Retirement Decisions*

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Abstract

Using the Household, Income and Labour Dynamics in Australia (HILDA) Survey, I find that gender effects on the retirement decision are less pronounced than in previous studies, which emphasize financial incentives for males and family reasons for females. Retirement decisions depend on the trade-off between household retirement wealth and individual career length. I estimate the intertemporal substitution elasticity of the retirement decision. Neither males nor females respond strongly to financial incentives, but do to job disutility.

Keywords: Probit, Career Length, Intertemporal Substitution Elasticity, Job disutility

JEL Classifications: J14 J26 C51

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1 Introduction

Selecting males and females data from 8 years of the Household, Income and Labour Dynamics in Australia (HILDA) Survey, I run a double log regression with on the career length model to estimate the responsiveness of retirement timing to the various factors and explore gender effects on the retirement decision. Females are more responsive to the age pension than males and less responsive to wages than males. This casts doubt on an earlier findings that in Australia, financial incentives prompt early retirement by males yet do not influence retirement decisions for females (Warren and Oguzoglu, 2007).

Within the life cycle setting and the pension provisions, the dependent variables of the labour market participation (de Jong et al., 1988) are chosen to run a Probit model to examine the effects on the retirement decisions of pension provisions and demographic factors . However, my findings on the influence of financial incentives are less pronounced than those found by Warren and Oguzoglu (2007) using the same methodology with an extended data set. Both males and females show a similar reaction to financial incentives and family factors . Retirement wealth, labour supply length or retirement planning span, consumptions are age dependent and family related. When age and family reasons are taken into consideration, the factors loaded into the Probit mode are less influential than the previous regression model. These findings are corroborated by descriptive statistics and graphical evidence.

2 HILDA Data and Graphical Evidence

2.1 Australian Pension System address to Gender inequality

In Australia, there is an unfunded public pension along with accumulation funds and limited coverage defined benefit funds.

The means tested flat rate age pension provides a primary income for three quarters of retirees. The non-contributory means-tested payment was raised in 2008 to 28 percent of male total average weekly earnings in the case of a single pensioner. This pension income is not associated with the personal wage earning history. Males tend to be the family breadwinner with a consistent employment history while females engage more in unpaid care work with a broken employment history.

The accumulation funds incorporate voluntary contributions by individual and compulsory employer contributed superannuation which depend on the contributions and the rate of return on the financial assets held by the funds. The minimum compulsory superannuation contribution rate is 9% of wages. The general public receives retirement income from superannuation and/or having savings outside superannuation.

The replacement rate provided by accumulation funds is generally lower than the two thirds.

2.2 Selecting Samples and The Variables of Interest

Efficient retirement timing is based on the trade-off between individual time to retirement span and household wealth at the point of retirement. The key measures out of the Household, Income and Labour Dynamics in Australia (HILDA) Survey are selected from 4455 individuals from 2532 households in which the household head is presented in 8 waves and aged at least 41 year old in year 2001. The data form the two balanced panel data files: household data and personal data. The personal data file consists of personal information such as employment status and wage income. The household data file consists of household information, such as consumption , saving, debt , net worth and wealth.

In the household file, the household to which the individual is attached to has its consumption c_{it} recorded every wave excepted wave 2. Linear imputation is used. The investment proportion π_{it} is defined as the proportion of household financial assets as a fraction of total household net worth a_{it} . The household type refers to the double wage income with or without dependents (children or other dependents), the single income household with or without dependents.

The households' wealth and expenditures are set to match the record with the individual characteristics of the household members. Each household has an identifier (Barrett and Tseng, 2008) which is selected from Wave 1 and the oldest person and satisfied two criteria: stays in the family the longest time and provides the most information in the household. Then the partner for the Household identifier is selected if there is one. The information is matched across 8 waves to form a longitudinal record for the household file. Every household has a nominated reference person with the characteristics of the reference person in record.

Most retirees in our data set do not have superannuation income but receive different types of pension before formal retirement and have been transferred from different types of pension to the age pension. All employed people have superannuation savings. Therefore the social security income or pension refers to the sum of age incomes support. The superannuation savings are collected only in wave 2 and wave 6. Other wealth data such as bank saving, insurance, business value, household debt are collected in wave 2 and wave 6.The net worth includes capital gain and loss, when personal saving behavior is captured in family banking deposit and superannuation saving changing over time.

In the personal file, after tax income y_{it} includes after tax human capital income w_{it} , after tax pension income p_{it} and after tax non-human capital income k_{it} . So one earns after tax human capital income w_{it} from a labour market in pre-retirement period R and invests his savings in financial market. He receives after tax pension income p_{it} in the retirement period $T- R$. Those income data care collected in 8 waves but the retirement intension survey are done in wave 3 and wave 7.

For a given exogenous retirement age $\bar{R}$ for a public pensioner with a opportunity set of consumption and portfolio , whose retirement wealth are bounded by the means test on income and assets, receives an anticipated flat rate pension at the eligible age. The non-public pensioner saves and invests to finance for retirement with a flexible retirement date, who retire when the retirement wealth equal the wealth level of disutility of work and has adjusted R to hedge against market value variation under optimal consumption and portfolio rule and run down the reserved retirement wealth. The total two periods duration is T .

