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Early retirement: the role of Mature Age Allowance

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Author note

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Abstract

In the past four decades, Australia has seen a decline in the labour force participation rate of older male workers, exhibiting patterns of early retirement. Male workers are increasingly retiring well before they reach the conventional retirement age of 65. In the context of a structurally ageing population, early retirement has implications for government spending – in terms of lost output, a lower tax base and social security outlays for those who do not have enough means to live by – and for the well-being of older males. One of government's responses is to encourage labour force participation among older male workers, through improved policy incentives to work. Changes were made in September 2003 to the Mature Age Allowance, the social security benefit for unemployed workers aged 60-64, encouraging them to more actively look for work. Using HILDA Wave 2 data obtained in 2002, it was found that receipt of MAA did not discourage male workers from participating in the workforce, rendering the effectiveness of the change made to MAA in 2003 questionable.

Contents

1 Introduction

The age of retirement among industrialised countries has steadily fallen towards the latter half of the 20th century. In the past four decades, Australia has seen a decline in the labour force participation rate of older male workers, exhibiting patterns of early retirement. That is, male workers are increasingly retiring well before they reach the conventional retirement age of 65.

Moreover, Australia is experiencing a structural ageing of its population, with the proportion of people of retirement age rising relative to the proportion of people of workforce age. In 2003, for every person aged over 65 there were 5.3 people of workforce age. By 2043 it is expected that this ratio will be 2.3 to 1 (based on ABS 3222.0 Population Projections, Australia).

Both these trends of early retirement and structural ageing have implications for government spending -- in terms of lost output (from older workers not being in the workforce), lower tax base (from having a smaller proportion of people in the workforce) and increased social security expenditure for older people who do not have enough financial means to live by (before and after they reach Age Pension qualification age[1]).

The government's preferred solution to this is to grow the economy more quickly via increases in labour force participation and productivity (Treasury, 2004). Since labour force participation rates respond to incentives, it further stated that it is important that government policies on income support, tax arrangements and retirement incomes do not discourage people from participating.

This paper aims to empirically assess whether the social security benefit, Mature Age Allowance, provides an incentive to older workers to withdraw from the labour force. MAA is the benefit for eligible unemployed people aged between 60 and 65. This paper will also outline the theoretical framework underpinning the choice of early retirement (non-participation among older workers), from both the demand and supply side perspectives. That is, factors influencing the individual's choice to work (supply side) and the market condition for the labour the individual is willing to supply (demand side) will be analysed.

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[1] To qualify for the Age Pension a male must be aged 65 years, while the age at which a female may qualify is being increased gradually to 65 years between 1 July 1995 and 2014. Currently, the Age Pension qualification age is 62.5 years for women (those born on 1 July 1941 to 31 December 1942 qualify when they reach 62.5).

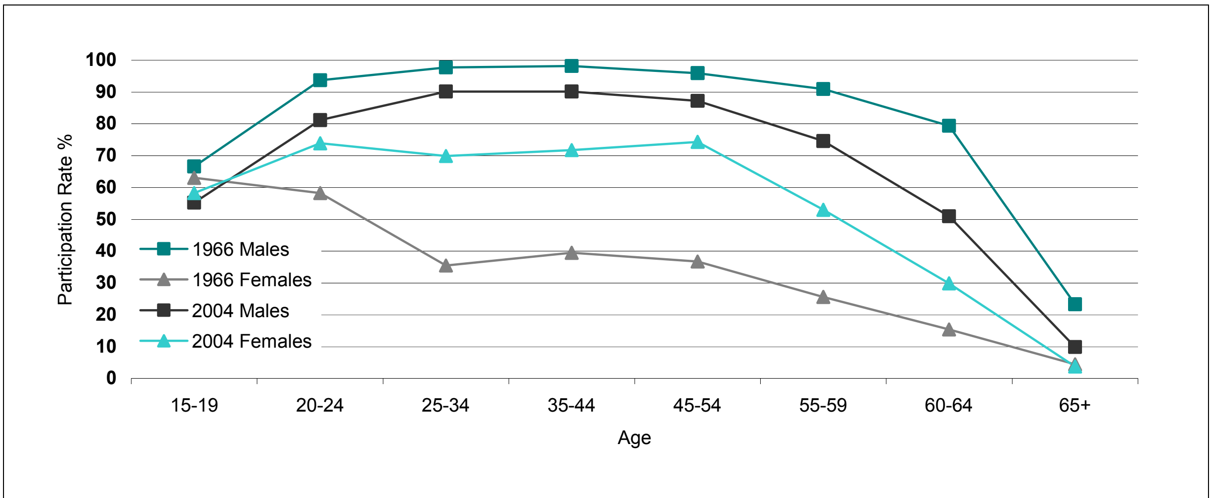
2 Background

2.1 Labour force participation rate trends

Over the 1966 to 2003 period, the proportion of male Australians participating in the workforce declined while the proportion of women in the workforce increased (Figure 1). Figure 1 shows that for all age cohorts, the labour force participation rate (LFPR) of males in 1966 were always higher than those of their counterparts in 2003. For example, at the peak participation ages of 35-44, virtually all males in this age cohort in 1966 were participating in the labour market, at 98.1 per cent, compared to 90 per cent of same-aged males in 2003.

Females on the other hand, exhibited a trend opposite to that for males, with 2003 witnessing higher LFPRs across most age cohorts than those of females in 1966. With child bearing and caring responsibilities influencing their LFPR, the peak occurs around the age of 45 to 54. This age cohort in 1966 only had 37 per cent participating in the labour market compared to 73 per cent in 2003.

Figure 1 **Male and female total participation rates (full-time and part-time) in 1966 and 2004**



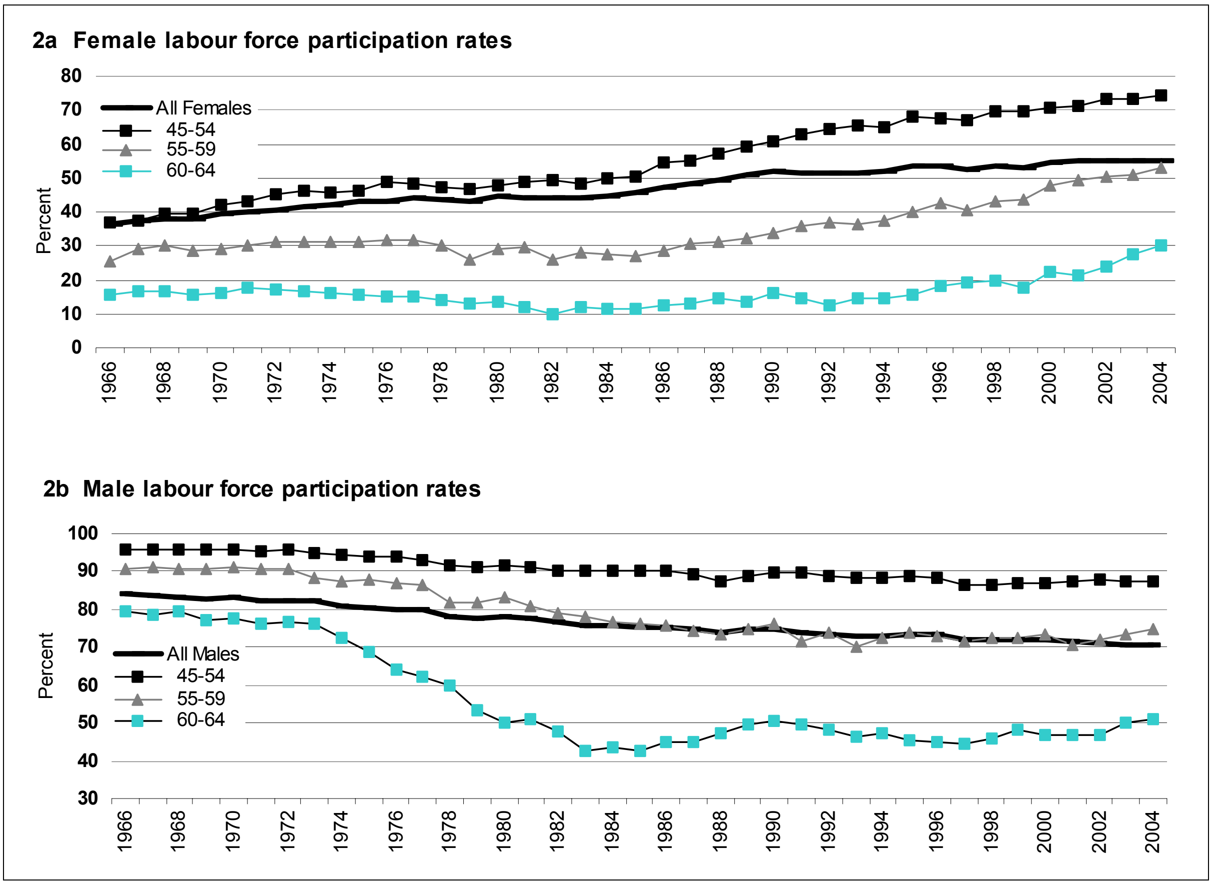
Data source: ABS Catalogue 6291.0.40.001 Labour Force, Selected Summary Tables, Australia

