# BIRTHS, DEBTS AND MIRAGES: THE IMPACT OF THE HIGHER EDUCATION CONTRIBUTION SCHEME (HECS) AND OTHER FACTORS ON AUSTRALIAN FERTILITY EXPECTATIONS

**Peng Yu**, The Australian National University
**Rebecca Kippen**,† The Australian National University
**Bruce Chapman**, The Australian National University

This paper uses survey data to examine the effect of the income-contingent charge mechanism, the Higher Education Contribution Scheme (HECS), and other demographic and attitudinal variables on fertility expectations in Australia over the recent past. HECS requires former Australian students to fund some of the costs of higher education through the repayment of interest-free loans made by the Australian government. Its defining characteristic is that repayments only occur when and if students' future incomes exceed a particular level. Since its introduction in 1989, media and other populist commentary has suggested that HECS has had unanticipated effects on behaviour. Most recently, attention has focused on the effects of HECS on fertility, with some arguing that university graduates are delaying births, and having fewer children, because of their HECS debts. This paper demonstrates that the introduction of HECS has had no discernible impact on Australian fertility rates, nor on the number of children that people expect to have. However, education, age and a number of attitudinal factors are associated with significant differences in fertility expectations.

**Keywords: Australia, fertility expectations, higher education contribution scheme, lifetime fertility, fertility determinants, education costs, religiosity, attitude**

This paper demonstrates that the Higher Education Contribution Scheme (HECS) has had no discernible impact on Australian fertility rates, nor on the number of children people expect to have. The background is as follows.

Governments in the majority of countries allow universities and colleges to charge students for tuition, and in many of these countries, for example, Canada and the United States, the financing process is assisted by the provision of commercial bank loans backed with a government guarantee of repayment. The availability of bank loans is usually limited to a subset of the student population, and eligibility and available amounts are often determined with reference to both age and family income. In Australia, however, there is a quite different system of student financing.

HECS was introduced in Australia in 1989 as a part-solution to university financing.[1] It involves former students repaying some of the direct taxpayer costs of higher

† Address for correspondence: Rebecca Kippen, Demography, Research School of Social Sciences, The Australian National University, Canberra ACT 0200, Australia. Email: rebecca.kippen@anu.edu.au.

education, but only if and when graduates' personal incomes exceed a minimum threshold (which in 2006 was AUD38,149 per annum). It is progressive in that those earning the highest incomes repay their debts fastest, and therefore have fewer years to benefit from the government subsidy implicit in the debt having a zero real rate of interest. When HECS was first introduced, students contributed, on average, 20 to 25 per cent of the cost of their higher education. By the early twenty-first century this had increased to 40 to 50 per cent (Chapman and Ryan 2002).

This study is motivated by the fact that recently HECS has been blamed for causing the university-educated to delay having children, and to limit their family size. This paper examines the contention that HECS has resulted in a fall in the birth rate of university-educated individuals, and tests directly whether HECS has caused men and women to adjust downwards their expectations about future completed family size. The multiple regression analysis allows isolation of the independent effects of a wide range of variables on expected lifetime fertility.

The paper begins with a discussion of fertility in Australia and why low and declining fertility is an important social and demographic concern. This is followed by a discussion of conceptual issues, including the definition of a counterfactual (how would higher education be funded in the absence of HECS?) and what HECS might mean for decisions concerning fertility choices. Previous research on the effect of HECS is then considered. The main contribution is an examination of the effect of HECS on recent Australian fertility rates, and an analysis of its effect on fertility expectations using the Household, Income and Labour Dynamics of Australia (HILDA) survey. While HECS does not seem to influence fertility, it is clear that a number of other demographic, economic and attitudinal factors are significantly associated with expected lifetime fertility.

## The importance of fertility

Australia's fertility, at around 1.8 births per woman, is relatively high compared to that of many other developed countries. This level of fertility, or one slightly lower, combined with moderate levels of net migration, leads to a demographically sustainable population future (McDonald and Kippen 1999). However, if fertility were to fall to the very low levels now seen in parts of Europe and Asia, this would not be demographically sustainable.

Very low fertility leads to hyper-ageing of the population. This occurs when the proportion of people at young ages drops substantially (because of fewer births) resulting in proportionately more people at older ages, eventually leading to spiralling population decline and decline in the absolute size of the labour force.[2] Thus, it seems imperative that fertility rates are not permitted to fall to very low levels. This situation is of particular concern if low fertility rates are not just a product of increasing personal control over reproduction, but result because people feel constrained by their circumstances to have fewer children than they would otherwise have.[3]

## Conceptual issues

### *Defining the question*

The apparently straightforward question motivating this paper is: has HECS affected Australian fertility and fertility expectations? The issue requires more clarity than

has so far characterized public debate. There are a number of possible interpretations of the potential relevance and nature of a HECS-fertility nexus.

A critical issue is the definition of a counterfactual. That is, it is not helpful to consider students' or graduates' fertility choices given the existence of a HECS debt without comparisons of what fertility choices would be in the absence of HECS debts. In other words, in a world of no HECS debts, it is necessarily the case that higher-education participants would face alternative university funding systems possibly having an impact on choices concerning fertility.

To clarify the importance of the counterfactual, it is useful to ask what Australian higher-education financing arrangements might have been after 1989 in the absence of HECS. This exercise assists significantly in an interpretation of the regression results which make up the main contribution of the paper. The alternative possible arrangements are now considered.

