4.5%	1% of HHY	–0.3
Income from government benefits	0.92***	3.1%	1% of HHY	0.1
Mortgage repayments	1.62***	6.4%	1% of HHDY	0.2
Credit cards	–0.19***	1.2	1 card	–2.3
Credit card interest	0.55***	31.2%	Pays interest	4.9
Constant	0.84			

Number of observations = 6 793

LR $\chi 2$ (17) = 995.85

Probability that the LR > $\chi 2$ = 0.00

Pseudo R^2 = 0.25

Number of cases correctly predicted = 82 per cent

Note:　　***, ** and * denote the 1, 5 and 10 per cent levels of significance respectively.

5.2.1 Demographic variables

On the basis of the logit model, Figures 5 and 6 plot the marginal effects of age and family size on the estimated probability of being financially constrained, holding all other variables constant at their sample means.

Figure 5: Marginal Effect of Age

Predicted probability of being financially constrained

Age of the household head
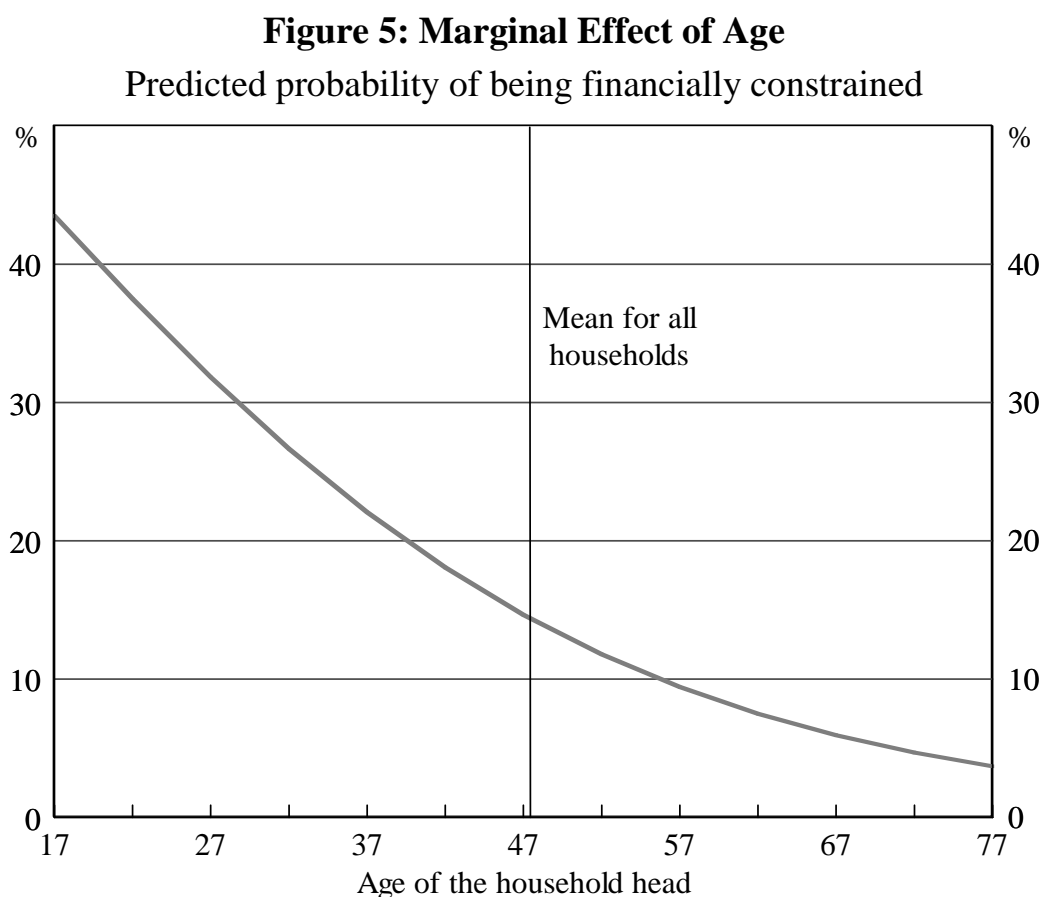
From Figure 5 and Table 1, as the age of the household head rises by 5 years, the likelihood of being cash-constrained is estimated to fall by 3.1 percentage points, on average. On the supply side, adverse selection in lending markets may lead to credit rationing for younger households as there is likely to be greater uncertainty over the future income streams of younger households and they are also less likely to have accumulated financial assets that could be used as collateral. On the demand side, cash flow constraints are likely to be tighter in the formative years of a household, given that desired consumption tends to be high relative to current labour income.

Because our data are not a panel we cannot rule out the possibility that this represents a cohort effect rather than an age effect. It may be that today's older people, as a result of the experiences they had when growing up, especially during World War II, go cold and eat less when they have liquidity problems, but rarely get behind on payments or seek assistance (or admit to it). It follows that they will be less likely to be cash-constrained according to our measure. Similarly, younger people may have different attitudes to debt and bills. It may be the case that younger households are *choosing not to pay* their bills (but are still classified as constrained) rather than *being unable to pay* their bills. Ultimately, this reflects the limitations of our data.

Figure 6 reveals that constraints are estimated to become tighter with more dependents, suggesting that, as families get bigger, their desired consumption increases relative to their income. An additional person in the household increases the probability of cash flow problems by 3.2 percentage points, on average.

In terms of household structure, the probability of couples without children being financially constrained is 3.2 percentage points lower than for persons living alone, on average. Both demand and supply effects are likely to work in the direction of relaxing the constraint for couples without dependents. For instance, they may have a lower level of desired consumption because of economies of scale in consumption (of both durables and non-durables). On the supply side, they could be given more credit because loans may be jointly underwritten. On the other hand, the probability of single parents with dependents being constrained is 2.9 percentage points higher than for persons living alone, *ceteris paribus*.

Figure 6: Marginal Effect of Family Size

Predicted probability of being financially constrained
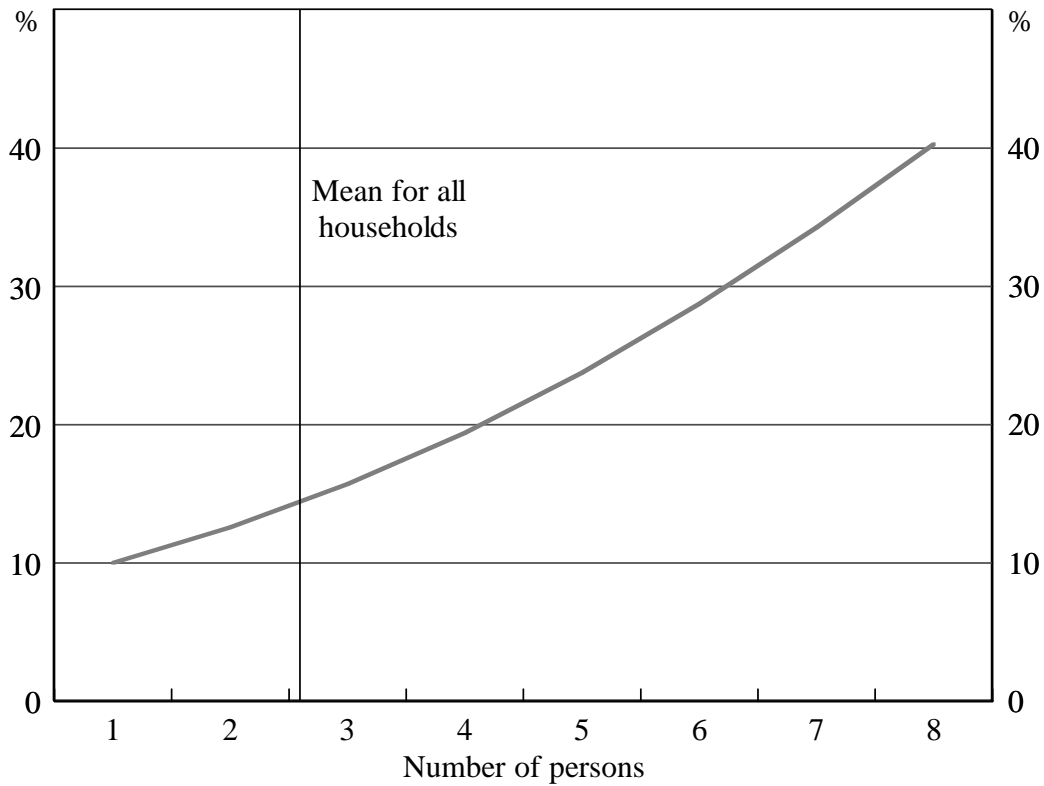
5.2.2 *Economic variables*