The time effect is set to be zero by indexing real term value from year 2001 to year 2008 using CPI index. In later formula is in term of age in a life cycle setting. The permanent income at time t are the current net worth a_{it} plus total present value of unearned retirement wealth and expected social security wealth, where the proportion of non-labour income $\frac{k_{it}}{k_{it}+w_{it}}$ and $\frac{k_{it}}{k_{it}+p_{it}}$ for the two period respectively. The Social Security Wealth accrual ACC is the expected pension wealth in one year after retirement in a continuous time expression.

$$A(t) = a_{it} + \underbrace{E\int_{t}^{R} e^{-rt}(w_{it}+k_{it})\,\mathrm{d}t}_{Retirement.Wealth} + \underbrace{(1+r)^{R-t}E\int_{R}^{T-R} e^{-rt}(k_{it}+p_{it})\,\mathrm{d}t}_{Social.Security.Wealth} \tag{1a}$$

$$ACC(t|R,r,T) = \ln SSW_t - \ln SSW_{t-1} \tag{1b}$$

$$RWC(t|R,r,T) = \ln RW_{t+1} - \ln RW_t \tag{1c}$$

Or in a discrete expression for the convenience of processing data:

$$A_t = a_{it} + \sum_{t}^{R}(1+r)^{-t}(w_{it}+k_{it}) + (1+r)^{R-t}\sum_{R}^{T-R}(1+r)^{-t}(k_{it}+p_{it}) \tag{2a}$$

$$ACC_t = \frac{SSW_t - SSW_{t-1}}{SSW_{t-1}} \tag{2b}$$

$$RWC_t = \frac{RW_{t+1} - RW_t}{RW_t} \tag{2c}$$

The Social Security Wealth SSW (Fields and Mitchell, 1982; Warren and Oguzoglu, 2007) is the expected total retirement income which includes a combination of all types of pension income. The Social Security Wealth accrual ACC at a given age captures the expected change in the social security wealth. Equivalently the Retirement Wealth Actual *RWC* is captures the expected change of unearned Retirement Wealth *RW* .

2.3 Descriptive Statistics

Ideal retirement age is when a person's working life savings are sufficient for a comfortable retirement life, or the net worth at retirement can generate income to cover the retirement living cost if the retirees maintain their consumption level across the states of retirement.

By selecting sample and constructing the financial incentive variables *SSW* and *RW* for retirement on 8 waves of income data, I construct the age profile and provide a graph solution when *ACC* is equal to *RWC* or the marginal social security income equals marginal retirement wealth. The efficient retirement age for male is 65 and female is at 62.

The mean retirement age (variable in HILDA : rtage) obtained from the sample of the retired people are 61.72 and 59.87 for male and female respectively, which indicates both female and male retire earlier at an inefficient age, male retired (61.72 -65) years earlier and female retired (59.87-62) years earlier. From the sample set of working cohort the intended retirement age(variable name in HILDA : rtiage): male at 64.55 and female at 62.96. There is a trend that male intend to work (64.55-61.72) years longer and female intend to work (62.96-59.87) years longer but man intend and actually retire earlier than the the efficient retirement age of 65 while female intend to retire over the efficient retirement age of 62. overall people intend to stay in work force and delay retirement.

Incorporate with the main reasons for retirement (variable in HILDA : rtmrea) , there are 23.9 % decide to retire because of health and physical abilities and 11.06% want to have more personal and leisure time.10.20% fed up with working or work stresses. 6.99% made redundant and 6.04% became eligible for the old age pension or reached compulsory retirement age. 5.06% could afford to retire who work. More people retire for health, leisure preference and job disutility and less retire for financial reasons.

Their main expected sources of retirement income (variable in HILDA : rtmsf) are a pension payment or annuity purchased with superannuation, the public age pension and other government pension or allowance. as for the retired people answered the question on the sufficiency of retirement saving (variable name in HILDA : rtexpri) : 61.7 % retirees consider their savings are sufficient to maintain current standard of living. The detailed table is provided in Appendix 1 Table 4 Data Summary.

Table 1: Financial Ratios at Retirement

Financial Ratios	Ratio	Std. Err	95% Conf.Interval
non wage income/total income	0.276	0.022	(0.232 , 0.320)
expenditure/wage	0.900	0.060	(0.782 , 1.019)
expenditure/pension	3.735	0.213	(3.317 , 4.153)
expenditure/net worth	0.017	0.002	(0.013 , 0.020)
RW/SSW	3.027	0.056	(2.916 , 3.138)
financial assets/net worth	0.380	0.033	(0.315 , 0.444)
property debt/net worth	0.085	0.014	(0.057 , 0.112)

From the financial ration summary table 1, the consumption out of net worth is about 1.7%. Based on ratio of $\frac{RW}{SSW}$ at 3.027, people generally save more than the actual needs for retirement. Mostly people pay out their property debt when the property debt over net worth is about 8.5%.

In order to understand the age dependency of income and wealth, I construct age profile of income , household expenditure and saving and wealth.The age profile diagram in appendix figure 1 and 2 shows income and wealth evolve along age. The wage earning increases during the most productive years of life then decreases in transition to the retirement. Labour wage peak at age of 50 for both man and woman but There are considerable earning gap between man and woman.

In contrast, the pension income is picking up during aging, men's pension pick up at at age 64 and woman' pension pick up at age 62. The other no human capital income is less concave than wage income. man's peak at 68 then reduced, while woman no wage income stay steadily concave and peak at 63 to 64.

The expenditure line is slightly downwards sloping. It shows the marginal propensity to consume out of disposable income is increasing approaching retirement.

The age asset class profile for households shows bank saving increase over age, the property debt peak at age 50 and stay steadily in post retirement year. Superannuation saving is peaked at age of 60. On the age wealth profile, household net wealth peak at age 63, financial asset peak at 65 and non final asset peak at 55.

