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Fertility Choices of Australian Couples

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by

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ABSTRACT

This paper examines the demand and supply factors that effect how many children a couple will have. It estimates the wage over working women to use as the potential wage for all women to avoid missing data and wage endogeneity problems. It estimates the total number and probability of having a certain number of children using a range of variables capturing preferences and demand and supply economic variables and other variables. OLS, Poisson, multinomial Logit, and Sequential Logit are used to examine which factors are significant in effecting fertility choices.

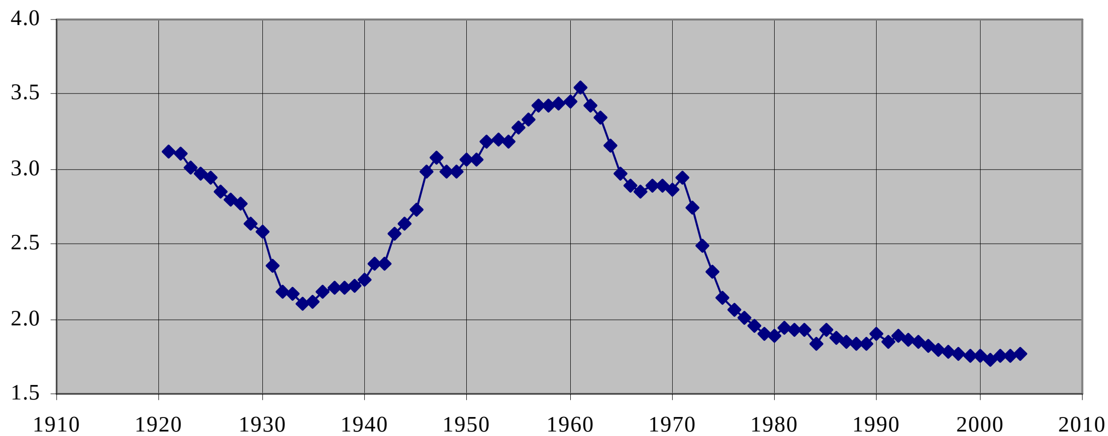
JEL Classification:
J1 - Demographic Economics
J13 - Fertility; Family Planning; Child Care; Children; Youth

Keywords: Fertility, Family Size

I. INTRODUCTION

Australia's total fertility rate (TFR) in 2004 was 1.77 babies per woman. From a high of 3.55 in 1961, Australia's TFR fell dramatically through the early 1960's and the 1970's, such that by 1976 it was below the replacement rate of 2.1. This situation is not unusual amongst OECD countries where the increased participation of women in the labour market and education and improvements in the availability of contraception and abortions had a significant effect in reducing the OECD average TFR.

Australian Total Fertility Rate (Births per women) - ABS 3301.0



While the TFR has been below the replacement rate for 30 years, Australia population continues to increase naturally as the number of births is almost twice that of deaths. This situation has been maintained due to the relatively young age structure of Australia's population. There are enough women of child bearing age (principally the children of the baby boomer generation) to ensure that births outweigh deaths.

Fears of overpopulation and the high unemployment rate in the 1980's and 1990's resulted in little public concern of the declining TFR in Australia over this period. Australia was first alerted to the "aging population".[1]

With the population projections by demographers indicating that the Australian population will decline by 2036[2]. Australia has come the realisation that the decline in TFR is likely to have significant effects on the Australian economy and society. Of particular note is the projected labour shortages, which may reduce economic growth and welfare, Productivity Commission (2005).

Governments of Australia have typically provided welfare payments for the support of children, but not attempted to alter the fertility rate. The current government has gone further providing "baby bonus payment" for the birth of a child, Howard (2001). In addition on the 11th May 2005 at Budget press conference Treasurer Peter Costello stated

> "You know, if you can have children, it's a good thing to do. You know, you should have, if you can - not everyone can - but one for your husband and one for your wife and one for your country."

It is important to determine the impact of these and a host of other factors on families' child-bearing decisions, so that policy-making can be sound, informed, and directed at those factors which are found to be significant in fertility decisions.

The foundation for economic models of fertility are Becker (1960) and Becker and Lewis (1973), which were to become the foundation of the Chicago-Columbia School's approach to fertility, and the basis for the majority of future economic and socio-economic studies of

[1] Of course we all age with time. "Aging population" refers to "structural aging" an increase in the proportion of older people and/or a decline in the proportion of younger people.
[2] ABS 3301.0 Series B Population Projections.

fertility. Becker's considered children as another choice variable in the households utility maximisation problem and that parents will, assuming they are able to, continue to have children as long as the expected benefits of having an additional child outweigh the expected costs.

Chicago-Columbia School's approach to fertility was debated by supporters of the Pennsylvania School who supported Easterlin's (1966,1975) theory that a range of social behaviour could be explained by considering that an individual's preferences are formulated in their life and not exogenously fixed. The distinction between these two school of thought can be crucial in interpreting the estimates of female education on fertility since it impacts on the females potential wage but may also alter preferences for children directly.

Modern economic models of fertility can be split into two distinct groups; static and dynamic. Static models estimate children ever had or "completed" fertility decisions while dynamic models estimate the intertemporal evolution of fertility choice. Dynamic models are either structural when the estimable equations are derived from the exact solution to dynamic optmisation problem or reduced form, which do not require on exact a solution to the optmisation problem. Reduced form models typically focus on the likelihood of birth, which is frequently modelled through hazard rate estimation.

The majority of applied static or completed fertility studies have not considered the underlying models behind their reduced form estimation, but focussed on alternate discrete estimation techniques. Particularly variations on the Poisson models, such as the ordered Logit or Probit; such as Merkle and Zimmermann (1992), negative binomial; for example and Caudill and Mixon (1995), generalised count; Winkelmann and Zimmermann (1994) and

Wang and Famoye (1997) and zero and two inflated gamma count; for example Melkersson. and Rooth (2000).

Such static fertility models are primarily limited to assessing factors that do not change from the time that child raising took place or supply side factors that can be derived from complete fertility data. This typically restricts the analysis to variables capturing underlying preferences, such as birthplace, parental and childhood information, education and supply side factors such as fertile length of relationship. Such models if correctly specified, can provide information or fertility predictions, however it is difficult to assess the effect of variables that can be manipulated through government policy, such as post tax wages, welfare payments and child care costs.

There have been a number of media pieces, journal articles and government papers discussing and or examining the determinants of Australian fertility. The majority of peer reviewed journal articles are sociology studies that focus on ethnic/migrant, religion and socio-economic differentials in completed fertility and fertility age profiles. See for example Caldwell and Ruzick (1978), Yusuf and Rocket (1981), Bracher and Santow (1991),Young (1991), Jain and McDonald (1997), Abassi-Shavazi and McDonald (2000) and Tesfahiorghis (2004).

Early economic studies of Australian fertility included Young (1975) who relied on univariate framework and Brooks, Sams and Wiliams (1982) who used aggregate time series analysis and Miller and Volker (1983) use area level data and focus on the likelihood of two or more children. Miller (1988) used OLS, sequential Logit and ordered Probit on the 1973 Sociol Mobility in Australia Survey to model the demand for children and the expenditure on them, but did not consider supply side factors. He found that cost of time as measured by the wife's wage significantly reduced the number of children but did not find any consistent class effects.

Fisher and Charnock (2003) use wave1 of the HILDA survey to examine partnering and fertility of men and women. They use a sequential Logit model to examine the sum of the number of children had and expected to be had in the future amongst three age groups of men and women. They note that estimates of the youngest group (18-29 years) and oldest group (50+ years) may be unstable and unreliable as they either have not yet established their education and labour characteristics or changed them upon retirement. They also warn against making comparisons across the groups due to differences in desired and actual fertility outcomes, which evolve over time. They present the effects of partnering status, education, work and income, employment type, housing arrangement and whether a migrant from non-English speaking background. They found that partnering, socio-economic status, education, self-employment and migrant from non-English speaking background were all significant in explaining childlessness.

Parr (2005) examined the incidence of childlessness in Australian women aged 40 to 54years using multi-level logistic analysis estimated a Logit model from wave 1 of the HILDA dataset He found marital status, number of siblings, region of birth, and childhood experiences to be significant factors. Never being married significantly increased the probability of being childless, as did growing up with a lower number of siblings.

To date Australian studies have focussed on assessing what the significant determinants of family size are, with little attention paid to modelling the birth decision. This paper estimates a static reduced form model of completed fertility of households. It does so using OLS, Poisson, Multinomial Logit and Sequential Logit econometric models. It updates the work of Miller (1984) and extends it by considering factors affecting the supply of children and additional variables responsible for preferences formulated in childhood. In addition improvements are made in the estimation of potential wage of potential mothers.

