2 Voluntary retirement module specification

As part of its research on *Superannuation Policy for Post-Retirement* the Commission has developed a model — referred to as the Productivity Commission Retirement Model (PCRM) — to assess the effects of increasing the preservation age. The PCRM can be described as a 'behavioural microsimulation' model. Behavioural microsimulation models seek to simulate individual or household level decisions, and are commonly used within an economic framework to assess the impact of policy changes (such as changes in tax and benefits) on governments' fiscal positions and on labour supply. They are particularly useful where there is a wide variety of decision makers, and where complex policy changes are likely to impact these different decision makers in different ways.

The Commission's model consists of three modules:

- *a voluntary retirement module*, which seeks to gauge the behaviour of individuals who have some discretion in how they respond to policy changes

- *an involuntary retirement module*, which seeks to account for those individuals who do not get to exercise choice around the timing of their retirement

- *a projection module*, which seeks to weight the outcomes from the voluntary and involuntary retirement modules, both now and in the future.

The role of this paper is to provide additional detail on the voluntary retirement module.

Households types

The voluntary retirement module consists of 120 households for a given age grouped into 12 household types (table 2.1). Households of the same type are identical (they have the same earnings, savings rates and drawdown rates) except in their preferences for non-work activities.

Table 2.1   Representative households

Household type	Household formation	Household group number	Household wealth quartile within group
1	Single – male	1	1 (lowest wealth quartile)
2	Single – male	1	2 (second lowest wealth quartile)
3	Single – male	1	3 (second highest wealth quartile)
4	Single – male	1	4 (highest wealth quartile)
5	Single – female	2	1
6	Single – female	2	2
7	Single – female	2	3
8	Single – female	2	4
9	Couple	3	1
10	Couple	3	2
11	Couple	3	3
12	Couple	3	4

Households maximise utility

Households have the choice to retire between the ages of 50 and 75 inclusive and choose the timing of their retirement to maximise their future discounted lifetime utility. Future discounted lifetime utility is calculated by multiplying utility for each future year of life by a discount rate and a probability of survival. Utility in a given year is derived from three sources — consumption, non-work activities (leisure) and bequests (multiplied by the probability of death in that year rather than the probability of survival). The utility function of a single household for time period t is presented in equation 7.1. The lifetime utility function for a single household is presented in equation 7.2.

$$(7.1) \quad U_t^{aij} = (1-\delta)^{(t-t_0)}\left((1-\beta)s_t^{ai}\left(\alpha^{ai}\left(L_t^{aij}\right)^{\left(\frac{\rho-1}{\rho}\right)} + (1-\alpha^{ai})\left(C_t^{aij}\right)^{\left(\frac{\rho-1}{\rho}\right)} \right)^{\left(\frac{\rho}{\rho-1}\right)} + \beta d_t^{ai}\left(\left(B_t^{ai}+\tau\right)^{\nu} - \tau^{\nu}\right) \right)$$

$$(7.2) \quad U^{aij} = \sum_t U_t^{aij}$$

Where:

- t is the year, a is the age of the individual, i is the household number, j is the retirement age choice

- L is leisure (non-work activities), C is consumption (in real terms) and is divided by a scaling factor of 100 000, B is the value of bequests (in real terms) and is also divided by a scaling factor of 100 000

- δ is the discount rate for utility[1], s is the probability that an individual survives to age a, d is the probability that an individual survives to age a-1 and then dies at age a[2]

- α is the preference for non-work activities (more detail on this parameter is provided below), β is the bequest preference, ρ is the intra-temporal elasticity of substitution, ν determines whether there are diminishing (or increasing) utility returns to bequests

- τ is a shift parameter for bequests.

Some additional assumptions are required to calculate utility for couple households. These include the following:

- both members of couple households are assumed to be of the same age

- members of a couple are assumed to retire at the same age and make retirement decisions jointly

- household utility for couples is assumed to be equal to the sum of the two individual utility functions

- members of a couple are assumed not to consider the possibility that their partner could die before them (leading to them receiving the assets owned by their partner) — this assumption helps limit the number of outcomes that need to be modelled

- couples are assumed to share consumption equally.

Why include a 'bequest' motive?

Commission analysis of data from the ABS *Survey of Income and Housing* (SIH) and *6238.0 - Retirement and Retirement Intentions, Australia, July 2012 to June 2013* suggests that the wealthiest quartile of households tend to work longer, accumulate more savings, and after they retire, draw down on their savings more slowly than would be expected if they intended to consume all of their savings before they die. There are a number of reasons why households might accumulate additional savings. Households might:

- be insuring themselves against adverse outcomes (like needing to pay for large one-off medical expenses or aged care bonds)

- enjoy working and prefer it to retiring

- wish to make bequests to family members or others

- derive utility from the process of accumulating assets.

