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# THE AUSTRALIAN GOVERNMENT SUPERANNUATION CO-CONTRIBUTION: ANALYSIS AND COMPARISON

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# THE AUSTRALIAN GOVERNMENT SUPERANNUATION CO-CONTRIBUTION : ANALYSIS AND COMPARISON

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## Abstract

This paper uses the LITES microsimulation model to analyse the impact on the lifetime experience of a cohort of employees of the proposed government co-contribution associated with the Australian Superannuation Guarantee Charge scheme. The effects on the equity and progressivity in relation to lifetime earnings, the incentives inherent in the superannuation taxation structure as implied by ex-post optimal behaviour at retirement, and the detail of individual income, taxation and consumption streams are discussed. Results are compared with those obtained for a mature Superannuation Guarantee Scheme structure, and for this incorporating an income tax refund associated with employee superannuation contributions as an alternative method of government support for superannuation savings.

It is found that the three structures differ little in their incentive effects on optimal behaviour at retirement, that they imply differing degrees of progressivity from taxation, and that the important distinguishing features, in quantitative terms, are the timing of the benefit of support, and on whom the burden of the cost falls. It is argued that there are risks in increasing the commitment of assets to preserved superannuation benefits beyond that of the proposed SGC, at the expense of providing immediate relief to lower and middle income earners.

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## 1 INTRODUCTION

The Superannuation Guarantee Charge scheme of compulsory occupational superannuation provision is in the early stages of establishment in Australia. This scheme, in its maturity, will require a minimum contribution of 3% of gross earnings from employees, and 9% from the employer in respect of these employees. All employees whose annual earnings level, approximately, exceeds the tax free threshold will be subject to these compulsory contributions. This extends the scope of compulsory advance superannuation provision to a vastly broader population than hitherto.

The proposed target level of contributions, rising to a total contribution level of 12%, has now been endorsed by the Opposition, and thus has bipartisan political support. There is general concensus on the need for and level of savings provision, see Dawkins (1992) and Fitgerald (1993). However there is not concensus on other details of retirement income policy and this paper examines and compares some of the contentious details, and in particular provides a quantitative analysis of the effect of the introduction of the proposed government co-contribution.

The Government announced in the 1995 Budget statement a proposal for government support for superannuation provision in the form of a co-contribution. This co-contribution has been described as a 'dollar for dollar' matching of the employee superannuation contribution, and

would be payable subject to various limits and thresholds. A detailed description of the co-contribution is given in Section 2.

This paper examines the effects of the co-contribution on intra-generational equity and progressivity, using a range of summary measures of lifetime earnings and consumption, for a large cohort of employees, and the incidence and source of costs and benefits. In addition, results are presented to show the effects, relative to the current structure, on the experience of individuals of a range of percentile lifetime earnings experience. These results are obtained using the LITES simulation model, which is described in detail in Atkinson, Creedy and Knox (1994a).

Various arguments have been raised against the suitability of this method of support, rooted in the fact that the gains to employees are not felt until their retirement. It has been argued that compulsory superannuation contributions already divert income from the immediate needs of low and middle income individuals and that the co-contribution reinforces this delay of receipt. It is argued, further, that the extent of the delay is excessive and therefore undesirable, and that additional government support would be better targeted towards early receipt than subject to the extended delay between contribution and realisation associated with superannuation .

Given the arguments raised regarding the co-contribution, results are also presented associated with an alternative, early realisation, method of government support for the low to middle income earner. This alternative is an income tax refund of 40% of the employee superannuation contribution, payable subject to various limits and thresholds. This refund is one suggested by Knox, in Knox (1995). The design and rationale of the refund is described in Section 2.

Section 3 presents results obtained using the LITES simulation model, for three alternatives: the current scheme; that including the co-contribution; and that including the Knox tax refund. The three structures of provision are compared in terms of summary equity and progressivity measures, the amount and timing of costs and benefit, and in terms of their effect on

individual experience of consumption and implied incentive. Section 4 presents a summary of conclusions. Appendix I gives a brief description of the LITES simulation model, and the basic economic assumptions used. Appendix II describes the calculations associated with the SGC, age pension and income taxation.

## 2 RETIREMENT INCOMES STRUCTURES

### 2.1 The Current Australian Scheme

There is active topical debate on the design of retirement incomes structures, provoked by the need perceived locally and internationally for increased advance provision for retirement. The need to avoid an excessive and onerous burden on future working populations, and to ensure an adequate level of future provision for the current working population is widely acknowledged. Much attention is focussed on the effects that an ageing population have on the costs of such provision, and on steps that may be taken in anticipation of it. The recent World Bank report (1994) propounds a 'three pillar' structure for provision, and this is broadly endorsed by practice in Australia and in other OECD countries. The 'three pillars' being basic welfare provision, a degree of occupational superannuation, and additional discretionary provision, made by individuals.

In Australia, alternatives to the SGC scheme have been suggested, including the detailed structure put forward by the Institute of Actuaries of Australia in 1994. For a quantitative comparison of this with the current scheme see Atkinson, Creedy and Knox (1994b). Results have also been presented which offer a comparison between the current scheme and others which incorporate a universal pension and other, less complex, taxation structures; see Atkinson, Creedy and Knox (1995b). The common finding in all these investigations is that the factors which most impact on the summary measures of progressivity and equity are less the elements of the system,

than the characteristics of individual behaviour at the time of retirement, and mortality after retirement.

Here we seek to establish whether or not the introduction of a co-contribution materially alters this finding, and also to discuss other implications of its introduction.

The current Australian retirement benefit and taxation structure is extremely complex. It has been shown elsewhere (see Atkinson, Creedy and Knox (1995a) ) that this complexity results in a situation where vastly different individual experience can result from this same structure. The inherent incentive effects are unclear and vary according to individual earnings and mortality experience. Even for a single individual, there is a significant range of possible results (measured in terms of consumption achieved) which may arise depending on how the accumulated superannuation benefit is disbursed at the time of retirement. This diversity of outcomes arises from the structure of the system, results in outcomes being beyond the control of the system, and constitutes a failure of the system to achieve stated aims. In particular, one of the stated aims of the SGC is to provide adequate levels of income in retirement, but incentives do not, in general, exist to support this. This feature is discussed further, later. For a discussion of the incentives to particular behaviour inherent in the current and in comparative, less complex, structures, see Atkinson and Creedy (1996a).

## 2.2 The Government co-contribution

The government co-contribution is based on the level of employee contribution, subject to a means-test based on the employee's gross earnings. The maximum amount of co-contribution payable is 3% of average weekly earnings, AWE. Thus, for employees paying the statutory 3% minimum contribution, those earning up to AWE will have their contribution matched by co-contributions, (though this co-contribution will be taxed at 15% on receipt by the fund). Employees with earnings less than AWE may choose to contribute at a higher rate than the

minimum 3%, in which case the co-contribution will match this amount, in as far as it does not exceed 3% of AWE.

The maximum co-contribution of 3% of AWE is reduced in such a way that it is extinguished entirely for employees whose earnings exceed twice AWE. The threshold of earnings, denoted here by TMIN, above which the maximum contribution is reduced, is defined by the following equation.

$$TMIN = AWE \times \{ 2 - .03/.05 \} = 1.4 \text{ AWE}$$

In this equation .03 is the contribution rate, and .05 is the rate at which the maximum co-contribution phases out. Thus the limits of earnings between which the co-contribution reduces are TMIN, equal to 1.4 times AWE, and twice AWE.

The amount by which the maximum co-contribution is reduced, R, is defined by the following equation, where X is employee gross annual earnings.

