

AIST submission

12 Percent: What's it Worth?

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aist

Australian Institute of Superannuation Trustees

AIST

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EXECUTIVE SUMMARY

- In the 2010 Federal Budget, a gradual increase in the superannuation guarantee contribution (SGC) from 9 to 12 per cent of wage and salary income was flagged. The SGC would increase to 9.25 and 9.50 per cent in 2013-4 and 2014-5 respectively and by 0.5 thereafter until a 12 per cent rate was reached in 2019-20.
- Budgetary estimates indicate the cost of this phased implementation at \$3.6 billion¹, or around \$0.3 billion for each 0.25 basis point increase in the SGC. Figures of this magnitude, when viewed in the context of the overall budget position should not be seen as impediments to the change if the long run consequences of higher retirement savings balances are favourable.
- To assist in this evaluation, this paper undertakes three simulations to examine the net benefit to individuals in different circumstances of the increase in the SGC on retirement savings or the *replacement rate*, that is retirement income relative to pre-retirement income. First, we test the impact on a new entrant to the workforce aged 20, second a couple where one member is absent from the workforce for ten years to raise children, and finally two older workers at ages 40 and 50 with limited superannuation savings.
- The impact of the increase in SGC from 9 to 12 per cent on the superannuation balance of a now 20 year old worker at retirement (age 67) is an increase from \$636,296 to \$877,317 in real (inflation adjusted) terms. The net *replacement ratio* increases from 57 per cent to 79 per cent and the multiple of final pre-tax salary to disposable income accordingly increases from 7.87 to 10.86 times.
- For the couple raising children, where one partner has a period of absence from the labor market from ages 30 to 40. The impact of the increase in SGC from 9 to 12 per cent is an increase in the *replacement ratio* from 50 to 70 percent, and an increase in the multiple of disposable income to retirement savings from 6.92 to 9.54.

¹ http://www.apf.gov.au/budget/2010-11/content/bp2/html/bp2_revenue-06.htm Those budget estimates appear not to include the consequences for tax revenues of the increased balances in superannuation funds which are subject to concessional tax, although the magnitude of any such effect depends on a range of assumptions including the extent to which super contributions lead to increased aggregate savings.

- Older workers have lower superannuation balances due to periods of non-contribution prior to the introduction of the SGC and when contribution rates were 3% and 6%. We consider the cases of a 40 year old and a 50 year old with current superannuation balances respectively of \$40,000 and \$50,000. The increase in SGC from 9 to 12 per cent has a significant effect on the *replacement ratio* for the 40 year old, increasing from 38 to 48 per cent, and a slightly lesser effect on the 50 year old, from 24 to 30 percent, as there is less time before retirement for the increased contributions to have an effect.
- Consequently it would appear that in all three cases, the increase in SGC from 9 to 12 per cent leads to a significant improvement in the standard of living post-retirement. Both the young worker entering the workforce at 20 and the couple facing life on a one salary for a period of 10 years would expect to see an increase in retirement savings of around 40 per cent. Older workers closer to retirement have less benefit, but would expect to find an increase of around 25 per cent in retirement savings.
- We also consider the net impact of deferring the increase in compulsory contributions for four years for an individual currently aged 20 and entering the workforce. The effect is a reduction in the replacement ratio (ie living standard in retirement) of 2 per cent.
- While the initial simulations consider a situation where employers bear the cost of increased superannuation contributions such that employees' disposable income is unchanged, we also consider the case where there is no change in employer labor costs, such that wages (net of super contributions) fall by the amount of the increase in the SGC. This reduction in employee disposable income can be expected to lead to some decline in other savings – creating a potential offset to the increase in superannuation savings. Assuming a voluntary savings rate (as a percentage of disposable income) of 4 per cent and that voluntary savings generate a real return after tax of 3 per cent which is less than that for tax-preferred superannuation, real disposable income pre retirement (for a currently 20 year old worker) falls to approximately \$78,000 compared to \$80,800 when employers bear the contribution cost. If there is no change in the voluntary savings rate, the replacement ratio is unaffected – but is based upon a lower pre-retirement disposable income. If the voluntary savings rate falls from 4 per cent to 2.8 per cent, the increase in the replacement ratio falls from 0.22 to 0.15. The overall decline in private savings is around 35 per cent of the increase in

superannuation savings, giving a net increase in total savings of about 65 per cent of the increase in superannuation savings – which is consistent with previous empirical findings.

12 Percent: What's it Worth?

In the 2010 Federal Budget, a gradual increase in the superannuation guarantee contribution (SGC) from 9 to 12 per cent of wage and salary income was flagged. The contribution rate would increase to 9.25 and 9.50 per cent in 2013-4 and 2014-5 respectively and by 0.5 thereafter until a 12 per cent rate was reached in 2019-20.