It is likely that if HECS had not been implemented, higher education would have been financed in one of the three other ways currently adopted internationally. First, higher education funding could have been provided entirely from taxpayers, tuition-free, as it was in Australia from 1973 to 1988, and as is the case in much of Western Europe, for example, France and Germany. Second, higher education funding could have been provided by up-front fees for all students, such as is the case in Japan. This means that students pay tuition charges at the point of entry. Third, funding could have come from up-front fees, but with a means-tested government-guaranteed commercial bank loan, as is the case in the United States and Canada.

The need to define a counterfactual is an important point missed in current discussion, but it is not the only concern with public pronouncements on the role of HECS with respect to fertility. There is also a more macro perspective concerning the availability to governments of revenue for the growth of university places.

There is a related complication concerning the effect of HECS on Australian fertility, promoting again the need for clarification of the counterfactual. This concerns the number of higher-education places there would have been if HECS had not been implemented. An obvious possibility would be to continue financing universities from taxes only, and in this case it is very likely there would have been fewer Australian graduates since 1989.[4] A different alternative might have been that, instead of HECS, the government adopted the financing system used by many countries: up-front fees with bank loans for the relatively disadvantaged. In this circumstance it is less clear that the number of graduates would have been lower than what occurred, but this seems to be likely. The critical issue is that, in the absence of consideration of a counterfactual, the question of the effect of HECS on fertility is poorly defined in a research context.

In what follows, the counterfactual to HECS is the Australian higher education financing arrangements in place in the 1973–1988 period. Thus, statements such as 'HECS reduces fertility' are taken to mean that individuals with income-contingent loan obligations would choose to have more children if they did not have any income-contingent or bank-loan debt.

### *Financial considerations*

Because HECS is a debt, the essence of the issue arguably involves the potential nexus between financial obligations and fertility. There are three matters to consider.

The first concerns 'opportunity costs', a term in this context reflecting the notion

that all choices made by individuals reflect a preference for spending time in particular activities instead of in others. In terms of fertility choices, an important opportunity cost relates to the time that a parent allocates to child rearing instead of working in the paid labour force[5].

The second and related financial issue associated with fertility concerns the possible role of savings. Both the indirect costs (such as forgone earnings) and the direct costs of rearing children (such as for food, clothing, and schooling) are significant. This implies that fertility decisions are undertaken in a financial context affected by levels of prenatal household income, since income is a fundamental determinant of savings.

The simplest way to deal with this complexity is to assume that HECS has had no important consequences for either the supply or demand of graduates since 1989, and that employers have not adjusted the salaries of graduates to compensate for their lower disposable incomes given debt repayment obligations.

Given the above assumptions, HECS repayments must reduce graduate take-home wages for individuals for the period in which the debt exists, so long as they are earning above the lowest repayment threshold. This reduces the opportunity cost of being out of the paid labour force to rear children, which would encourage fertility. On the other hand, lower disposable incomes resulting from HECS imply a reduced potential to accumulate savings to help finance child rearing. This could discourage or delay fertility.

The third issue concerns the nature of the HECS interest rate. HECS debts are adjusted annually to reflect changes in the Consumer Price Index, meaning that, in effect, there is a zero real rate of interest on unpaid debt[6]. In other words, the government subsidizes HECS debtors and the subsidy is greater the longer a former student takes to repay.

These adjustments mean that HECS implicitly rewards those who take a relatively long time repaying. That is, in strict financial terms and ignoring the implications for savings, it is in the interests of a HECS debtor to defer repayments (Chapman 1997). This could well be a pertinent issue for fertility choices, since it means that spending time out of the labour force, rearing children, for example, is rewarded[7].

Even so, HECS debtors may not be fully informed about the nature of the continuing adjustments to their debts, and/or may give negative weight instead to the fact that they have an unpaid HECS debt.

***Summary***

The effect of HECS on fertility is not well defined or straightforward. The counterfactual—what would higher-education financing arrangements have been in the absence of HECS?—is fundamental to the definition and clarification of the question and is also critical to an interpretation of the statistical work presented below.

If HECS had not been introduced in Australia in 1989 there would have been higher taxes, lower higher-education enrolments, or even a bank loan system. These alternatives would also have had implications for fertility; the number of graduates would not have been the same, and students would have experienced different financial obligations.

To clarify the analysis this paper considers some of the fertility–financial implications for HECS debtors compared to otherwise-similar former students without HECS debts. Examination of the effect of HECS on fertility suggests that, *a priori*,

unambiguous predictions cannot be made about a possible HECS-fertility relationship. It is clearly a matter for the data.

**Previous discussion of HECS and fertility**

Attention focused on HECS as a factor in low and falling fertility reached fever pitch in November 2003 as the result of a radio interview on the then new AMP–NATSEM report *Income and Wealth of Generation X* (Harding, Kelly and Bill 2003). During this interview one of the report's authors made the following comment: 'It's possible that we may see major declines in fertility amongst university-educated women if they have to struggle with very high HECS debts' (Harding 2003).

However, although the *Generation X* report confirmed the age-old link between higher education and lower fertility,[8] there was no evidence provided of a link between a HECS debt and lower fertility. Despite this, the statement on HECS and fertility quickly infiltrated the public consciousness. Within a very short period after the interview, news articles appeared with headlines such as 'HECS debt fertility warning' (*Age* 2003). It is now quoted as fact by politicians, social commentators and others that HECS causes low fertility (see, for example, Baird 2002; Harding *et al.* 2003; Macklin 2003; Pearse 2003; Stott Despoja 2003; Armstrong 2004; Queensland Government 2005).