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[1] This is a pure time preference rate as consumption and bequests are represented in real terms. It is somewhat analogous to the real discount rate in financial modelling.

[2] Survival probabilities are obtained from the population projection module. Individuals are assumed to know their future survival probabilities.

The Commission has included a bequest motive as a proxy for all of these effects. Including a bequest motive substantially improves the capacity of the model to reflect observed retirement behaviour.

Additional assumptions to improve model performance

Data suggest that after accounting for different wage levels and savings balances, there is still a substantial amount of variation in the retirement ages of individuals and not all of this variation can be attributed to involuntary retirement. To account for this variability, preferences for non-work activities were varied across the ten versions of each household type. This variation ranged from 60 per cent below to 60 per cent above the value of α (table 2.2). This resulted in a more accurate spread of retirement ages from 50 to 75 when the model was calibrated.

Table 2.2   Variation in preferences for non-work activities

Version of a single household type	Preference for non-work activities (α) as proportion of the base level
	Per cent
1	100
2	40
3	55
4	70
5	85
6	100
7	115
8	130
9	145
10	160

Calculating leisure, consumption and bequests

As noted in supplementary paper 6, it is necessary to make a number of assumptions in order to calculate consumption and bequests. These include assumptions about the share of individuals who are employed, their wage income and their superannuation and non-superannuation savings.

Wage income

Households are assumed to earn wage income from the age of 20 until such time as they retire. Wage income varies by household type (and by individuals within couple

households) and is calculated by multiplying the average wage income of those who are employed by the proportion of individuals who are employed.[3] A more detailed description of the wage income data is presented in modelling paper 1.

Individuals pay personal income tax (including the Medicare levy) on their wage income. Income tax thresholds are assumed to stay constant for 10 years after which time they are indexed in line with wages growth.

Wages are assumed to increase by 3 per cent per year (0.5 per cent in real terms) due to productivity improvements.

In the voluntary retirement module, welfare payments that are paid to individuals prior to retirement are not included. This assumption has no impact on modelling results as it is assumed that these income support payments are not saved (they are consumed in the same year that they are received).

Age Pension

Individuals are assumed to only be eligible for the Age Pension if they:

- have retired
- have reached the Age Pension age
- meet the assets and income tests (which are calculated at the household level).[4]

The Age Pension rates and means tests are assumed to be indexed to wages growth. The deeming rates for the Age Pension income test are assumed to remain constant in future years.

Superannuation contributions and other savings

Individuals are assumed to receive the full Superannuation Guarantee (9.5 per cent in 2014-15). The legislated Superannuation Guarantee changes are included in the model.

Individuals are assumed to make both concessional and non-concessional superannuation contributions based on two separate rates derived from the SIH and unpublished ATO data. If an individual's concessional superannuation contributions exceed the concessional cap, the excess contributions are converted into non-concessional contributions. Concessional superannuation contributions are taxed at 15 per cent, while non-concessional superannuation contributions are not taxed (as they are made from after-tax income).

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[3] Beyond age 50, the proportion of individuals who are employed is kept at the proportion for age 49. This is because beyond age 50, this proportion will include those who have retired (wage income is only received by those who have not retired).

[4] The two highest wealth single households and the three highest wealth couple households are assumed to be homeowners for the purposes of the Age Pension asset and income tests.

Individuals are also assumed to invest in non-superannuation assets based on rates derived from the SIH. This investment does not include investment in the family home (rather mortgage repayments are implicitly included in consumption).

Superannuation savings earn an annual return of 6.5 per cent in nominal terms in the accumulation phase and 5 per cent in the retirement phase.[5] In the accumulation phase, superannuation returns are taxed at 10 per cent rather than the legislated rate of 15 per cent. This is to reflect the fact that superannuation funds receive franking credits for dividends received from Australian equity and a capital gains tax discount for assets owned for at least 12 months. In the drawdown phase superannuation returns are not taxed. Non-superannuation returns are taxed at an individual's marginal tax rate.

Draw down assumptions

Most individuals only draw down their superannuation and non-superannuation savings after they retire. Within the model, individuals are assumed to draw down their superannuation on the basis of drawdown rates derived from the SIH. These rates are replaced with the legislated minimum drawdown rates if they are below the minimum rates. Households are assumed to make a once off lump sum withdrawal of $80 000 (or the total value of the superannuation balance when balances are less than $80 000).[6]

Additionally, households are assumed to have a minimum drawdown amount in absolute terms. This amount was included to prevent households with mid-sized savings balances only living off small drawdowns. The minimum drawdown amounts are set at 50 per cent above the maximum Age Pension rates to reflect the fact that households would be unlikely to only consume an amount equivalent to the Age Pension if they had savings remaining. For couple households, the total minimum drawdown amount can be reached by drawing down from a single individual's savings if the other member of the couple has insufficient savings. If households elect to retire before they reach the preservation age, they draw down from their non-superannuation savings until they reach the preservation age.