$R = 0$ for X less than 1.4 AWE

$R = .05 (X - TMIN)$ for $1.4 \text{ AWE} < X < 2 \text{ AWE}$

The actual amount of government co-contribution made on behalf of the employee is given by the minimum of the employee contributions, and the amount 3% AWE - R. This amount is reduced on receipt by the fund by the contributions tax at 15%.

As can be seen from the definition of the co-contribution as part of the superannuation accumulation, all the benefit of the additional government support is subject to preservation, and thus delay, until the time of retirement. The co-contribution was offered as a replacement to the tax cuts which were promised, but not enacted, in previous budgets. The co-contribution is seen

to be targeted at the low to middle income earner, and appears to carry no advantage to those on over twice average weekly earnings. Individuals who have high lifetime earnings are likely to receive benefit from the co-contribution in the early years of their working life, until their earnings rise beyond twice AWE. While additional support, per se, may seem to be an attractive proposal, there may be more efficient ways of providing it, and there may be more pressing priorities.

As an alternative to immediate tax cuts, the co-contribution offers nothing to those who place a relatively high value on increased levels of disposable income in the short term. While the co-contribution is effectively rather less than the 'dollar for dollar' that it is described as, due to the delay in its payment and the 15% contribution tax, it still provides a considerable addition to retirement provision for most individuals. The extent of this is examined in a later section. The issue of what subjective value this addition to retirement benefits is seen to have is separate from this, and is discussed later. It can be argued that a nominal total contribution rate of 15% of gross earnings throughout the working life is far in excess of what some employees can afford, and that the burden of 12% compulsory occupational contributions should not be increased at the expense of immediate relief. In acknowledgement of this argument this paper presents comparative figures based on an income tax refund related to superannuation contributions as an alternative vehicle for government support.

## 2.3 A Refund Alternative

The co-contribution is support which is realised only at the time of retirement. Occupational superannuation contributions will be compulsory for employees whose earnings exceed, approximately, the tax free threshold, which is of the order of one sixth of average earnings. For those on low incomes, support which involves such a delay before receipt has little perceived value, since the utility value put on benefits for such individuals is very much weighted towards the short term future. This objection has significance of more than just subjective value,

since these individuals are those with little or no discretionary wealth, and so the relative value of a small increase in income available for immediate consumption is much more significant than for those on higher incomes. For these individuals which would qualify , by the described means-tests, for the co-contribution, it is by no means clear that additional support is best given by an increase in their superannuation provision.

It has been observed that this same class of lower-earning employee is likely to suffer higher mortality rates than the relatively higher earning employee, (see Hammermesh (1985)), and preliminary studies by Knox and Tomlin (1996) of classes of Australian male retiree experience support this. For this reason, the lower earners can expect to realise less from the long term superannuation benefit than the more affluent, longer lived, employee. Thus, on the basis of the expectation of life, the expected present value of benefits actually received by the relatively lower earners, expressed as a proportion of their theoretical entitlement at retirement, will be much less than that for an individual on above average earnings. Further, if we consider the survival expectation beyond retirement age, and if benefits are taken largely, or wholly, as income, and assuming all individuals are subject to the same annuity purchase rates, then the relative advantage to the higher paid is increased further. In short, this individual has pressing immediate needs, and has a lower expectation of surviving to realise the increased retirement benefits, particularly if these are taken as income rather than as a lump sum on retiral.

While it is desirable that advance provision for retirement benefits is made for and by all employees, it is not clear that it is to all employees' best advantage to raise the level of such provision: for some employees it may be expected that there is an optimum level of provision, given both their immediate need and their expectation of future realisation of their entitlement. Given these considerations, it is useful to consider an illustrative alternative method of support which attempts to allow for both of these effects.

The alternative considered here is the provision of a tax refund, as referred to in Knox(1995), associated with employee contributions and paid during the working life.

The refund is payable at a rate of 40% of the employee contributions. The maximum amount of refund which may be paid is 40% of 3% of twice AWE, that is 2.4% of AWE. If maximum government support is paid, then, this refund method amounts to approximately the same as does the co-contribution method, net of contributions tax at 15%. The maximum amount of refund payable is reduced by an amount that depends on the individuals' earnings, such that individuals earning in excess of twice AWE receive no refund. The threshold of earnings at which the maximum refund begins to be reduced is the same as that prescribed for the co-contribution , TMIN, where TMIN for current rates of contribution is 1.4 AWE. The amount of the reduction in refund, *R*, is defined by the following equations.

$R = 0$ for $X < 1.4$ AWE

$R = .04\ (X - TMIN)$ for $1.4$ AWE $< X < 2$ AWE

The amount of the refund actually paid is the lesser of 40% of the employee contributions, and 2.4 % of AWE less the earnings related reduction, *R*.

Thus, an individual earning less than 1.4 AWE, and paying the minimum contribution rate of 3%, will receive a refund of 40% of their contributions. For those earning more than this, the refund will only be paid in respect of contributions up to the level of 3% of twice AWE less the earnings related reduction. The refund payable may exceed the income tax liability, (unlike a rebate, which may not).

Thus, for example, an individual subject to marginal tax rates less than 40% would receive an immediate cash incentive to contribute to superannuation by increasing their after-tax income, but individuals subject to higher marginal rates of tax would not. Also there is a limited incentive

to contribute in excess of the required minimum 3% for the lower paid, since the maximum refund payable is 2.4% of AWE, and is only reduced for those earning in excess of the threshold, 1.4 AWE. Such individuals could make above minimum contributions on their own behalf, or on behalf of a dependent, and still find the cash refund to their financial advantage, whereas those paying higher marginal tax rates would have no refund incentive to do so.

This refund is not, in itself, regressive, since it does not provide a relative incentive to the higher earner. The refund also acknowledges and responds to the lower paid individuals' need for disposable income during the working years- the government support is provided within the short term horizon. It thus meets considerations of welfare and subjective utility.

## 3 SIMULATION RESULTS

### 3.1 The simulation model

This paper uses the microsimulation model LITES to construct a cohort of 3000 individuals, each with unique lifetime earnings profiles, such that the distribution of the cohort earnings experience is representative of that of Australian males. Each individual is assumed to be in continuous employment from the age of 20 until they retire at age 65. The experience of each individual throughout their working life and their retirement is constructed based on their unique earnings experience, and results are obtained on two different mortality bases. Mortality may be assumed to be 'average' after retirement, where this average relates to the Australian Life Table 1985/87 (males) and gives a common survival of 14 complete years for all individuals. Alternatively, differential mortality may be allowed for which reflects the tendancy of those with higher lifetime earnings to survive longer. The differential mortality assumption incorporates a stochastic element, so the link between earnings level and longevity is not strict. The detail of the

calculation is described in Appendix I. However, each individual is uniquely described by their earnings profile and their age at death.

It is acknowledged that this male cohort is not representative of female, and also, therefore, of population, experience in general. Important factors such as partial and broken workforce participation, and the existence of dependents, are not catered for here. However, these results are representative of the largest homogeneous group of the workforce, and of the group which has the largest stake, some 75%, in superannuation in dollar terms. These results are therefore of some value in assessing the issues and principles under discussion.