Two previous papers have examined the link between HECS and fertility. The first, entitled 'The Higher Education Contribution Scheme—A HECS on the family?' (Jackson 2002), argued that government policies can have unintended demographic consequences, and that HECS may be one such policy. Jackson contended that the cost of paying off a HECS debt may cause university-educated men and women 'to delay their childbearing and/or to have fewer children than they otherwise would' (Jackson 2002: 105). She argued that more-highly educated women have fewer children because of the opportunity costs of taking time out of the workforce to bear and raise children, and the incompatibility of worker and mothering roles, and that 'Theoretically this relationship will be stronger for those who have invested more heavily in their education' (Jackson 2002: 106). That is, the paper asserts that the relationship between higher education and lower fertility will be stronger for those with a HECS debt as opposed to those without.

However, it is by no means clear that the presence of a HECS debt would result in even lower fertility for educated women. As noted above, the presence of a HECS debt reduces the opportunity cost for women to take time out to raise children. Jackson was perhaps on stronger ground when arguing that that those with a HECS debt might delay fertility because of their reduced income and the implications this has for savings. Because of a lack of data, Jackson was unable to empirically test her hypothesis that there is a link between HECS debt and lower fertility.

The second paper, 'Student debt: a HECS on fertility' (Norton 2003), was essentially written as a response to Jackson's research. It took the stance that, since most women with a HECS debt are still relatively young, it is difficult to say whether HECS will affect their completed family size, but it probably will not, and even if it did, that is no reason to abolish HECS. Norton argues that Jackson's paper points to education, rather than HECS, as the major factor in lower fertility. The intervening variable appears to be partnership rates. More-highly educated women are less likely to be in a cohabiting relationship than less-educated women.

Perhaps tongue in cheek, Norton argues that the solution may be to improve the early education of boys. This would increase the number of men attending university and therefore the pool of eligible partners for university-educated women, assuming that university-educated women prefer university-educated men as partners. As was the case with Jackson, Norton was not able to test empirically the contention that HECS reduces fertility.

### Examining the effect of HECS on fertility using aggregate data

As noted by Norton (2003), it is difficult to determine if the introduction of HECS has had an impact on fertility. There are two reasons for this. The first is that HECS was only introduced in 1989, and so the vast majority of people with a HECS debt are still relatively young, aged from late teens to early thirties. Most of these will not have had children yet, with or without a HECS debt. This is because of the effect that education has in delaying fertility. This delay has become more pronounced over time. For example, the proportion of 25–29-year-old women with a bachelor degree (or higher qualification) who were childless increased from 71 per cent in 1981, to 76 per cent in 1986, and to 84 per cent in 1996 (ABS 2004). The second, related, reason is that it is difficult to separate the effect of HECS from the effects of education. Most young people with a university education will also have, or have had, a HECS debt and *vice versa*.

If HECS is causing large numbers of young people to delay starting a family and to restrict the number of children that they have, then we might expect to see this effect on aggregate fertility rates. This should be especially evident for women born since 1971, more than one-quarter of whom have been subject to HECS. However, as Figure 1 shows, no effect is apparent. The average number of births to women by age 25 years and by age 30 years has been declining steadily for decades. There is no extra reduction that might be attributable to HECS. In fact, the rate of decline seems to have slowed for recent cohorts of women.

A similar picture emerges when women are considered by education level. Fertility has fallen for women at all levels of education but has fallen more for those with no post-school qualifications than for women with a bachelor degree (Figure 2).

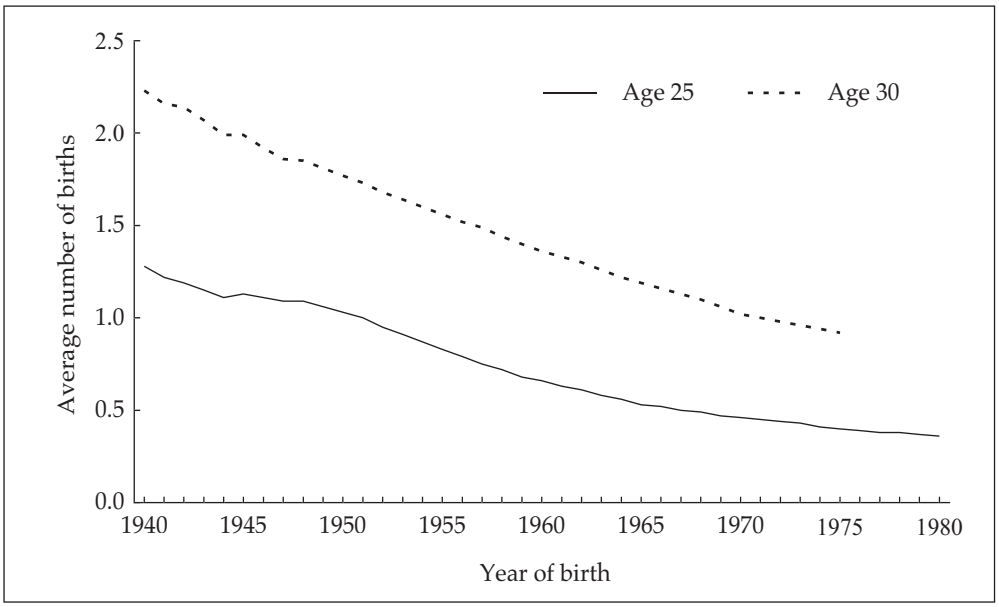
### Examining the effect of HECS on expected lifetime fertility using multiple-regression analysis: model and data

The major contribution of this paper lies in testing the determinants of Australian fertility expectations, including the possible role of HECS. Following Fisher and Charnock (2003) this analysis takes into account both the existing number of children and respondents' expectations concerning how many more children they intend to have.