Figure 1 also shows the rapid decline in LFPRs as older Australians reach their mid-50s, in 2003, indicating early retirement behaviour. This decline in LFPR means that workers in their 50s tend to detach themselves from the workforce (that is, they tend to stop looking for work altogether) if they lose or leave their jobs before the standard retirement age of 65.

While complete withdrawals from the workforce before 65 are more common in recent years than it was four decades ago for both males and females (in Figure 1, steep descent in the plots of LFPRs of males and females as they reach mid-50s), examination of the LFPRs of both males and females over time suggests that there was a marked change towards complete withdrawals among males. Males increasingly withdrew from the workforce well before the standard retirement age whereas females have basically maintained their pattern of early retirement.

Figures 2a and 2b show that the gaps in participation rates between the 45-54 age cohorts and the 55 and older age cohorts widened from mid-1960s towards the 1990s and started stabilising since the early 1990s. However, the stories behind this pattern slightly differ between sexes. The LFPR of all the older female cohorts increased. But with the participation rate of the 45-54 age cohort increasing the fastest (Figure 2a), a comparison of the LFPR of this cohort with the LFPR of females aged 55 and above, in a particular year (as in Figure 1) – as opposed to comparison of LFPRs of cohorts over time (as in Figure 2a) --- will show a steep decline in LFPR as females reach mid-50s. That is, the significant increase in LFPR of females in the 45-54 group relative to the increase in LFPR of females 55 and above, made it appear in Figure 1 that there were a lot more women dropping off the labour force as soon as they reached their mid-50s in recent years than there were in the 1960s, when the LFPR rates of those aged 55 and over slightly increased from 1966 to 2002 (as shown in Figure 2a).

Figure 2 **Labour force participation rates by sex, 45-64 age cohorts, 1966-2004**



Data source: ABS Catalogue 6291.0.40.001 Labour Force, Selected Summary Tables, Australia

And among these older males participating in the labour force, there was also an increase in the proportion of part-timers. As table 1 shows, between 1978 and 2004, the proportion of part-time participants in the male labour force, aged 60 to 64, increased from 8.8 per cent to 23.9 per cent; the figures for the 55-59 age cohort between 1978 and 2004, were 3.9 per cent and 12.7 per cent, respectively.

Table 1 **Older male labour force participation status by age cohort, 1978 and 2004**

	Employed(FT)+ Unemployed(FT) (%)	Employed(PT)+ Unemployed(PT) (%)	Labour Force (%)
August 1978			
45 - 54	97.6	2.3	100
55 - 59	96.1	3.9	100
60 - 64	91.2	8.8	100
65+	62.0	37.9	100
August 2004			
45 - 54	91.7	8.3	100
55 - 59	87.3	12.7	100

60 - 64	76.0	23.9	100
65+	56.1	43.9	100

Source: ABS Catalogue 6291.0.55.001 Labour Force, Australia (Electronic delivery)

These part-time workers would include those who used to be in full-time employment and decided to ease into retirement through a period of part-time employment prior to completely leaving the labour force permanently.

2.2 Social security for older workers

Once out of employment, older people often have less success in getting re-employed than younger jobseekers and are therefore at risk of remaining unemployed for a long time. In November 2003, among unemployed 45-54 year olds almost half were long-term unemployed (i.e. had been unemployed for 52 weeks or more) more than double the proportion of long-term unemployed among all unemployed people, at 23 per cent (ABS 2004). This increases their level of dependence on income support prior to age pension age. Thirty per cent of people aged 50 to 64 depend on income support payments (COTA, 2003).

Mature age males, below age pension age, who are out of work mainly apply for two social security payments: the Disability Support Pension (DSP)[2] for those incapacitated to work; and Mature Age Allowance (MAA)[3] for long-term unemployed aged between 60 and 65. Table 2 shows that over the 1989-2000 period

[2] To be eligible for DSP, a person must have a permanent physical, intellectual or psychiatric impairment of at least 20 points and unable to do work (or be re-skilled for work) for at least 30 hours per week at award wages for at least the next two years because of that impairment; or be permanently blind. Disability Support Pension applicants are subjected to income and assets tests under pensions rules. Under the income test, income above a free area is assessed. For every dollar each fortnight in excess of this income test free area, 40 cents are deducted from the maximum pension amount. Similarly, under the assets test, assets over the assets test threshold are assessed. The asset test thresholds vary depending on whether the applicants are homeowners or not. For every $1000 in excess of the threshold, $3 a fortnight is deducted from the maximum pension amount. The test, which gives the biggest deduction from the maximum pension amount, applies.

[3] MAA was instituted in March 1994 as an interim measure to help long-term unemployed mature-aged workers facing difficulties finding work in a tight labour market. From 1 July 1996, MAA was modified and became a permanent payment. Prior to 20 September 2003, MA Allowees were not required to actively look for work or participate in training activities. Under current arrangements, MAA customers aged between 50 and Age Pension age are invited to see a Personal Adviser who will help them develop a workforce participation plan. MAA granted before 1 July 1996 are subjected to income and assets tests under pensions rules. Those granted after this date are subjected to income and assets tests under benefits (allowance) rules.

the proportion of males aged 50-64 who received DSP increased from 28.6 per cent to 34.2 per cent. MAA recipients increased from 7.9 per cent to 9.7 from when it was instituted in 1994 to 2000.

Table 2 **Older males receiving DSP and MAA, 1989, 1994 and 2000 (% of Civilian Population)**

	DSP 50-59	DSP 60-64	MAA 60-64
1989	9.1	19.5	n.a.
1994	10.1	25.5	7.9
2000	10.5	23.7	9.7

Note: MAA was introduced in 1994. Only those aged 60 and over are eligible for MAA.