The LITES model is used to present both cohort experience and individual results. The simulations present each individual with a choice of 47 different 'routes' of behaviour at the time of retirement. These routes are defined in Tables 1 and 2, and described in more detail in Appendix 2. Briefly, individuals choose how much, if any, of their superannuation benefit is taken as a lump sum, and how much is used to purchase a superannuation annuity. Any lump sum is aggregated with the savings accumulation, and the total is disbursed as cash consumption, invested in an interest bearing bank account, or used to purchase an annuity. These options may be exercised in a combination of ways and proportions, as stated in the table. For each individual, the value of net lifetime consumption is calculated, according to a defined criterion of utility, and whichever 'route' affords the maximum value is the one which the individual is deemed to follow. Thus the results present the ex-post optimal behaviours for each individual. For a detailed description and analysis of optimal retirement behaviours under these conditions see Atkinson and Creedy (1996a).

### 3.2 Cohort Evaluation of Routes

Table 3 shows the optimal route choices made by a cohort of 3000 individuals based on common mortality experience after retirement. Each individual is assumed to survive 14 complete

TABLE 1.

ROUTES 1 - 24: Defined Benefit Routes

| Route no. | Superannuation pre-tax destination | Savings and post-tax destination | Defined benefit% age of Final Salary | % age of Balance to Bank | % age of Balance to consumption |
|---|---|---|---|---|---|
| 1 | ANNUITY | ANNUITY | 85 | - | 100 |
| 2 | ANNUITY | ANNUITY | 75 | - | 100 |
| 3 | ANNUITY | ANNUITY | 65 | 100 | 0 |
| 4 | ANNUITY | ANNUITY | 65 | 50 | 50 |
| 5 | ANNUITY | ANNUITY | 65 | - | 100 |
| 6 | LUMP SUM | ANNUITY | 65 | 100 | - |
| 7 | LUMP SUM | ANNUITY | 65 | 50 | 50 |
| 8 | LUMP SUM | ANNUITY | 65 | - | 100 |
| 9 | LUMP SUM | ANNUITY | 60 | - | 100 |
| 10 | ANNUITY | ANNUITY | 50 | 100 | - |
| 11 | ANNUITY | ANNUITY | 50 | 50 | 50 |
| 12 | ANNUITY | ANNUITY | 50 | - | 100 |
| 13 | LUMP SUM | ANNUITY | 50 | 100 | - |
| 14 | LUMP SUM | ANNUITY | 50 | 50 | 50 |
| 15 | LUMP SUM | ANNUITY | 50 | - | 100 |
| 16 | LUMP SUM | ANNUITY | 45 | - | 100 |
| 17 | ANNUITY | ANNUITY | 35 | 100 | - |
| 18 | ANNUITY | ANNUITY | 35 | 50 | 50 |
| 19 | ANNUITY | ANNUITY | 35 | - | 100 |
| 20 | LUMP SUM | ANNUITY | 35 | 100 | - |
| 21 | LUMP SUM | ANNUITY | 35 | 50 | 50 |
| 22 | LUMP SUM | ANNUITY | 35 | - | 100 |
| 23 | ANNUITY | ANNUITY | 25 | - | 100 |
| 24 | ANNUITY | ANNUITY | 10 | - | 100 |

TABLE 2

ROUTES 25-47: Money Purchase Routes

| Route no. | % age of Superannuation to annuity | % age of Savings and post-tax to annuity | % age of Balance to Bank | % age of Balance to consumption |
|---|---|---|---|---|
| 25 | 100 | 100 | Nil balance | Nil balance |
| 26 | 100 | 0 | 100 | 0 |
| 27 | 100 | 0 | 50 | 50 |
| 28 | 100 | 0 | 0 | 100 |
| 29 | 50 | 50 | 100 | 0 |
| 30 | 50 | 50 | 50 | 50 |
| 31 | 50 | 50 | 0 | 100 |
| 32 | 50 | 0 | 100 | 0 |
| 33 | 50 | 0 | 50 | 50 |
| 34 | 50 | 0 | 0 | 100 |
| 35 | LUMP SUM | 100 | Nil balance | Nil balance |
| 36 | LUMP SUM | 85 | 100 | 0 |
| 37 | LUMP SUM | 70 | 100 | 0 |
| 38 | LUMP SUM | 70 | 50 | 50 |
| 39 | LUMP SUM | 50 | 100 | 0 |
| 40 | LUMP SUM | 50 | 50 | 50 |
| 41 | LUMP SUM | 50 | 0 | 100 |
| 42 | LUMP SUM | 0 | 100 | 0 |
| 43 | LUMP SUM | 0 | 75 | 25 |
| 44 | LUMP SUM | 0 | 50 | 50 |
| 45 | LUMP SUM | 0 | 25 | 75 |
| 46 | LUMP SUM | 0 | 10 | 90 |
| 47 | LUMP SUM | 0 | 0 | 100 |

years after age 65. This is consistent with the Australian Life Table (1985-87) males.

Results are shown for the current scheme in maturity, for the current scheme with the government co-contribution, and for the current scheme with the refund allowance. Each of the three structures has been investigated on two different evaluation criteria.

The results compare the level of net post-retirement consumption achieved by the various route choices. Criterion 1 maximises the present value of the stream of net consumption in retirement as at age of entry to the work force. Criterion 2 maximises the present value of the log of each years net consumption. Both criteria include the value of any residual estate as part of the stream of consumption at the end of the year of death.

In calculating the present values, consumption is assumed to occur uniformly throughout the year, and the estate, b, is valued at the end of the year of death. If c(t) is the net consumption in year t, the working life begins at age 20 when t=0, retirement begins at the end of year t=45, at age 65, death occurs in year t=d and the interest rate is denoted by i, Criterion 1 is defined as follows.

$$\text{Criterion 1} = \sum_{t=46}^{d} c(t)\,(1+i)^{-t+0.5} + b\,(1+i)^{-d} \qquad (1)$$

Criterion 1 thus involves an additive utility function with utility in each period simply a linear function of consumption. Criterion 2 allows for decreasing marginal utility, and is calculated as follows.

$$\text{Criterion 2} = \sum_{t=46}^{d-1} (1+i)^{-t+0.5} \log c(t) + (1+i)^{-d+0.5}\{\log[\, b(1+i)^{-0.5} + c(d)]\} \qquad (2)$$

Table 3. Common Mortality.Optimal route choices.

| Route no. | Current scheme | | with Co-contribution | | with Refund | | Universal pension | |
|---|---|---|---|---|---|---|---|---|
| | Criterion 1 | Criterion 2 | Criterion 1 | Criterion 2 | Criterion 1 | Criterion 2 | Current scheme Criterion2 | Co-contribution Criterion 2 |
| 1 | 2 | 42 | 3 | 45 | 2 | 42 | 70 | 57 |
| 2 | 1 | 34 | 2 | 41 | 1 | 35 | 40 | 39 |
| 3 | | | | | | | | |
| 4 | | 18 | | 19 | | 18 | 22 | 23 |
| 5 | 7 | 26 | 9 | 31 | 7 | 26 | 27 | 35 |
| 6 | | | | | | | | |
| 7 | | 438 | | 277 | | 434 | 224 | 85 |
| 8 | 6 | 279 | | 124 | 6 | 284 | 138 | 72 |
| 9 | 3 | 166 | 2 | 65 | 3 | 158 | 113 | 31 |
| 10 | | | | | | | | |
| 11 | | 4 | | 2 | | 4 | 10 | 11 |
| 12 | 50 | 3 | 63 | 4 | 50 | 3 | 4 | 3 |
| 13 | | | | | | | | |
| 14 | | 30 | | 15 | | 29 | 57 | 17 |
| 15 | | 93 | | 20 | | 96 | 38 | 8 |
| 16 | | 35 | | 3 | | 32 | 18 | 2 |
| 17 | | | | | | | | |
| 18 | | | | 1 | | | | 1 |
| 19 | 167 | 1 | 162 | | 167 | 1 | 1 | |
| 20 | | | | | | | | |
| 21 | | 6 | | 1 | | 6 | 3 | |
| 22 | | 3 | | | | 3 | | |
| 23 | 502 | | 497 | | 502 | | | |
| 24 | 1872 | | 1937 | | 1872 | | | |
| 25 | | 187 | | 146 | | 190 | 21 | 14 |
| 26 | | | | | | | | |
| 27 | | 8 | | 273 | | 4 | 195 | 343 |
| 28 | | | | | | | 4 | 70 |
| 29 | | | | | | | | |
| 30 | | | | | | | | |
| 31 | | | | | | | | |
| 32 | | | | | | | | |
| 33 | | | | | | | | |
| 34 | 51 | | 57 | | 51 | | | |
| 35 | 1 | 161 | 1 | 313 | 1 | 162 | 2002 | 2183 |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | 1466 | | 1620 | | 1473 | 13 | |
| 39 | | | | | | | | |
| 40 | | | | | | | | |
| 41 | 4 | | | | 4 | | | |
| 42 | | | | | | | | |
| 43 | | | | | | | | |
| 44 | | | | | | | | |
| 45 | | | | | | | | |
| 46 | | | | | | | | |
| 47 | 334 | | 267 | | 334 | | | |