Home ownership is correlated with fewer cash flow problems. The likelihood that home owners (with and without a mortgage) are constrained is 6.2 percentage points lower, on average, than for renters. The number of unemployed persons in the household is also a strong determinant of cash flow problems. If a household member becomes unemployed, the household is nearly 5 percentage points more likely to be constrained, on average.

Figures 7 and 8 plot the marginal effects of weekly income and housing wealth on the predicted probability of being constrained, *ceteris paribus*. As we can see in Figure 7, a $100 increase in weekly household income reduces the probability of being cash-constrained by 1.2 percentage points, on average. However, most of the effect of income on cash flow occurs at low-income levels. For instance, the probability of being constrained declines by about 13 percentage points when household income rises from $0 to $1 000 per week. It only falls a further 6 percentage points when income rises from $1 000 to $2 000.

Dwelling value is also a good predictor of financial constraints. An increase in dwelling value of $25 000 reduces the likelihood of being constrained by 0.6 percentage points, on average (Figure 8).

Figure 7: Marginal Effect of Household Income

Predicted probability of being financially constrained

Weekly household income – A$
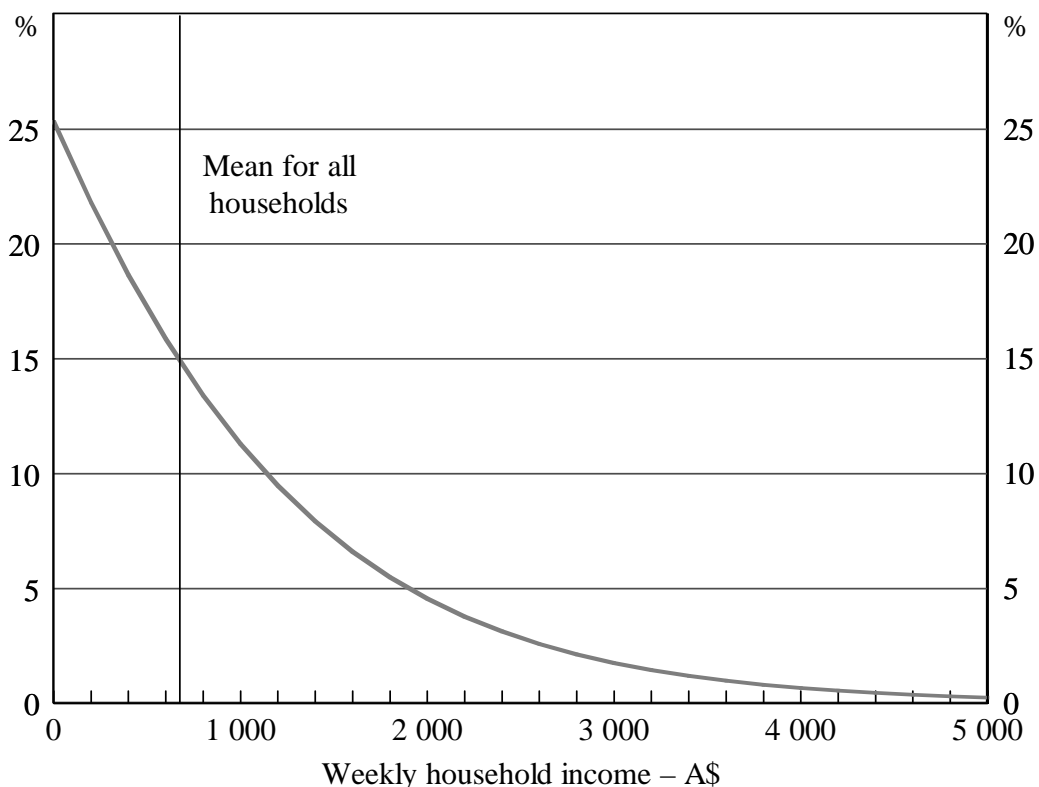
Figure 8: Marginal Effect of Dwelling Value

Predicted probability of being financially constrained
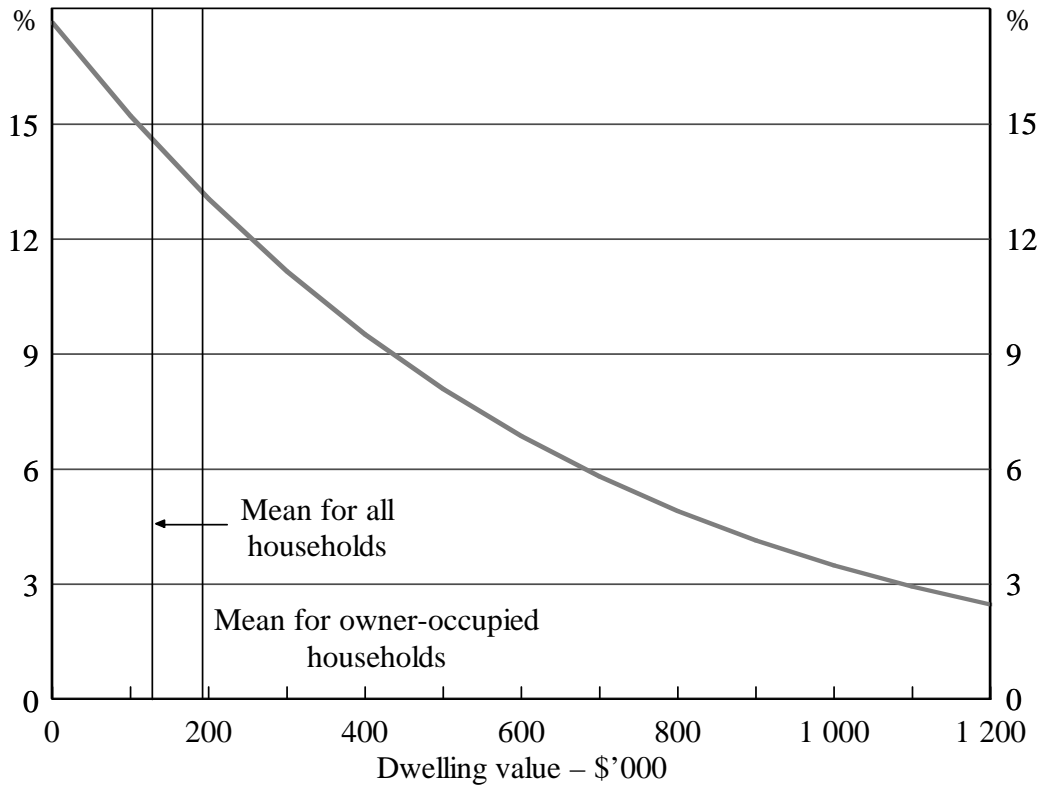
Figure 9 shows that the greater the share of income sourced from interest the less likely a household is to be constrained. Increasing the share of income earned from interest by 1 per cent reduces the probability of being cash-constrained by 0.3 percentage points. This is presumably because these households are wealthier and/or hold higher levels of precautionary savings to effectively buffer against adverse cash flow movements. Conversely, a 1 per cent rise in the share of income coming from government benefits is estimated to increase the likelihood of being financially constrained by 0.1 percentage points. The significant, albeit mild, effect of this variable is unsurprising given that cash-constrained households include a higher proportion of pension recipients such as the unemployed, the disabled and the elderly.