II. THEORETICAL FRAMEWORK

Whether a birth occurs at time *s*, can be considered as the interaction between the:

- demand_s - "demand" or the desire for children at time *s*, and the
- supply_s - "supply" of children that is their ability to have children at time *s*.
- ε_s - is an error, such that $E\left[\varepsilon_s\right]=0$, $E\left[\varepsilon_s^2\right]=\sigma^2$ and $E\left[\varepsilon_s\varepsilon_t\right]=0\ \forall\ s\neq t$

$$nc_{h,t}=\sum_{s=0}^{t}Pr\left(b_{h,s}\right)=\sum_{s=0}^{t}\left\{f\left(\text{demand}_s,\text{supply}_s\right)+\varepsilon_s\right\}$$

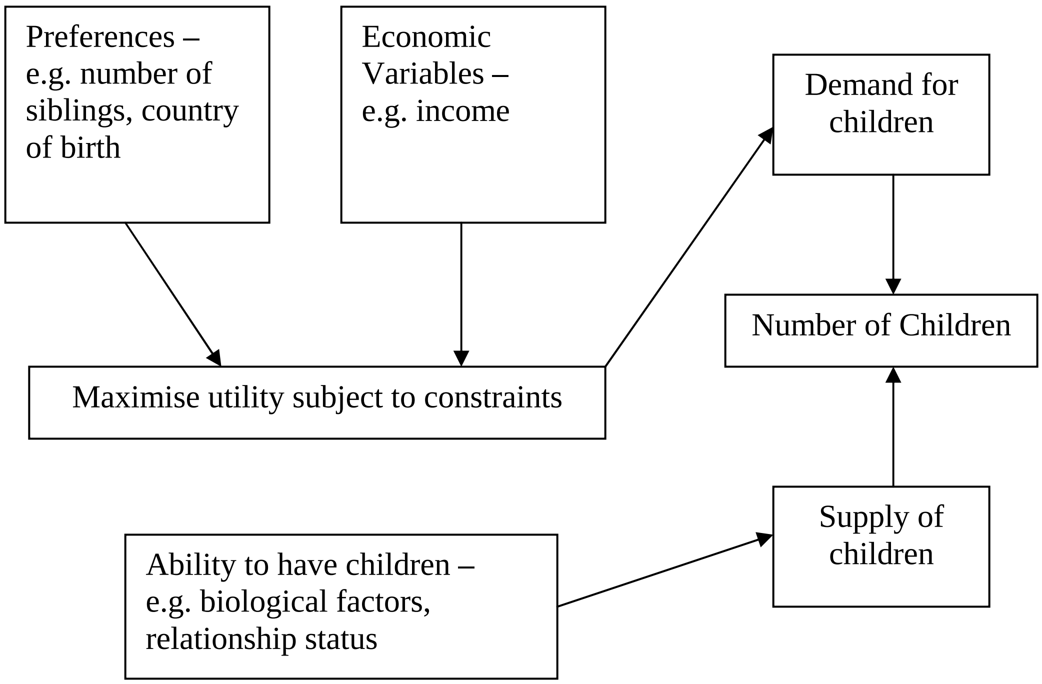
$$\Pr\left(b_s=1\right)=f\left(\text{demand}_s,\text{supply}_s\right)+\varepsilon_s \tag{1}$$

$$\Pr\left(child_t\right)=\sum_{s=0}^{t}Pr\left(b_s\right)=\sum_{s=0}^{t}\left\{f\left(\text{demand}_s,\text{supply}_s\right)+\varepsilon_s\right\} \tag{2}$$

$$\Pr\left(child_t\right)=\sum_{s=0}^{t}Pr\left(b_s\right)=\sum_{s=0}^{t}\left\{f\left(\text{demand}_s,\text{supply}_s\right)+\varepsilon_s\right\}$$

Parents choose how to divide their resources between children and other goods so as to maximise their utility, subject to their constraints. The number of children had by a family is determined by the parents' 'demand for' and 'supply of' children. Demand for children arises out of parents' desire to have the number of children which maximises their utility subject to their constraints, and a range of different factors will feed into the parents' choice through either their utility function or their constraints. Supply of children relates to the parents' ability to have children. This may be determined by biological factors affecting fertility, as well as 'exposure variables'. Figure 1 represents the problem in diagrammatical form.

Figure 1: Diagrammatic Representation of the Demand for and Supply of children



Supply of Children

Factors affecting the supply of children within a couple-household primarily include the physical fertility of fecundity of the mother and the mother's exposure time to the risk of childbirth

- The age of the mother is often used as a proxy of fecundity in the absence of any other suitable data.
- The time spent married or in a relationship in the fertile years is likely to increase the exposure time to the risk of childbirth.

- Jain and McDonald (1997) suggest the duration of the relationship and the age of the mother when she had her first child are used as exposure time variables.

Demand for Children

The demand for children can be considered as the outcome of maximising lifetime utility with respect to the total number of children.

- A couple household attempts to maximise its lifetime utility by choosing household expenditure, leisure/labour and the number of children subject to their resources of initial wealth, time and their characteristics.
- It assumed that all children are planned, that is there is no surprise children as there is no way to identify these children in datasets available.

Traditional Model of Births

$$\underset{\mathbf{x},\mathbf{j},nc}{\text{Max}}\; U\left(\mathbf{x},\mathbf{j},\mathbf{b},\mathbf{m},\boldsymbol{\theta}\right)=E_t\left[U\left(\sum_{s=0}^{T}\left(1+\delta\right)^{-s}u\left(x_s,j_s,b_s,m_{\mathbf{s}},\boldsymbol{\theta}\right),nc,\boldsymbol{\theta}\right)\right] \tag{3}$$

s.t.

$$m_{s+1}=m_s+b_s-e_s \tag{4}$$

$$a_{s+1}=\left(1+r\right)a_s+y_s-x_s \tag{5}$$

$$y_s=\sum_{i=1}^{2}w_s^i\left(\mathbf{z}_{\mathbf{s}}^{\mathbf{i}}\right)\left(\underline{h}_s^i-j_s^i\right) \tag{6}$$

$$nc=\sum_{s=0}^{T}b_{\mathbf{s}}=MAX\left(m_s\right) \tag{7}$$

The dynamic budget constraint (3) can be expressed as a lifetime budget constraint which under certainty of death and no bequest motive can written as

$$LBC:\quad a_0+E_0\left[\sum_{s=0}^{T}y_s\left(1+r\right)^{-s}\right]-E_0\left[\sum_{s=0}^{T}x_s\left(1+r\right)^{-s}\right]=0 \tag{7}$$

where

$\mathbf{x}'=\left[x_0,x_1,...x_t,...,x_T\right]$ is household expenditure choices over lifetime T.

$\mathbf{j}' = \begin{bmatrix} j_0^1 & \dots & j_t^1 & \dots & j_T^1 \\ j_0^2 & \dots & j_t^2 & \dots & j_T^2 \end{bmatrix}$ is the leisure choices of adult 1 and 2 over lifetime *T*.

$\mathbf{b'} = \left[b_0, b_1, \dots b_t, \dots, b_T \right]$ is household birth outcomes over lifetime *T*, where $b_t = 1$ indicates a birth at time t

$\mathbf{m'} = \left[m_0, m_1, \dots m_t, \dots, m_T \right]$ is the number of people in the household over lifetime *T*,

$\boldsymbol{\theta}' = \left[\theta_0, \theta_1, \dots \theta_k, \dots, \theta_K \right]$ is a vector or variables governing the household preferences,

a_s is the household financial wealth in period *s*,

y_s is non-capital household income in period *s*,

x_s is the household expenditure in period *s*,

r, is the constant real interest rate,

w_s^i is the available wage of adult *i* in period *s*, with characteristics $\mathbf{z_s^i}$

$\mathbf{z'} = \begin{bmatrix} \mathbf{z_0^1} & \dots & \mathbf{z_t^1} & \dots & \mathbf{z_T^1} \\ \mathbf{z_0^2} & \dots & \mathbf{z_t^2} & \dots & \mathbf{z_T^2} \end{bmatrix}$

is the labour characteristics profile of the household's members over lifetime *T*.

g_s^i is the government transfer to adult *i* in period *s*,

l_s^i is the labour choice of adult *i* in period *s*

j_s^i is the leisure choice of adult *i* in period *s*

$\underline{h}_s^i$ is the total available time to adult *i* in period *s*.