Criterion 2 thus favours a smoother flow of consumption than does Criterion 1, evidenced by the fact that Route 47, (immediate consumption at retirement of all accrued superannuation and savings assets), is only favoured on the basis of the Criterion 1 evaluation.

While the simulation model LITES can use other evaluation criteria chosen from a range of utility evaluations, the important point here is that there is a difference between the intuitive present value evaluation and other criteria involving more refined utility functions which allow for decreasing marginal utility. Criterion 2 is a reasonable representative of these other possible evaluation criteria, and the main results are not lost by restricting the results presented to these two evaluation methods.

### 3.2.1 Common Mortality

Table 3 presents the distribution of optimal route choices under an assumption of common mortality experience after retirement.

Included in Table 3 are optimal choices for the current scheme, and for the co-contribution results, on the basis of a universal pension, as opposed to the existing means-tested pension. The comparative results thus indicate the degree to which the choices are driven by the motive of exploiting the means-tests to best advantage, or minimising the disadvantage inherent in them. The universal pension figures here thus show optimal behaviour uninfluenced by the means test or mortality experience.

Note that most routes chosen involve the use of post-tax superannuation money, that is, superannuation is first converted to a lump sum. This is because, for most individuals, it is most efficient to expose themselves to lump sum tax and buy annuities with after-tax money, and thereby secure an allowance of the whole annuity purchase price as a deduction against taxable income. Superannuation annuities are treated differently in calculating the purchase price

deduction for income tax purposes, and also for the operation of the age pension assets means-test. A full description of these rules is given in Appendix 2.

The major features of Table 3 are summarised here.

(i) Under either evaluation criteria, there is no significant difference in optimal choices between the current scheme, and the current scheme with refund element.

(ii) Criterion 1 evaluation results in the immediate consumption route 47 being favoured by about 10% of the cohort, but it is not otherwise chosen.

(iii) Under either criterion, and all scheme structures with the means-tested pension, the most favoured route is one of purchasing a low level of income (routes 23, 24 and 38) in order to exploit the means-test thresholds: the 'limbo-dancing' phenomenon.

(iv) The optimal choices made where there is a universal age pension target almost 70% of the cohort towards route 35, which involves all assets being used to purchase an annuity.

(v) The choices with the co-contribution feature are essentially the same as those for the alternatives, with the differences in route choice being in the degree of behaviour, rather than the nature of it.

To summarise these results, the major incentive affecting optimal choice arises from the existence of the means-tests, and there is little to distinguish the three structures in terms of the incentives they imply. The co-contribution optimal choices vary from the other structures because the co-contribution increases the level of superannuation savings and thereby changes the relationship to the means-tests for some individuals. Some individuals are brought into the range affected by the means-test, and some escape it, and it is these individuals who change their route choice.

The percentage of final average salary which each individual has the resources to replace at retirement depends on the course of their earnings through the working life. An individual

whose earnings peak early in their working life will accumulate more than an individual of the same average lifetime earnings, but whose peak earnings occur later. Generally, individuals under the conditions and assumptions operating in this simulation would be capable of replacing about 60% of their final average salary. That they do not is purely in response to conditions imposed by the retirement incomes structure.

3.2.2 Differential Mortality

The optimal choices made independently of any mortality effects are instructive, but not realistic. To more realistically evaluate the ex-post advantages of behaviour choices, results have also been obtained on the assumption of differential mortality experience after retirement, and are presented in Table 4. On this assumption the model allows a correlation between the longevity of an individual and the level of their total lifetime earnings relative to the whole cohort. This correlation incorporates a stochastic element, but generally the higher earner lives longer, and the relatively low earner lives less than the average expectation of 14.6 years. The details of calculation are described in Appendix 1.

Under Criterion 1 evaluation, the change in mortality assumption results in the extremes of behaviour (route 47, immediate consumption, and routes 25 and 35, all annuity) becoming optimal for far more individuals, about half of the cohort choose these routes. There is nothing to distinguish the refund alternative with the current scheme. The co-contribution, as before, shuffles the cohort in relation to the means-test, and results in a higher level of annuity purchase for some.

The Criterion 2 evaluation favours a smoother flow of income, and none choose Route 47. Essentially there is a trade-off for those experiencing high mortality between the advantages of immediate consumption and the advantage of the estate, or bequest, arising from the balance in the bank account. The bank account routes become attractive to more in the cohort than before,

Table 4. Differential Mortality.Optimal route choices.

| | Current scheme | | with Co-contribution | | Refund | |
|---|---|---|---|---|---|---|
| Route no. | Criterion 1 | Criterion 2 | Criterion 1 | Criterion 2 | Criterion 1 | Criterion 2 |
| 1 | 4 | 26 | 7 | 22 | 4 | 26 |
| 2 | 3 | 17 | 5 | 20 | 3 | 17 |
| 3 | | | | | | |
| 4 | | 6 | | 29 | | 6 |
| 5 | 2 | 12 | 5 | 15 | 2 | 12 |
| 6 | | | | | | |
| 7 | | 176 | | 185 | | 174 |
| 8 | 65 | 184 | 64 | 88 | 64 | 182 |
| 9 | 38 | 89 | 30 | 24 | 38 | 91 |
| 10 | | | | | | |
| 11 | | 10 | | 13 | | 10 |
| 12 | 6 | 1 | 12 | 3 | 6 | 1 |
| 13 | | | | | | |
| 14 | | 114 | | 98 | | 113 |
| 15 | 49 | 55 | 46 | 10 | 48 | 54 |
| 16 | 68 | 19 | 64 | 1 | 68 | 17 |
| 17 | | | | | | |
| 18 | | 5 | | 8 | | 5 |
| 19 | 39 | | 36 | | 38 | |
| 20 | | | | | | |
| 21 | | 98 | | 86 | | 98 |
| 22 | 219 | 1 | 213 | | 219 | 1 |
| 23 | 94 | | 89 | | 94 | |
| 24 | 579 | | 590 | | 579 | |
| 25 | 265 | 315 | 370 | 482 | 267 | 317 |
| 26 | | | | | | |
| 27 | | 14 | | 50 | | 14 |
| 28 | | | | | | |
| 29 | | | | | | |
| 30 | | 3 | | 8 | | 3 |
| 31 | | | | | | |
| 32 | | | | | | |
| 33 | | | | 4 | | |
| 34 | 4 | | 5 | | 4 | |
| 35 | 160 | 598 | 99 | 622 | 157 | 597 |
| 36 | | | | | | |
| 37 | | | | | | |
| 38 | | 558 | | 580 | | 564 |
| 39 | | | | | | |
| 40 | | 148 | | 148 | | 147 |
| 41 | 135 | | 109 | | 139 | |
| 42 | 1 | 1 | | | 1 | 1 |
| 43 | 3 | 162 | 1 | 118 | 3 | 162 |
| 44 | 52 | 248 | 26 | 218 | 52 | 248 |
| 45 | 156 | 128 | 164 | 143 | 156 | 128 |
| 46 | 36 | 12 | 57 | 25 | 36 | 12 |
| 47 | 1022 | | 1008 | | 1022 | |

because of the value put on the estate. Those individuals who live beyond average life expectancy continue to favour the purchase of annuities, from which they derive a mortality profit. As was the case for the common mortality results, the co-contribution exaggerates, rather than changes, the cohort behaviour.