Source: Bond and Wang, 2001; DFaCS 2002; and ABS Catalogue 6291.0.55.001 Labour Force, Australia (Electronic delivery)

3 Factors influencing early retirement: a theoretical framework

Many factors have been advanced to explain the early retirement patterns among older males in the past three decades. Explanations put forward in the Australian literature are divided into two camps. The "supply-side" advocates (Hughes 1984; Merrilees 1986,1982; Ryan and Williams 1984; BLMR 1983; Miller 1983) argue that the decline in LFPR stems from the workers' preference not to supply labour[4]. Factors influencing individual preferences include personal characteristics such as age, education, health and financial characteristics such as wealth, income and social security benefits.

Other explanations take a "demand-side" orientation (Biddle, Burgess and O'Brien 2002; O'Brien 2001; Stricker and Sheehan 1981) attributing the fall in labour force participation to weaker demand for older workers' labour compared to demand for younger workers' labour (structural unemployment) especially in times of recession (cyclical unemployment)[5]. With prolonged experience of unsuccessfully finding a job, older workers can become resigned to failure and stop searching for jobs, withdrawing from the workforce altogether – the so-called discouraged worker effect. The unemployment rate and the ratio of prime age workers to older workers are variables commonly used to capture labour demand conditions.

Retirement models are usually cast in a life-cycle framework, reflecting the fact that the eventual withdrawal from the workforce is planned over many years. In a life-

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[4] The work-leisure choice conceptual framework underpins the labour supply theory, stating that the decision to retire (not to supply labour) stems from an individual's preference over having some non-work activities and some work activities to purchase consumption goods, given available time and income. The extent to which an individual is willing to trade-off leisure units and consumption goods is represented by his indifference curve. This curve is usually assumed to be a function of age, education, marital status and number of children. The available budget/income is made up of both labour and non-labour income. These personal and financial characteristics determine the minimum wage one would be willing to accept to supply labour (the reservation wage).

[5] The labour demand theory states that a firm will choose that labour (variable input) which is cost-effective (cost-minimising) given other fixed inputs and the output it needs to achieve. On the assumption that younger workers have a comparative advantage in producing outputs using highly technological capital inputs (while older workers have a comparative advantage in making use of their lengthy professional experience) and that the labour of younger workers is relatively cheaper compared to that of older workers (given seniority/experience in firm), a firm with highly technological inputs chooses to maximise its profit by employing relatively more younger workers. Displacement of older workers can happen, especially in times of recession.

cycle model of labour supply, the individual forms a long-term plan of consumption and work that maximises his utility, over the remaining lifespan. Utility is a function of the consumption of goods and non-work (leisure) or retirement years. The decision depends on one's preference for retirement over consumption goods, on the one hand, and the income opportunities one faces.

On the supply side, the base theoretical framework underpinning retirement decision will be discussed first. Variations of this framework will be presented for three groups of early retirees: those workers who are retiring early due to substantial wealth, those workers who are retiring early due to existence of social security benefits and those workers who are retiring as work can not be found. In response to the social security policy, the second group engages in a behaviour that results in an externality. Given their behaviour being a policy-induced externality, they will be referred to as the PIE group. While the last group seems to be motivated by demand side condition, it is their decision to supply labour in the face of this condition that will be presented in the framework. They tend to initially maintain marginal attachment to the workforce and then ultimately decide to retire from sheer discouragement.

On the demand side, the economic advantages of hiring young workers over older workers will be discussed. It aims to provide the theoretical grounding for most discussions in the literature relating to the displacement of older workers by younger workers, both on the grounds of cost of hiring young workers and their comparative advantage in using highly-technological processes of production.

On the assumption that younger workers have a comparative advantage in producing outputs using highly technological capital inputs (while older workers have a comparative advantage in making use of their lengthy professional experience) and that the labour of younger workers is relatively cheaper compared to that of older workers (given seniority/experience in firm), it would be cost-saving for a firm with highly technological inputs to choose to maximise its profit by employing relatively more younger workers. Especially in times of recession, displacement of older workers can happen.

3.1 Theoretical framework of retirement – labour supply side

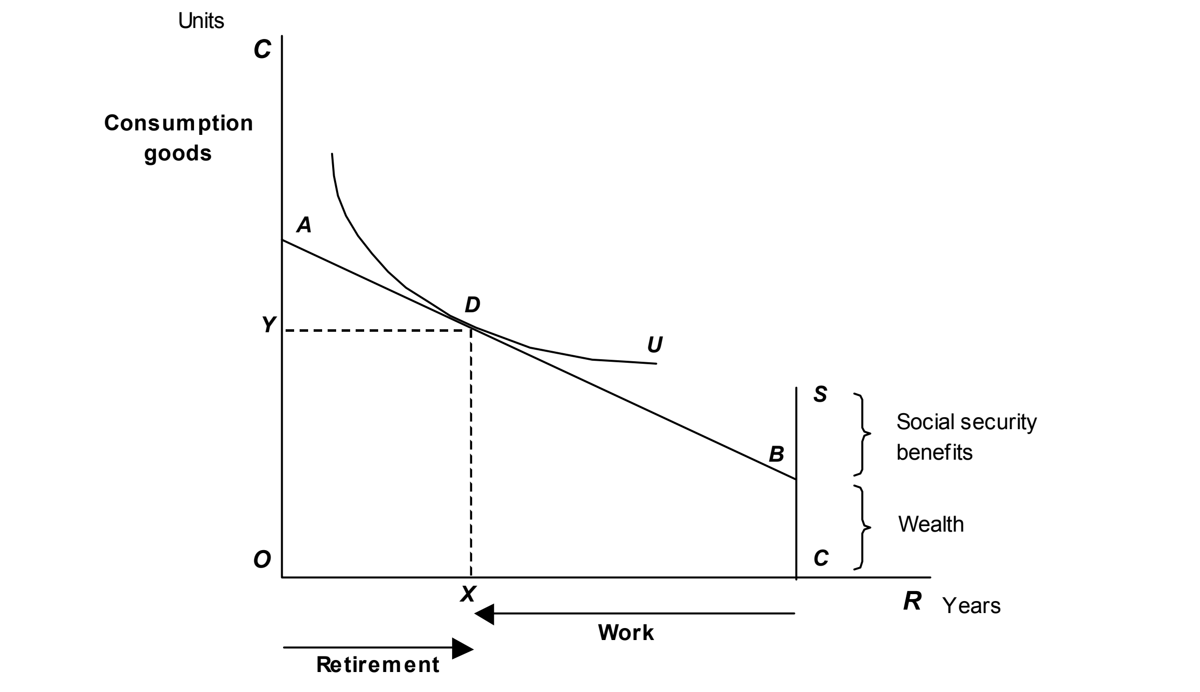
Base framework

The decision to retire stems from the problem of how one allocates his remaining lifespan between work and retirement years at year *t*. The decision is made on whether to retire or not by comparing the utility from retiring that year (retirement state) with the utility from postponing retirement another year (non-retirement state). The extent to which an individual is willing to trade-off leisure (non-work) units *R* and consumption of goods (through working) *C*, at year *t*, is represented by his intertemporal utility function, depicted as the indifference curve *U* in Figure 3. *U* embodies one's preference for non-work activity over consumption goods. The steeper this is, the stronger the preference for retirement; the flatter it is, the stronger the preference for consumption goods. The higher *U* is, the greater utility or satisfaction it gives.

However, in maximising her utility, she is faced with a set of constraints as shown in Figure 3 – one representing the income constraint at retirement state *AB* and the other the income constraint at the non-retirement state *SC*. The income constraint, *ABSC*, is an intertemporal budget set, made up of possibly three components: the present discounted value of labour income from another year of work, if she were to work for another year *AB*, the present discounted value of investment income *BC* and the present discounted value of social security benefits if she were entitled to, *SB*.