Demand is given by the solution to the above model. The first order conditions give rise to the following:

$$\frac{U_{x_s}}{LBC_{x_s}} = \frac{U_{j_s}}{LBC_{j_s}} \quad \Rightarrow$$

or more succinctly as

$$\frac{U_x}{(1+r)^{-s}} = \frac{U_j}{-\sum_{i=1}^{2} w_s^i \left(\mathbf{z_s^i} \right)} \tag{8}$$

where $U_x = U_x \left(\mathbf{x}, \mathbf{j}, \mathbf{m}, \theta \right) = \dfrac{\partial U \left(\mathbf{x}, \mathbf{j}, \mathbf{m}, \theta \right)}{\partial x_s}$

$$U_j = U_j(\mathbf{x}, \mathbf{j}, \mathbf{m}, \theta) = \frac{\partial U(\mathbf{x}, \mathbf{j}, \mathbf{m}, \theta)}{\partial j_s}$$

$$U_m = U_m(\mathbf{x}, \mathbf{j}, \mathbf{m}, \theta) = \frac{\partial U(\mathbf{x}, \mathbf{j}, \mathbf{m}, \theta)}{\partial m_s}$$

and with respect to family size and children

$$\begin{aligned} \frac{\partial U(\mathbf{x}, \mathbf{j}, \mathbf{m}, \theta)}{\partial m_s} &= U_x \frac{\partial x_s}{\partial m_s} + U_j \frac{\partial j_s}{\partial m_s} + U_m = 0 \\ U_m = U_x \frac{\partial x_s}{\partial m_s} &= U_j \frac{\partial j_s}{\partial m_s} = 0 \end{aligned} \tag{9}$$

$$U_m = U_x \frac{\partial x_s}{\partial m_s} = U_j \frac{\partial j_s}{\partial m_s} = 0$$

Benefits and Costs of Children of the Traditional Model

Equation (9) simply says that the marginal benefit of an extra child less the marginal cost of an extra child should equal zero. Children are assumed to provide benefit to the household by

- i) directly raising lifetime utility through U_m
- ii) by increasing the utility from consumption $U_x \frac{\partial x_s}{\partial m_s}$ and leisure $U_j \frac{\partial j_s}{\partial m_s}$

The costs of children to the household can be considered as

- i) the reduction in the consumption per person in the household and
- ii) the effect of increased leisure(non-work) time reducing their labour income.

Thus completed fertility can be considered the number of children ever had $nc = \sum_{s=0}^{T} b_s$

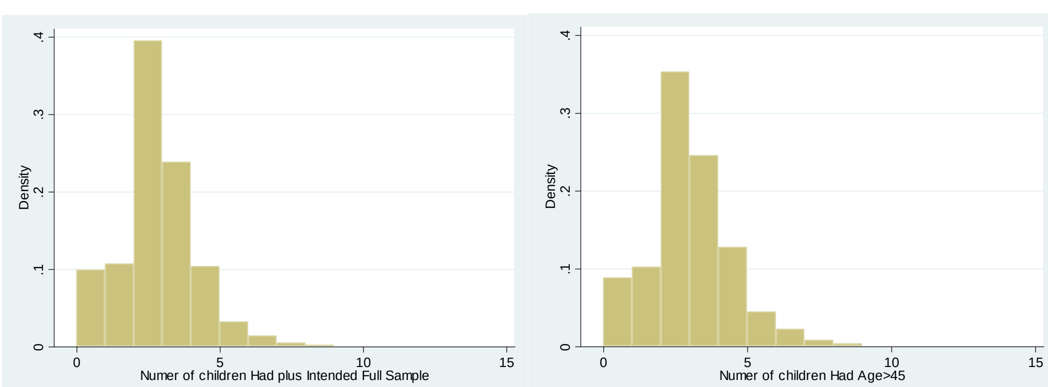
III. DATA, ESTIMATION AND METHODOLOGY

Data

This study uses data taken from the Household, Income, and Labour Dynamics in Australia (HILDA) survey[3], in which 7096 randomly selected households throughout Australia were surveyed on a wide range of household and personal characteristics. This study uses wave 3 (including data from wave 1 and 2) from the 2003 release of the HILDA dataset. Information the household unit record file were merged with reported persons file of women aged 18 or over, who's relationship was a couple, single parent or lone person and their male partners if present. This resulted in sample of 5719 families.

To examine completed fertility this study follows the lead of Fisher and Charnock (2003) and uses the sum of the number of children ever had and the number expected to be had in the future as the dependent variable. This dissipates the need to restrict the sample to families who have completed their fertility, such as restricting the sample to women aged over 45 years.

Figure 2 Frequency Histogram – Number of Children Had/Intend to Have



[3] The HILDA dataset was developed by the Melbourne Institute of Applied Economic and Social Research (University of Melbourne), the Australian Council for Educational Research and the Australian Institute of Family Studies (HILDA website, 2005).

Figure 2 provides a frequency histogram of the number of children ever had plus intend to together with a frequency histogram of the number of children ever had by women aged over 45. The level and the distribution of the two, adding support to using number of children ever had plus intended, as the completed births variable.

Minor inconsistencies in the dataset were corrected. For example one person reported that they arrived in Australia 5 years before they were born! (It was summed that this was incorrect and that there age and thus birth year was correct).

Female Wages

Including wages in completed fertility models suffers from two problems. Firstly the wage is observed wage well after child raising and so does not reflect the opportunity cost of the children. An alternate is to calculate the potential wage of mothers at the time of child raising by estimating wages from a sample of single women as performed by McCabe and Rosenzweig (1976) and Robinson and Tomes (1982). This removes much of the causation of labour supply on wages as noted by Robinson and Tomes (1982). Or computing a life-time earnings from age based estimates of potential wages. If real age earnings profiles are relatively stable overtime and flat across age groups then observed wages from completed fertility data may be an appropriate proxy for the shadow price of children.

More importantly is the problem that observed wages may have be endogenously determined by labour market experience which is affected by the presence of children. To avoid the difficulties of a estimating a system of equations including continuous (wages) and discrete (number of children) endogenous variables a two-step IV estimation procedure has often been performed.

Potential Wage Equation

Number of obs	1462
F(29, 1460)	24.18
Prob > F	0
R-squared	0.292
Root MSE	6.0812

Variable	Coef.	t-ratio	P>t	Signif.
age	**0.54**	**5.35**	**0.00**	**
ageSQ	**-0.01**	**-4.30**	**0.00**	**
ed_degree	**4.62**	**9.63**	**0.00**	**
ed_diploma	**1.28**	**2.23**	**0.03**	**
ed_notyr10	-0.86	-1.31	0.19	
ed_notyr12	**-1.44**	**-3.17**	**0.00**	**
ed_private	0.06	0.16	0.87	
ed_year12	0.38	0.68	0.50	
seifedhi	**1.85**	**4.33**	**0.00**	**
seifedlo	-0.22	-0.53	0.60	
cob_asia_n	**-3.42**	**-2.84**	**0.01**	**
cob_asia_s	-0.62	-0.75	0.46	
cob_eur_nw	**1.54**	**2.48**	**0.01**	**
cob_eur_s	-1.42	-1.28	0.20	
cob_os_oth	-1.46	-1.42	0.16	
troubeng	-2.05	-1.18	0.24	
disa	-0.51	-1.12	0.26	
hist_fathe~w	-0.61	-0.96	0.34	
sect_govt	**2.54**	**6.25**	**0.00**	**
sect_nfp	-0.25	-0.46	0.65	
state_act	0.68	0.57	0.57	
state_nt	0.16	0.07	0.95	
state_qld	**-2.06**	**-4.66**	**0.00**	**
state_sa	**-1.59**	**-2.81**	**0.01**	**
state_tas	-1.80	-1.91	0.06	*
state_vic	**-1.45**	**-3.12**	**0.00**	**
state_wa	-0.19	-0.31	0.75	
state_regi~l	-0.30	-0.67	0.50	
state_remote	-0.41	-0.73	0.47	
_cons	**5.52**	**2.96**	**0.00**	**

Firstly a wage equation is estimated and used to create an age-specific potential wage that is included in the fertility equation. There are of course problems with this approach too. Especially when estimated from a single cross-section. Not all aspects of workers human capital may be captured through the wage estimation. A standard Mincer earnings function (education and labour force experience) plus supply side factors augmented by variables to take into account of the labour market in which the person operates can be used to estimate the potential wage.