### 3.2.3 Equity and progressivity

In order to distinguish the three structures summary measures of lifetime earnings equality and progressivity are obtained, and presented in Table 5. The present study compares progressivity and inequality based on present values of lifetime income, using the Kakwani progressivity index, K, and the Gini measure of inequality of net income, G. The tax concentration index, $C_t$ , and the effective total tax ratio are also reported. Other measures were calculated, but gave similar results and are therefore not presented. The Kakwani index of progressivity indicates the extent to which the taxation structure results in the redistribution of wealth, and is equal to the tax concentration index less the Gini measure of pre-tax income. A higher figure indicates that the tax system is more progressive. We are not concerned here with the absolute values of these summary measures but rather the relative values under different conditions. Further details of these measures are provided in Appendix 1.

From Table 5 it can be seen that the Kakwani index is lower when optimisation is evaluated according to Criterion 2. This is because Criterion 2 places some value on the smoothing of the stream of consumption income at the expense of an amount of the unweighted present value of consumption. Thus, an individual may choose to pay a higher proportion of the cohorts tax liabilities in order to secure a smoother flow of benefit. Under either criterion of evaluation, and either mortality assumption, the use of a refund is more progressive than the current system, and the introduction of a co-contribution is significantly more progressive than both of these.

Table 5. Summary measures

| Common Mortality | | Kakwani | Gini post-tax | Tax conc index | Tax ratio | Atkinson-Plotnick |
|---|---|---|---|---|---|---|
| Current scheme | Criterion1 | .5415 | .2109 | .8275 | .1218 | .0001 |
| | Criterion2 | .4483 | .2068 | .7343 | .1503 | .0000 |
| | | | | | | |
| Co-contribution | Criterion1 | .7005 | .2079 | .9865 | .1004 | .0001 |
| | Criterion2 | .5202 | .2052 | .8062 | .1345 | .0001 |
| | | | | | | |
| Refund | Criterion1 | .5891 | .2103 | .8752 | .1139 | .0001 |
| | Criterion2 | .4809 | .2062 | .7669 | .1425 | .0000 |
| | | | | | | |
| Differential Mortality | | | | | | |
| Current scheme | Criterion1 | .4517 | .2317 | .7378 | .1104 | .0037 |
| | Criterion2 | .3755 | .2332 | .6615 | .1288 | .0058 |
| | | | | | | |
| Co-contribution | Criterion1 | .6124 | .2292 | .8984 | .0873 | .0039 |
| | Criterion2 | .4609 | .2323 | .7469 | .1097 | .0065 |
| | | | | | | |
| Refund | Criterion1 | .4978 | .2309 | .7838 | .1025 | .0037 |
| | Criterion2 | .4092 | .2324 | .6953 | .1209 | .0058 |
| | | | | | | |

Gini pre-tax measure is .2860

The tax concentration index gives a measure of how unevenly the burden of taxation lies. It behaves in the same way as does the Kakwani measure, and here a comparison of the index for common mortality and differential mortality shows the extent to which mortality experience can affect the burden of taxation. The effect of allowing for longevity to be linked to lifetime earnings is to allow an opportunity for relative profit or loss, usually associated with the purchase of annuities. A 'profitable' mortality experience, such as the higher earners are inclined to experience, is an opportunity for these individuals to offset the higher effective rates of taxation that they pay. The co-contribution increases progressivity, and differential mortality decreases it, but has less impact than the co-contribution.

Previous investigations into retirement incomes structures have concluded that, of those investigated, the details of structure have less impact on intra-generational equality than either the relative mortality of the individuals or their route choice at retirement. This result violates this general finding. Raising the amount of contribution to superannuation to the extent that the co-contribution does, now has a relatively greater effect on progressivity, (increasing it), than does a differential mortality assumption, (decreasing it).

That the tax ratio is lower for the co-contribution reflects the fact that the costs of the increase in benefits are paid for largely by the investment earnings of the superannuation contributions during the accumulation period. Further details of this are given later. The Atkinson-Plotnick index shows that it is the effect of mortality profits and losses which arise under each structure that re-orders the ranking of individuals. Also that this effect is stronger using the criterion 2 evaluation, because this utility function favours behaviours which actually increase liability to tax, in exchange for the added stability these routes appear to offer. The following discussion of individual characteristic behaviour examines this further.

3.3 Individual experience

The LITES model is used to calculate results for individuals, each of whom represent a percentile earnings pattern. These results have been obtained on the assumption of differential mortality and common mortality, and enable a more detailed understanding of who contributes to changes, and how, in the cohort results.

Table 6 presents results for three distinct individuals, representing the 25th, median and 75th percentile average lifetime earnings, on the basis of criterion 2 evaluation. Also shown is the present value of net lifetime consumption achieved by each of the individuals under their optimal route.

The 25th percentile individual chooses route 38 in all cases. This individual follows the same course in each case, buying a low level of income with after-tax money, and receiving the full age pension and associated rebate during retirement, and taking advantage of the residual capital value of the estate arising from the bank account. This is the optimal behaviour for the median earner also, since the benefits of the mortality profit from the purchase of the annuity and the assessment under the income tax and means-test rules, outweigh the expense of the lump sum tax paid. In addition the individual becomes eligible for the age pension after a few years in retirement as the residual capital value of the purchased annuity erodes.

The 75th percentile earner chooses Routes 4 and 5 under the common mortality assumption. These routes allow a high level of income replacement with the balance of funds to the bank account and, or, consumption. When this high earner experiences commensurately low mortality, the optimal choice is always route 25, which allows for all assets to be used to purchase an annuity, and the opportunity to realise a profit from longevity. The low earner, driven by the risk averse utility evaluation, suffers a reduction in total net consumption of over 10% under the higher mortality experience. The high earner realises an increase in their consumption of about 5%.