In sum, males and females save during most productive years, and not eagerly increase saving by reduce consumption approaching retirement, the consumption level maintain across stat of retirement and household non wage income increase to the first stage of post retirement age and the second half of post retirement age show level rundown financial assets.

2.4 Intertemporal Substitution Elasticity Estimates

Considering a career length model with preference θ of a separable additive utility includes two parts: maximizing life time consumption utility with CRRA γ and minimize labour supply with labour supply span R and constant intertemporal labour supply elasticity e . It is simplified that the discount factor equals to 1 and investment earnings are ignored :

$$U(c,R) = \left(\frac{c^{1-\gamma}}{1-\gamma} - \theta\frac{R^{1+\frac{1}{e}}}{1+\frac{1}{e}}\right) \tag{3}$$

Assume that consumption and labour supply are independent $\dfrac{\partial^2 U(c,R)}{\partial c \partial R} = 0$, let utility $U(c,R)$ holds constant, the marginal rate of substitution between consumption and labour supply:

$$\text{MRS:} \quad \frac{\mathrm{d}c}{\mathrm{d}R} = \frac{\dfrac{\partial U(c,R)}{\partial c}}{\dfrac{\partial U(c,R)}{\partial R}} = -\frac{c^{-\gamma}}{\theta R^{\frac{1}{e}}}$$

. With constant annual labour income w and flat pension income p, maximize lifetime utility $U(c,R)$ with maximized consumption c and minimized labour supply R subject to permanent income constraints:

$$\text{Lagrangian: } \mathcal{L} = \left(\frac{c^{1-\gamma}}{1-\gamma} - \theta\frac{R^{1+\frac{1}{e}}}{1+\frac{1}{e}}\right) + \lambda\left(c - (w-p)\frac{R}{T} - p\right) \tag{4a}$$

$$\text{FOC: } 0 = \frac{\partial \mathcal{L}}{\partial c} = \frac{\partial U(c,R)}{\partial c} - \lambda = c^{-\gamma} - \lambda \tag{4b}$$

$$0 = \frac{\partial \mathcal{L}}{\partial R} = \frac{\partial U(c,R)}{\partial R} - \lambda\frac{(w-p)}{T} = \theta R^{\frac{1}{e}} - \lambda\frac{(w-p)}{T} \tag{4c}$$

$$0 = \frac{\partial \mathcal{L}}{\partial \lambda} = c - \frac{(w-p)}{T}R - p \tag{4d}$$

The optimal maximized consumption is expressed in term of wage and pension:

$$c^* = \frac{(w-p)}{T}R + p \tag{5a}$$

$$\text{rewrite : } \quad R = \frac{(c^*-p)}{(w-p)}T \tag{5b}$$

The optimal career length is obtained by the first two FOCs:

$$R^* = \left(\theta^{-1}c^{-\gamma}\frac{(w-p)}{T}\right)^e \tag{6a}$$

$$\text{take log: } \quad \ln R^* = e\ln\left(\frac{(w-p)}{c^{\gamma}}\theta^{-1}T^{-1}\right) \tag{6b}$$

In this structural setting, the uncompensated elasticity or Marshallian elasticity $e_M = \dfrac{\partial \ln R}{\partial \ln w}$ is estimated on maximizing consumption c^* equation 5a. The compensated elasticity or Hicksian elasticity $e_H = \frac{\mathrm{d}\ln R}{\mathrm{d}\ln w}$ is estimated on minimizing labour supply R^* equation 6b subjected to the constraints on the constant utility level $U^*(c,R)$. The Hicksian elasticity is smaller than Marshallian elasticity. The Frisch elasticity show labor supply responds to an intertemporal reallocation of wage that leaves marginal utility of wealth unaffected for assessing the impact of wage change though time(Blundell and Macurdy, 1999). The Frisch labour supply elasticity need to be obtained with a control over a constant marginal utility of wealth. However, this structural setting does not allowed the control. The assumption of independent consumption and labour supply is not hold and increasing labour supply posts a counter effect on over overall utility: increases job disutility and increases wealth at the same time. It needs to decomposition to test which affects more the unhappyness of one's job or retirement wealth?

Without a structure model, simply consider the co-movement of two variables that the intertemporal substitution elasticity illustrates the wage w effects on extensive margin of career length R :

$$e = \frac{dR}{dw}\frac{w}{R} \quad \text{integrating on both sides: } \int \frac{dR}{R} = e \int \frac{dw}{w} \tag{7a}$$

$$\ln R = e \ln w + \ln \text{ (constant) } = \ln \text{(constant) } w^{e} \tag{7b}$$

$$R = \text{(constant) } w^{e} \tag{7c}$$

The simple double log regression coefficient, the intertemporal labour supply substitution elasticity e , though biased , still can reveal the difference in gender, wage, pension and wealth . Comparing with the structure model , the positive constant intercept is omitted, therefore the elasticity estimated without structure model control is upward biased. The intertemporal substitution elasticity on pension and wealth can be estimated without a structure model:

$$e_{\text{(wage)}} = \frac{d \ln(R)}{d \ln \text{(wage)}} = \frac{d \ln(t - \hat{R})}{d \ln w_{it}} \qquad \ln(t - \hat{R}) = e_{\text{(wage)}} \ln w_{it} + \epsilon_{it} \tag{8a}$$