Figure 9: Marginal Effect of Income from Interest and Government Benefits

Predicted probability of being financially constrained
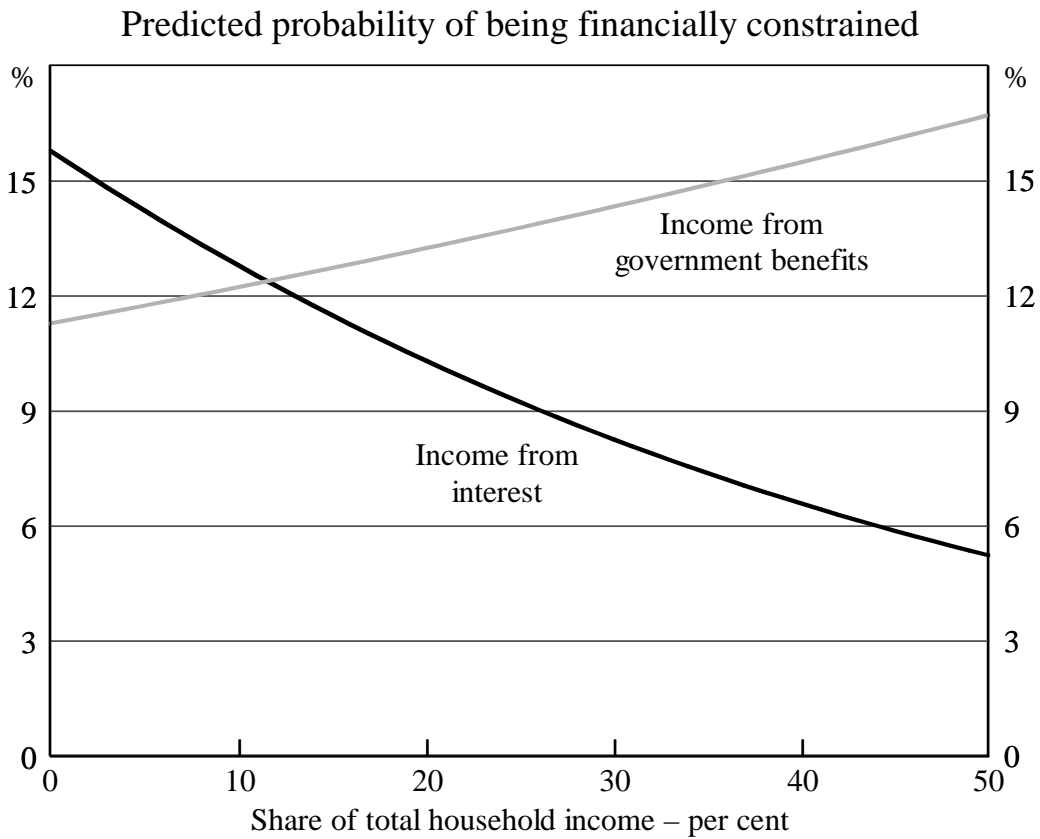
5.2.3 *Interest-sensitive variables*

A 1 per cent rise in mortgage debt (as a share of income) increases the probability of the average household being constrained by 0.2 percentage points, all other things being equal (Figure 10). While the magnitude of the effect is not large, it is statistically significant at the 1 per cent level.

Figure 10: Marginal Effect of Mortgage Debt

Predicted probability of being financially constrained
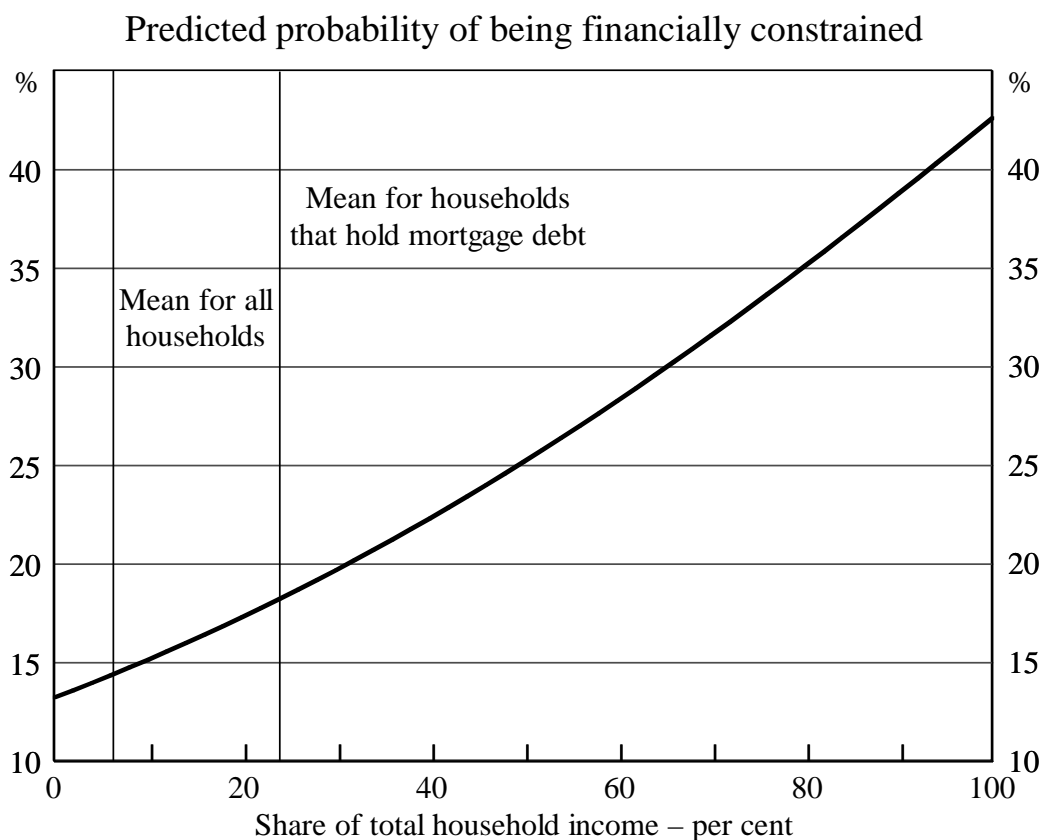
As Figure 11 shows, a higher number of credit cards is correlated with less binding constraints, on average. Having an additional credit card is associated with a fall in the probability of being cash-constrained of 2.3 percentage points, *ceteris paribus*. This most likely reflects the fact that banks are less likely to issue credit cards to high-risk households. As such, this variable may be related to whether households have been denied credit – the variable used in some US studies.