Such a change would impact upon the Federal budget outcome, reducing tax revenues because of the concessional tax rate of 15 per cent applied to the compulsory employer contributions. On the other hand, it would undoubtedly increase employees' superannuation balances at retirement age, reducing future government budget expenditures due to reduced reliance upon the old-age pension. While that effect is somewhat far-distant, it should be taken into account in considering the fiscal consequences of an increase in the SGC. At the very least, the consequence of an initial increase in public debt (from a higher deficit) will eventually be partially offset by reduced future old-age pension outlays. Indeed, those neo-classical economists enamored of rational expectations could be expected to argue that those future reductions in government expenditure will be factored into and moderate private sector reactions to a current increase in the budget deficit.

The size of the impact of an increased SGC upon the government budget is not inconsequential at a time when the political focus is upon returning the budget to surplus in the short to medium term. Based on figures in the 2011 Budget Papers² tax expenditures resulting from concessional tax treatment of employer superannuation contributions were \$14.3 billion in 2010-11 (out of total superannuation related tax expenditures of \$28 billion – with most of the remainder reflecting concessional tax treatment of super fund earnings). A “ball-park” upper bound for the budgetary consequences of increasing the SGC from 9 to 12 per cent is thus in the order of an increase of 33 per cent or \$4.8 billion, although this assumes that all employer contributions are currently only at the compulsory amount, and is thus an overstatement. The 2010 budget, where a phased introduction (involving an increase of 0.25 percentage points p.a. in 2013-4 and 2014-5 and then 0.5 percentage points until 12 per cent is reached in 2019-20, estimated a budgetary cost at that latter

² http://www.budget.gov.au/2011-12/content/bp1/html/bp1_bst5-12.htm

date of \$3.6 billion.³ This suggests a budgetary cost of around \$0.3 billion for each 0.25 basis point increase in the SGC, such that the consequences for the first two years would be increased tax expenditures of \$0.3 and \$0.6 billion respectively. Figures of this magnitude, when viewed in the context of the overall budget position should not be seen as impediments to the change if the long run consequences of higher retirement savings balances are favourable.

Also important from a macroeconomic perspective, and heightened by the concerns about a “two-speed” economy where the non-resource sector faces growth concerns from a higher exchange rate and a world (and possible domestic) economic slowdown, is the impact upon employers’ labor costs. While superannuation guarantee contributions are “labeled” as employer contributions, it would be extreme to assume that there is no offset via market and bargaining responses in the form of (temporarily) reduced real wage growth. In the extreme, higher contributions could be completely offset by an equivalent reduction in wages net of employer contributions. Indeed, this was the genesis of the original 3 per cent SGC in the early 1990s, when an award wage increase was forgone for the introduction of compulsory superannuation contributions.

In this regard, a gradual increase in the SGC has merit in allowing whatever offsetting adjustment in wages necessitated by macroeconomic forces is required to occur gradually without undue disruption to labor markets.

It is thus important to address the question of what effect will an increase in the compulsory SGC ultimately have on retirement savings (and demands upon future government budgets due to reliance of retirees on the old-age pension)? This can be addressed by considering the effect it will have on the *replacement rate* (retirement income relative to pre-retirement income). Of course, the answer depends on a host of assumptions about such unknowns as: future income growth; superannuation earnings rates; the effect of an increased SGC on wage levels and its effects on other savings. The magnitude of all these factors is open to debate, and will vary across individuals and families depending upon their particular circumstances. More generally, to incorporate all the interrelationships and feed-back effects of a change in the SGC would require a formalized model of

³ http://www.apf.gov.au/budget/2010-11/content/bp2/html/bp2_revenue-06.htm Those budget estimates appear not to include the consequences for tax revenues of the increased balances in superannuation funds which are subject to concessional tax, although the magnitude of any such effect depends on a range of assumptions including the extent to which super contributions lead to increased aggregate savings.

the macro-economy. That is not attempted here, where it is assumed that there is no effect on real national output growth.

Measuring retirement income adequacy.

Retirement income adequacy is typically considered by reference to the *replacement ratio*, defined as the ratio of post retirement income to immediate pre-retirement income. Generally it is suggested that a ratio of around 70 per cent is adequate for a comfortable retirement, reflecting lower employment-related and other expenses in retirement.

However, the precise definitions of income which are appropriate need examination. Prior to retirement, the disposable income of individuals, available for consumption (and voluntary saving) will be their gross income less superannuation contributions and tax payments. Post retirement, under current tax arrangements, disposable income will be total income available from superannuation accounts (which is not subject to tax), income from other savings (which will potentially be subject to tax), and old age pension payments or other social security benefits.