Data are derived from the Household, Income and Labour Dynamics in Australia Survey (HILDA), Waves 1 and 2, carried out in 2001 and 2002. The data on existing number of children, intended future children,[9] education, preferences, and family background are from Wave 1, and the HECS-related information is from Wave 2. The sample includes 11,416 respondents aged 18 years and over, 997 (401 men and 596 women) of whom have or have had a HECS debt.

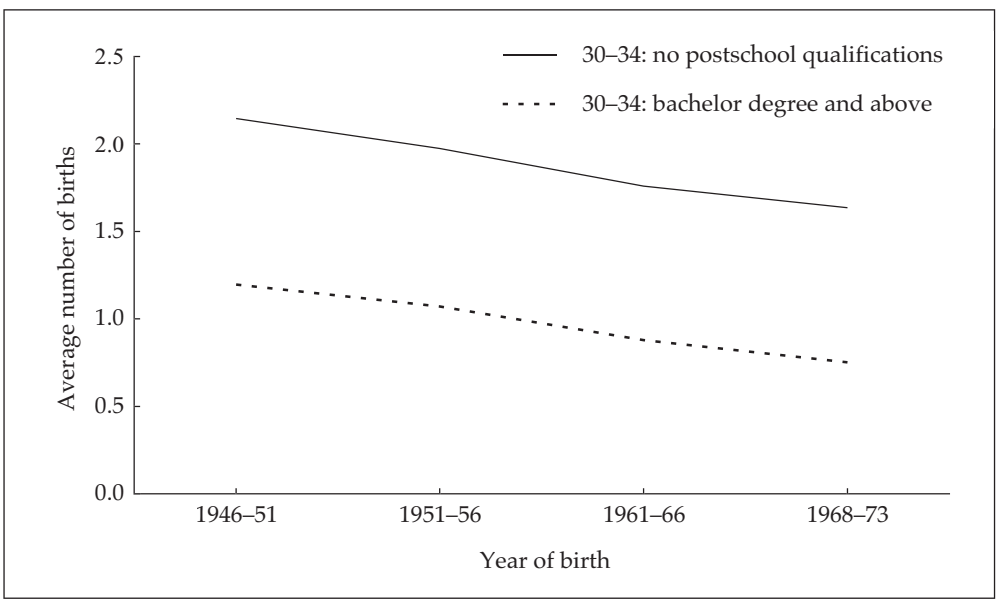
This analysis focuses on data for individuals, even though it is likely that fertility decisions are made jointly by potential parents. While HILDA would allow the

**Figure 1 Average number of births by age 25 years and age 30 years, women born 1940–1980, Australia**




Sources: ABS, various years; authors' calculations.

**Figure 2 Average number of births by education level (bachelor degree and above/no post-school qualifications), women aged 30–34 years, born 1946–1973, Australia**




Sources: ABS 2004; HILDA Wave 1 2001; authors' calculations.

estimation of fertility models correcting for this possibility, the problem of endogeneity is very obviously strong in such an approach.[10] Indeed, this is exactly what was found in unreported estimates taking partners' fertility preferences into account.

The essential test of the relationships takes the general form:

$$\text{Expected Lifetime Fertility} = f(\text{demography} + \text{economic net benefits} + \text{attitudinal variables}) \quad (1)$$

In the demographic category there is information on age, sex, number of siblings, country of birth and region of residence. In the economic category is education (which is also a demographic factor) and the existence and level of HECS debt. The attitudinal variables measure the importance of religion in the respondents' lives and respondents' values with respect to the roles of work, family and women's place in society. The next section describes the right-hand side variables and their possible role in fertility decisions.

## The variables described

### *Expected lifetime fertility*

The dependent variable, expected lifetime fertility, is defined as:

$$ELF = NC + ENFC \quad (2)$$

where ELF is expected lifetime fertility, NC is the number of children that a person has already borne, and ENFC is the number of children that a person expects to have in the future. Compared to previous research, this variable has both advantages and disadvantages as a representation of the number of children a person will have in his or her lifetime.

The main advantage relates to the fact that ELF provides a measure of expected lifetime fertility for those who have yet to complete their fertility because of age. That is, taking into account the number of expected future children provides a completed fertility measure for the young. Consequently relationships can be estimated for the entire sample.

However, the use of ENFC is problematic. The reason is that, although there is evidence that expected future fertility is strongly correlated with actual future fertility (Schoen *et al*. 1999), young people tend to systematically overestimate the number of children they will have in the future (Noack and Østby 2000; Morgan 2003; Smallwood and Jefferies 2003). This is unfortunate because it introduces measurement error in the dependent variable. However it is not necessarily a significant issue for analysis involving hypothesis testing: the coefficients in the estimations will only be affected if there is a correlation between particular variables and the error people make in their expectations of the number of future children. It is likely that more-educated women will exaggerate their intended fertility, since at any age they would tend to have had fewer children, and this possibility will be captured through controls for education. There is no reason to believe that there would be an effect of HECS debt on expected fertility errors. In any case, this possibility cannot be tested until participants in HILDA have completed their fertility experience.