$$e_{\text{(pension)}} = \frac{d \ln(|T - R|)}{d \ln \text{(pension)}} = \frac{d \ln(|t - \hat{R}|)}{d \ln p_{it}} \qquad \ln(|t - \hat{R}|) = e_{\text{(pension)}} \ln p_{it} + \epsilon_{it} \tag{8b}$$

$$e_{(ACC)} = \frac{d \ln(|T - R|)}{d \ln \ (ACC)} = \frac{d \ln(|t - \hat{R}|)}{d \ln ACC)} \qquad \ln(|t - \hat{R}|) = e_{(ACC)} \ln ACC + \epsilon_{it} \tag{8c}$$

$$e_{(SSW)} = \frac{d \ln(|T - R|)}{d \ln (SSW)} = \frac{d \ln(|t - \hat{R}|)}{d \ln SSW} \qquad \ln(|t - \hat{R}|) = e_{(SSW)} \ln SSW + \epsilon_{it} \tag{8d}$$

$$e_{\text{(Net worth)}} = \frac{d \ln(|T - R|)}{d \ln \ a_{it}} = \frac{d \ln(|t - \hat{R}|)}{d \ln a_{it}} \qquad \ln(|t - \hat{R}|) = e_{\text{(Net worth)}} \ln a_{it} + \epsilon_{it} \tag{8e}$$

Chetty's new method proves the relationship between the coefficient of relative risk aversion and the ratio of the income elasticity to the price elasticity. The ratio of $\frac{e_{SSW}}{e_{ACC}}$ indi-

Table 2: The Intertemporal Substitution Elasticity On Extensive Margin

Elasticity	**Male**	**Female**	**All**
Wage	0.2108	0.2074	0.2092
Std. Err	(0.0009)	(0.0010)	(0.0007)
Pension	0.2278	0.2566	0.2448
Std. Err	(0.0013)	(0.0012)	(0.0009)
ACC	0.4143	0.3882	0.4010
Std. Err	(0.0012)	(0.0012)	(0.0008)
SSW	0.1802	0.172	0.1761
Std. Err	(0.0006)	(0.0006)	(0.0004)
Net worth	0.1710	0.1649	0.1681
Std. Err	(0.0007)	(0.0007)	(0.0005)
Risk Aversion*	2.3	2.257	2.277

* R.Chetty, A New Method of Estimating Risk Aversion, 2003 .

cates a high coefficient of constant risk aversion coefficient at around 2.2-2.3. In empirical study the first moment estimation of elasticity is at around 0.4-1 (Dandie and Mercante, 2007). From table 2 the summary output of elasticity, the elasticity is low, which indicate consumption smoothing is less costly.

Both females and males have low elasticities, while males respond more on labour wage than on pension benefit, females respond more on pension to wage. Both are relatively sensitive to e_{ACC} than e_{SSW}. Intuitively the explanation is that people response to the price change more than they respond to wealth change.

There is traditional regression approach to estimate γ under a separable additive utility setting:

$$\frac{c^{1-\gamma}}{1-\gamma} = \left(U(c,R)^{*} - \theta \frac{R^{1+\frac{1}{e}}}{1+\frac{1}{e}} \right) \tag{9}$$

$$\frac{c_{it}^{1-\gamma} - c_0}{1-\gamma} = X_{it}'\beta + \epsilon_{it}. \tag{10}$$

$$\epsilon_{i,t} \sim N(0,1), \quad X_{it} \text{ include } ,R\ ,w,\ p,k \text{ and age.} \tag{11}$$

$$1-\gamma=\begin{cases}-1 & c_0-\frac{1}{C_{it}}=X_{it}'\beta+\epsilon_{it}\\ 0 & \ln C_{it}=X_{it}'\beta+\epsilon_{it}\\ 1 & C_{it}-c_0=X_{it}'\beta+\epsilon_{it}\end{cases} \tag{12}$$

Table 3: estimate γ under a separable utility setting

Variable	Coefficient	(Std. Err.)
$1-\gamma$	-0.182	(0.009)

Test Ho	Restricted log likelihood	LR statistic	P-value.
$1-\gamma$ = -1	-338151.15	7294.98	0.000
$1-\gamma$ = 0	-334703.48	399.64	0.000
$1-\gamma$ = 1	-345041.70	21076.07	0.000

In this setting up without minimizing labour supply and only consider maximizing utility of consumption, the estimates of CRRA is close to 1 . however , from table 3, the three scenario are rejected. The career length model is closer to the ``truth''. The estimated low elasticity and the high risker aversion are in better position to explain behavior of retirement decision.

3 Retirement Decision Model

An individual chooses a feasible path of smoothing spending and allocating the proportion of net worth to increase wealth to the threshold that triggers a decision to exit the labour supply, the net worth at retirement plays a key role to bring retirement date forward or delaying it. In this paper the retirement decision model is a set of panel data regressions on (1) the consumption smoothing (2) the age profile on wealth (3) the binary outcome decision model which considers demographic factors and financial incentives (Farhi and Panageas, 2007).