The final decision of whether to retire or not depends on whether *U* cuts *SC* above or below point S. If *U* cuts *SC* below *S*, then a higher utility level can be had by retiring -- in which case the higher *U* becomes tangent to the intertemporal budget constraint at *S*. Figure 3 is drawn in such a way that the individual is better off not retiring, as a *U* curve higher than the one tangent to the intertemporal budget constraint at *D*, is not possible.

Figure 3 **Graphical illustration of the retirement decision**



Theoretical frameworks for the three groups of retirees

The situation of the three groups of early retirees will be presented in a stylised way. For the first group of wealthy retirees, their budget constraint will just be made up of the segment ABC. With their wealth (accumulated through savings while working and bequests), they will not be eligible for any social security benefit. In this case, their decision to retire is mainly governed by their wealth levels and preference for non-work units, *R*, over consumption goods *C* (whether they have a steep indifference curve). Figure 4a shows that if they did not have any wealth or source of retirement income, they would work for some hours, *X*, and have *Y*-worth of consumption goods. With their substantial amount of wealth, their inter-temporal budget constraint is pushed upwards from *ABC* to *A′WC*. With this change in the budget constraint, a higher indifference curve *U′* is now feasible. At *D′*, they are better off and are able to have *Y′*-worth of consumption goods while not working at all.

Retirees in the PIE group, on the other hand, are mainly driven by the social security benefits and their general preference for *R* over *C* (steeper indifference curve). If they were not eligible for any social security benefit, they would be working for some hours *X* and consuming *Y*-worth of goods (Figure 4b). Eligibility for some social security benefit adds the SB segment to the income constraint, making it possible for them to reach a higher indifference curve *U′*. At *D′*, they are better off and are able to have *Y′*-worth of consumption goods.

Discouraged older workers who decide to retire face the budget constraint *SBC* (Figure 4c). With little or no chance of finding work, their budget constraint does not have a segment that represents discounted present value of future labour income. With this budget constraint, it does not matter whether they prefer to work (flatter indifference curve) or not (steeper indifference curve). They do not have a choice but to retire.

Hence for all the groups, the objective is to maximise

$$U = F(C, R) \qquad \text{(eq.1)}$$

where *C* is the discounted present value of future labour income in terms of amount of consumption goods for their remaining lifespan and *R* the number of retirement (non-work) years. *R* is constrained by the lifespan one expects to have

$$R = T - W \qquad \text{(eq.2)}$$

where *T* is the age one expects to live to and *W* the number of work years.

The amount of consumption goods they can obtain is constrained by the total income available during their remaining lifespan. Total income is comprised of labour income LY and other income OY (investment and social security benefits).

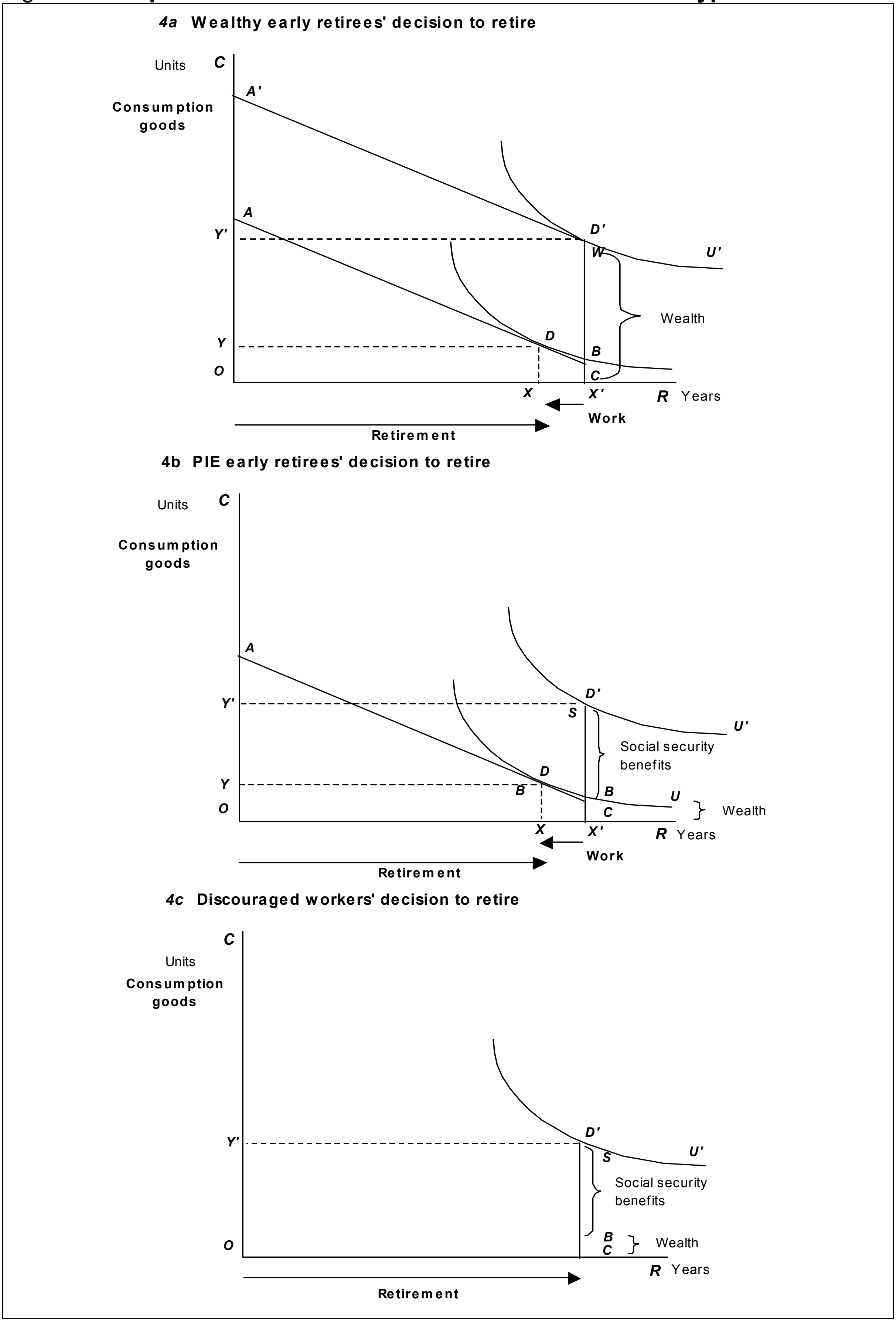
$$Y = LY + OY \qquad \text{(eq.3)}$$

If they have any chance of finding work, then their discounted present value of labour income if they were to work another year, at time, *t*, is

$$LY = \rho[(1+\delta)^{-1}(1-s)w_{t+1}] \qquad \text{(eq.4)}$$

where ρ is the probability of finding work, δ is a discount factor representing their time preference and expectations about mortality, s is the portion saved and w is the annual wages. The discouraged workers have $\rho=0$.

Figure 4 **Graphical illustration of retirement decision – three types of retirees**



The discounted present value of other income is

$$OY = \rho(1+\delta)^{-1} sw_{t+1} + \sum_{t=0}^{T}(1+\delta)^{-t}[Inv + SS] \quad \text{(eq.5)}$$

where *Inv* is the value of the stream of future investment income as at decision-making period *t* and *SS* the value of the stream of social security benefits one is eligible to for the remaining lifespan including the benefit for the first year had he worked. *Inv* is purchased through savings accumulated while working and bequests. Additional investment income can be accumulated through savings from another year's worth of labour income, if one were to work, as represented by the first term of eq. 5.