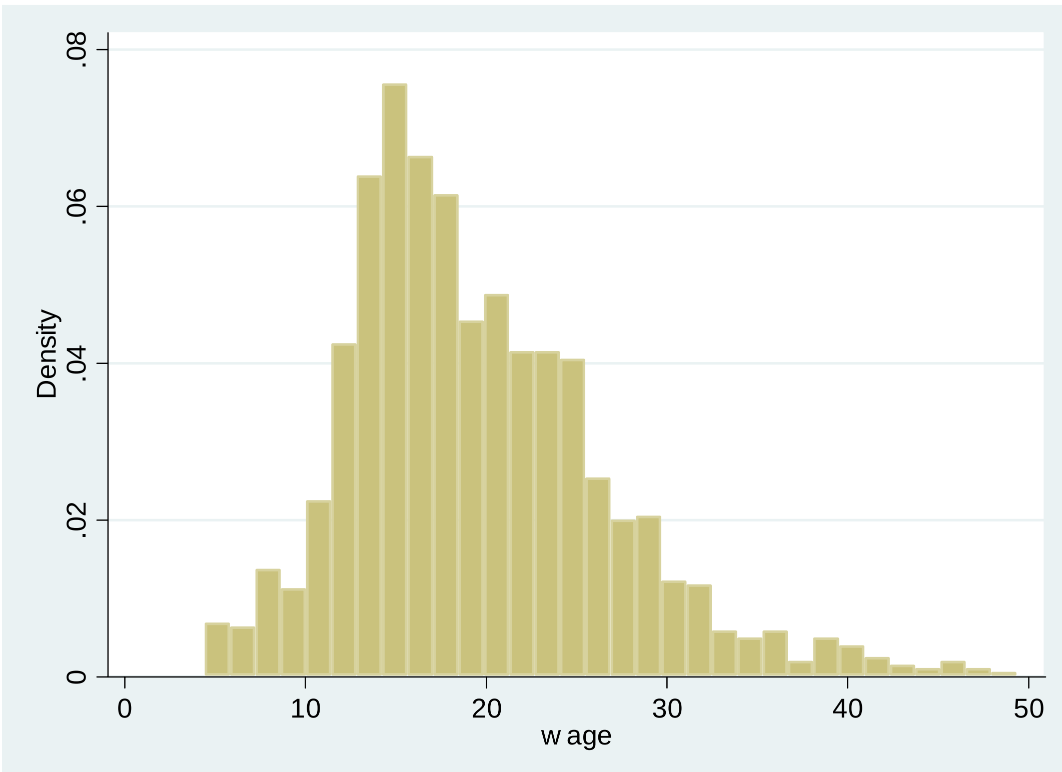
Breusch and Gray (2004) modelled the earnings of women from the HILDA data set using a Heckman procedure using a range of education, demographic and labour force variables. They create three hypothetical women to simulate the effect of earnings over lifetime with and without children. However when the purpose of the wage equation is to forecast the potential wage of non-workers and workers, the range of variables used to predict the potential wage, are limited to those that are reported by both working and non-working women. For example many non-working women do not record their occupation, industry, or years in their occupation, current job and labour force. Unfortunately this considerably reduces the predictive power of the potential wage equation.

The gross hourly wage derived from gross weekly wages from all jobs derived by hours per week worked in all jobs, resulting in 2817 legal observations. The sample was further reduced to fulltime earners leaving 1490 observations. To reduce the influence of outliers the bottom and top 1% of fulltime wage earners were removed, resulting in 1462 observations of female wage earners who earn between \$4.44 and \$48.08.[4] The predicted values of the instrumental

[4] Many HILDA survey respondents report wages that are below the minimum wage. No adjustment is made as it could represent people who do not participate in the traditional labour market.

variable (IV) regression were then extrapolated for all females and included in the fertility estimation.

Figure 2 Frequency Histogram of Predicted Hourly Wages



Econometric Methodology

The paper uses OLS and a Poisson model to estimate the number of children had plus intend to have. Both have easily interpretable coefficients as the marginal effect on the mean number of children conditional on the other explanatory variables. The OLS estimates suffer in that they make no allowance for the discrete and non-negative nature of the dependent variable. The Poisson estimation takes this into consideration, but the Poisson distribution can be restrictive with its assumption that the standard deviation is equal to the mean not always appropriate for child choice. In particular it suffers from over dispersion in that it under predicts the probability to have zero and to a lesser degree two children. Negative Binomial (NB) models overcomes the over or under dispersion, but not the zero and two problem specifically, as Zero Inflated Possion (ZIP) and Negative Binomial (ZINB) other generalised count models. Unfortunately the ZIP, ZINB and NB models would not converge for chosen variables as the log-likelihood function was not concave.

Multinomial Logit and Sequential Logit models are used to further examine the choice to of the number of children had plus intend to have. The Multinomial Logit estimates the probability of having 0, 1, 3, 4 and 5+ children relative to having 2 children, allowing for different effects for each explanatory variable over each of the choices. Finally a Sequential Logit is estimated where by the probability that a couple has; i) one or more children given it has none, ii) two or more children given it has one, iii) three or more children given it has two and iv) four or more children given it has three. This is done by restricting the sample based on the number of children had plus intended to have appropriately and onducting a Logit estimation on the restricted samples. The Sequential Logit Analysis performs a similar role to the Multinomial Logit but allows the probability of each choice (for example to have two children) to be made relative to previous choice made (in the example, to have one child).

IV. RESULTS

This section contains the results of estimating the number of children and the probability of a certain number of children that a couple household have had plus intend to have. The variable names in the result tables are relatively self-explanatory. Table A1 in the appendix provides a list of the variables used and a description of them. Note that the suffix "_h" indicates that he variable relates to the male partner in the couple.

Table 4.1 provides the OLS results, which are useful due to the ease at which the coefficients can be interpreted. For example the significant coefficient of *cob_asia_s* a dummy variable indicating that the female in the couple was born in south Asia of -0.92 indicates that the couple is likely to have 0.92 less children (almost one less child). The female's predicted wage significant coefficient of -0.05 indicates that for very extra dollar of hourly income they could earn they are likely to have 0.05 less children (thus an increase in the wage by $40 is likely to reduce the number of children had by one). However the OLS estimation ignores the discrete and truncated nature of the data and so a discussion of estimating the total number of children ever had plus intend to have will be left for the Poisson results.

The Poisson estimation results which consider the discrete and non-negative nature of the dependent variable are provided in table 4.2. Many of the variables explaining couples preferences are significant. Current residence with couple is Queensland and Tasmania having significantly less children. However living in regional or remote areas raises the mean number of children had. Country of birth is also a significant determinant. Those couple where the female where born in south Asia, southern Europe or North-Western Europe / North America are likely to have less children, ceteris paribus. Having a male partner who was born into the Baby Boomer Generation or the generation before, the Builder Generation are likely to have almost ¼ more children.

Family history variables while growing up, such as father not working, being the first-born reduce the average number of children by one tenth. Having parents who were migrants slightly raises the number of children. While for both the male and female growing up with more siblings encourages more children especially for the male partner, where every extra sibling increases the mean number of children by 0.46. Marital status also has a significant at positive effect on the number of children had at the 5% level. Note that being in defacto relationship conditional on the other variables has a significantly larger effect on the expected number of children had than being married.

Many of the economic variables in the Poisson estimation are significant. The coefficient of estimated house price variable (ehousepr) is positive and significant effect at 5% level. The potential wage of the female has a negative and significant effect at the 5% level. This suggests that it is capturing the opportunity cost of children in the foregone wages. The dummy variable for a low SEIFA index (1, 2 or 3) demonstrating that the couple is socially and economic disadvantaged, is also significant at the 10% level in decreasing the mean number of children that will be had.

The multinomial Logit results in Table 4.3 are interesting as they show that the factors that effect the probability whether to have 0, 1, 3,4 and 5+ is different to the probability of having two children. They also shed light on the earlier results, for example residing in Tasmania significantly reduces the probability of having three children, while residing in rural areas increases the chance of having three children. If the female is first born it significantly increases the chance of being childless and reduces the chance of having three or five or more children, compared to having two. The effect for the female of growing up with more siblings increases the chance of three, four or five or more children. The potential wage of the female only has a significant effect in decreasing the probability of having four children and only at the 10% level.

Table 4.1 OLS with Hetero Correct SE's - Number of Children Ever Had /Will Have - Women aged 30 to u45 with partners

Number of obs	1116			
F(29, 1460)	3.34	Prob > F	0	
R-squared	0.1363	Log-L	-1626.9	
Root MSE	1.0678	AIC	3369.88	

Variable	Coef.	t-ratio	P>t	Signif.
state_act	-0.06	-0.29	0.77	
state_nt	-0.46	-1.15	0.25	
state_qld	**-0.33**	**-3.08**	**0.00**	**
state_sa	-0.18	-1.50	0.13	
state_tas	**-0.59**	**-2.54**	**0.01**	**
state_vic	-0.09	-1.00	0.32	
state_wa	0.20	1.42	0.16	
state_regional	0.17	1.77	0.08	*
state_remote	0.22	1.80	0.07	*
abor	0.28	1.02	0.31	
abor_h	-0.01	-0.03	0.98	
cob_asia_n	-0.36	-1.03	0.30	
cob_asia_n_h	-0.41	-0.97	0.33	
cob_asia_s	**-0.92**	**-4.17**	**0.00**	**
cob_asia_s_h	0.22	0.99	0.32	
cob_eur_nw	-0.23	-1.72	0.09	*
cob_eur_nw_h	0.05	0.35	0.73	
cob_eur_s	**-0.51**	**-2.04**	**0.04**	**
cob_eur_s_h	0.07	0.31	0.76	
cob_os_oth	-0.23	-1.32	0.19	
cob_os_oth_h	**0.44**	**2.33**	**0.02**	**
disa	-0.18	-1.77	0.08	*
disa_h	-0.10	-0.97	0.33	
ed_degree	0.10	0.70	0.48	
ed_notyr10	0.00	-0.01	0.99	
ed_private	**0.18**	**2.31**	**0.02**	**

Table 4.1 OLS No. of Children Ever Had /Will Have (continued)

Variable Coef. t-ratio P>t Signif.