Model with Bellman equation with a discount factor equal to 1, since the real value have indexed to the value of the same year:

$$
\begin{aligned}
V(a(t)|t, c(t), \pi(t)) &= \max_{c,\pi,R} \left(\int_0^T U(c(t), t)\, \mathrm{d}t \right) \\
&= \max_{c,\pi,R} \left(\int_0^T \left(c(t)^{-\gamma}\right) \mathrm{d}t - \int_0^{\bar{R}} \theta t^{\frac{1}{e}}\, \mathrm{d}t \right) \\
&= \max_{c,\pi,R} \left(\frac{c(t)^{1-\gamma}}{1-\gamma} - \theta\left(\frac{\bar{R}^{1+\frac{1}{e}}}{1+\frac{1}{e}}\right) \right)
\end{aligned}
$$

$$
\text{s.t. } g(t, c(t), \pi(t), a(t)).\text{:} \quad \dot{a(t)} = r\pi(t)a(t) + (1-D)w(t) + Dp(t) - c(t)
$$

$$
a(0) = \mathbb{E} \int_0^T \dot{a(t)}\, \mathrm{d}t
$$

$$
a(R^*) = \mathbb{E} \int_{R^*}^T \left(r\pi(t)a(t) + p(t) - c(t)\right) \mathrm{d}t
$$

$$
\text{Post-Retirement } (D = 1).\text{:} \quad \max_{c,\pi} \left(\int_{R^*}^T c(t)^{-\gamma}\, \mathrm{d}t \right)
$$

$$
\text{s.t.:} \quad \dot{a(t)} = r\pi(t)a(t) + p(t) - c(t)
$$

$$
\text{Pre-Retirement } (D = 0).\text{:} \quad \max_{c,\pi,R} \left(\int_0^{R^*} \left(c(t)^{-\gamma} - \theta t^{\frac{1}{e}}\right) \mathrm{d}t \right)
$$

$$
\text{s.t.:} \quad \dot{a(t)} = r\pi(t)a(t) + w(t) - c(t)
$$

$$
\text{Retirement Wealth Sufficiency.:} \quad \int_0^{R^*} \left(ra(t) + w(t) - c(t)\right) \mathrm{d}t - \int_{R^*}^T \left(c(t) - p(t)\right) \mathrm{d}t \geq 0
$$

$$
\text{RW and SSW at retirement.:} \quad \int_0^{R^*} \dot{a(t)}\, \mathrm{d}t + \int_{R^*}^T p(t)\, \mathrm{d}t = \mathbb{E} \int_{R^*}^T c(t)\, \mathrm{d}t
$$

3.1 The Age Profile and Regression on Consumption and Wealth

The smoothing consumption path regression and the asset allocation regression are built with the income profile. The smooth consumption regression measures the autonomous spending, the marginal propensity of consumption out of individual wealth. With age effect considered , the significance of the coefficient of the binary variable retirement status D is judged on consumption motives cross the status of retirement.

Refer to Appendix table 5, a subsample are selected over a 30 years span (15 year before and 15 year after the retirement). There retirement status is statistically significant difference in consumption standard. However the data selection criteria is changed to a 2 years span, the retirement status is not significant. Both regressions with age effect and without age effect confirm that there is no consumption puzzle. In general there is consumption standard difference between working people and retired people; the consumption drop is gradual across the status of retirement. The output shows it is plausible to assume that the marginal propensity to consumption out of wealth is a declining function of wealth. The marginal propensity of consumption out of wealth is age dependent and it shows a strong indication of consumption smoothing in pre-retirement period.

The asset allocation regression is adapted from Yoo (1994).This regression outputs of asset allocation path is given in table 6. The individual adjust portfolio weight to allocate the part of the wealth into different asset classed.

3.2 The Probit Model of Retirement Decisions

In HILDA survey, the record of households earnings capture the wealth drift and volatility process, following previous studies on Panel Probit Model (Warren and Oguzoglu 2007) , The $I_{i,t}$ measure the financial incentives across females and males in their retirement decisions. The variables $X_{i,t}$ collect the heterogeneity of gender, human capital endowment, occupation, and job satisfaction etc. The retirement value thresholds is the unobserved latent variable V* but the outcome of retirement states $D_{i,t}$ are observed :

$$Pr(D_{i,t}=1)=\Phi(\delta I_{i,t}+X_{i,t}^{'}\beta) \qquad D_{i,t}=\begin{cases}1 & \text{if } V \geq V^*.\\ 0 & \text{otherwise.}\end{cases} \tag{13}$$

The value function $V(t, c(t), \pi(t), a(t))$ connects parameters of decision variables in optimization problem. Refer to Probit model output in Appendix D table 7, in pooled data set, sex is insignificant, there is no significant difference between female and male. SSW as financial incentive is omitted because less variant for the pooled data set and the male data set. It is significant for female. The public pension has effect on the retirement decision for female, the high SSW increase slightly the chance of retirement. However ,the change of wage rate, the change in asset allocation ratio, the change of pension rate is insignificant, which is consistent with the Australian flat rate pension, we can conclude the expected pension payment is not the cause earlier retirement. People intend to work longer for financial security and works to eligibility age for pension. In general neither the expected social security nor its change influences the retirement decisions.

In the panel Probit model, the Hausman test confirms that individual differences are systematic. Accordingly, the fix effect model is preferred because the individual job, education, tenure and job satisfaction demonstrate influence the retirement decision. In seeking for an explanation for retirement motivation for both male and female, there are less distinctive difference, both job satisfaction are significant for male and female , both their own age and partner's age are significant, the better job satisfaction the later retirement . The older an individual is the more likely that he or she will retire earlier. The more the number of dependents in household they need to support the less likely they will retire earlier. For man the higher education and the longer experience they have the more likely they remain at work. For woman, the partner retirement status has a significant effect.

4 Conclusion

The low intertemporal substitution elasticity for retirement implies low responsiveness to pension incentives on the trade off between retirement planning span and retirement wealth. The low elasticity can be explained by the invariability of pension rate, and the pensions are unrelated to earning history may lead to the low responsiveness. People generally are not willing to delay retirement. The model and estimation explain the trend emerging since 2007 that people intend to work longer.