### *Higher Education Contribution Scheme (HECS) Debt*

Since the motivation of the paper is to examine the effect of HECS on expected lifetime fertility, it is critical to properly measure the influence of this higher-education financing arrangement.

Ideally, tests of the relationships between HECS and lifetime fertility would involve having information on two variables: whether or not a person had ever incurred a HECS debt and, if so, the total amount of debt incurred. Wave 2 of HILDA asked several questions about HECS, however these were not directly informative on either matter. However, whether a respondent had ever incurred a HECS debt can be inferred, and this was done as follows.

Respondents were asked if they currently had a university debt, and if so, they were measured as being in the category of ever having incurred a HECS debt. This leaves the problem of not being able to identify those who previously had a HECS debt but had paid it off by the time of the HILDA Wave 2 survey. The correction entailed making an adjustment for the group of respondents who said they did not currently have a HECS debt. It was assumed that they originally had a debt if they had completed a university degree in Australia after 1989. This method has the weakness of ascribing a HECS debt to the minority of students who paid their entire charge obligation up-front.[11]

### *Age*

Analyses of fertility determinants typically identify the age of those surveyed as a critical variable. There are two issues here, one of which can be traced to the nature of the data used, and a second with a more important conceptual dimension for this exercise.

The data issue with respect to the role of age is of relevance to fertility analyses that involve explanations of the number of children that a person has so far parented. The young will necessarily report low fertility on average because they have not yet completed childbearing. This is not an issue for this exercise because the specified dependent variable takes into account future fertility expectations.

However, interpretation of the effect of age on fertility still matters for this analysis, because there is likely to be a fertility cohort effect. That is, cultural, technological and attitudinal forces have resulted in lower aggregate fertility rates over time. Their influence cannot be isolated, but because these so-called cohort effects will be significantly related to age, it must follow that the relationship between fertility expectations and age will reflect their influence.

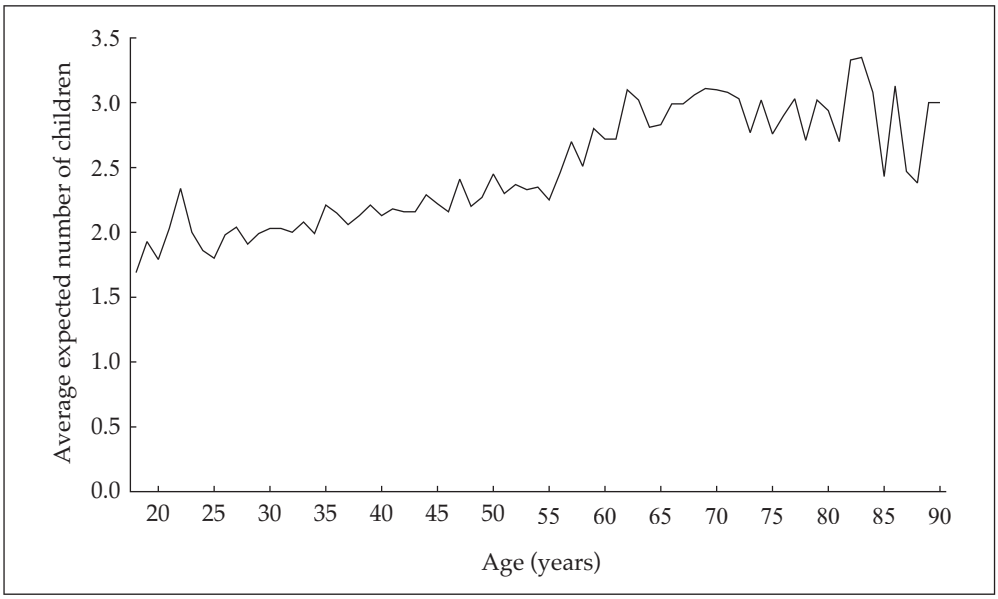
This possibility is clear from Figure 3, which shows the total expected number of children by HILDA respondents' age. The data imply, for example, that those over about the age of 60 years have almost a 30 per cent higher total expected lifetime fertility compared to those aged less than about 40 years.

Different specifications in the estimations showed that the functional form involving age is statistically very complex. This led to the estimation of the relationships in the most flexible possible way, with a dummy variable for each year of age. This is addressed further below.

### *Sex*

The fertility expectations of men and women are likely to be systematically different (see, for example, Weston *et al*. 2004). To test this possibility, a sex dummy was

**Figure 3 Average expected lifetime fertility, respondents aged 20–90 years, HILDA, Australia, 2001**




Source: HILDA Wave 1 2001; authors' calculations.

included in the model, as well as interaction terms of this dummy and all other explanatory variables. Tests of joint significance suggested strongly that the appropriate functional form involves separate models for males and females and this is the approach reported below.

***Education***

Around the world more-educated women have, and expect to have, fewer children than less-educated women (Castro Martin 1995; Rindfuss, Morgan and Offutt 1996; Weston *et al.* 2004). In an environment in which women make life decisions involving both educational investments and fertility, increased educational attainment increases the opportunity cost of child-rearing[12]. In the context of the main question the other important reason to control for education is that having a degree is highly correlated with ever having had a HECS debt, meaning that in the absence of control for education it is not possible to determine the true effect of HECS on fertility.