Variable	Coef.	t-ratio	P>t	Signif.
genb_h	**-0.89**	**-2.29**	**0.02**	**
genbb	0.05	0.41	0.69	
genbb_h	0.05	0.56	0.57	
geny_h	**0.46**	**2.01**	**0.05**	**
healthpoor	-0.16	-0.55	0.58	
healthpoor_h	0.70	1.42	0.16	
hist_fathernw	-0.06	-0.35	0.73	
hist_fathernw_h	-0.09	-0.67	0.50	
hist_mothernw	0.00	-0.01	0.99	
hist_mothernw_h	0.02	0.26	0.80	
hist_oldest	**-0.24**	**-3.23**	**0.00**	**
hist_oldest_h	-0.01	-0.09	0.93	
hist_pardivor	0.09	0.98	0.33	
hist_pardivor_h	-0.02	-0.26	0.80	
hist_parmigra	0.05	0.51	0.61	
hist_parmigra_h	**-0.21**	**-2.14**	**0.03**	**
hist_parone	-0.05	-0.36	0.72	
hist_parone_h	-0.04	-0.33	0.74	
hist_siblings	**0.10**	**4.59**	**0.00**	**
hist_siblings_h	**0.04**	**2.18**	**0.03**	**
hvitality	0.07	1.15	0.25	
hvitality_h	0.07	1.04	0.30	
married	**0.34**	**3.18**	**0.00**	**
defacto	**1.12**	**2.49**	**0.01**	**
ehousepr	**0.00**	**2.19**	**0.03**	**
emortowe	0.00	-1.26	0.21	
incdisp	0.00	-1.15	0.25	
seifahi	-0.03	-0.31	0.76	
seifalo	-0.14	-1.58	0.12	
wage_pred	**-0.05**	**-2.37**	**0.02**	**
wage_h	0.00	1.12	0.27	
constant	**2.73**	**6.05**	**0.00**	**

Table 4.2 Poisson with Hetero Correct SE's- No. of Children Ever Had /Will Have - Women aged 30 to u45 with partners

Poisson regression		
	Number of obs=	1116
	Wald chi2(57) =	198.33
	Prob > chi2 =	0.0000
	Log pseudolikelihood =	-1741.7499
	Pseudo R2 =	0.0238
	AIC =	3599.5

Variable	Coef.	t-ratio	P>t	Signif.
state_act	-0.03	-0.34	0.73	
state_nt	-0.23	-1.17	0.24	
state_qld	**-0.15**	**-3.13**	**0.00**	**
state_sa	-0.08	-1.50	0.13	
state_tas	**-0.27**	**-2.37**	**0.02**	**
state_vic	-0.04	-1.03	0.31	
state_wa	0.09	1.49	0.14	
state_regional	0.07	1.82	0.07	*
state_remote	0.10	1.86	0.06	*
abor	0.10	0.99	0.32	
abor_h	0.00	0.03	0.98	
cob_asia_n	-0.17	-1.07	0.29	
cob_asia_n_h	-0.19	-0.93	0.35	
cob_asia_s	**-0.43**	**-4.18**	**0.00**	**
cob_asia_s_h	0.10	0.98	0.33	
cob_eur_nw	-0.11	-1.71	0.09	*
cob_eur_nw_h	0.02	0.29	0.77	
cob_eur_s	**-0.24**	**-1.97**	**0.05**	**
cob_eur_s_h	0.03	0.31	0.76	
cob_os_oth	-0.11	-1.49	0.14	
cob_os_oth_h	**0.19**	**2.46**	**0.01**	**
disa	-0.08	-1.76	0.08	*
disa_h	-0.04	-0.95	0.34	
ed_degree	0.04	0.70	0.49	
ed_notyr10	-0.01	-0.10	0.92	
ed_private	**0.09**	**2.52**	**0.01**	**

Table 4.2 POISSON No. of Children Ever Had /Expected to Have (continued)

genb_h	**-0.47**	**-2.12**	**0.03**	**
genbb	0.03	0.50	0.62	
genbb_h	0.02	0.55	0.58	
geny_h	**0.21**	**2.08**	**0.04**	**
healthpoor	-0.08	-0.52	0.61	
healthpoor_h	0.29	1.71	0.09	*
hist_fathernw	-0.03	-0.38	0.70	
hist_fathernw_h	-0.04	-0.69	0.49	
hist_mothernw	0.00	-0.04	0.97	
hist_mothernw_h	0.01	0.24	0.81	
hist_oldest	**-0.11**	**-3.35**	**0.00**	**
hist_oldest_h	0.00	-0.05	0.96	
hist_pardivor	0.04	1.08	0.28	
hist_pardivor_h	-0.01	-0.29	0.78	
hist_parmigra	0.02	0.51	0.61	
hist_parmigra_h	**-0.10**	**-2.18**	**0.03**	**
hist_parone	-0.02	-0.32	0.75	
hist_parone_h	-0.02	-0.35	0.73	
hist_siblings	**0.04**	**5.03**	**0.00**	**
hist_siblings_h	**0.02**	**2.27**	**0.02**	**
hvitality	0.03	1.15	0.25	
hvitality_h	0.03	1.05	0.30	
married	**0.17**	**3.18**	**0.00**	**
defacto	**0.46**	**2.94**	**0.00**	**
ehousepr	1.3E-07	**2.29**	**0.02**	**
emortowe	-1.8E-07	-1.21	0.23	
incdisp	-4.7E-07	-1.16	0.25	
seifahi	-0.01	-0.34	0.74	
seifalo	-0.06	-1.66	0.10	*
wage_pred	**-0.02**	**-2.47**	**0.01**	**
wage_h	1.1E-03	1.30	0.19	
_cons	**2.73**	**6.05**	**0.00**	**

Table 4.3 Multinomial logistic regression - No. of Children Ever Had /Expected to Have - Women aged 30 to u45 with partners

variable	0	1	3	4	5+
state_act	-0.19	0.36	0.67	-0.90	-32.84
state_nt	-33.55	1.00	0.91	-37.47	-37.62
state_qld	0.51	0.50	-0.23	**-1.01**	-0.43
state_sa	-0.11	0.41	0.22	-0.91	-1.78
state_tas	0.53	-0.11	**-1.42**	-1.91	-1.94
state_vic	-0.02	0.04	0.17	**-0.75**	-0.32
state_wa	-0.33	-0.05	0.27	0.12	1.00
state_regional	0.18	0.23	**0.47**	0.39	0.84
state_regional	-0.46	0.17	0.25	0.64	0.75
abor	0.62	-0.64	0.32	1.43	0.02
abor_h	-0.48	0.59	-0.57	-35.29	**3.03**
cob_asia_n	-33.86	0.59	-1.14	-0.82	-33.61
cob_asia_n	-28.46	1.40	1.09	-34.43	-28.38
cob_asia_n	0.30	0.74	-1.09	-35.77	-32.96
cob_asia_n	-0.32	-0.13	0.31	0.71	-30.35
cob_eur_nw	0.57	0.15	**-0.88**	-0.38	0.93
cob_eur_nw	0.47	-0.58	0.39	0.64	0.34
cob_eur_nw	-33.28	1.27	-0.72	-0.69	-33.53
cob_eur_nw	-33.20	0.35	0.30	0.47	-32.49
cob_os_oth	-0.28	0.02	-0.68	**-1.91**	-0.13
cob_os_oth	-0.92	-34.70	-0.75	**1.43**	1.55
disa	0.19	0.17	-0.32	-0.18	-1.71
disa_h	0.34	0.04	-0.26	0.41	-0.76
ed_degree	-0.53	-0.24	-0.61	0.65	-0.53
ed_notyr10	-0.99	-0.11	0.23	-0.65	-0.77
ed_private	-0.16	0.10	**0.45**	0.38	0.67
genb_h	1.71	1.25	0.28	-35.76	-33.75
genbb	-0.06	0.02	-0.09	-0.17	0.78
genbb_h	0.31	0.45	0.28	0.45	0.65
geny_h	-35.12	-34.25	1.19	-33.92	-33.37