3.2 Theoretical framework of retirement – labour demand side

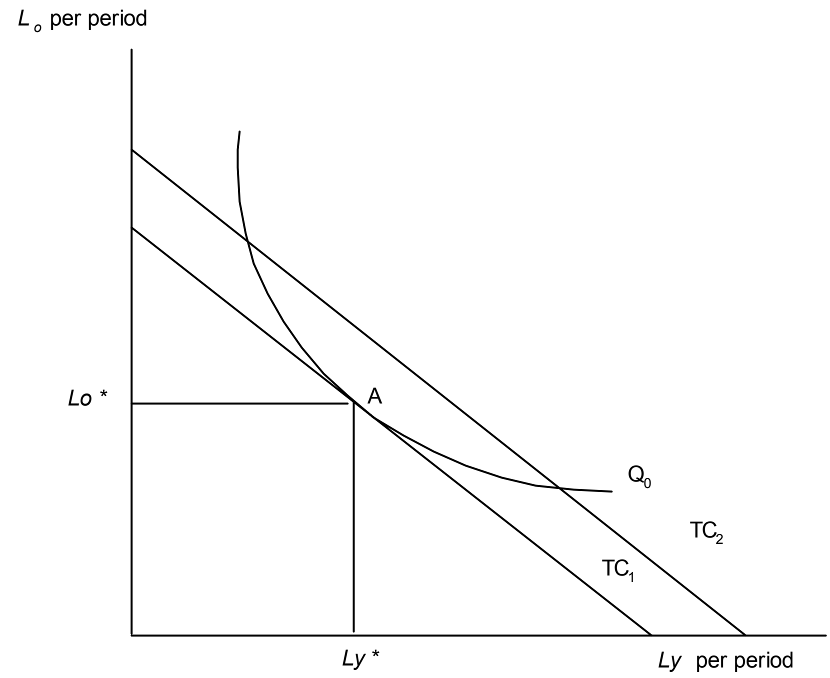
The old workers' employment outcome not only depends on their willingness to supply labour but on the existence of demand for their labour. A firm can maximise profits by either maximising output given its cost function or minimising costs given its production function. Since the interest is in determining the impact of output constraints (constrained economic activity) on labour demand, the cost minimising approach rather than that of output maximisation will be used as basis for the theoretical framework. For a given level of output, the firm will choose that labour which is cost-effective.

From the firm's point of view, it will hire labour to the extent that the extra labour units increase its profits. The labour demand theory states that a firm will choose that labour (variable input) which is cost-effective (cost-minimising) given the other fixed inputs and the output it wants to achieve.

Consider a firm with two factors it can vary, labour of younger workers (L_y) and labour of older workers (L_o), and a fixed amount of capital. For a given level of output, a firm can use different combinations of L_y and L_o. Each type of labour has its comparative advantage and hence cannot be a full substitute for the other. Younger workers are assumed to produce more output units per unit of high-technology capital (eg computer usage). On the other hand, older workers are assumed to have gained valuable professional experience over the years (eg corporate knowledge). As more of L_y is used to replace L_o, diminishing marginal returns occur and vice versa.

For a given level of output, the set of combinations of L_y and L_o that a firm can use is represented by the firm's isoquant, Q_o (Figure 5). The slope of the isoquant shows the rate at which L_y can be substituted for L_o while keeping output fixed, or the rate of technical substitution (RTS). The rate at which these inputs are traded in the market is represented by wage of younger workers to wage of older workers ratio, the slope of *TC*.

Figure 5 **Firm's choice of labour units to minimise costs given desired output**



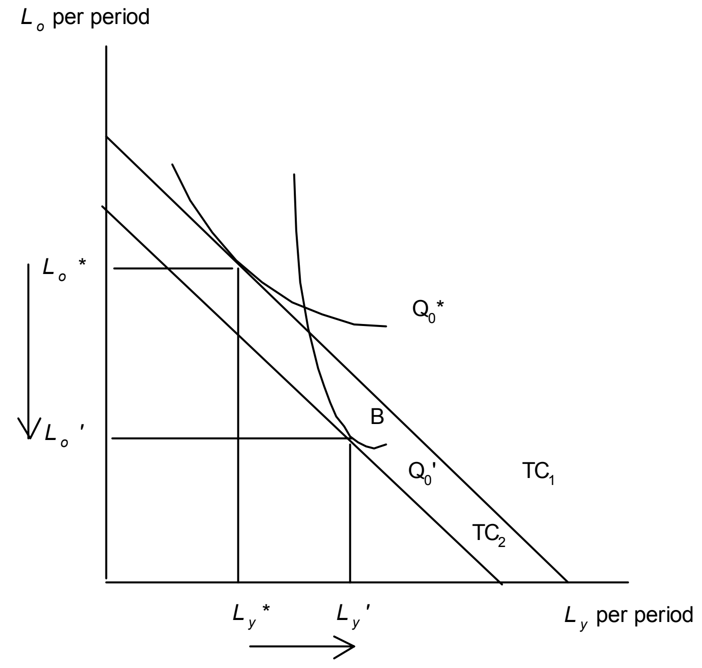
In order to minimise the cost of producing a given level of output, the firm should choose that point on the isoquant for that level of output at which the RTS of L_y for L_o is equal to the ratio of wage of older workers to wage of young workers (*w/v*). That is, for its desired output $Q_o=f(L_o,L_y)$, the firm will seek to minimize total costs, $TC=wL_y+vL_o$.

In Figure 5, this is shown at pt *A*, the point of tangency between the isoquant and the cost line, TC_1. At A, the firm equates the rate at which L_o can be traded for L_y in the productive process to the rate at which they can be traded in the marketplace. At this point too, the firm has hired additional units of each factor of production up to the point at which the extra revenue yielded by hiring one more unit is equal to the extra cost of hiring that unit. Say for labour, its marginal revenue product is equal to *w*. That is, a profit-maximising demand for labour depends both on how productive the person is in producing goods (and thereby yielding revenue to the firm), and on how hiring of inputs affects costs.

Theoretically, a firm will tend to substitute younger workers for older workers if the former can produce more outputs per unit of capital and/or relatively cheaper to hire than the older workers.

Figure 6 shows the impact on mixture of labour inputs if capital/technology which younger workers have comparative advantage in using is adopted by the firm. The steeper isoquant Q_o' depicts the L_y and L_o combinations the firm can use with the new technology, to produce the same level of output as that achieved prior to the introduction of the new technology. It is steeper as the firm will have to forego more units of labour of older workers to obtain a unit of labour of younger workers to maintain its output at the new isoquant.