***Other independent variables***

A number of controls were included that are typically used in demographic analyses of the determinants of fertility. They include number of siblings, state or territory of residence, urban or rural location and country of birth[13]. Information was also included concerning the importance of religion in the respondents' lives ('religiosity'), and respondents' attitudes to motherhood and the importance of paid work for both men and women. Many of these controls were found to have important associations with expected lifetime fertility, and these are described below. The statistical characteristics of the fertility, HECS, demographic and attitudinal variables are shown in Table 1.

**Table 1 Variables in the HILDA analyses, Australia, 2001–2002**

| Variables | Mean | Std dev. | Minimum | Maximum |
|---|---|---|---|---|
| **NC: Number of children already borne** | 1.93 | 1.65 | 0 | 14 |
| **ENFC: Expected number of future children** | 0.40 | 0.93 | 0 | 16 |
| **ELF: Expected lifetime fertility** | 2.33 | 1.51 | 0 | 16 |
| **Sex** (proportion) | | | | |
| Male | 0.47 | | | |
| Female | 0.53 | | | |
| **Age** (proportion) | | | | |
| <25 | 0.10 | | | |
| 25–29 | 0.09 | | | |
| 30–34 | 0.11 | | | |
| 35–39 | 0.11 | | | |
| 40–44 | 0.12 | | | |
| 45–49 | 0.10 | | | |
| 50–54 | 0.09 | | | |
| 55–59 | 0.07 | | | |
| 60+ | 0.22 | | | |
| **Education** (proportion) | | | | |
| Postgraduate | 0.07 | | | |
| Bachelor | 0.12 | | | |
| Diploma | 0.09 | | | |
| Certificate | 0.27 | | | |
| Year 12 | 0.11 | | | |
| Other | 0.34 | | | |
| **Ever had HECS debt** | 0.09 | | | |
| **Current HECS-debt level** | $8,577 | 7,402 | 100 | 40,000 |
| **Number of siblings** | 2.99 | 2.28 | 0 | 25 |
| **State/Territory** (proportion) | | | | |
| NSW | 0.30 | | | |
| Vic | 0.25 | | | |
| Qld | 0.20 | | | |
| SA | 0.10 | | | |
| WA | 0.10 | | | |
| Tas | 0.03 | | | |
| NT | 0.01 | | | |
| ACT | 0.02 | | | |
| **Country of birth** (proportion) | | | | |
| Low-fertility | 0.12 | | | |
| Medium-fertility | 0.07 | | | |
| High-fertility | 0.06 | | | |
| Australia | 0.75 | | | |
| **Urban/rural location** (proportion) | | | | |
| Major cities | 0.58 | | | |
| Inner regions | 0.28 | | | |
| Outer regions | 0.12 | | | |
| Remote areas | 0.02 | | | |
| **Religiosity** | 4.69 | 3.61 | 0 (least important) | 10 (most important) |
| **Importance of motherhood** | 5.72 | 1.71 | 1 (strongly disagree) | 7 (strongly agree) |
| **Importance of paying job** | 5.18 | 1.92 | 1 (strongly disagree) | 7 (strongly agree) |

Sources: HILDA Wave 1 2001; HILDA Wave 2 2002; authors' calculations.

The main characteristics of the data are as follows: the average number of children that respondents had ever had was 1.93, and, on average, a further 0.4 were anticipated, giving an average expected lifetime fertility of 2.33 children. Forty-seven per cent of the sample were male, 40 per cent were between the ages of 18 and 39 years, 19 per cent had completed a university degree, 9 per cent had ever incurred a HECS debt, 56 per cent lived in either New South Wales or Victoria, 75 per cent were born in Australia, and 58 per cent lived in major cities. The average response to the question, 'How important is religion in your life?' was 4.7 (on a scale of 0 to 10). The average score for the statement 'Whatever career a woman may have her most important role in life is still that of being a mother' was 5.7 (on a scale of 1 to 7) and for the statement 'To be happy in life it is important to have a paying job' was 5.2 (also on a scale of 1 to 7).

The broad characteristics of the respondents (for example, age, location, education and country of birth) are quite similar to those found in other recent Australian cross-sectional surveys, such as the Australian Bureau of Statistics Housing and Income Distribution Surveys (see Addison and Worswick 2002 for comparisons with the major variables). This allows some confidence that the HILDA sample is representative of the population of adults living in Australia. With this as background the regression results are discussed below.

## Examining the effect on expected lifetime fertility using regression analysis

### *Estimation results: statistical significance*

Several estimation approaches were used, for both men and women. Results of two equations, using different but very similar dependent variables, are shown in Table 2.

The following results stand out with respect to the statistical associations between expected lifetime fertility (ELF) and the main independent variables.

Neither the size nor the existence of a HECS debt is associated with differences between either women's or men's ELF. However, at the 10 per cent level of significance, and for women only, having ever had a HECS debt is associated with a slightly higher expected number of children. The effect is very small, somewhere between 0.14 and 0.16 children (compared to the average of 2.33), or about six per cent.

Education is found to be significantly and negatively associated with ELF for women, but not for men. People who come from large families (those with more siblings) are more likely to have higher ELF. Religiosity and attitudes to the importance of motherhood are highly significant correlates of ELF for both women and men, while attitudes towards the importance of having a paying job are associated with women's but not men's ELF.

In terms of the geographic variables, fertility levels of immigrants' countries of birth are correlated with ELF for both women and men, the state or territory of residence is significantly associated with ELF for women, but not for men, and urban or rural location is not statistically associated with expected lifetime fertility for either women or men.