Table 4.3 Multi-Nomial LOGIT – No. of Children Ever Had /Expected to Have (continued)

variable	0	1	3	4	5+
healthpoor	0.65	0.98	-1.07	0.76	-30.72
healthpoor	-37.57	-36.03	-36.50	1.16	2.19
hist_fathernw	0.57	-0.37	-0.09	0.19	-0.73
hist_fathernw	0.72	0.16	0.43	-0.22	-0.26
hist_mothernw	0.21	0.26	0.19	0.11	0.03
hist_mothernw	0.09	0.14	-0.13	0.45	0.37
hist_oldest	**0.67**	0.27	**-0.40**	0.19	**-1.41**
hist_oldest	-0.02	0.04	-0.01	-0.12	0.17
hist_pardivor	0.42	-0.20	**0.58**	0.02	1.19
hist_pardivor	0.26	0.10	-0.09	-0.20	1.14
hist_pardivor	-0.29	0.28	0.11	0.23	-0.07
hist_pardivor	0.27	-0.14	-0.44	-0.78	-1.14
hist_pardivor	0.30	0.03	0.10	-0.02	-0.27
hist_pardivor	0.19	0.00	0.00	-0.61	1.27
hist_siblings	-0.14	0.03	**0.14**	**0.19**	**0.55**
hist_siblings	0.00	-0.03	0.05	**0.17**	0.07
hvitality	0.00	-0.33	0.10	0.24	-0.21
hvitality	-0.49	0.09	-0.04	-0.25	0.43
married	**-1.28**	-0.22	**0.53**	0.72	-0.40
defacto	-36.32	-36.23	-0.10	1.63	1.75
ehousepr	0.00	0.00	**0.00**	0.00	0.00
emortowe	0.00	0.00	0.00	0.00	0.00
incdisp	0.00	0.00	0.00	0.00	0.00
seifahi	0.02	0.25	-0.22	0.24	-0.07
seifalo	-0.20	-0.21	-0.09	-0.19	**-1.81**
wage_pred	0.12	0.00	-0.01	-0.18	-0.22
wage_h	-0.02	0.00	0.00	0.01	-0.01
constant	**-3.60**	-1.75	-1.63	-0.33	-1.58

Table 4.4 Sequential Logit Pr(nc>=1)

Variable	Coef.	t-ratio	P>t	Signif.
state_act	0.35	0.31	0.76	
state_qld	-0.58	-1.46	0.14	
state_sa	0.13	0.24	0.81	
state_tas	-0.94	-1.31	0.19	
state_vic	0.00	0.00	1.00	
state_wa	0.42	0.83	0.41	
state_regional	0.03	0.09	0.93	
state_regional	0.60	1.20	0.23	
abor	-0.46	-0.35	0.72	
abor_h	0.53	0.49	0.63	
cob_asia_n	-0.59	-0.34	0.73	
cob_asia_n	0.37	0.23	0.82	
cob_eur_nw	-0.69	-1.38	0.17	
cob_eur_nw	-0.44	-0.95	0.34	
cob_os_oth	0.05	0.06	0.95	
cob_os_oth	0.80	0.93	0.35	
disa	-0.27	-0.75	0.45	
disa_h	-0.38	-1.08	0.28	
ed_degree	0.43	0.76	0.45	
ed_notyr10	0.97	1.08	0.28	
ed_private	0.33	0.99	0.32	
genb_h	-1.45	-1.20	0.23	
genbb	0.08	0.18	0.86	
genbb_h	-0.14	-0.43	0.67	
healthpoor	-0.50	-0.41	0.69	

Table 4.4 Sequential Logit Pr(nc>=1) continued

Variable	Coef.	t-ratio	P>t	Signif.
hist_fathernw	-0.63	-1.08	0.28	
hist_fathernw	-0.62	-1.40	0.16	
hist_mothernw	-0.11	-0.42	0.67	
hist_mothernw	-0.06	-0.23	0.82	
hist_oldest	**-0.74**	**-2.26**	**0.02**	**
hist_oldest	0.01	0.05	0.96	
hist_pardivor	-0.35	-0.84	0.40	
hist_pardivor	-0.27	-0.71	0.48	
hist_pardivor	0.37	0.82	0.41	
hist_pardivor	-0.44	-1.08	0.28	
hist_pardivor	-0.31	-0.50	0.62	
hist_pardivor	-0.22	-0.43	0.67	
hist_siblings	**0.20**	**2.13**	**0.03**	**
hist_siblings	0.03	0.34	0.73	
hvitality	-0.01	-0.05	0.96	
hvitality	0.49	1.83	0.07	*
married	**1.39**	**4.55**	**0.00**	**
ehousepr	0.00	1.75	0.08	*
emortowe	0.00	0.31	0.76	
incdisp	**0.00**	**-2.58**	**0.01**	**
seifahi	0.00	0.00	1.00	
seifalo	0.09	0.24	0.81	
wage_pred	-0.14	-1.51	0.13	
wage_h	0.02	1.54	0.12	
constant	**4.33**	**2.24**	**0.03**	**

Table 4.5 Sequential Logit Pr(nc>=3/nc=2)

Variable	Coef.	t-ratio	P>t	Signif.
state_act	-0.04	-0.10	0.92	
state_nt	-0.93	-1.15	0.25	
state_qld	-0.20	-1.04	0.30	
state_sa	-0.20	-0.77	0.44	
state_tas	**-1.20**	**-2.74**	**0.01**	**
state_vic	-0.07	-0.43	0.67	
state_wa	-0.24	-1.05	0.29	
state_regional	**0.39**	**2.43**	**0.02**	**
state_regional	**0.57**	**2.66**	**0.01**	**
abor	0.50	0.98	0.33	
abor_h	-0.50	-0.69	0.49	
cob_asia_n	-0.41	-0.34	0.73	
cob_asia_n	-0.34	-0.29	0.77	
cob_asia_n	**-1.75**	**-3.26**	**0.00**	**
cob_asia_n	0.77	1.56	0.12	
cob_eur_nw	-0.41	-1.47	0.14	
cob_eur_nw	0.13	0.46	0.65	
cob_eur_nw	0.23	0.46	0.64	
cob_eur_nw	-0.31	-0.71	0.48	
cob_os_oth	**-0.86**	**-2.09**	**0.04**	**
cob_os_oth	0.18	0.44	0.66	
disa	-0.17	-1.02	0.31	
disa_h	0.06	0.35	0.73	
ed_degree	0.22	0.83	0.41	
ed_notyr10	-0.06	-0.29	0.77	
ed_private	**0.55**	**3.88**	**0.00**	**
genb	0.24	0.69	0.49	
genb_h	-0.23	-0.72	0.47	
genbb	-0.11	-0.58	0.56	
genbb_h	-0.03	-0.16	0.87	
geny	-0.62	-1.48	0.14	
geny_h	-0.35	-0.66	0.51	
healthpoor	0.05	0.12	0.91	
healthpoor	0.16	0.22	0.83	

Table 4.5 Sequential Logit Pr(nc>=3/nc=2) continued

hist_fathernw	0.19	0.80	0.42	
hist_fathernw	-0.08	-0.30	0.76	
hist_mothernw	0.14	1.20	0.23	
hist_mothernw	0.02	0.15	0.88	
hist_oldest	**-0.36**	**-2.72**	**0.01**	**
hist_oldest	-0.07	-0.57	0.57	
hist_pardivor	0.24	1.38	0.17	
hist_pardivor	0.07	0.40	0.69	
hist_pardivor	0.22	1.06	0.29	
hist_pardivor	-0.25	-1.22	0.22	
hist_pardivor	0.20	0.72	0.47	
hist_pardivor	0.13	0.45	0.65	
hist_siblings	**0.12**	**3.65**	**0.00**	**
hist_siblings	0.05	1.72	0.09	*
hvitality	-0.02	-0.13	0.90	
hvitality	0.12	0.99	0.32	
married	0.24	0.62	0.53	
defacto	0.59	1.12	0.26	
ehousepr	0.00	1.16	0.25	
emortowe	0.00	0.07	0.95	
incdisp	0.00	1.54	0.12	
seifahi	0.25	1.35	0.18	
seifalo	-0.14	-0.91	0.37	
wage_pred	-0.02	-0.41	0.68	
wage_h	0.00	-0.88	0.38	
defatch2	-0.87	-1.57	0.12	
maratch2	-0.45	-1.51	0.13	
ageprch2	-0.21	-1.24	0.22	
ageprch2SQ	0.02	0.69	0.49	
ageprch2CUBE	0.00	-0.15	0.88	
sexinb2	-1.19	-1.35	0.18	
marryrskid2	0.01	0.13	0.89	
defyrskid2	-0.04	-1.42	0.15	
ageatkid2	**-0.18**	**-10.66**	**0.00**	**
constant	**6.21**	**4.73**	**0.00**	**

V. CONCLUSIONS

The results how that the models can explain less than 15% of the variation in the number of children suggesting that many other variables effecting the choice of family effecting the fecundity and demand for children that are difficult to capture. However an number of factors can be identified as significant in determining family size. Many of the variables that are consistently significant relate to the preferences of the household. In particular residing in Queensland or Tasmania and being the first born significantly reduces the number of children. The number of siblings a woman and also her partner grew up with, whether the male partner was born into the Builder or Baby Boomer generation and being married significantly increases fertility has a positive and significant effect on increasing fertility.