It consistently shows the retirement wealth and investment portfolios are age dependent , when the age effect are taken into consideration, the retirement wealth has less impact on retirement decision which show job disutility play important role. The invariability of pension rate and unrelated to wage earning history lead to less responsiveness for both man and woman, The effects of gender on retirement decision are less pronounce that man on financial incentive and woman on family reason.

The retirement decisions are family related and job related for both men and women. The job satisfaction affect both males and females' retirement decisions. Own age and the partners’ age have most effect on people retirement decision. The partner's retirement status affects woman's decision but less influence on man's. The expected accumulation of social secretly has influence woman's retirement decision provides some indication that the government pension provides a sense of security and it has more impact on woman than man.

The findings of relative risk aversion of 2.2 to 2.3 in the career length model is a higher than theoretically solution. The double log model causes bias estimation that lead to high CRRA and low elasticity. Australian prefer steady flow in consumption at low level income than a more erratic flow at high level, which implies people increase present consumption more than increasing retirement wealth level. The graphical evidence of age profile and the set of regression also show strong motive smoothing consumption in pre-retirement time, people does eagerly increase retirement wealth or save more for retirement.

The findings further explain that the financial incentive in Australian pension system. The incentive lies on the wide accessible of low rate but steady public pension. The public pension provides a sense of security against contingency and longevity risk at low flat rate. Peoples save more than sufficient for retirement.

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Appendix A

Figure 1: Age income profiles for male.

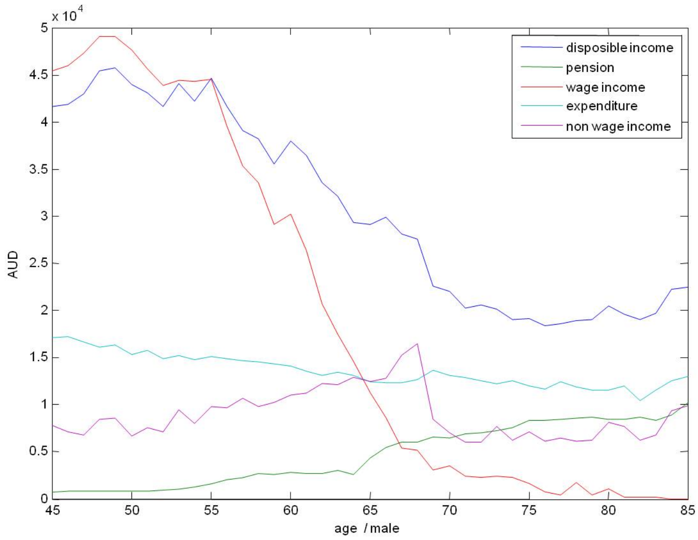
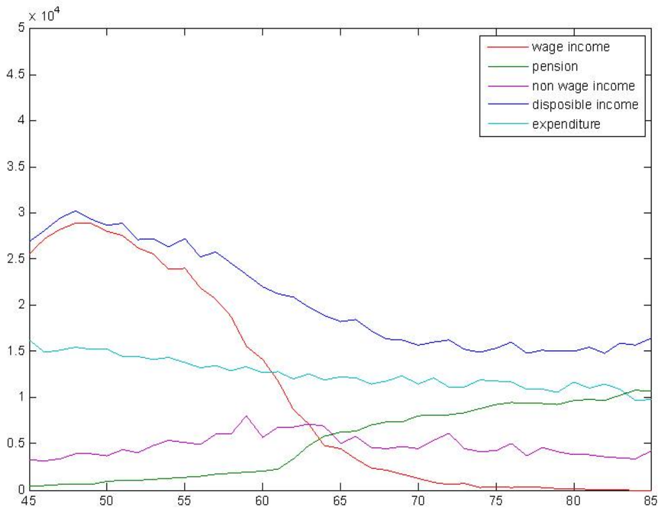


Figure 2: Age income profiles for female.



Appendix A

Figure 3: Households wealth data fitting.

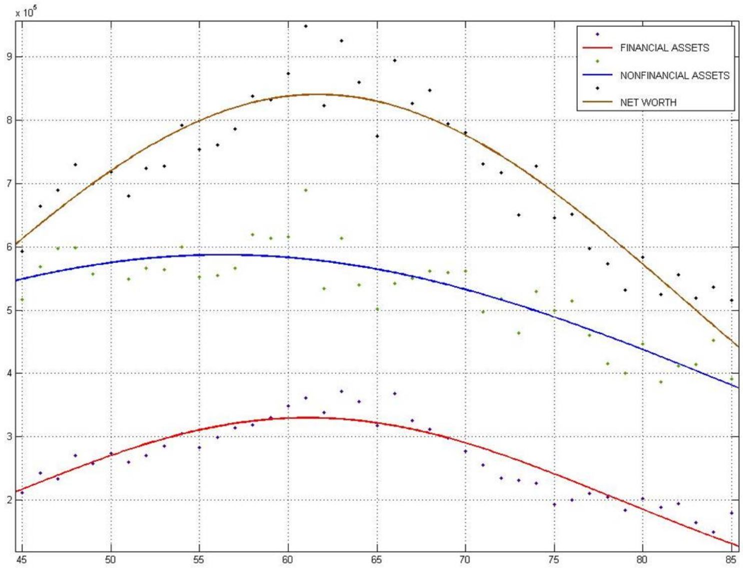


Figure 4: Households asset class data fitting.