Importantly, if any member of the household pays interest on their credit card, the probability of the household being constrained is estimated to rise by 4.9 percentage points, all other things being equal. However, the overall effect of the credit card debt-service burden is small, as credit card interest payments generally constitute a small share of the weekly household budget.

Figure 11: Marginal Effect of Credit Card Ownership

Predicted probability of being financially constrained
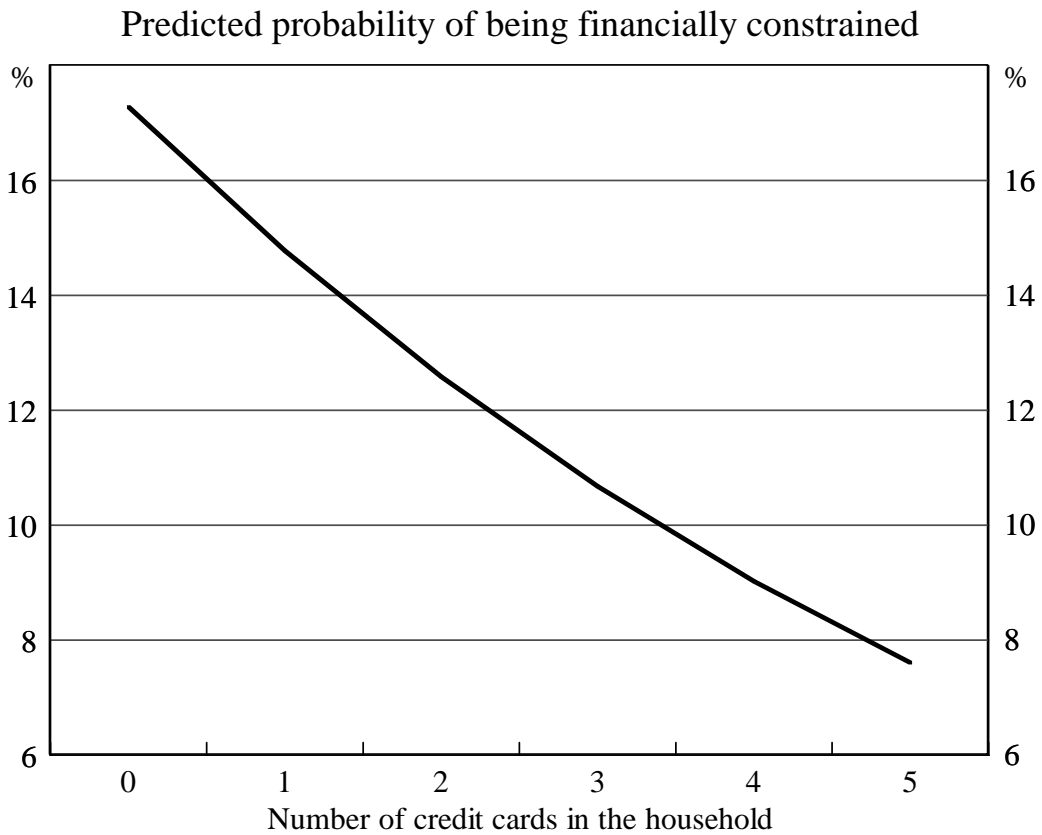
Finally, there are some interesting differences between constrained and unconstrained households. As Table 2 reveals, the average mortgage debt-service ratio is higher for constrained households at 6.6 per cent of disposable income, compared to 6.3 per cent for unconstrained households. When mortgage repayments are split into principal and interest it becomes clear that the composition of the burden differs significantly between the two groups. On average, mortgage interest payments take a greater share of income for constrained households. Conversely, greater cash flow for unconstrained households allows them to make more voluntary excess repayments, so their principal debt payments are higher.

Table 2: Comparing Constrained and Unconstrained Households

Variable	Constrained households	Unconstrained households	Full sample
Weekly household disposable income ($)	573 (9)	757 (7)	716 (6)
Dwelling value ($)	69 600 (2 600)	155 600 (2 100)	136 500 (1 800)
Home ownership (% HH)	42.7 (1.3)	76.6 (0.6)	69.1 (0.6)
Mortgage repayments – total (% HHDY)	6.6 (0.3)	6.3 (0.2)	6.4 (0.2)
Mortgage repayments – interest (% HHDY)[a]	3.8 (0.2)	3.0 (0.1)	3.2 (0.1)
Mortgage repayments – principal (% HHDY)	2.7 (0.2)	3.3 (0.1)	3.2 (0.1)
Has at least one credit card (% HH)	50.7 (1.3)	70.0 (0.6)	65.7 (0.6)
Has at least one housing loan (% HH)	29.9 (1.2)	30.0 (0.6)	30.0 (0.6)
Has at least one loan (% HH)	70.0 (1.2)	77.7 (0.6)	76.0 (0.5)

Notes: Standard errors in parentheses.

(a) Our measure of interest paid (relative to disposable income) of 3.2 per cent for the full sample is significantly below the aggregate measure of 4.7 per cent in 1998/99. This is mainly due to the aggregate measure giving greater weight to higher-income households. Also, our debt-service ratio only includes standard mortgage interest payments. If we calculate interest paid (relative to disposable income) on a basis comparable to the aggregate measure, we find a reasonably consistent estimate of 4.4 per cent.

5.3   What Has Happened Over Time?

In this section we take the model estimated on the 1998/99 data, and apply it separately to the data from the 1993/94 HES and 2001 HILDA Survey to investigate how the factors that influence financial constraints may have changed over time. That is, we look at how the demographic and economic variables (that our model finds are significant) have evolved over time and, using our model, predict what may have happened to household constraints. We adopt this procedure because the 1993/94 HES did not ask the particular questions on financial fragility, while the 2001 HILDA Survey's financial fragility questions elicited very different answers suggesting that they are not directly comparable with the HES questions and answers.

5.3.1   Comparing the HES and HILDA

The raw data from HILDA for 2001 suggest that approximately 30 per cent of households in the sample have experienced some form of financial constraints. This is significantly higher than the 22 per cent found in the HES for 1998/99. On the face of it this would suggest that constraints have risen significantly in the two years between surveys.

However, it seems more likely that the difference in reported cash flow problems is mainly the result of the relevant questions in the HES being administered on a face-to-face basis whereas the HILDA financial stress questions were self-administered. If respondents see the answers to some of these questions as sensitive or embarrassing then the likelihood of obtaining truthful responses will be reduced by the presence of the interviewer. Some respondents may be reluctant to admit that they have asked for financial help from others or, for example, actually went without meals because of money problems. This reluctance will be most likely to occur when the question is posed directly by an interviewer in the home situation (as was the case with the financial stress questions in the HES).[12]

To investigate this further, we look at the results we get if we use the 2001 data with the 1998/99 model and also if we estimate a 2001 model and apply it to the 1998/99 HES data. Doing so, we find that while the constant is higher in 2001, the slope coefficients and marginal effects are broadly the same for the two models, both in magnitude and significance. In other words, there does not appear to have been any change *in the cross-sectional relationships* between the explanatory variables and the dependent variables, merely a change in the level.[13] Secondly, the predicted change in cash constraints between the two periods from both models are

---

[12] A change in the wording of the questions may also explain the rise in reported problems. The HES asks one respondent, speaking on behalf of the household, to think about the *household's* financial position while HILDA asks each person in the household to think about *their own* personal finances. Larger households may be more likely to have at least one person suffering from financial stress and so the household as a whole would be counted as being in distress. But, alternatively, larger households provide greater opportunities for intra-household income transfers and therefore are less likely to have cash flow problems. However, even single-person households reported higher cash flow problems in 2001, presumably a household type where the distinction between the household and the individual disappears.