The results also show that economic variables capturing the wealth, income and resources of the couple and the female's potential wage are also significant in determining fertility outcomes. In particular the estimated house price is significant in raising the number of children had. If a couple is socially and economic disadvantaged then it significantly reduces the number of children had. The potential wage of females estimated form the data, reflects the opportunity cost of child raising time. It was found to have significant negative effect on the total number of children had and in the probability of having 4 children compared to two.

The statistical significance of the economic type variables can be used to draw suggestions of policy implications if the birth rate wishes to be raised to provide a labour force for the future. Providing assistance to mitigate the opportunity cost if time of children could be considered as is the case with current federal subsidy to child care payments. Also attention should be paid to the ability if couple to afford their own home.

REFERENCES

Abassi-Shavazi, M. and P. McDonald, 2000, "Fertility and Multiculturalism: Immigrant Fertility in Australia 1977-1991", *International Migration Review*, vol. 34,no. 1,pp. 215-242.

Australian Bureau of Statistics, 2004, *Births*, ABS 3301.0, ABS, Canberra.

Australian Bureau of Statistics, 2004, *Australian Historical Population Statistics – 4. Births*, Cat. No. 3105.0.65.001, Australian Bureau of Statistics, Canberra.

Becker, G.,1960, "An Economic Analysis of Fertility", *Demographic and Economic Change in Developed Countries*, Universities-National Bureau Committee for Economic Research. Cited in Becker, G.S. (1976); *The Economic Approach to Human Behaviour*, The University of Chicago Press.

Becker, G. and H. Lewis, 1973, "On the Interaction between the Quantity and Quality of Children", *Journal of Political Economy*, vol. 81, no. 2, part 2, S279-S288. Cited in Becker, G.S. (1976); *The Economic Approach to Human Behaviour*, The University of Chicago Press.

Behrman, J. and P. Taubman, 1989, "A Test of the Easterlin Fertility Model Using Income For Two Generations and a Comparative With The Becker Model", *Demography*, vol. 26, no. 1, 117-123.

Boulier, B. and M. Rosenzweig, 1984, "Schooling, Search, and Spouse Selection: Testing Economic Theories of Marriage and Household Behaviour", *Journal of Political Economy*, vol. 92, no. 4, pp. 712-732.

Bracher, M. and G. Santow, 1991, "Fertility Desires and Fertility Outcomes ", *Journal of the Australian Population Association*, vol. 8, no. 1, pp. 33-49.

Breusch, T. and E. Gray, 2004, "New Estimates of Mothers' Foregone Earnings Using HILDA Data", *Australian Journal of Labour Economics*, vol. 7, no. 2, 125-150.

Brooks, C., D. Sams and L. Williams, 1982, "An Econometric model of Fertility, Marriage, Divorce and Labour force Participation for Australian Women 1921/22 to 1975/76", *IMPACT Preliminary Working Paper*, No. BP-29.

Caldwell, J and L. Ruzicka, 1978, "The Australian Fertility Transition: An Analysis", *Population and Development Review*, vol. 4, no. 1, pp. 81-103.

Caudill, S. and F. Mixon, 1995, "Modelling Household Fertility Decisions: Estimation and Testing of Censored Regression Models for Count Data", *Empirical Economics*, vol. 20, pp. 183-196.

Easterlin, R., 1966, "On the Relation of Economic Factors to Recent and Projected Fertility Changes", *Demography*, vol. 3, no. 1, 131-153.

Easterlin, R., 1975, “An Economic Framework for Fertility Analysis”, *Studies in Family Planning*, vol. 6, no. 3, pp. 54-63.

Fisher, K. and D. Charnock, 2003, “Partnering and Fertility Patterns: Analysis of the HILDA Survey , Wave 1”, *Paper presented at HILDA Conference 2003*.

Gurmu, S. and P. Trivedi, 1996, “Excess Zeroes in Count Models for Recreational Trips”, *Journal of Business & Economic Statistics*, vol. 14, no. 4, pp.469-477.

Howard, J., 2001, Address at Federal Liberal Party Campaign Launch, Sydney28th October 2001. http://www.pm.gov.au/speeches/2001/speech1211.htm

Jain, S. and P. McDonald, 1997, “Fertility of Australian Birth Cohorts: Components and Differentials”, *Journal of the Australian Population Association*, vol. 64, no. 1, pp. 31-46.

Kalwij, A., 2000, “The Effects of Female Employment Status on the Presence and Number of Children”, *Journal of Population Economics*, vol. 13, pp. 221-239.

King, G., 1989, “Variance Specification in Event Count Models: From Restrictive Assumptions to a Generalized Estimator”, *American Journal of Political Science*, vol. 33, no. 3, pp. 762-784.

Macunovich, D., 1998, “Fertility and the Easterlin Hypothesis: An assessment of the literature”, *Journal of Population Economics*, vol. 11, pp. 53-111.

McCabe, J. and M. Rosenzweig, 1976, “Female Labor-Force Participation, Occupational Choice, and Fertility in Developing Countries’, *Journal of Development Economics*, vol. 3, no. 2, pp. 141-60.

Melbourne Institute, The University of Melbourne (2005). *The Household, Income and Labour Dynamics in Australia (HILDA) Survey*, viewed September 2005, <http://www.melbourneinstitute.com/hilda/>

Melkersson, M. and D. Rooth, 2000, “Modelling Female Fertility Using Inflated Count Data Models”, *Journal of Population Economics*, vol. 13, pp. 189-203.

Merkle, L. and K. Zimmermann, 1992, “The Demographics of Labour Turnover: A Comparison of Ordinal Probit and Censored Count Data Models”, *Recherches Economiques de Louvain*, vol. 58, no. 3-4, pp. 283-306.

Miller, P. and P. Volker , 1983, “A Cross-Section Analysis of the Labour Force Participation of Married Women in Australia”, *Economic Record*, vol. 59, no. 164, pp. 28-42.

Miller, P., 1988, “Economic Models of Fertility Behaviour in Australia”, *Australian Economic Papers*, vol. 27,no. 50, pp. 65-82.

Parr, N., 2005, “Family Background, Schooling and Childlessness in Australia”, *Journal of Biosocial Science*, vol. 37, pp. 229-243.

Productivity Commission, 2005, “Productivity Commission Annual Report Focuses on Ageing”, Media Release, 16 February 2005. http://www.pc.gov.au/research/annrpt/annualreport0304/mediarelease.html.

Tesfaghiorghis, H., 2004, “Education, Work and Fertility: A HILDA based analysis”, *Australian Social Policy*, pp. 51-73.

Wang, W. and F. Famoye, 1997, “Modelling Household Fertility Decisions with Generalized Poisson Regression”, *Journal of Population Economics*, vol. 10, 273-283.

Weston, R. and R. Parker, 2002, “Why Is The Fertility Rate Falling?: A Discussion of the Literature”, *Family Matters*, no. 63, pp. 6-13.

Winkelmann, R. and K. Zimmermann, 1991, “New Approach for Modelling Economic Count Data”, *Economics Letters*, vol. 37, no. 2, pp. 139-43

Winkelmann, R. and K. Zimmermann, 1994, “Count Data Models for Demographic Data”, *Mathematical Population Studies*, vol. 4, no. 3, 205-221.

Winkelmann, R. and K. Zimmermann, 1995, “Recent Developments in Count Data Modelling: Theory and Application”, *Journal of Economic Surveys*, vol. 9, no. 1, pp. 1-24.

Young, C.,1990, “Changes in the Demographic Behaviour of Migrants in Australia and the Transition Between Generations”, *Population Studies*,. vol.45, no. 1, pp. 67-89.

Yusuf, F. and I. Rocket, 1981, “Immigrant Fertility Patterns and Differentials in Australia, 1971-1976”, *Population Studies*, vol. 35,no. 3, pp. 413-424.