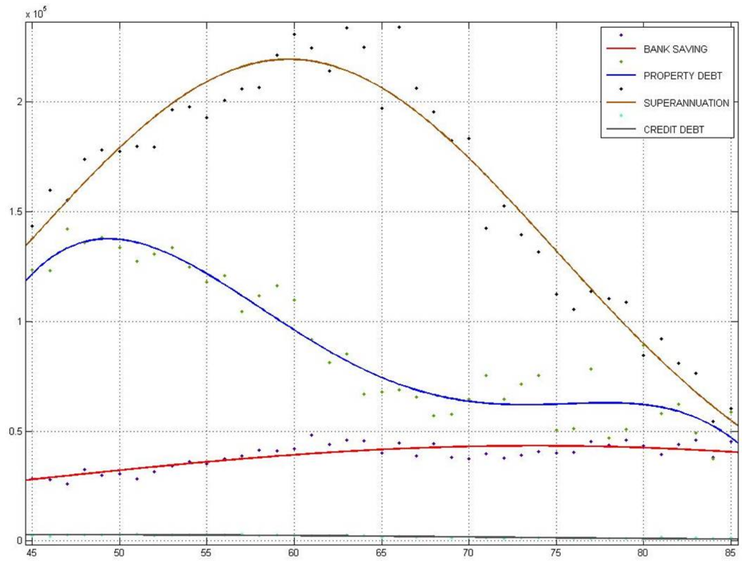


Table 4: Data Summary

expected retirement income sufficiency	Freq.	Percent	Cum.
sufficient to maintain current standard of living	1,448	7.16	7.2
enough to maintain standard of living	11,024	54.53	61.7
not enough to maintain current standard	7,744	38.31	100.0
Total	20,216	100	

Main Expected Source of Income at Retirement	Freq.	Percent	Cum.
Became eligible for the old age pension	272	1.34	1.34
Offered reasonable financial terms to retire early	232	1.15	2.49
Superannuation rules made it financially advantageous	280	1.38	3.87
Could afford to retire / Had enough income	816	4.03	7.90
Spouses / partners income enabled me to retire	208	1.03	8.93
Made redundant / Dismissed / Had no choice	1,416	6.99	15.92
Reached compulsory retirement age	440	2.17	18.10
Could not find another job	256	1.26	19.36
Fed up with working / work stresses, demands	1,672	8.26	27.62
Pressure from employer or others at work	392	1.94	29.55
Own ill health	4,848	23.94	53.50
Ill health of spouse / partner	912	4.5	58.00
Ill health of other family member	376	1.86	59.86
Partner had just retired or was about to retire	632	3.12	62.98
Spouse / partner wanted me to retire	488	2.41	65.39
To spend more time with spouse / partner	848	4.19	69.58
To spend more time with other family members	1,424	7.03	76.61
To have more personal / leisure time	2,240	11.06	87.67
To have children/ start family/ to care for children	648	3.2	90.87
NEI to classify	400	1.98	92.85
Other reason (Specify)	1,448	7.15	100
Total	20,248	100	

Main Reason for Retirement	Freq.	Percent	Cum.
Age pension / Service pension	3,904	19.68	19.68
Other government pension or allowance	672	3.39	23.1
Lump sum superannuation payout	3,920	19.76	42.8
A pension or annuity purchased with superannuation	5,384	27.14	70.0
Income from savings and investments	3,784	19.07	89.0
Income from a business	1,072	5.40	94.4
Income or pension from your spouse / partner	784	3.95	98.4
Financial support from family	104	0.52	98.9
Inheritance	8	0.04	99.0
Other source (Specify)	208	1.05	100.0
Total	19840	100	

Appendix:C

Table 5: Regression on smoothing consumption with age effect

$$c_{it} = \beta_1 + \beta_2(wage)_{it} + \beta_3(pension)_{it} + \beta_4 D_{it} + \beta_5 age_{it} + \epsilon_{it}$$

	all	**30years span**	**2 years span**	**ln (all)**	**ln(30years span)**	**ln (2years span)**
wage	0.0006	-0.001	-0.0007			
	(0.813)	(0.760)	(0.595)			
pension	0.0295	0.013	-0.0247			
	(0.085)	(0.52)	(0.595)			
age	-154.0002***	-194.1808***	201.5288	-0.0227**	-0.0212*	-0.1408
	(0.000)	(0.000)	(0.509)	(0.003)	(0.016)	(0.207)
retirement D_{it}	-533.1808*	-347.0021	-733.3132	-0.0177	-0.0179	0.1651
	(0.016)	(0.137)	(0.139)	(0.752)	(0.753)	(0.307)
ln(wage)				0.0349	0.0316	0.0436
				(0.084)	(0.152)	(0.479)
ln(pension)				0.0225	0.008	-0.0286
				(0.398)	(0.788)	(0.734)
constant	2.31e04***	2.54e04***	1345.4305	10.1212***	10.1904***	17.6563*
	(0.000)	(0.000)	(0.941)	(0.000)	(0.000)	(0.011)
N	33200	22100	2632	1057	823	201
r2-w	0.0035	0.0049	0.0027	0.0327	0.0314	0.077
r2-b	0.0817	0.0556	0.0074	0.003	0.0063	0.0032
r2-o	0.0365	0.0263	0.0041	0.0213	0.0347	0.0002

Note: Standard errors are reported in parentheses. * denotes statistical significant at 5 % level , ** denotes statistical significant at 1% level and ***denotes statistical significant at 0.1% level.