Since the objective of this report is to examine the consequences of a change in the compulsory SGC on retirement savings, we adopt a replacement ratio definition which focuses purely upon superannuation and other voluntary savings and ignoring government provided old-age pension or other payments. It is thus a measure of to what extent an individual's private wealth at retirement will be able to provide an income stream to sustain expenditures in retirement. Reflecting the change in employment circumstances at retirement, the replacement ratio concept used is:

$$\text{Replacement Ratio} = \frac{\text{Pre-retirement income after super contributions and tax}}{\text{Post retirement income (after tax) available from accumulated super and other savings}}$$

Use of other measures (such as using gross pre-retirement income before tax and super contributions) give different values, but have minimal consequences for the size of the change in the replacement ratio following a change in the compulsory SGC.

Calculating the Replacement Ratio

Details of our approach to calculating the replacement ratio before and after a change in the SGC from 9 to 12 per cent are provided in the Appendix. Essentially, we focus upon real (inflation-adjusted) measures, such that key drivers of the results are the assumed rate of real income growth over the individual's working life and the real (after tax) rate of return on superannuation and other savings. We calibrate the model such that assumptions about these and other parameters are consistent with currently observed or projected values.

For example, data on the after tax real rate of return of super funds (ie the rate of return reported to members less the inflation rate) can be obtained from APRA statistics. APRA's 2010 Superannuation Fund-Level Rates of Return provides annual returns over a five year and seven year horizon for the largest 200 funds. The average figure for 5 years ending June 2010 is 2.96% p.a. while that for 7 years is 6.37% p.a.. The seven years to June 2010 includes the significant downturn in equity markets during the GFC, but it also includes several years of 20% plus returns in the earlier years). Over the past seven years the inflation rate in Australia has averaged approximately 3% p.a. Hence a figure of 3.5% p.a. for real (after tax) returns generated by super funds is taken as a benchmark rate and calculations also made for alternative values.

Also important is the rate of increase of real income. In aggregate, it can be expected that, on average, real incomes grow at approximately the same rate as labor productivity growth. Predicting productivity growth over long periods into the future is particularly hazardous, as can be seen from the significant slowdown in productivity growth between the 1990s and the 2000s. Consequently we use a ball park estimate based on the real growth rate in average weekly earnings over the last decade. We adopt a figure of 2% p.a. (reflecting nominal wages growth of around 4.8% p.a. and inflation of around 3% p.a.).

However, when considering the rate of real income growth for an individual over their lifetime, the effect of age (experience)-related increases in wages also need to be considered. Hence we assume a future real wage profile in which the growth rate tapers-off with ageing, and calibrated such that the average growth rate at any time across workers of all ages matches the assumed real aggregate labor productivity growth rate. This leads to an assumption of real income growth of over 3 per cent

p.a. for employees up to age 30, gradually tapering off to less than 1 per cent p.a. for employees over 60.

If the compulsory SGC is raised from 9 to 12 per cent, an important consideration is that of who bears that cost. At one polar extreme, it could be assumed that gross wages of employees are unchanged, such that the extra contributions reduce take-home pay. At the other extreme it could be assumed that the extra contributions are borne by employers via an increase in gross wages with all of the effect falling on take-home pay.

Note, however, that if gross wages are unchanged, then because of personal tax the after-tax take home pay would fall by less than the increased amount of contribution. For example, if the worker's personal tax rate is 0.3, take-home pay will fall by 70 per cent of the increase in contribution). In the alternative extreme scenario, gross wages would increase by the amount of the increased contribution, leaving the worker's after tax pay unchanged.

Another important consideration is how an increase in compulsory contributions impacts upon other savings decisions of the individual. Arguably, even if the contributions are borne by employers individuals may reduce other savings because of the greater wealth accumulation via super. If contributions are borne by employees, an extreme outcome could be that other saving falls by an amount equal to reduction in take-home pay due to the increased contributions, in order to keep consumption levels unchanged.

Turning to retirement incomes, it is necessary to address the question of what annual income in retirement can be generated from accumulated savings available at the retirement date (assumed to be age 67). We make the assumption that remaining average life expectancy at age 67 is 20 years, and calculate the constant real payment stream available for that duration from accumulated savings for an account based pension. Because earnings of the pension fund in the retirement phase are not subject to tax, the rate of return should be higher than during the accumulation phase. Assuming an effective tax rate on superfunds in the accumulation phase of 10 per cent (reflecting tax benefits available from franking credits), the retirement phase rate of return should be approximately 11 per cent higher.⁴ However, reflecting additional administrative costs of post-

⁴ Based on $r_{\text{post-retirement}} = r_{\text{pre-retirement}} / (1-t)$ where t is the super fund effective tax rate.

retirement accounts, and for conservatism, we assume that the post-retirement and pre-retirement earnings rates are equal. (While this affects the size of the replacement ratios calculated, it has little effect on the change in the ratio arising from an increased SGC).