Table 6. Individual choices

| Common | 14 years | | 25 %ile | 50%ile | 75%ile | |
|---|---|---|---|---|---|---|
| Mortality | | | | | | |
| Current scheme | Route Criterion2 | | 38 | 38 | 5 | |
| | Consumption | | 566380 | 1,019295 | 1,956676 | |
| | | | | | | |
| Co-contribution | Route Criterion2 | | 38 | 38 | 4 | |
| | Consumption | | 578320 | 1,040381 | 1,968506 | |
| | | | | | | |
| Refund | Route Criterion2 | | 38 | 38 | 5 | |
| | Consumption | | 570674 | 1,030911 | 1,961841 | |
| | | | | | | |
| Differential | survival | | 10 years | 14 years | 18 years | 24 years |
| Mortality | | | | | | |
| Current scheme | Route Criterion2 | | 38 | 38 | 25 | 25 |
| | Consumption | | 524103 | 1,019295 | 2,052296 | 2,191845 |
| | | | | | | |
| Co-contribution | Route Criterion2 | | 38 | 38 | 25 | 25 |
| | Consumption | | 533713 | 1,040381 | 2,072185 | 2,217312 |
| | | | | | | |
| Refund | Route Criterion2 | | 38 | 38 | 25 | 25 |
| | Consumption | | 528373 | 1,030911 | 2,057465 | 2,197053 |
| | | | | | | |

**Consumption is the present value of total net lifetime consumption**

Taking the current scheme under common mortality as the benchmark case, though the lower earner increases their consumption with the co-contribution, (and the refund), the adverse effect of high mortality outweighs this advantage, and the route choice does not vary. Indeed, for each individual here it is mortality which materially alters the outcomes, rather than the structures themselves.

3.4 Cohort costs

A major distinguishing characteristic of the three structures presented here is the relative revenue cost. LITES provides figures for cohort simulations representing the total present value of various items of benefit and taxation. These should not be interpreted as accurate predictions of actual revenue costs, but can legitimately be used to compare the structures.

Table 7 summarises some totals for the assumption of differential mortality. The costs to government, over the cohort lifetime, represented by the age pension and the co-contribution, are virtually the same for the current scheme with or without the Knox refund. The net costs with the co-contribution are some 50% higher, since the amount of the co-contribution is offset, but not outweighed, by the the reduction in age pension costs. The timing of the costs is quite different for these alternatives.

However, when the taxation items are taken into account, the increase in tax on superannuation contributions and on the investment income to the superannuation funds is sufficient to render the net cost of providing the co-contribution very small over the lifetime of the cohort. In effect, the increase in investment income to the superannuation funds is subsidising the cost of the co-contribution almost entirely over the longer term. This effect does not obtain for the Knox refund, where the cost of the support falls entirely on the government, and in the years of the working life. However, the timing of the costs is such that, over the cohorts working life only, the revenue costs of the co-contribution are $56 million compared to $30 million for the

Table7. Individual choices
Differential mortality. values in $000,000's

| | Current scheme | co-contribution | refund |
|---|---|---|---|
| Age pension | 125 | 99 | 125 |
| Government co-contribution | | 82 | |
| TOTAL | 125 | 181 | 125 |
| Income tax working life | 1083 | 1083 | 1053 |
| " in retirement | 66 | 85 | 66 |
| Superannuation contribution tax | 51 | 63 | 51 |
| " investment income tax | 78 | 92 | 78 |
| Lump sum tax | 50 | 55 | 50 |
| TOTAL | 1328 | 1378 | 1298 |
| | | | |
| Consumption working life | 2540 | 2540 | 2569 |
| " in retirement | 826 | 897 | 827 |
| | | | |
| TAX - COST | 1203 | 1197=1203-**6** | 1173=1203-**30** |

Amounts are present values on underlying assumptions, see Appendix 1

refund, and in the early years the net revenue costs of the co-contribution would far exceed those of the refund.

To further distinguish these two methods of support, consider the present value of the net consumption of the cohort. The net consumption during the working life is increased by virtually the total cost of the Knox refund. By contrast, the co-contribution increases the cohorts consumption only after retirement.

The effects of welfare payments and fringe benefits, before or during retirement, are not modelled here, indeed it becomes a very complex matter to account for these. Studies, notably by the Australian Institute of Family Studies, identify the child rearing years as those of high poverty risk. Recent results presented in a The Smith Family study, see Orr(1996), suggest that when fringe and related benefits are taken into account, families earning about AWE have the same effective standard of living as those receiving welfare benefits and considered to be 'in poverty'. To increase the cash in hand of the lower and middle income workers before retirement would be expected to relieve hardship during the child-rearing years. The value of such relief is easily underestimated, since it has more than cash value, and some of the resultant benefits may be far removed from the relief that is given. It has been observed, for example, that the most effective use of funds to improve the health of a population is improved poverty alleviation, and *not* improved health care. The costs involved in diverting funds from immediate social support to the years of retirement must be far more diverse than can be modelled here. It can be argued that this diversion, because it neglects immediate needs, increases the division between the higher and lower earner. It supports the advantages already enjoyed by the former (freedom from poverty and associated stresses, with concommitant improved health and increased longevity), and exaggerates the complimentary disadvantages of the latter. If one then begins to consider the costs which may be associated with the social stresses provoked by need, such as family breakdown and the associated health and child welfare expenses to the community, it becomes

clear that it is not valid to judge the merits of these structures only on the immediate tax and benefit costs presented here.

The total real costs of the various structures may be considerably remote from the immediately quantifiable ones, and are, for the purposes of this simulation, imponderable. It is important to raise the matter of these 'remote' costs however, both for considerations of dollar comparisons of structure and for the social implications. A fundamental purpose of superannuation is a social one, to relieve poverty, and this purpose cannot be justifiably subverted by the additional purpose of ensuring that standards of living in retirement reflect those during employment. Just as the structure of provision for retirement may best stand on three pillars, so the purpose and nature of superannuation in payment may be seen as a complex of need, reward and discretion.

## 4. CONCLUSIONS

This paper compares the mature current Superannuation Guarantee Charge structure with one enacting the proposed government co-contribution, and with one incorporating a refund associated with employee contributions. Results suggest that there is little to choose between the alternatives on the grounds of the inherent incentives to behaviour at the time of retirement. The summary economic measures of cohort lifetime earnings and consumption under the action of the alternatives show that there is some increase in progressivity from the current scheme to that with the refund, and from that to the co-contribution. This effect on progressivity is greater than that associated with an allowance for differential mortality, and this result is one not observed in other studies of comparative structures.

One of the most significant distinguishing features which is quantitatively examined here relates to the comparative revenue effects. In the early years the co-contribution has much higher revenue costs than the refund alternative, since the offsetting effects (lower age pension and higher taxation of investment income, contributions and retirement income) accumulate over the long term, and are largely felt after the retirement of the cohort.

Over the entire experience of the cohort, the cost of the co-contribution is approximately revenue neutral on the assumptions used here, and is largely funded from the increase in investment earnings of the superannuation funds. It is thus a method of support which is particularly dependent on the investment performance of the funds, and which increases the exposure of the retiree to risks associated with such performance. Whether or not this is a desirable characteristic is not a matter which can be decided quantitatively, and, in general, this is also true of the other distinguishing features of the alternatives.

The refund alternative, as suggested by Knox, has a smaller revenue cost in the early years and broadly delivers benefits equal to the cost to government in the form of increased consumption before retirement. The additional immediate and long term benefits of this, associated with poverty alleviation, are not modelled, but are discussed and considered to be of pressing importance. The refund does not increase the division between the higher and lower earner as measured by their net consumption, as the co-contribution does. This is, to a significant degree, due to the difference in mortality experience of the different individuals. The lower earner, experiencing higher mortality, will derive benefit from immediate cash relief, but benefits less from payments delayed until the post-retirement ages, and not at all from the purchase of annuities. The higher earner, conversely, does derive benefit from longevity exceeding the average, and this mortality profit which is accessible to them further separates them from the lower earning individual.

The choice between the alternatives, it is argued, should not be made only in the light of the immediately identifiable costs. The remote costs and benefits associated with the alternatives may outweigh the immediate ones both in social and dollar terms, if indeed these terms are distinguishable. 'Social' poverty is expensive to service.