Statistical significance is just the first interesting aspect of the regression, the other being the actual size of the coefficients and thus what empirical effects on the number of expected lifetime children are implied by particular changes in the independent variables. This is the subject of the next section.

**Table 2 The determinants of expected lifetime fertility, Australia, 2001–2002**[a]

| | Males | | Females | |
|---|---|---|---|---|
| Variables | (i) | (ii) | (i) | (ii) |
| **Age dummies (18–90)** | + | + | + | + |
| **Ever had HECS debt** | 0.048 | 0.041 | 0.163 | 0.136 |
| **Current HECS-debt level** | $1.55e^{-05}$ | $1.42e^{-05}$ | $-8.38e^{-06}$ | $-7.44e^{-06}$ |
| **Education:** | | | | |
| Other (ref.) | – | – | – | – |
| Postgraduate | 0.124 | 0.114 | –0.397** | –0.396** |
| Bachelor | 0.132 | 0.126 | –0.234** | –0.241** |
| Diploma | 0.161* | 0.157 | –0.217** | –0.213** |
| Certificate | 0.056 | 0.060 | –0.132** | –0.129** |
| Year 12 | –0.014 | 0.005 | –0.036 | –0.039 |
| **Number of siblings** | 0.056** | 0.057** | 0.088** | 0.086** |
| **State/Territory:** | | | | |
| ACT (ref.) | – | – | – | – |
| NSW | 0.005 | 0.031 | –0.334** | –0.392** |
| Vic | 0.101 | 0.111 | –0.289** | –0.341** |
| Qld | 0.033 | 0.045 | –0.347** | –0.397** |
| SA | 0.012 | 0.019 | –0.348** | –0.410** |
| WA | 0.100 | 0.126 | –0.196 | –0.251 |
| Tas | –0.111 | –0.124 | –0.572** | –0.632** |
| NT | –0.361 | –0.348 | –0.544 | –0.644** |
| **Country of birth:** | | | | |
| Australia (ref.) | – | – | – | – |
| High-fertility country | 0.118 | 0.108 | –0.209** | –0.204** |
| Medium-fertility country | –0.116 | –0.110 | –0.228** | –0.209* |
| Low-fertility country | –0.251** | –0.261** | –0.097 | –0.101 |
| **Urban/rural location:** | | | | |
| Remote areas (ref.) | – | – | – | – |
| Major city | –0.120 | –0.144 | –0.122 | –0.107 |
| Inner region | 0.079 | 0.043 | 0.169 | 0.169 |
| Outer region | 0.079 | 0.061 | 0.164 | 0.171 |
| **Religiosity** | 0.043** | 0.043** | 0.048** | 0.047** |
| **Importance of motherhood** | 0.089** | 0.085** | 0.119** | 0.119** |
| **Importance of paying job** | –0.001 | –0.005 | –0.031** | –0.032** |
| Constant | 0.899** | 1.045** | 1.049** | 1.255** |
| Observations | 4871 | 4871 | 5479 | 5479 |
| R-squared | 0.12 | 0.11 | 0.16 | 0.15 |

a The difference between equations (i) and (ii) is that the latter uses the modified expected lifetime fertility, which is one more expected child for those respondents younger than 46 years and with a likelihood of 5/10 of having a child in the future; + Not reported but included in the models as single-year dummies; *p<0.05; **p<0.01

Sources: HILDA Wave 1 2001; HILDA Wave 2 2002; authors' calculations.

**Table 3 Interpretative estimates of the coefficient sizes, Australia, 2001–2002**

| Variables | Males | Females |
|---|---|---|
| **Education**[a] | | |
| Postgraduate | | –0.40 |
| Bachelor | | –0.24 |
| Diploma | | –0.21 |
| Certificate | | –0.13 |
| **Number of siblings**[b] | 0.11 | 0.17 |
| **State/Territory**[c] | | |
| NSW | | –0.39 |
| Vic | | –0.34 |
| Qld | | –0.40 |
| SA | | –0.41 |
| WA | | –0.25 |
| Tas | | –0.63 |
| NT | | –0.64 |
| **Country of birth**[d] | | |
| High-fertility countries | | –0.20 |
| Medium-fertility countries | | –0.21 |
| Low-fertility countries | –0.26 | |
| **Religiosity**[e] | 0.43 | 0.47 |
| **Importance of motherhood**[f] | 0.51 | 0.71 |
| **Importance of paying job**[f] | | –0.19 |

a Compared to having year 12 or less.

b The impact of each two additional siblings.

c Compared to living in the ACT.

d Compared to being born in Australia.

e Increasing the number from 1 to 10.

f Increasing the response from 1 to 7.

Sources: HILDA Wave 1 2001; HILDA Wave 2 2002; authors' calculations.

### *Estimation results: coefficient sizes*

Table 3 shows the size of the ELF effects for those independent variables that are statistically significant at the one per cent level, with results taken from the preferred models (ii) for both males and females. The coefficient sizes reported in Table 3 should be interpreted as follows.

Compared to having completed only year 11 or year 12, women with a post-graduate or bachelor degree, diploma or certificate have an ELF which is 0.40 (almost half a child), 0.24. 0.21 and 0.13 less children. There is no ELF education effect for men.

For every two additional siblings, women expect to have 0.17 more children, men expect to have 0.11 more children.