[13] This is confirmed in a pooled regression where dummies are interacted with all the estimated coefficients to allow for different cross-sectional relationships across time.

roughly similar. Thus, the 1998/99 model predicts that the proportion of constrained households falls by 3.6 percentage points from 1998/99 to 2001 and the 2001 model predicts a fall of 4.9 percentage points which, given the higher level involved, is roughly similar in percentage terms. Thus, there is some question about the actual level of constraints but less about the relative change.[14]

Given all this, we believe that the model we have estimated is fairly robust across time. On this basis we report the results from the 1998/99 model across all time periods. This allows us to focus on the main demographic and economic factors driving the changes in financial constraints over time without worrying about the changes induced by the change in survey between 1998/99 and 2001.

5.3.2 Changes in key variables

The base model estimates that financial constraints have fallen from 22.5 per cent of households in 1993/94 to 18.9 per cent in 2001. Table 3 shows how some of the key explanatory variables in the model have contributed to this estimated change in the level of constraints in Australia between 1994 and 2001. A positive sign in either of the last two columns indicates that the variable is estimated to have contributed to increased cash constraints over the period.

Table 3: Marginal Effects of Key Explanatory Variables					
Variable	**Sample means**			**Marginal effects**	
	1993/94	1998/99	2001	From 1994 to 1999	From 1999 to 2001
Weekly household disposable income (1999 $)	673	716	757	–0.56	–0.50
Dwelling value (1999 $)	123 200	136 500	157 800	–0.33	–0.48
Income from interest (% HHY)	5.0	4.5	2.5	0.12	0.62

While our base regression estimated that demographic variables were important explanators of cash constraints, most of them did not change significantly over the sample period. Thus, demographic variables are not estimated to have contributed

---

[14] The results of this exercise are available from the authors upon request.

significantly to the estimated relaxation in constraints. This is unsurprising given the relatively short period of seven years between the three surveys.

Relatively strong economic growth and rising housing wealth from 1994 to 2001 are estimated to have contributed the most to relaxing constraints in Australia over this period. Combined, growth in real income and wealth are predicted to have reduced the probability of being cash-constrained by around 0.9 percentage points between 1994 and 1999 and a further 1 percentage point between 1999 and 2001, *ceteris paribus*.

Our model predicts that an increase in the mortgage debt-service ratio raises the probability of an average household being constrained, though the effect is relatively small. *Ceteris paribus*, it increased the probability of being constrained by 0.2 percentage points between 1993/94 and 2001.

In addition, the model predicts that the fall in income earned from interest has increased constraints.[15] The share of household income sourced from interest fell from 5 per cent in 1993/94 to 2.5 per cent in 2001, partly offsetting the positive effect of economic growth. More significantly, the number of respondents reporting zero weekly interest income rises from around 30 per cent of the population in 1994 to 73 per cent of the population in 2001. This is estimated to have increased the likelihood of a given household being cash-constrained by 0.74 percentage points, *ceteris paribus*.

However, we have reason to question the change in this variable. The fall in interest income can be explained by lower retail deposit and investment rates, leading to a reduction in the interest paid on existing accounts. But this effect may have seen household savings redirected towards higher-return investments. This is supported at the aggregate level as households have redirected their wealth into shares and other equity at the expense of interest-bearing accounts. Household wealth held in cash and interest-bearing deposits at banks has fallen (as a percentage of the total stock of household financial assets) by around 5–6 per cent between 1993/94 and 2000/01. If this is true, we cannot conclude that the fall in

---

[15] Income from interest includes interest receipts from savings accounts, debentures, bonds, trusts, and personal loans to persons outside the household. It excludes income from superannuation, property income and income from royalties and dividends on shares.

savings has led to more binding constraints as households are simply holding their wealth in other assets. Thus, households may have been less constrained in 2001 than our model indicates.

In addition to the income from interest variables, there are a number of other explanatory variables that are likely to be problematic when making comparisons across surveys. We remove the partial effects for the number of credit cards owned by the household, whether households pay interest on their credit cards, whether a disabled person lives in the household, and how much household income is sourced from interest and government benefits. Once all these adjustments are made, our preferred model predicts that financial constraints have only fallen slightly between 1993/94 and 2001 from 24.1 per cent to 21.6 per cent. We do not consider this substantially different from the base model, and the numbers tell essentially the same story.

6.   Analysis and Implications

While the results so far are interesting in their own right, they also provide us with a framework with which to address some other related issues. For instance, we are now in a position to reconcile the household evidence on debt to income ratios with the aggregate evidence presented in the introduction. Also, by examining the characteristics of the households taking on debt we can draw out some implications for financial fragility.

6.1   Components of the Rise in the Aggregate Debt to Income Ratio

Between September 1993 and December 2001, the period covered by the three surveys, the aggregate debt to income ratio rose by nearly 51 percentage points and this may reflect three separate effects:

1. Households that hold debt hold higher levels of debt; and/or

2. The proportion of households that hold debt has increased; or

3. More debt is held by higher-income households, all other things being equal.[16]

Table 4: Contributions to Changes in Aggregate Debt to Income Ratio

	1993/94	1998/99	2001
Proportion of HHs with at least one outstanding loan	72%	76%	N/A
Proportion of HHs with at least one home loan	28%	30%	32%
Proportion of HHs with at least one standard mortgage[a]	26%	29%	29%
Average level of housing debt (1999 $) (HH with debt)	N/A	$76 500	$87 200
Average disposable income (1999 $) (HH with debt)	$45 800	$48 000	$51 600
Average housing debt to income ratio (HH with debt)	N/A	177%	212%
Average housing debt to income ratio	N/A	53%	67%
Average mortgage repayments to income ratio (HH with debt)	23%	24%	24%
Average mortgage repayments to income ratio	6.1%	6.4%	7.3%

Notes: (a) Each of the surveys asks slightly different questions so it is very difficult to be definitive about trends in housing-related lending. An alternative measure can be obtained from the Census. The Census classifies the person's house either as 'fully owned', 'being purchased', 'being rented', or 'other'. If the respondent says it is 'being purchased' they are classified as having a mortgage. The Census data suggests that 28.5 per cent of households had a mortgage in 1991, 27.2 per cent in 1996 and 28.6 per cent in 2001. Alternatively, both the HES and HILDA specifically ask how many loans the household has and the purposes of those loans. In particular, the HES asks whether the housing loans are 'to buy/build the principal dwelling', 'to buy or build other property' (generally holiday homes and short-lived investment properties), and 'loans for alterations and additions to the principal dwelling and other property'. The HILDA Survey asks for loans from financial institutions or family and friends taken out to help pay for the principal dwelling and other home loans secured against the property (e.g., home equity loans). Our broader measure of housing debt includes all these types of loans in the HES and HILDA while the standard measure shown here is calculated on a comparable basis to the Census and broadly matches those numbers.