Under some circumstances, individuals are able to draw down from their superannuation savings prior to retirement. For example, individuals who have reached the preservation age can draw down on their superannuation savings by using a transition to retirement

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[5] Based on consultations with industry analysts and discussions at the modelling workshop (see appendix A).

[6] This quantum was chosen following analysis of SIH data, which indicated that those with superannuation balances of up to $80 000 typically took the entirety of these savings as a lump sum. In contrast, those with larger superannuation balances tend to take a smaller proportion of their savings as a lump sum, and this is discussed in greater detail in chapter 4. A more realistic way to model lump sum use would be to take into account the relationship between the size of superannuation savings and the proportion taken as a lump sum in retirement. However, attempts to include this relationship in the model (in a simple way) caused excessive rates of early retirement (relative to observed behaviour) and drawdown rates below legislated minimums.

pension (TTR pension) if they have not yet reached the unconditional access age, which is currently 65, or without the use of a TTR pension if they have reached the unconditional access age. In the PCRM (and consistent with the patterns observed in the data) these mechanisms are assumed to be only used by four households types (the highest wealth single households and the two highest wealth couple households) and only then to minimise their tax liabilities.

Households that minimise their tax liabilities in this way do so by saving an additional proportion of their before tax income (between 1-2 per cent based on Commission analysis of ATO data), and withdrawing an equivalent amount from their superannuation accounts. It is assumed that when they reach the preservation age, these households rollover the largest amount of superannuation savings that they can (into an account-based pension) while still meeting the minimum drawdown percentage. There is assumed to be no minimum drawdown amount (in absolute terms) when superannuation balances are accessed in this way.

Taxes are applied to some superannuation draw downs. Taxable superannuation withdrawals (withdrawals of savings that were originally concessional contributions) are taxed at an individual's marginal tax rate (minus a 15 per cent offset) if they have not reached the tax-free age (currently 60). There is no withdrawal tax payable if an individual has reached the tax-free age. Tax-free superannuation withdrawals (withdrawals of savings that were originally non-concessional contributions) are not taxed. Lump sum withdrawals are not taxed in the model.[7]

Some of the key assumptions are summarised in table 2.3.

Table 2.3   **Assumptions about rates of growth and returns**

Parameter	Parameter value (per cent per year, nominal)
Wage growth	3.0
Price growth (CPI)	2.5
Returns to superannuation (in accumulation phase)	6.5
Returns to superannuation (in drawdown phase)	5.0 [a]
Returns to non-superannuation assets	6.0

a The return to superannuation assets in the drawdown phase is lower than in the accumulation phase because retired individuals typically have less risky superannuation asset allocations than those who are still in the workforce.

Source: Based on consultations with workshop participants (appendix A).

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[7] For lump sums taken before the tax-free age, but after the preservation age, there are no taxes on lump sum withdrawals up to $185 000. A 22 per cent tax rate is applied to lump sums taken before preservation age.

How is retirement age determined?

The age at which households retire affects all three terms in the utility function:

- *Non-work activities* — by retiring, households can spend more of their time on non-work activities. If this term were the only term that changed when a household retired then all households would be expected to retire at the earliest possible age.

- *Consumption* — by retiring, households cease to receive wage income but can access additional sources of income (and thus consumption). This additional income can be from the drawdown of savings — both superannuation (if they have reached the preservation age), and non-superannuation savings — and/or by receiving the Age Pension (if they meet the relevant assets and income tests). If the consumption term were the only term that changed when an individual retired, retirement age would be determined by the relative values of before-retirement income (from wages) and post-retirement income.

- *Bequests* — by retiring (and thus beginning the process of consuming accumulated savings) households reduce the savings that will remain when they die. If the bequest term were the only term that changed when an individual retired, it is expected that individuals would retire at the latest possible age.

Retirement age is determined by the balancing of the effects that push households towards early retirement (such as extra time for non-work activities and large savings balances that lead to high levels of post-retirement consumption) and the effects that push households towards a later retirement (such as high wage incomes and the desire to leave large bequests). The parameters in the utility function and the utility framework itself augment how this balancing occurs. For example:

- the preference parameters (α, β, ρ, ν) change the weight placed on the utility function terms and thus the weight placed on different effects

- the presence of a positive discount rate (rate of time preference) means that utility obtained in early periods is weighted more highly than in later periods — all things equal, this diminishes the value placed on benefits that occur later in life (like bequests or the drawdown of savings balances at older ages)

- the utility function exhibits diminishing marginal returns to consumption when leisure is fixed — all else being equal, this implies that households should spread their consumption as equally as possible across multiple years.