Women living outside the ACT expect to have around 0.3 to 0.6 fewer children, with those living in Tasmania and the Northern Territory having the fewest. This result seems inconsistent with aggregate data, given that Tasmania and the Northern Territory have the highest fertility rates in Australia. However it must be remembered that all other factors, for example, education and religiosity, are being held constant. Tasmania and the Northern Territory have comparatively low education levels which are related to their higher levels of aggregate fertility (measured by the total fertility rate) and expected lifetime fertility. However once education and other factors are controlled for, they have relatively low levels of expected lifetime fertility. For example, a woman in the Northern Territory expects to have, on average, 0.6 less of a child than a woman with exactly the same characteristics in the Australian Capital Territory.

Compared to those born in Australia, women born in high- and medium-fertility countries have 0.2 lower ELF. Compared to those born in Australia, men born in low-fertility countries have 0.26 lower ELF.

Women and men who believe that religion is 'extremely important' to their lives have 0.47 and 0.43 higher ELF than women and men who believe that religion is 'not at all important' to their lives. Women and men who believe that motherhood is 'very important' have 0.71 and 0.51 more ELF than women and men who believe that motherhood is 'not at all important'. Women who believe that having a paying job is 'very important' have an ELF which is about a fifth of a child less than women who believe that having a paying job is 'not at all important'. There is no effect for men.

Of broad interest is that there is a much larger number of variables affecting the expected lifetime fertility of women than is the case for men.

## Conclusion

There are four main findings from the investigation of the determinants of expected lifetime fertility. The first is that, after other factors are taken into account, there is no significant effect of having had a HECS debt, or the current level of unpaid HECS debt, on men's and women's expected lifetime fertility.

Second, while the age relationships have not been reported in any detail here, it is worth stressing that age is significantly positively associated with expected lifetime fertility. While the age–ELF relationships are very complicated, an additional ten years of age is associated with around 0.18 and 0.10 more ELF for males and females. It is unclear to what extent this reflects the long-term downward trend in fertility, but it is very likely that this aspect of changing fertility patterns is a critical part of the explanation.

Third, education is strongly negatively associated with women's expected lifetime fertility. For example, women holding a university degree expect to have around 0.24 fewer children than those who have not completed high school.

Finally, tastes, attitudes and values are very importantly associated with expected lifetime fertility. To illustrate this with respect to women, for example, two women with opposite levels of measures in these areas will have a total difference of 1.37 expected children over their lifetimes.

A caveat to fertility analysis of this kind is that a single equation model is unlikely to capture accurately the interrelationships between the many factors determining a person's expected number of children. The method and findings discussed here are certainly not the end of the story.

It might be interesting to reflect on what the exercise and results imply for government policy in the area of higher education financing and, in particular, the role and functioning of HECS. It is clear that in considering this type of financing scheme for higher education, no weight should be placed on the implications for fertility, since it is apparent that there are none.

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**Notes**

1 For analysis of the policy debate, see Edwards (2001). HECS was the first national income-contingent loan policy, and variations of it have now been adopted or will soon be adopted in many other countries, including New Zealand (1991), South Africa (1994), Chile (1995), the United Kingdom (2006), Thailand (2006) and Israel (2007).
2 Kippen and McDonald (2004) argue that this situation cannot be prevented by simply increasing immigration levels to compensate for very low fertility.
3 See, for example, Cannold's (2005) and Macken's (2005) discussion of the circumstantially childless in Australia.
4 HECS has facilitated this expansion through the raising of over AUD10 billion since 1989 (Chapman and Ryan 2005).
5 For recent analysis of the opportunity costs of child rearing, see Chapman *et al.* (2001) and Breusch and Gray (2004).
6 A normal bank loan is adjusted for inflation plus what the bank considers to be the opportunity costs of unpaid debt, which is around 3–4 per cent above the CPI.
7 To understand the size of the subsidy, imagine that a former student has an unpaid HECS of $10,000. Each year that this remains unpaid is effectively worth around $500 in terms of the interest rate subsidy.
8 Educated women have always had fewer children than those with less education. In the nineteenth century, this was attributed by various learned doctors to the process of education itself. It was thought that blood, vital for the development of the reproductive organs, was instead directed to the brain, leading to undeveloped ovaries and subnormal fecundity (see, for example, Greg 1872; Clarke 1873).
9 The survey asked respondents, on a scale of 0 to 10, how likely they were to have a child or another child in the future. Respondents who answered 6 or more were asked how many (more) they intended to have. For those who answered 5 or less, the survey tacitly assumed that they intended to have no (more) children in the future. There is a methodological problem here. For example, respondents who answered '5' were arguably thinking that they had a 50–50 chance of having children in the future, but were not given the opportunity of saying how many. Consequently the model was rerun so that respondents who answered 5 were assumed to want one (more) child. As reported, this made little difference to the results.

10 Given that couples are highly likely to make joint decisions about future fertility, including a partner's fertility preferences in a fertility equation would clearly be problematic because of two-way causality.
11 This number will be small. In any given year around 20 per cent of students pay HECS up-front (Chapman 1997). It follows that the proportion paying their entire charge in this way must be considerably lower than this.
12 This is a common finding and is illustrated empirically in Chapman *et al.* (2001) and Breusch and Gray (2004).
13 Countries of birth were classified into four categories: Australia; high-fertility (total fertility rate greater than 2.4 births per woman in 2000–2005); medium-fertility (total fertility rate between 1.7 and 2.4); and low-fertility (total fertility rate of 1.7 or less). Total fertility rates for the period 2000–2005 were obtained from United Nations (2003). Australia is used as the reference category.

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