---

[16] The aggregate debt to income ratio is the weighted average of individual debt to income ratios where the weights are the shares of each household in total income. So if higher-income households (with greater weights) incur proportionately more debt, the aggregate debt to income ratio can rise even at constant household debt to income ratios. For example, suppose there are only two households, A and B. Household A earns $50 000 and Household B earns $100 000. Initially, suppose Household A has $10 000 in debt (and Household B has no debt). The average household debt to income ratio will be 10 per cent while the aggregate debt to income ratio will be 6.7 per cent. Suppose instead that Household B takes out a loan at the same debt to income ratio (i.e., a $20 000 loan). If Household A were now to repay its loan, the average household debt to income ratio would still be 10 per cent but the aggregate debt to income ratio would have risen to 13 per cent.

The data in Table 4 suggest that all of these factors have been at work. Most importantly, a large part of the rise in the aggregate debt to income ratio appears to be explained by households now taking on *higher levels of debt*, on average. Secondly, we see that around 72 per cent of all households had at least one loan in 1993/94 and this increased to 76 per cent in 1998/99. And while we cannot compare these figures to the total number of loans in 2001 as we have imperfect data on credit cards and personal loans, we can use the number of housing loans as a proxy, especially as housing loans are likely to dominate the aggregate debt stock. Thus, while the data suggest that the proportion of people who hold standard mortgages has not increased significantly over the period, there has apparently been a rise in the proportion of households holding other types of housing-related loans, such as home equity loans, secured against their principal place of residence.

We can also examine the effect of distributional factors using household survey data. In general, we know that households at the lower end of the income distribution account for less than proportionate amounts of debt while high-income households account for more than their proportionate share of debt.[17] Calculating the aggregate debt to income ratio based on the survey data, we find that the aggregate debt to income ratio grew by 12.3 per cent between 1998/99 and 2001. Doing the same for the average debt to income ratio, we find that the average debt to income ratio grew by 15.3 per cent between 1998/99 and 2001. As such, the aggregate measure (which gives greater weight to higher-income households) grew by less than the average measure (which gives equal weight to all households). This implies that there is now a more equal distribution of debt through the income distribution with lower-income households holding proportionately more debt in 2001 than in 1998/99. This distributional effect would serve to hold the aggregate debt to income ratio down, all other things being equal, compared with the average debt to income ratio reported in our tables.

So, while there has been a relatively small rise in the proportion of households with housing debt, in percentage terms it appears that the growth in the average size of loans has been the main contributor to the rise in the aggregate debt to income

---

[17] Very high income households, those representing around the top 15 per cent of the aggregate income stock (which corresponds, approximately, to the top 5 per cent of households in the income distribution), account for less than their proportionate share of debt – as might be expected of very wealthy households.

ratio. Slightly offsetting this, there has been a redistribution of debt to lower-income households and this has served to hold down growth in the aggregate debt to income ratio, relative to what it would have been had there been no change in the distribution.

6.2   Financial Fragility

To gain a better understanding of whether the increase in debt to income ratios is associated with greater financial fragility we look at the split between constrained and unconstrained households. In particular, we look at who is holding the higher levels of debt.

We are able to divide the sample into cash-constrained and unconstrained households on the basis of their actual responses to the questions about financial fragility in 1998/99 and in 2001. However, as the questions are unavailable for 1993/94 we need to adopt a different procedure to examine the characteristics of constrained and unconstrained households in 1993/94. One way of doing this would be to generate the predicted probability of being constrained for each household, based on the 1998/99 model, and then choosing some arbitrary cut-off to divide them into the two classes (e.g., less than 50 per cent predicted probability of being constrained means they are unconstrained, greater than 50 per cent predicted probability means they are constrained). However, this can be misleading when the distribution of cash flow problems is skewed towards one end (i.e., in the model many households are predicted to be a 30–40 per cent chance of being constrained). Instead, we 'weight' each household by their predicted probability of being constrained. If we then sum across these weighted estimates, we get an estimate for the average constrained household.[18]

---

[18] For example, suppose there were only two households (A and B) in the economy. Household A earns $100 a week while Household B earns $200 a week. Suppose Household A has a 70 per cent chance of being constrained while Household B has only a 30 per cent chance of being constrained. Then applying these weights to both households ($100 x 70/(30+70) for Household A and $200 x 30/(30+70) for Household B) and summing across the weighted estimates ($70 + $60) gives us the income of the average constrained household ($130). This can be compared with the estimate of $100 (Household A) that we would get if we used a cut-off between 0.3 and 0.7 probability.

From Table 5 we can see that our measure of the proportion of households that hold debt has been rising for both constrained and unconstrained households. This is likely to reflect the fact that access to debt, for example, through access to home equity loans, has improved for most households following the deregulation of the Australian financial sector. And while both groups have been taking on higher debt levels, unconstrained households appear to have taken on proportionately more debt than constrained households, on average. Conversely, growth in average disposable income has been more pronounced amongst unconstrained households over the period.

Table 5: Comparing Constrained and Unconstrained Households

		1993/94	1998/99	2001
Proportion of HHs with at least one home loan	Constrained	25%	30%	29%
	Unconstrained	29%	30%	34%
Proportion of HHs with at least one standard mortgage	Constrained	24%	30%	28%
	Unconstrained	27%	29%	31%
Average level of housing debt (1999 $) (HH with debt)	Constrained	N/A	$70 600	$82 100
	Unconstrained	N/A	$78 200	$91 100
Average disposable income (1999 $) (HH with debt)	Constrained	$37 200	$38 800	$40 100
	Unconstrained	$48 000	$50 600	$56 000
Average debt to income ratio (HH with debt)	Constrained	N/A	203%	249%
	Unconstrained	N/A	170%	197%
Average debt to income ratio	Constrained	N/A	61%	69%
	Unconstrained	N/A	51%	67%
Average mortgage repayments to income ratio (HH with debt)	Constrained	27%	25%	27%
	Unconstrained	22%	24%	23%
Average mortgage repayments to income ratio	Constrained	6.5%	6.6%	7.3%
	Unconstrained	6.0%	6.3%	7.4%

Overall, comparing the changes in the debt to income ratios of constrained and unconstrained households between 1998/99 and 2001, the debt to income ratio of constrained households has risen from 61 per cent to 69 per cent while the debt to income ratio of unconstrained households has risen from 51 per cent to 67 per cent – a considerably larger increase. Thus, it appears that the rise in the aggregate debt to income ratio is mainly the result of unconstrained households voluntarily taking on higher levels of debt.

And while we noted earlier that the housing debt to income ratio has increased for both groups, the mortgage debt-service burden is often seen as a better measure of households' capacity to service debt. The average mortgage debt burden has actually increased more for unconstrained households (from 6.0 per cent to 7.4 per cent) than for constrained households (from 6.5 per cent to 7.3 per cent). Among those constrained households that actually have a mortgage, the average mortgage debt burden has remained roughly constant at around 25–27 per cent between 1993/94 and 2001. We also know that the interest burden for these households fell from around 16 per cent in 1993/94 to 14 per cent of disposable income in 1998/99. This is partly explained by falling lending rates over the period. So while there is tentative evidence that constrained households are taking on more interest-sensitive debt, their capacity to service this debt (as measured by the debt burden) has not worsened, on average. As such, their financial fragility is likely to have remained relatively unchanged.

There is stronger evidence that unconstrained households are taking on more debt and in increasing amounts. This is reflected in the fact that the mortgage repayments (as a share of disposable income) of unconstrained households appear to have increased more than for constrained households. Moreover, there are now more unconstrained households than there were in the past. This suggests that relatively strong economic growth and falling nominal interest rates more than offset the increase in household indebtedness over this period. So, in summary, most of the rise in household debt at the aggregate level appears to be explained not only by more unconstrained households taking on debt, but also by unconstrained households taking on increasing amounts of debt.