The other important issue is one of risk, and the importance of diversification to reduce risk, since the co-contribution channels considerable additional resources into the superannuation funds and violates the desired aim of diversity. The risks associated with this include the investment risk, but also, most importantly, the risk associated with the individual behaviour in disbursing the accumulated assets. Essentially, the complexity and mixed incentives which are features of the current scheme constitute a risk, which can affect the actual value of the superannuation benefits which the individual realises: they provide an opportunity for value to be lost. To increase the amount of wealth which is included in this pool of benefit, by means of a co-contribution, while it is subject to this complexity thereby increases the exposure to this potential risk for each individual.

In the extreme, individuals are free to choose to retire early and spend their lump sum without making any provision at all for their support during the term of their retirement. There is nothing in the current structure to prevent this, the incentives to do otherwise are obscure, if they exist at all, and are certainly beyond the discernment of most retirees. Atkinson and Creedy (1996) present optimal choices of retirement age in response to current inherent incentives, and discuss the fact that higher levels of provision may encourage earlier retirement rather than higher levels of retirement income. Another extreme possibility is one where a retiree invests entirely in a life time annuity, or a product approximating to it, (allocated pensions , for example) and whose mortality experience distorts their realisation of benefit. They may die early in retirement, having derived very much less from their benefit than they have contributed to it, in real terms or in terms of consumption foregone, or delayed.

The individuals behaviour can vary their actual receipt of benefit considerably, and it must be considered that it is not appropriate to increase the level of contribution to a retirement incomes structure which is so vulnerable to individual and financial market behaviour, and so complex for the mass of employees which are being brought into its purlieu. It seems advisable, rather, to establish a scheme with clear incentives, which is relatively stable in structure and thus engenders confidence and understanding, and which provides a reasonable level of security by limiting the extent of exposure to the risks of (very) long term retirement income investment. Such stability would reduce the likelihood of anomolies between individuals, and enable a degree of long term planning appropriate for such a scheme. Until the structure which establishes these qualities is set in place, it seems perverse to increase the level of contribution to it.

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# Appendix 1. THE LITES MODEL

The model is designed to calculate the contributions, taxes and benefits associated with earnings, direct and indirect levels of taxation, savings and superannuation, under a variety of conditions. It enables examination of selected individuals or simulated cohorts, and produces alternative measures of inequality and progressivity. For a full description see Atkinson, Creedy and Knox (1994).

Earnings profiles

Gross earnings in each year of working life are generated using a model of age-earnings profiles in which earnings in age group t are lognormally distributed as $\Lambda(\mu_t,\sigma_t^2)$, where $\mu_t$ and $\sigma_t^2$ are respectively the mean and variance of the logarithms of earnings. These two parameters are assumed to be quadratic and linear functions of t respectively, so that :

$$\mu_t = \mu_1 + (\theta + g)t - \delta t^2 \qquad \text{(A1)}$$

$$\sigma_t^2 = \sigma_1^2 + \sigma_u^2 t \qquad \text{(A2)}$$

where g is the nominal growth rate of earnings which affects all age groups equally. The five parameters $\mu_1$, $\sigma_1^2$, $\theta$, $\delta$ and $\sigma_u^2$ were estimated using data for Australian males and are $\mu_1 = 9.98064$, $\theta = 0.0385$, $\delta = 0.00086$, $\sigma_1^2 = 0.1817$, $\sigma_u^2 = 0.00575$, $g = 0.06$; see Creedy (1992).

Age at Death

Where differential mortality is assumed, the number of years the individual survives after retirement, d, is obtained using the following formula:

$$d = \bar{d} + B \log\frac{\overline{X}}{M} + u \qquad \text{(A3)}$$

where $\overline{X}$ is the individual's annual average real earnings, M is the geometric mean value of the $\overline{X}$s, $\bar{d}$ is the average number of years individuals in the general population survive after retirement and $u$ is the random normal variable $N(0, \sigma_u^2)$. The values used are: $\bar{d} = 14.6$, $B = 8$ and $\sigma_u^2 = 50$.

Summary measures

Let x and y denote respectively the gross and net lifetime incomes (in present value terms) of an individual. The complex tax and benefit structure operating over the life cycle can be summarised by the tax function t(x), so that $y = x - t(x)$. If individuals are ranked in ascending order, the Gini measure of pre-tax income, $G_X$, can be expressed in terms of the following covariance:

$$G_X = (2/\bar{x})\ \mathrm{Cov}(x, F(x)) \qquad \text{(A4)}$$

Where F(x) is the distribution function, and $\bar{x}$ is the arithmetic mean; see Jenkins (1988). The concentration index of net income, $C_y$, is given by:

$$C_y = (2/\bar{y})\ \mathrm{Cov}(y, F(x)) \qquad \text{(A5)}$$

The tax concentration index, $C_t$, may be obtained by substituting $\bar{t}$ for $\bar{y}$ and t(x) for y in (6). Kakwani's measure, K, is the difference between the tax concentration index and the Gini measure of x:

$$K = C_t - G_x \qquad \text{(A6)}$$

If two individuals have the same (present value of) gross lifetime income, the requirement of horizontal equity would be that they also have the same net income. Therefore, the re-ranking of individuals when moving from the distribution of x to that of y measures horizontal inequity. The Atkinson-Plotnick index, P, measures this using:

$$P = \frac{G_y - C_y}{2\,G_y} \qquad \text{(A7)}$$

The effective total tax ratio, g, is the difference between the present values of gross income and net consumption divided by the present value of gross income over all individuals. The various measures are related by:

$$G_x - G_y = K\{\, g/(1-g)\} - 2G_yP \qquad \text{(A8)}$$

Thus the redistributive effect of the tax and transfer system, $G_x - G_y$, is proportional to its progressivity, K, less a term that depends on the extent of re-ranking; see Lambert (1993). A change which increases tax progressivity need not necessarily reduce the Gini inequality of net income. This approach assumes that the pre-tax distribution is not affected by the tax system, and this assumption is made by the simulation model.

Assumptions

The major economic assumptions used in the simulation are as follows.

| | |
|---|---|
| Tax on super fund investment income | 7.5% |
| Tax on savings fund investment income | 25% |
| Annual increase in Average Weekly Ordinary Time Earnings | 6% |
| Annual increase in income tax thresholds | 5.5% |
| Annual inflation rate | 5% |
| Gross annual investment rate of return on Super accumulation | 9% |
| Gross annual investment rate of return on Savings accumulation | 7% |
| Gross annual rate of return on Bank account during retirement | 5% |
| The purchase price of retirement annuities is | 12.5 |
| Annuities purchased escalate in payment at | 5% |

# Appendix 2: THE CURRENT AUSTRALIAN SYSTEM

Superannuation taxation before retirement

Prior to the recent announcements in the 1995-96 Federal Budget, the long term Government objective for superannuation contributions was an employer contribution of 9% of earnings and employee contributions of 3% of earnings.

The current system is modelled in the following way. Assume that X is the level of the individual's gross annual earnings, ERC represents the employer contributions; $T_c$ represents the tax on deductible employer contributions; and EEC represents the employee contributions, then:

$$ERC = 0.09\ X$$

$$T_c = 0.15 * 0.09\ X \qquad = 0.0135\ X$$

$$EEC = 0.03\ X$$

The net contribution to superannuation each year is:

$$NETC = ERC + EEC - T_c$$

$$= 0.1065X$$

Assuming that these contributions are made, on average, mid year, that the superannuation fund ($SF_t$ at time t) earns rate i p.a., and that there is a net tax on investment earnings (after allowing for imputation and other credits) of 7.5%, and I represents the net investment income received in the year, then

$$SF_t = SF_{t-1} + 0.925\ I + 0.1065X$$

where $I = i(SF_{t-1} + 0.5*0.1065X)$

An employee may be entitled to a tax rebate in respect of undeducted employee contributions. However, the level of the rebate is limited to 10% of the employee's contributions subject to a maximum of $100 per annum. It is also income-tested so that any individual with earnings in excess of $31,000 receives no rebate. There is also a restriction linked to age and the level of the employer's contribution but this rarely applies due to the severity of the income testing. There is also a tax rebate payable to low income earners. Let R represent the total rebates payable.