Figure 6 **Firm's choice of labour mix given younger workers produce more output per unit of capital**

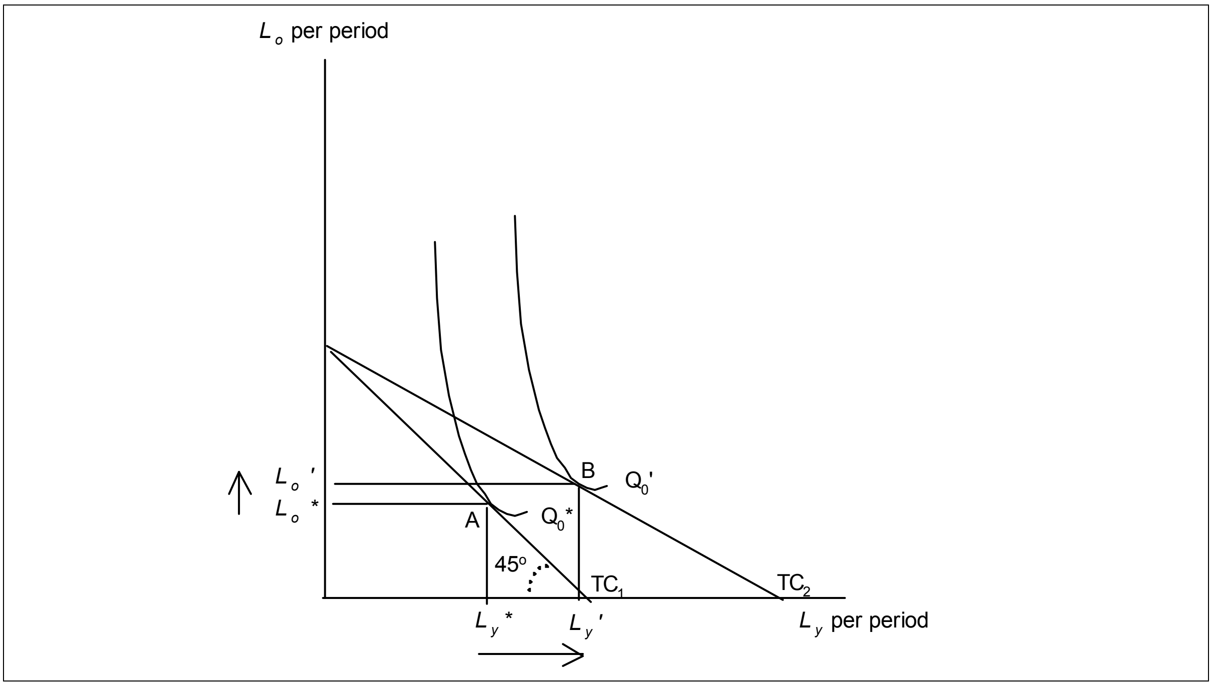


The intersection of Q_o* and Q_o' shows that same output levels can be obtained before and after the introduction of the new technology. However, with the new technology the firm will be operating at a lower cost TC_2. At the new tangency *B*, the firm will use more of the labour of younger workers (L_y'– L_y*) and less of the labour of the older workers (L_o* - L_o').

Figure 7 shows the impact of the availability of relatively cheaper labour of young workers on the mixture of labour inputs. Compared to TC_1, at which both labour inputs are paid the same wage rates (TC_1 at 45-degree angle to *X* axis), TC_2 depicts the more realistic scenario in which younger workers (eg new recruits) are paid relatively lower wages than the older workers.

Depending on the shape of the isoquants, the firm can hire more of both inputs. The cheaper price of L_y encourages firms to replace some older workers with younger workers (substitution effect) while the improved financial situation of the firm -- due to the relatively cheaper price of L_y -- can encourage it to also purchase more labour of older workers (income effect) as well as labour of younger workers. The steeper the isoquant (as in Q_o' in Figure 6), the more likely that the increase in L_y will be bigger than that in L_o (greater substitution effect). That is, with a technology / capital better used conjunctively with L_y, the relatively cheaper L_y can bring about relative displacement of older workers with younger workers.

Figure 7 **Firm's choice of labour mix given relatively cheaper labour cost of younger workers compared to older workers**



4 Strategy for evaluating the impact of Mature Age Allowance

It has been said that compared to the US, Australia's retirement income arrangements provide greater disincentives to labour force participation (Borowski 1988, p. 65). This section discusses the strategy for assessing the impact of MAA on early retirement in Australia, that is, whether receipt of MAA benefits does provide some disincentive to labour force participation.

Having defined early retirement as retirement before the age of 65, the role of MAA on this retirement decision was chosen because MAA could only be made available to older people aged between 60 and 64. Moreover, prior to 2003, MAA recipients have not been required to seriously look for a job, unlike the younger unemployed people on Newstart Allowance. This change would have made it easier for MAA recipients to consider withdrawing from the workforce altogether compared to the NSA recipients (ie MAA is providing an incentive for workforce withdrawal).

The objective is to evaluate the effect of MAA (the treatment) on an individual's outcome, Y_i, in our case, non-participation in the labour force. Ideally, the impact of MAA on retirement can be estimated if data exist on both the pre-treatment (Y_i*) and post-treatment (Y_i**) outcomes of an individual – respectively, the participation status before receiving MAA and the participation status after receiving MAA. This means that the impact of participating in MAA on a given person's retirement decision (non-participation) consists of the difference it makes to their decision. The treatment effect, α, for any individual i will be then given by

$$Y_i^{**} - Y_i^{*} = \alpha \qquad \text{(eq.6)}$$

The difficulty lies in the fact that we do not observe both pre and post-treatment outcomes for each individual. We only have the participation outcome of those who received MAA payments (treatment group) as post-treatment data and the participation outcome of those who did not receive MAA payments (control group) as pre-treatment data. These data are the pre and post-treatment outcomes for different individuals. That is, we are only able to estimate

$$\tilde{\alpha} = E(Y_i^{**} \mid d_i = 1) - E(Y_i^{*} \mid d_i = 0) \qquad \text{(eq.7)}$$

where d_i is a dummy variable indicating whether an individual has received MAA (takes a value of 1) or not (takes a value of 0). That is, if we had the ideal data, we would be able to estimate

$$\hat{\alpha} = E(Y_i^{**} \mid d_i = 1) - E(Y_i^{*} \mid d_i = 1) \qquad \text{(eq.8)}$$

If we could only observe the non-participation outcomes of MAA recipients prior to receiving MAA – their unobservable Y_i* -- then we would have the ideal pre-treatment outcomes that we could compare to their non-participation outcomes after receiving MAA. We would be able to estimate the difference MAA receipt made to their non-participation or retirement decision since we have both the pre- and post-treatment outcomes of those who received treatment.

The treatment effect estimate produced by (eq 7) will only be unbiased or equal to that produced by (eq 8) if

$$E(Y_i^* \mid d_i = 0) = E(Y_i^* \mid d_i = 1) \qquad \text{(eq.9)}$$

That is, the average pre-treatment outcomes of those who did not receive treatment and those who did receive treatment are the same. Those who are in the control group would on average arrive at the same retirement/non-participation decision as the average decision that would have been obtained by the treatment group, if the latter had not received any MAA payments at all.

However, it is not implausible to think that MAA recipients would more likely prefer to retire than the non-recipients – a violation of assumption (9). That is, initial outcomes (prior to treatment) may be systematically (vis-à-vis randomly) heterogenous between the two groups or there is *selection effect*. Regression-based approaches should provide a consistent estimate of the treatment effect, α, if the variation in the untreated outcomes of both treatment and control groups can be captured by observable characteristics.

$$E\left[Y_i^* \mid x_i\right] = \delta + \beta x_i$$

where x_i is a set of observable individual characteristics. This implies

$$Y_i^* = \delta + \beta x_i + \mu_i$$

If μ_i are random so that $E\left[\mu_i \middle| d_i = 1\right] = E\left[\mu_i = 0\right] = E\left[\mu_i\right] = 0,$ then from (eq 6)

$$Y_i^{**} = \delta + \alpha d_i + \beta x_i + \mu_i \qquad \text{(eq.10)}$$

OLS estimation of equation (10) should then give a consistent estimate of, α, if x_i includes all the variables affecting both participation and outcomes in the absence of participation. This is the conditional mean independence assumption which is a weaker assumption than the strict independence assumption (9) because

$$E(Y_i^* \mid d_i = 0, x_i) = E(Y_i^* \mid d_i = 1, x_i) \qquad \text{(eq.11)}$$

That is, untreated outcomes do not vary systematically between treatment and control groups once differences in observable characteristics x are controlled for.