7.   Conclusion

Using the 1998/99 HES data, a logit model was constructed to examine the relationship between the probability of being financially constrained and the economic and demographic characteristics of households in Australia. The proportion of Australian households that were cash-constrained in 1998/99 is around 22 per cent, which is broadly consistent with the findings of previous macroeconomic studies in Australia. Whether a household is constrained is significantly determined by demographic variables such as age, unemployment,

disability and marital status. Important economic variables include home ownership, weekly household income, the proportion of income earned from interest and the share of income going to repayments on mortgage debt.

We also apply the model to the 1993/94 HES data and the 2001 HILDA data to determine whether the proportion of financially constrained consumers is likely to have changed over time and, if it has, to identify which economic and demographic variables may have been driving the change. Despite both economic and demographic variables being important determinants of cash flow constraints, only the economic variables have changed significantly between the sample periods. Relatively strong economic growth is predicted to have relaxed financial constraints through growth in earnings, growth in housing wealth and falling unemployment. Partly offsetting this, rising mortgage repayments (as a share of income) and increasing credit card debt are predicted to have increased constraints.

Putting these effects together at the aggregate level, we estimate that fewer households are now constrained. In 1994, 24.1 per cent of Australian households are estimated to have been constrained; this falls to 22.5 per cent in 1999, before falling marginally to a projected 21.6 per cent in 2001 (based on our preferred model). On balance, it appears that the overall level of cash constraints in the economy has fallen. However, the magnitude of the fall is small due to numerous offsetting effects.

To further examine changes in household fragility, we separate the sample into cash-constrained and unconstrained households and examine whether important changes have occurred within the two groups. The mortgage debt-service ratio has hardly changed for constrained households, on average, suggesting that they are no more fragile than in the past. And while there appears to have been a rise in the proportion of constrained households who have incurred at least one form of debt, the relative size of this sector of the community has fallen, as there are fewer constrained households in 2001 than in the mid 1990s.

Accordingly, despite the increase in the aggregate household debt to income ratio to historically high levels, we find little evidence that Australian households are now significantly more financially fragile than in the past. Much of the rise in debt appears to have been due to unconstrained households. There are now more

unconstrained households in the population and it is these households that are primarily responsible for the increase in household debt. Indeed, the rise in the aggregate debt to income ratio seems to reflect households reacting to increased household income and low unemployment rather than being an indicator of increased household financial distress or fragility.

Hence, in summary, we find no evidence of an increase in financial fragility from the rise in debt associated with owner-occupier mortgages. This does not preclude an increase in fragility for those households that have significantly increased their exposure to investment housing. Information on this will become available with the next wave of HILDA data.

Appendix A: Previous Studies on Liquidity Constraints

Table A1: Studies Estimating the Proportion of Liquidity-constrained Consumers

Study	Country and period examined	Econometric technique	Source of data	Estimated proportion of liquidity constrained consumers
Hall and Mishkin (1982)	US (1969–75)	OLS regression to test RE-PIH. Sample split into permanent income (random walk) and liquidity-constrained (rule of thumb) consumers	Panel Study of Income Dynamics	20%
Hayashi (1985)	US (1963–64)	OLS and Tobit estimation of reduced-form consumption equation. Sample split into high/low-saving households	Survey of Financial Characteristics of Consumers	No estimate
McKibbin and Richards (1988)	Australia (1971–87)	OLS (IV) regression to test RE-PIH. Sample split into permanent income and liquidity-constrained consumers	Aggregate time-series	25% (1971–80) 20% (1980–87)
Jappelli and Pagano (1989)	US (1961–84); Japan (1971–83); Sweden (1965–83); Italy (1961–85); UK (1961–83); Spain (1961–84); Greece (1965–82)	OLS (IV) and maximum likelihood estimation of reduced form consumption function	Aggregate time-series	US: 21%; Japan: 34%; Sweden: 12%; Italy: 58%; UK: 40%; Spain: 52%; Greece: 54%
Zeldes (1989)	US (1968–82)	Tests for excess sensitivity in Euler equations	Panel Study of Income Dynamics	No estimate
Campbell and Mankiw (1989)	US (1953–86); Japan (1959–86); Germany (1962–86);	OLS and IV estimation of reduced form consumption function	Aggregate time-series	US: 48%; Japan: 55%; Germany: 65%;

	France (1970–86); Italy (1973–86); UK (1957–86); Canada (1963–86)			France: 110%; Italy: 40%; UK: 22%; Canada: 62%
Jappelli (1990)	US (1983)	Logit estimation of reduced form debt functions	Survey of Consumer Finances	19%
Duca and Rosenthal (1993)	US (1983)	Probit estimation of reduced form debt functions	Survey of Consumer Finances	30%
Blundell-Wignall, Browne and Tarditi (1995)	US (1960–92); Japan (1961–91); Germany (1961–92); France (1964–91); Italy (1962–91); UK (1961–91); Canada (1960–91); Australia (1961–92)	OLS and IV estimation of reduced form consumption function over various sub-periods	Aggregate time-series	1960s/70s → 1980s/90s US: 60% → 57% Japan: 42% → 26% Germany: 41% → 104% France: 31% → –2% Italy: 70% → 16% UK: 36% → 33% Canada: 43% → 28% Australia: 35% → 43%
Debelle and Preston (1995)	Australia (1973–94)	OLS and IV estimation of reduced form consumption function	Aggregate time-series	43% (1973–82) 20% (1983–94)
de Brouwer (1996)	Australia (1975–94)	OLS and IV estimation of reduced form consumption function	Aggregate time-series	24%
Olekalns (1997)	Australia (1959–95)	OLS and IV estimation of reduced form consumption function	Aggregate time-series	21% (1959–83) 3% (1984–1995)

37

Appendix B: Variable Definitions

Dependent variable

ANYCFPRO = 1 if the household had cash flow problems in the past year and 0 if not.

Demographic variables

AGE = age of the household head (years).

GENDER = 1 if household head is a female and 0 if not.

FAMILY SIZE = number of usual residents in the household.

DISABILITY/HEALTH = 1 if household has a person with a disability or health condition and 0 if not.

COUPLE NO CHILD = 1 if couple without children and 0 if not.

COUPLE CHILD = 1 if couple with children (either 0–14 or 15+ years or both) and 0 if not.

SINGLE PARENT = 1 if lone parent with children (either 0–14 or 15+ years or both) and 0 if not.

MIXED FAMILY = 1 if mixed families in household and 0 if not.

Economic variables

HOME OWNER = 1 if home owner or home buyer and 0 if renting from landlord, government housing authority or other.

UNEMPLOYED = number of unemployed persons in the household.

DWELLING VALUE = estimated dwelling value ($).

DISPOSABLE INCOME = total weekly household disposable income (gross weekly income minus imputed tax) ($).

INCOME FROM GOVT BENEFITS = household income from government benefits as a proportion of total weekly household gross income (%).

Interest-sensitive variables

INCOME FROM INTEREST = household income from interest as a proportion of total weekly household gross income (%).

MORTGAGE DEBT = household mortgage repayments as a proportion of total weekly household disposable income (%).

CREDIT CARDS = number of credit cards in the household.

CREDIT CARD INTEREST = 1 if household pays interest on credit cards and 0 if not.