Appendix:D

Table 6: Regression outputs on age wealth path

Logged assets ratio $\ln \pi_{it} = \beta_1 + \beta_2 \ln a_{it} + \beta_3 D_{it} + \beta_4 Age_{it} + \sum_5^j \beta_j x_{j,it} + \epsilon_{it}$

	all	**working**	**retired**	**log (all)**	**log(working)**	**log(retired)**
retirement status	0.0181			0.0284		
	(0.0117)			(0.0622)		
ln(household net worth)	0.0462***	0.0351***	0.0587***	0.1182***	0.1019***	0.1409**
	(0.0057)	(0.0068)	(0.0097)	(0.0245)	(0.0274)	(0.0440)
ln(household bank saving)	0.0308***	0.0279***	0.0347***	0.2933***	0.2230***	0.3795***
	(0.0024)	(0.0030)	(0.0040)	(0.0201)	(0.0222)	(0.0337)
age	-0.0014**	-0.0011	-0.0016*	-0.0064*	-0.0100*	-0.0047
	(0.0005)	(0.0008)	(0.0007)	(0.0028)	(0.0040)	(0.0038)
household owner	-0.4048***	-0.3667***	-0.4554***	-1.2370***	-1.0104***	-1.4977***
	(0.0236)	(0.0288)	(0.0396)	(0.0908)	(0.0957)	(0.1655)
education	-0.0021	-0.0004	-0.0045	-0.009	-0.0065	-0.0116
	(0.0016)	(0.0019)	(0.0026)	(0.0078)	(0.0092)	(0.0132)
job satisfaction	0.0016	0.0018	0.0017	0.0094	0.0098	0.0105
	(0.0013)	(0.0016)	(0.0021)	(0.0066)	(0.0088)	(0.0099)
household dependents	-0.0133***	-0.0125**	-0.0147*	-0.0418*	-0.0579**	-0.0364
	(0.0036)	(0.0042)	(0.0073)	(0.0186)	(0.0213)	(0.0400)
partner retirement	0.0257**	0.0413***	0.0023	0.0571	0.1587*	-0.0759
	(0.0092)	(0.0122)	(0.0140)	(0.0523)	(0.0676)	(0.0838)
partner education	-0.0067***	-0.0042*	-0.0098***	-0.0320***	-0.0230*	-0.0387**
	(0.0016)	(0.0020)	(0.0027)	(0.0080)	(0.0091)	(0.0136)
partner job satisfaction	0.0013	0.0031	-0.0015	0.0290***	0.0365***	0.0166
	(0.0012)	(0.0016)	(0.0018)	(0.0062)	(0.0080)	(0.0097)
constant	-0.0477	0.0349	-0.1069	-4.1648***	-3.3908***	-4.9406***
	(0.0682)	(0.0850)	(0.1125)	(0.3530)	(0.4108)	(0.5892)
N 3	944	2141	1803	3944	2141	1803
chi2	729.5547	368.7609	384.8965	475.6093	238.5787	285.3101

Note: Standard errors are reported in parentheses. * denotes statistical significant at 5 % level , ** denotes statistical significant at 1% level and ***denotes statistical significant at 0.1% level.

Appendix:E

Table 7: Probit Regression Outputs
Dependent binary variable : retirement status $D_{i,t}$

	all		**male**		**female**	
	coefficients	**standard error**	**coefficients**	**standard error**	**coefficients**	**standard error**
sex	0.1464	(0.4644)				
SSW	-	(0.0000)	-	(0.0000)	-0.0001**	(0.0000)
ln(wage)	-0.1005	(0.1554)	-0.2821	(0.4540)	0.0683	(0.1540)
ln(pension)	0.1314	(0.1748)	0.5343	(0.6303)	0.0546	(0.1753)
ln(assets ratio)	0.0338	(0.1454)	-0.5791	(0.3616)	0.0237	(0.1296)
age	0.2756***	(0.0833)	1.2107***	(0.3281)	-0.0441	(0.0735)
household dependents	-0.0027	(0.1754)	-0.4292	(0.4907)	0.11	(0.1668)
job	0.4791***	(0.0887)	0.8823***	(0.2067)	0.4224***	(0.0907)
tenure	-0.0709**	(0.0260)	-0.4625*	(0.1844)	-0.0231	(0.0163)
job satisfaction	-0.0976*	(0.0420)	-0.1376	(0.1060)	-0.083	(0.0443)
education	-0.2189*	(0.0911)	-0.6661*	(0.3029)	-0.0398	(0.0894)
house owner	-0.0582	(0.5750)	0.1278	(1.7170)	0.0257	(0.5010)
partner age	-0.0816*	(0.0352)	-0.2734**	(0.0952)	-0.0783*	(0.0315)
partner job	-0.0746	(0.0780)	-0.0758	(0.1712)	-0.056	(0.0844)
partner retire	0.4839	(0.3529)	0.9445	(0.9602)	0.9292*	(0.3637)
partner education	0.0527	(0.0866)	0.3255	(0.2647)	0.002	(0.0877)
partner job satisfaction	-0.0584	(0.0458)	-0.1038	(0.1086)	-0.0531	(0.0468)
constant	-9.5001	(7.8051)	-52.8809*	(26.1821)	31.2877*	(13.9530)
lnsig2u						
constant	1.4037**	-0.4588	3.7530***	-0.3952	-0.9365	-1.1595
N	562		265		297	

Note: Standard errors are reported in parentheses. * denotes statistical significant at 5 % level , ** denotes statistical significant at 1% level and ***denotes statistical significant at 0.1% level.