Assuming that there are no other sources of income, income tax, $T_X$, is calculated on the value of gross earnings, X, rounded down to the nearest dollar. The Medicare levy (in respect of compulsory medical insurance) is also added. The total income tax payable by the individual, T, since rebates may not exceed the amount of tax assessed, may therefore be written as:

$$T = \text{maximum } [T_X + \text{Medicare levy} - R, 0]$$

The individual's disposable income, A, is defined as the gross earnings less employee superannuation contributions less income tax payable so that:

$$A = X - EEC - T \qquad = 0.97X - T.$$

In addition, provision is made for non-superannuation savings which are accumulated each year in a fund (namely $F_t$ after t years). It is assumed that savings are made, on average, mid year, the gross

annual nominal rate of interest earned on savings is r, and that the effective tax rate on any interest income is 25%. This assumed flat rate has been chosen as it is not appropriate to assume that interest income is simply added to income from employment for income tax purposes due to the wide range of investment opportunities available. This assumption reflects the level and degree of the tax efficient behaviours available. Hence, if S is the amount of non-superannuation savings made in the year, the value of $F_t$ at the end of year t is:

$$F_t = F_{t-1} + 0.75\ r\ (F_{t-1} + 0.5\ S) + S$$

Taxation in retirement

Taxation in retirement includes a number of components including a tax on any lump sum benefit, tax on any superannuation pension or annuity and other income tax. The lump sum tax, $T_L$, is calculated as follows, with a threshold of $77,796 (as applied in the 1993-94 tax year):

$$T_L = 0 \qquad \text{if } L_T \leq 77{,}796$$

$$= 0.164\ (L_T - 77{,}796) \qquad \text{if } L_T > 77{,}796$$

where $L_T$ represents the taxable post-1983 lump sum benefit excluding undeducted contributions,

or, if there is an excessive benefit, then:

$$T_L = 0.164\ \{L_T\ (1 - E) - 77{,}796\} + 0.484\ L_T\ E$$

where E is the proportion of the superannuation benefit (excluding the amount of undeducted contributions) that qualifies as 'excessive'.

The taxable benefit is considered excessive when it exceeds $400,000 (if more than half the fund is taken as a lump sum) or $800,000 in other circumstances.

By contrast with lump sums, part of the income arising from purchased annuities is subject to normal personal income taxation and the Medicare levy. The taxable component for annuities purchased by after tax capital (either savings or from after tax lump sum benefits) is the annual income, less the purchase price divided by 14.6. The deduction represents a spreading of the capital cost over the expected term of the annuity, in this case, a life expectancy of 14.6 years for a male aged 65. For non-excessive superannuation annuities, the taxable portion is the annual income, less the amount of undeducted contributions divided by 14.6.

Finally, there exists a special income tax rebate relating to superannuation annuities which is designed to allow for the 15% contributions tax levied during the accumulation period of the fund. This rebate is 15% of the non-excessive proportion of the taxable annuity purchased by the superannuation taxable benefit.

Eligibility for the age pension

The amount of age pension awarded is subject to independent means-tests of income and assets, which depend on the marital status of the pensioner and whether or not the pensioner is a homeowner. Non-homeowners are permitted to hold a higher value of assets than homeowners before the means-test disqualifies them from eligibility. The individuals considered in this study are assumed to be homeowners. The full rate of pension for single individuals in 1994 was $8,115 per annum.

The full rate of pension may be reduced depending on the income of the retiree. The income which is subject to the means-test includes all taxable income from sources other than the age pension, but excludes the repayment of capital amounts in any annuity. If Y is the level of income subject to the income test, the reduction in the age pension, $R_P$, is:

$R_P = 0$ for $Y \leq 2{,}236$

$R_P = 0.5\ (Y - 2{,}236)$ for $2{,}236 \leq Y \leq 18{,}466$

$R_P = 8{,}115$ for $Y > 18{,}466$

The pension payable also depends on the asset test limitations. In the cases considered in this study, a retiree has only three relevant assets. These are:

(i) an interest bearing bank account, in which case the balance in the account is an assessable asset. It is also assumed that the bank balance is reduced by capital drawings each year in such a way as to extinguish the account at age 80;

(ii) an annuity purchased using after tax money, then the entitlement to the remaining future income stream is deemed to have an assessable asset value. If N is the number of completeyears since the first annuity payment, the asset value of the assessable future whole life income stream is taken to be purchase price multiplied by (14.6 - N)/14.6. Hence, this component of the asset test ceases to have any relevance beyond age 80;

(iii) an annuity purchased directly by a superannuation benefit which is not assessable under the assets test.

Where applicable, the reduction in the pension arising from the asset test, $R_a$, is:

$R_a = 0$ for assets $\leq$ $112,750

$R_a = 0.078\ (\text{assets} - 112{,}750)$ for $112,750 $\leq$ assets $\leq$ $216,788

$R_a = 8{,}115$ for assets > $216,788

where the threshold value of $112,750 is that which applies to homeowners who are single.

The actual age pension paid is the lesser one resulting from the independent application of the income test and the assets test.

A tax rebate, $P_r$, may also be received by some age pensioners. Where $Y_t$ represents taxable income, this is calculated as:

$P_r = 972$ if $Y_t \leq \$10,260$

$P_r = 972 - 0.125\ (Y_t - 10,260)$ if $\$10,260 \leq Y_t \leq \$18,036$

$P_r = 0$ if $Y_t > \$18,036$

If a pension rebate is payable, the tax payer is also exempt from the Medicare levy.

Retirement Decisions

At retirement, it is assumed that the individual transforms assets accumulated during the working life (from both superannuation and non-superannuation savings) into immediate expenditure, interest bearing assets and annuities. The superannuation benefit is divided into two components according to their source; namely the employee's 'undeducted contributions' and the balance of the fund, which is called the 'taxable benefit'. This includes all employer contributions and all investment income earned by the fund, including that earned by the undeducted contributions. These two components of the superannuation benefit are treated differently for taxation purposes, as are the lump sums or annuities arising from them. Where only part of the superannuation benefit is taken as a lump sum, the two components are split in the same proportion between the lump sum and any annuity purchase.

The options available to the retiree in choosing how to receive the superannuation benefit are many and have important tax and age pension implications. For instance, all the superannuation benefit may be taken as a lump sum benefit, the appropriate level of lump sum tax paid, and this after-tax benefit may then be combined with other savings before considering the purchase of an annuity. Once the lump sum tax has been paid on a superannuation benefit, the resulting capital is no longer identified in terms of its source. In contrast, if the superannuation benefit is used to purchase an annuity directly without incurring a liability to lump sum tax, the annuity continues to be identified as arising from the superannuation benefit for the purposes of income taxation and the age pension means-tests.

Hence, the source of the capital used to purchase annuity income, whether it be purchased from the superannuation benefit directly or from a taxed capital amount, has continuing implications for the individual's taxation position and age pension entitlement. However, the market price of a retirement annuity is independent of the source of the purchase monies.

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