Appendix C: Imputation of Household Income in HILDA[19]

Compared with similar international household surveys, HILDA does not suffer greatly from problems of missing data (Watson and Wooden 2003). However, there is a relatively high incidence of missing data for income-related questions. We can separate the most common reasons for the missing data into 'item non-response' and 'incomplete households'. *Item non-response* occurs when a member of a selected household agrees to be interviewed, but then either refuses, or is unable, to answer some of the questions asked. This is the main source of missing data, accounting for 64 per cent of the missing household income information. Most of the missing income data is due to item non-response for income sourced from business (missing 23.5 per cent) and investments (missing 8.1 per cent). Wages and salaries (missing 7.2 per cent) and government benefits and pensions (missing 1.4 per cent) have relatively low incidences of missing data.

The other major source of missing data is the 810 *incomplete households*, accounting for 10.5 per cent of the household sample and 36 per cent of the missing household income information; these are households in which not all eligible adult members agreed, or were able, to be interviewed. The HILDA unit record files do not include an entry for household income if any of its eligible members were not interviewed, or did not report complete income information; in all, 29 per cent of households have a missing value for household income.

In such circumstances we have two choices. We can drop the 29 per cent of households for which income data is missing from the sample, or impute the income of the individuals with missing data. Our choice to impute income for missing individuals is shaped by two factors. First, because income non-response is not random or uncorrelated with the variable(s) of interest, the missing cases cannot be safely dropped from the sample (Watson and Wooden 2003). For example, men, individuals outside the labour force, individuals living in Tasmania and Perth, people that have been recently divorced, and people that have a high regard for their leisure time (and generally have low incomes) were more likely to offer complete income information than other individuals. Second, we have a large

---

[19] The work in Appendix C was done by Gianni La Cava and Jeremy Lawson. Further discussion of the income imputation procedure may be found in Ellis, Lawson and Roberts-Thomson (2003).

cross-section of information from the HILDA Survey that permits us to do a reasonable job of imputing income for missing individuals.

Following the recommendations of the HILDA Survey team and methods adopted in the British Household Panel Survey (BHPS), we impute income using the 'predictive mean matching' method (Little 1988; Watson and Wooden 2003). This is a stochastic imputation technique that has the advantage of maintaining the underlying data distribution by allowing the imputation of error around the mean.

The nature of the missing data leaves us with the need to impute income for three separate types of missing cases:

1. Individuals that did not complete a person questionnaire and therefore did not report any income information (Type I) (n = 1 158).

2. Individuals that completed a person questionnaire but did not provide information on wage income (Type II) (n = 673).

3. Individuals that completed a person questionnaire but did not provide information on non-wage income (Type III) (n = 1 621).

Three separate models are estimated to impute income for each type of missing case. For Type I respondents we have information on the characteristics of their household (e.g., value of the dwelling, geographic location, the number of bedrooms) and a limited range of personal information from the household questionnaire. We also have personal information collected about other respondents in the household. These 'family variables' include the income, labour force status and occupation of other household members. Both the household and family variables are likely to be correlated with both personal and household income and hence act as useful explanatory variables in the model. We impute total gross financial year income for these individuals.

We have the same information for Types II and III respondents, but also additional personal information obtained from items that they did complete during the interview – labour force status, age, gender, English-speaking background – including information about the sources of their income. This allows us to predict

wage and non-wage income in the final two models, and add the income that individuals report from other sources to our estimates. For example, for Type III individuals we add their imputed non-wage income to any actual reported wage and salary income.

In the regression model for Type I households our model explains nearly 32 per cent of the variation in total gross household income. The root mean square error (RMSE) is about \$26 000. In the regression model for Type II households our model explains about 46 per cent of the variation in individuals' wage and salary income and the RMSE is nearly \$19 000. In the regression model for Type III households our model explains nearly 21 per cent of the variation in individuals' non-wage income and the RMSE is about \$20 500. Although these errors are quite large, we regard the imputation as being relatively successful, not least because it allows us to use actual data for other income and household members that would otherwise be lost. The actual results from the three regression models are available from the authors upon request.

Our income imputation strategy allows us to recover household income estimates for all but 337 households (about 4 per cent of the sample), ensuring that any bias introduced by dropping missing observations from the sample is minimised.

References

Attanasio OP (1998), 'Consumption demand', NBER Working Paper Series No 6466.

Blundell-Wignall A, F Browne and A Tarditi (1995), 'Financial liberalization and the permanent income hypothesis', *The Manchester School of Economic and Social Studies*, 63(2), pp 125–144.

Bray JR (2001), 'Hardship in Australia: an analysis of financial stress indicators in the 1998–99 Australian Bureau of Statistics Household Expenditure Survey', Department of Family and Community Services Occasional Paper No 4.

Campbell JY and NG Mankiw (1989), 'Consumption, income, and interest rates: reinterpreting the time series evidence', NBER Macroeconomic Annual No 4.

Cox D and T Jappelli (1993), 'The effect of borrowing constraints on consumer liabilities', *Journal of Money, Credit and Banking*, 25(2), pp 197–213.

Deaton, A (1992), *Understanding Consumption*, Clarendon Press, Oxford.

Debelle G and B Preston (1995), 'Consumption, investment and international linkages', Reserve Bank Research Discussion Paper No 9512.

de Brouwer GJ (1996), 'Consumption and liquidity constraints in Australia and East Asia: does financial integration matter?', Reserve Bank Research Discussion Paper No 9602.

Duca JV and SS Rosenthal (1993), 'Borrowing constraints, household debt, and racial discrimination in loan markets', *Journal of Financial Intermediation*, 3(1), pp 77–103.

Ellis L, J Lawson and L Roberts-Thomson (2003), 'Housing leverage in Australia', paper presented at the National Conference on the Household, Income and Labour Dynamics in Australia Survey (HILDA), Melbourne, 13 March.

Hall RE (1978), 'Stochastic implications of the life-cycle permanent income hypothesis: theory and evidence', *Journal of Political Economy*, 86(6), pp 971–987.

Hall RE and FS Mishkin (1982), 'The sensitivity of consumption to transitory income: estimates from panel data on households', *Econometrica*, 50(2), pp 461–481.

Hayashi F (1985), 'The effect of liquidity constraints on consumption: a cross-sectional analysis', *The Quarterly Journal of Economics*, 100(1), pp 183–206.

Jappelli T (1990), 'Who is credit-constrained in the US economy?', *Quarterly Journal of Economics*, 105(1), pp 219–234.

Jappelli T and M Pagano (1989), 'Consumption and capital market imperfections: an international comparison', *American Economic Review*, 79(5), pp 1088–1105.

Little R (1988), 'Missing-data adjustments in large surveys', *Journal of Business and Economic Statistics*, 6(3), pp 287–301.

McKibbin WJ and AJ Richards (1988), 'Consumption and permanent income: the Australian case', Reserve Bank Research Discussion Paper No 8808.

Muelbauer J (1994), 'The assessment: consumer expenditure', *Oxford Review of Economic Policy*, 10(2), pp 1–41.

Olekalns N (1997), 'Has financial deregulation revived the permanent income/life cycle hypothesis?', *The Australian Economic Review*, 30(2), pp 155–166.

Watson N and M Wooden (2003), 'Toward an imputation strategy for wave 1 of the HILDA Survey', HILDA Project Discussion Paper Series No 1/03.

Zeldes SP (1989), 'Consumption and liquidity constraints: an empirical investigation', *Journal of Political Economy*, 97(2), pp 305–346.