However estimation of equation (11) using OLS can still produce biased estimates of a. This is because, with OLS, the assumption is that both participants in the MAA and non-participants have exactly the same X vectors, making α the pure effect of participation on the outcome variable, Y. This is the so-called common support condition. The bias in the estimates comes from failing to satisfy this condition (Heckman, Ichimura and Todd 1997). That is, in the sample one is dealing with, there may be participants in the MAA who have no common observable characteristics with the non-participants in the MAA. The method of matching is going to be used to address this problem. The following section discusses this.

4.1 Propensity score matching

It is, thus, important to be able to identify those non-participants in the MAA program, who are very much alike the MAA participants (treatment group) in terms of observable characteristics, except for the fact that the treatment group received MAA and the non-participants did not. Once identified, these non-participants in the MAA will form the appropriate counterfactual group (control group).

In the literature on program evaluation (Rosenbaum and Rubin, 1983 and Dehejia and Wahba, 2002), counterfactuals are recovered using matching methods to satisfy the common support condition. Similar to regression analysis, matching methods assume selection (the systematic heterogeneity in untreated outcomes) is based on observable characteristics, x. Rosenbaum and Rubin (1983) developed "propensity score" matching in which participants and non-participants are matched using a vector of observed characteristics. In propensity score matching, matching on x is undertaken by matching on $P(x)$, where $P(x)=Pr(d=1|x)$, the estimated probability of being treated. This makes matching individuals tractable given that individuals may differ in many dimensions.

So we could closely estimate equation 8 addressing possible selection bias and common support problems, the participation outcomes of the counterfactuals, $Y_i{}'$ will be used as data points for the unobservable Y_i^*,

$$\overline{\alpha} = E(Y_i^{**} - Y_i^{'} \mid \Pr(x), d = 1) \qquad \text{(eq.12)}$$

The matching with replacement method will be used, where each treatment unit will be matched to the nearest counterfactual unit, based on their propensity scores, even if this counterfactual unit has already been matched once. Comparison units within a pre-defined propensity score radius of .01 (or "caliper") will be used. The advantage of this is that it allows for the use of extra (fewer) units when good matches are (not) available (Dehejia and Wahba 2002).

4.2 Difference-in-differences

However, the counterfactuals could indeed have different untreated outcomes from those in the treatment group due to characteristics that are not observable. For example, if counterfactuals come from a different age cohort, the matching method will not be able to capture any systematic heterogeneity if they were recovered to match their treated counterparts based on observable characteristics x. For example, given observable characteristics are the same between older and younger age cohorts, older age cohorts may have a greater (unobservable) tendency to retire (leave the labour force) and apply for MAA.

To remove this unobserved heterogeneity between the treatment and control groups, the difference-in-differences method will be used to net out any pre-existing differences prior to program implementation between the treatment and control groups from the difference between their outcomes after program implementation, to make α the pure effect of program participation. Practitioners in the field have combined both propensity score matching and difference-in-differences methods to cover both selection on observables and unobservables (Meng and Ryan 2003 and Blundell and Costa Dias 2000). Since the unobservable heterogeneity in their untreated outcomes is due to the difference in their age cohorts, we have to find groups that belong to the respective age cohorts of the treatment and control groups. Since their participation outcomes will represent any pre-existing program participation tendencies of the treatment and the counterfactuals, these groups will have to be like the treatment and the counterfactuals – they would have been treated (based on observable characteristics), but did not receive any treatment.

For example, if $Y_{i\ 60\text{-}64T}^{**}$ represents the participation outcome of MAA recipients aged 60-64 and $Y_{i\ 50\text{-}59T}'$ represents the participation outcome of their counterfactuals in the 55-59 age cohort, then $Y_{i\ 60\text{-}64NT}^{**}$ will represent the participation outcome of non-MAA recipients aged 60-64 (whose propensity scores are close to the propensity scores of the MAA recipients) and $Y_{i\ 55\text{-}59NT}'$ the participation outcome of their counterfactuals in the 55-59 age cohort. The treatment effect then is estimated as

$$\overline{\alpha} = E[(Y_{i60-64T}^{**} - Y_{i50-59T}^{'}) - (Y_{i60-64NT}^{**} - Y_{i50-59NT}^{'}) \mid \Pr(x), d = 1] \qquad \text{(eq.13)}$$

The estimator consists of the difference in workforce participation outcomes between the treated and their counterfactuals after program implementation, net of any pre-existing differences in their workforce participation outcomes prior to program implementation, hence the name "difference-in-differences".

4.3 The Data

Household, Income and Labour Dynamics in Australia (HILDA) Survey

HILDA is a household-based panel survey funded by the Commonwealth Department through the Department of Family and Community Services. HILDA Wave 2 used in this research was collected over an eight-month period beginning late August 2002. There were 710 male respondents to the HILDA survey, aged 55-64. This sample represented 856,140 males in 2002 (around 88 per cent of ABS' estimated population). There were 27 male respondents aged 60 to 64 who received Mature Age Allowance in the survey – this represented 32,295 in the population (around 83 per cent of the actual number of recipients during this period).

5 Results

Those who received MAA comprised the treated group. Initially, those Australian males aged 60-64 who did not receive MAA were thought as a possible control group. They belong to the same age cohort as the treated group (those who qualified for MAA), and hence unobservable cohort differences need not be differenced out. However, the fact that this group is more likely to have higher levels of assets and income relative to those of the treated group (hence some of them would have failed to qualify for MAA if they had applied) gives this control group the problem of lack of the common support condition relative to the treated group.

Instead the control group in this study came from the 55-59 age cohort who would have met the eligibility criteria for MAA receipt except for their age (as one needs to be aged 60 and above to qualify for MAA). In forming the control group from the 55-59 age cohort, propensity score matching was used.

5.1 Propensity score matching

In the propensity score matching, a probit equation for assignment into MAA was estimated within the 60-64 age cohort. Table 3 presents the variables included in the probit equation. Overall, the probit statistical model is highly significant[6] – even at a significance level far less than 0.01. That is, the probit model is robust in explaining the likelihood (propensity) of individuals in the sample receiving MAA.

The parameter estimates were used to calculate the probability of being assigned into MAA (ie, the propensity score) for each individual in the 55-59 age cohort. Those in the 55-59 cohort who had similar propensity scores to the propensity scores of the treated group were selected to form the control group.

Table 3 **Probit estimates used in propensity score matching**

Parameter	Estimate	*Standard error*	*Pr > ChiSq*
Intercept	-8.1017	*497.3*	*0.987*
Highest education level achieved			
Year 12	-0.567	*0.6126*	*0.3547*
Certificate	0.0178	*0.3132*	*0.9548*
Diploma	-0.5041	*0.5521*	*0.3612*

[6] The likelihood ratio shows that the data does not support the null hypothesis that all the 25 parameters, jointly, have no impact on the probability of an older worker receiving Mature Age Allowance. The extremely low significance level shows the extremely low probability of falsely rejecting this null hypothesis.