APPENDIX

Table A1 Variables and their Description

Variable Name	Type	Description
age	C	
GenA	D	Birth Year: Before 1931
GenB	D	Birth Year: 1931 to before 1946
GenBB	D	Birth Year: 1946 to before 1961
GenX	D	Birth Year: 1961 to before 1976
GenY	D	Birth Year: 1961 to before 1991
cob_eur_nw	D	Country of Birth: NW Europe and North America
cob_eur_s	D	Country of Birth: Southern Europe
cob_asia_s	D	Country of Birth: SE and Central Asia
cob_asia_n	D	Country of Birth: North Asia
cob_austnz	D	Country of Birth: Australia or New Zealand
cob_os_oth	D	Country of Birth: Other
YOA	C	
engnotfl	Dummy	English Not First Language
abor	Dummy	Aboriginal, Torres Straight Islander
migrant	Dummy	Not born in Australia
yrsAUS	C	Years spent in Australia
yrsOS	C	Years spent in Overseas
yrsAUS45	C	Years spent in Australia under the age of 45
yrsOS45	C	Years spent in Overseas under the age of 45
pardivor	D	Parents Divorced
siblings	Discrete	Number of Siblings
oldest	D	Oldest child
parmigra	D	Both Parents were migrant
fathernw	D	Father did not work when growing up
mothernw	D	Mother did not work when growing up
parone	D	Primarily Raised by One Parent
kidexpc	Discrete	
kidwant	Discrete	
nkidwant	Discrete	
healthpoor	D	Has Poor Health
hvitality	D	Has High Vitality
disa	D	Has a Disability
troubeng	D	Has Trouble Speaking English
nsw	D	Resides in: NSW
vic	D	Resides in: VIC
qld	D	Resides in: QLD
sa	D	Resides in: SA
wa	D	Resides in: WA
tas	D	Resides in: TAS
nt	D	Resides in: NT
act	D	Resides in: ACT
remote	D	Resides in: Remote Area
regional	D	Resides in: Regional Area

Table A1 Variables and their Description (continued)

Variable	Type	Description
degree	D	Highest level of Education: Degree or Higher Degree
diploma	D	Highest level of Education: Diploma
Hcertif	D	Highest level of Education: Certificate
Lcertif	D	Highest level of Education: Certificate
year12	D	Highest level of Education: Year 12
notyr12	D	Highest level of Education: Less than Year12
notyr10	D	Highest level of Education: Did not complete Year10
prschool	D	Attended a private school
incinv	C	
wgw_main	C	Gross weekly wage from main job
wgw_oth	C	Gross weekly wage from other job
wgw_all	C	Gross weekly wage from all jobs
wgf_all	C	Gross financial year income from all jobs
wgfiall	C	Gross financial year income from all jobs – imputed
wgwiall	C	Gross weekly wage from all jobs – imputed
selfemp	D	Self employed
contemp	D	Contract employed
casuemp	D	Casually employed
permemp	D	Permanently employed
fulltime	D	Works full time
parttime	D	Works part time
unemp	D	Unemployed
nilf	D	Not in the Labour Force
yrswork	C	Years spent working
yrsunem	C	Years spent unemployed
yrsnotlw	C	Years spent not looking for work
yrsaftered	C	Years since leaving education
yrsinjob	C	Years in current job
yrsinocc	C	Years in occupation
yrsinlj	C	Years in labour force
holilv	D	
sicklv	D	
parentlv	D	
upmatlv	D	
pdmatlv	D	
famlv	D	
priv	D	Works in the private sector
oth	D	Works in the other sector
govt	D	Works in the government sector
nfp	D	Works in the not for profit sector
hrsall	C	Hours worked in all jobs per week
hrsmain	C	Hours worked in main jobs per week
SEIFAlo	D	SEIFA index of disadvantage =1, 2 or 3
SEIFAhi	D	SEIFA index of disadvantage =8, 9 or 10
SEIFERlo	D	SEIFA index of resources =1, 2 or 3
SEIFERhi	D	SEIFA index of resources =8, 9 or 10
SEIFEDlo	D	SEIFA index of education =1, 2 or 3
SEIFEDhi	D	SEIFA index of education =8, 9 or 10

Table A2 Wage Estimation Sample Statistics

Estimation sample regress   Number of obs = 1462

Variable	Mean	Std. Dev.	Min	Max
wage	19.52048	7.155234	4.48571	48
age	39.92681	10.93228	18	70
ageSQ	1713.583	884.7044	324	4900
ed_degree	.3556772	.4788818	0	1
ed_diploma	.1128591	.3165288	0	1
ed_notyr10	.0636115	.2441431	0	1
ed_notyr12	.1696306	.3754364	0	1
ed_private	.2729138	.4456093	0	1
ed_year12	.124487	.3302493	0	1
seifedhi	.3666211	.4820467	0	1
seifedlo	.2387141	.4264435	0	1
cob_asia_n	.0123119	.1103116	0	1
cob_asia_s	.0437756	.2046656	0	1
cob_eur_nw	.0875513	.282738	0	1
cob_eur_s	.0239398	.152914	0	1
cob_os_oth	.0294118	.1690155	0	1
troubeng	.0068399	.0824488	0	1
disa	.127907	.3341005	0	1
hist_fathe~w	.0882353	.2837338	0	1
sect_govt	.3597811	.4801003	0	1
sect_nfp	.0943912	.2924723	0	1
state_act	.0225718	.1485848	0	1
state_nt	.0109439	.1040747	0	1
state_qld	.2140903	.4103301	0	1
state_sa	.0813953	.2735349	0	1
state_tas	.0253078	.1571121	0	1
state_vic	.2373461	.4256017	0	1
state_wa	.0923393	.2896033	0	1
state_regi~l	.2072503	.4054751	0	1
state_remote	.122435	.3278997	0	1

Table A2 Sample Statistics for Fertility Estimation –

No. of Children Ever Had / Expected to Have: Woman's age>=30 & age<45

Variable	Obs	Mean	Std. Dev.	Min	Max
nkids	1928	2.181535	1.228122	0	12
state_act	1928	.0160788	.1258114	0	1
state_nt	1928	.0072614	.084926	0	1
state_qld	1928	.2287344	.4201268	0	1
state_sa	1928	.0876556	.2828667	0	1
state_tas	1928	.0326763	.1778342	0	1
state_vic	1928	.2437759	.4294705	0	1
state_wa	1928	.0928423	.2902866	0	1
state_regi~l	1928	.2494813	.4328251	0	1
state_remote	1928	.1379668	.3449546	0	1
abor	1928	.0243776	.1542584	0	1
abor_h	1401	.0142755	.1186667	0	1
cob_asia_n	1928	.0176349	.1316543	0	1
cob_asia_n_h	1401	.0085653	.0921847	0	1
cob_asia_s	1928	.0466805	.2110083	0	1
cob_asia_s_h	1401	.0449679	.2073076	0	1
cob_eur_nw	1928	.0772822	.2671079	0	1
cob_eur_nw_h	1401	.0899358	.2861919	0	1
cob_eur_s	1928	.0197095	.1390363	0	1
cob_eur_s_h	1401	.0235546	.151711	0	1
cob_os_oth	1928	.0404564	.1970783	0	1
cob_os_oth_h	1401	.0371163	.1891144	0	1
disa	1928	.1571577	.3640438	0	1
disa_h	1401	.1641685	.3705606	0	1
ed_degree	1928	.2702282	.4441928	0	1
ed_notyr10	1928	.0845436	.2782735	0	1
ed_private	1928	.2422199	.4285378	0	1
genb_h	1401	.0092791	.0959143	0	1
genbb	1928	.1415975	.3487273	0	1
genbb_h	1401	.3276231	.4695142	0	1
genx	1928	.8584025	.3487273	0	1
genx_h	1401	.6523911	.4763811	0	1
geny_h	1401	.0107066	.1029542	0	1
healthpoor	1928	.0160788	.1258114	0	1
healthpoor_h	1401	.0199857	.140001	0	1
hist_fathe~w	1928	.0840249	.2774971	0	1
hist_fathe~h	1401	.0756602	.2645482	0	1
hist_mothe~w	1928	.4491701	.4975387	0	1
hist_mothe~h	1401	.4710921	.4993419	0	1
hist_oldest	1928	.6670124	.4714044	0	1
hist_oldes~h	1401	.662384	.4730657	0	1
hist_pardi~r	1928	.7074689	.4550429	0	1
hist_pardi~h	1401	.7401856	.4386892	0	1
hist_parmi~a	1928	.3127593	.4637375	0	1
hist_parmi~h	1401	.3083512	.4619773	0	1
hist_parone	1928	.1104772	.3135649	0	1
hist_paron~h	1401	.0999286	.3000119	0	1
hist_sibli~s	1928	2.938278	2.050182	0	14
hist_sibli~h	1401	2.872234	2.095255	0	14
hvitality	1928	.5020747	.5001254	0	1
hvitality_h	1401	.4789436	.4997348	0	1
married	1928	.6561203	.4751248	0	1
defacto	1928	.0513485	.2207649	0	1
ehousepr	1928	266214.1	316454.9	0	2828819
emortowe	1928	70002.09	100027.2	0	734093
incdisp	1928	57596.33	39396.6	240	488329
seifahi	1928	.278527	.4483904	0	1
seifalo	1928	.3319502	.4710354	0	1
wage_pred	1928	18.56335	3.538383	9.767929	28.45883
wage_h	1116	24.70579	16.33071	1.371429	191.75

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