Bachelor	-0.0359	*0.6379*	*0.9551*
Graduate Diploma	-3.8331	*603.1*	*0.9949*
Masters and higher	-4.1133	*469.1*	*0.993*
Unemployed	1.6531	*0.762*	*0.0301*
Not in the labour force	0.4017	*0.3973*	*0.3119*
Weeks without a job	0.00009	*0.000679*	*0.8945*
Total number of weeks in paid work	-0.00017	*0.000586*	*0.773*
Has long-term health condition/disability	-0.0883	*0.3533*	*0.8027*
General Health (scale: 0-100)	0.0296	*0.00895*	*0.0009*
Buying house/paying off mortgage	-1.7261	*0.9655*	*0.0738*
Own a house	-0.2649	*0.3202*	*0.408*
Living in major city	4.6294	*497.3*	*0.9926*
Living in inner regional city	4.9674	*497.3*	*0.992*
Living in outer regional city	4.666	*497.3*	*0.9925*
Net personal assets	-5.04E-07	*1.23E-06*	*6.82E-01*
Total private income	-0.00003	*1.70E-05*	*0.1268*
Government pensions (Australian & foreign)	0.000147	*3.50E-05*	*<.0001*
Decile of Index of Economic Resource	-0.141	*0.1073*	*0.1891*
Decile of Index of Education & Occupation	-0.00831	*0.1139*	*0.9418*
Decile of Index of Socio-Economic Disadvantage	0.1809	*0.1161*	*0.119*
Living in lone person household	-0.8606	*0.4848*	*0.0758*
Living in multiple person household	-0.468	*0.373*	*0.2095*
	Test Value	*5% Crit Value*	*Pr > ChiSq*
₋ikelihood ratio (chi-square)	77.9	37.6	*<.0001*

Propensity score matching facilitated recovery of a control group from the 55-59 age cohort that was more alike the recipients of MAA, than the non-recipients of MAA. As can be seen from Table 4 in terms of characteristics relevant to the selection into MAA[7], the control group from the 55-59 age cohort have a lot more in common with the treatment group than the non-MAA recipients in the 60-64 age group. Age, personal income and assets and time without a job essentially form the eligibility criteria for MAA. The 5-year difference between the mean ages of the treatment and the control groups just captured the age cohort difference between the two groups – if they did not belong to different cohorts their mean ages would be the same.

[7] To be eligible for MAA in 2002, applicants need to be:

- 60 and over but less than Age Pension age of 65 for males
- have not worked for at least 20 hours a week for a total of 13 weeks or more in the 12 months before claiming; and
- have passed the income and assets tests (see footnote 3)

Table 4 **Selected characteristics of Australian males in the treatment and control group, HILDA 2002**

Variable	Treatment (MAA, 60-64)		Control (55-59)		non-MAA (60-64)	
	Mean	*Std Error*	Mean	*Std Error*	Mean	*Std Error*
Age (years)	62	*0.2*	57	*0.2*	62	*0.1*
% Employed	15.2	*0.1*	22.1	*0.1*	45.0	*0.0*
% Unemployed	7.6	*0.1*	27.8	*0.1*	1.2	*0.0*
% Not in the labour force	77.2	*0.1*	50.1	*0*	53.8	*0.0*
Weeks without a job	321	*55.6*	287	*54.7*	228	*16.6*
Total number of weeks in paid work	2,101 (40 yrs)	*60.6*	1,865 (36 yrs)	*53.1*	2,153 (41 yrs)	*19.9*
% Has long-term health condition/disability	47.5	*0.1*	45.3	*0.1*	44.1	*0.0*
Net personal assets ($)	45,088	*14,110*	53,714	*15,509*	147,604	*15,937*
Total private income ($)	2,264	*1,216*	3,050	*1,829*	23,697	*1,986*
Government pensions (Australian & foreign)	8,609	*548*	9,037	*1321.4*	2,754	*269*
Sample size	27		45		312	
Population	32,300		56,500		369,200	

However, despite these similarities in *observable* characteristics between the control and treatment groups, these two groups may still have differences in *unobservable* characteristics – pre-existing differences that could be differenced out.

5.2 Difference-in-differences

The aim is to arrive at treatment and control groups that are very much alike, in terms of both observable and unobservable characteristics. Given that they were from different cohorts, there is reason to believe that there were pre-existing differences in their labour force participation behaviour prior to receiving MAA. Miller (1983) found that Australians tended to retire at some threshold ages (eg at 55, 60, 65, etc…) at each 5th year between 45 and 75. This indicates that regardless of MAA receipt, the 60-64 age cohort will tend more to retire than those in the 55-59 age cohort. Accordingly, any differences in the labour force participation rates of our treatment and control groups could not be then mainly attributed to MAA – some of these differences could be due to pre-existing cohort differences.

To difference out cohort differences, males aged 60-64 who did not receive MAA but based on their observable characteristics were similar to those who did receive MAA, and their counterfactuals in the 55-59 age cohort were recovered. This cohort difference in their labour force participation outcomes formed the second term in equation 13. This was netted out of the initial difference in the labour force participation rates of the treated and the control groups captured in the first term of equation 13, to estimate the pure treatment effect.

5.3 Treatment effects

Table 5 presents the treatment effects estimates. These results show that relative to their counterfactuals in the 55-59 age cohort, the MAA recipients were slightly less likely to participate in the workforce, with a negative difference of 4 percentage points. However, the lower likelihood of the MAA recipients to participate in the workforce compared to those in the control group was insignificant compared to the large negative difference in the participation outcomes between these two age cohorts. Belonging to a cohort which have reached the threshold age of 60 at which workers were found to contemplate on retiring, MAA recipients might just capturing some of that cohort effect.

The last two columns of Table 5 show that the older cohorts were very much less likely to participate than their counterfactuals in the younger age cohort, with a negative difference of 27 percentage points. Netting out this negative magnitude from the negative difference in the participation outcomes of MAA recipients and their counterfactuals made the net effect of MAA on labour force participation positive. The difference-in-difference estimate seems to show that MAA could have the effect of countering this considerably lower participation rate of 60-64 age cohort compared to that of the 55-59 age cohort, increasing the participation rate of 60-64 workers in receipt of MAA by 23 percentage points.

Table 5 **Treatment effects estimates**

	Treatment vs Control (A)		**Cohort difference (B)**		**Difference-in-differences (A-B)**	
	Mean	Std Error	Mean	Std Error	Mean	Std Error
Effect	-0.04	0.1	-0.27	0.04	0.23	0.01
	Treated	Control	Aged 60-64	Aged 55-59		
Matched sample size	27	45	223	252		
Population size	32,300	56,500	260,500	305,200		

6 Discussion

Prior to September 2003, MAA recipients were not required to look for work. After this date, MAA recipients were encouraged to see personal advisers who would help them draft workforce participation plans.

Using HILDA Wave 2 data, collected in 2002 prior to this change in MAA guidelines, the findings showed that the effect of MAA receipt on participation rates was positive. The slightly lower participation rates of MAA recipients compared to their counterfactuals was insignificant compared to the substantial difference in participation rates of the different cohorts they belonged to. Netting out the latter from the difference in participation rates of the MAA recipients and their counterfactuals brought about a positive treatment effect.

If there already was the general tendency by older cohorts to withdraw from the workforce, MAA receipt should have increased the level of encouragement for them to withdraw from the workforce (that is, a substantially negative treatment effect). That is, in terms of figure 4b, the relatively steeper indifference curve (preference for retirement over consumption goods) among older workers coupled with the wealth effect of social security benefits would have led them to retire. Note too that the cohort difference may not only be capturing the greater preference for retirement but also the smaller chances faced by older workers to get re-employed once they leave employment (lower expected income constraint). Some financial benefit would have further encouraged unemployed older workers with a preference for leisure, to withdraw from the workforce. But clearly, it was not the case for the MAA recipients analysed in this paper.

The positive treatment effect of MAA then indicates that the recipients do not possess as strong a preference for retirement as the other workers aged 60-64 (relatively flat indifference curve) and view better chances of finding work (higher expected income constraint) than the other workers aged 60-64. They keep attachment to the workforce and the MAA is only an added means of supporting themselves.

Given this finding on the positive effect of MAA on labour force participation, the move by the government to tighten the participation guidelines for MAA may prove to be ineffective.

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