Simulations

It is necessary to parameterize the model with realistic assumptions, and benchmark values for key parameters are given below. Note that although we assume a specific figure for the income of a twenty-year old (y_{20}) this is simply for convenience of exposition and does not affect results for the replacement ratio.⁵

For the benchmark simulations, we assume:

- $g = 0.02$ (average real income growth of 2 per cent p.a.)
- $r = 0.035$ (real after tax earnings rate of super fund of 3.5 per cent p.a.)
- $c = 0.09$ (current 9 per cent SGC)
- $c^* = 0.12$ (proposed 12 per cent SGC)
- $s = 0.05$ (current "other" savings rate of 5 per cent)
- $y_{20} = \$40,000$ (annual wage income of current 20 year old)
- $m = 20$ years (post retirement lifespan)

For simplicity, our benchmark simulations assume a once-off increase in the SGC from 9 to 12 per cent, rather than the gradual phase-in of increased contributions. We model the approximate difference from gradual phase in by considering the alternative where the start date of a on-off lift in the rate is delayed by two years.

(a) Benchmark scenario: A new entrant into the workforce at age 20.

We first consider the case where the employee bears the full cost of increased contributions (ie there is no change in wages: $\alpha = 0$) and where there is no effect on other savings ($\beta = 0$). It is also assumed that the "other" savings are in the form of mortgage repayments on an owner-occupied home, such that there is no cash income or financial wealth arising from these.

⁵ This is because the outputs of the model of interest are all expressed as ratios (such as accumulated savings/pre-retirement income).

The average real growth in income of 3 per cent p.a. means that for a current 20 year old earning gross income (including employer super contributions) of \$40,000 p.a. the pre-retirement real gross income at age 67 (in 47 years) will be \$104,460 or \$95,059 after superannuation contributions. With the current SGC of 9 per cent and super fund real after-tax earnings of 3.5 per cent, the superannuation balance at age 67 will be \$636,296. This is a multiple of 6.69 times of final pre-tax salary or 7.87 times disposable income (after tax) of \$80,800. In the post-retirement tax-free phase the super fund is assumed to be able to earn a real rate of return for an account based pension of $0.035/0.9^6 = 0.0389 = 3.89$ per cent. Assuming a life span of 20 years this means that the superannuation balance can yield an annual income of 49 per cent of final pre-tax salary or a *replacement ratio* of 57 per cent of final disposable income.

If instead, the SGC is raised to 12 per cent, the superannuation balance at age 67 will be \$877,317. The *replacement ratio* (relative to final disposable income) increased from 57 per cent to 79 per cent. The table below summarizes these results.

SGC	9 per cent	12 per cent
Final super balance/disposable income	7.87	10.86
Replacement ratio (assuming 20 years post retirement)	57 per cent	79 per cent

To identify the sensitivity of these scenarios to particular assumptions, the table below shows the outcomes for different values of the assumed real income growth rate and the super fund earning rate. It is clear that a crucial variable in determining ultimate replacement ratios is the size of the gap between the earnings rate and the real income growth rate. The assumed earnings rate also has a separate influence on the replacement ratio (because the size of the account based pension for a given final balance is positively related to the earnings rate).

Real Income Growth Rate	Post tax real super earning rate	Final Balance / Disposable Income (9%)	Replacement Ratio (9%)	Final Balance / Disposable Income (12%)	Replacement Ratio (12%)
0.02	0.04	8.97	0.69	12.37	0.95
0.02	0.035	7.87	0.57	10.86	0.79
0.02	0.030	6.93	0.48	9.56	0.66
0.02	0.025	6.13	0.40	8.45	0.56

⁶ Pre-tax earnings rates are assumed equal, but in the post retirement, zero- tax phase all of this gets passed to the member, whereas in the accumulation phase it is subject to tax at an assumed rate of 10 per cent.

Regardless of the assumptions used, the shift from a 9 per cent to a 12 per cent SGC has a substantial impact on the replacement ratio, increasing it from somewhere between 16 percentage points (when the earnings rate is assumed low) to 26 percentage points (when the earnings rate is assumed high).

If, instead of the tapered real income growth rate average 2 per cent over the working life, it is assumed that real income grows at 2 per cent each year, the effect of the change in the SGC is affected relatively little. For an assumed superfund earnings rate of 3.5 per cent, the replacement ratio increases from 0.51 to 0.70 (compared to a change from 0.57 to 0.79) with the difference in the size of the replacement ratios reflecting the lower early-year accumulation of superannuation balances in the constant growth scenario.

(b) Family circumstances, Child raising and retirement savings

In this section we consider the effect of an increase in super contributions from 9 to 12 per cent on a family where one partner has a period of absence from the labor market. We assume that both partners commence work at age 20 and have equal wages, but that age 30 one member leaves the workforce until age 40 to be responsible for their children. Consequently the household income is assumed to be halved over the ages 31-40.

The table below illustrates the consequences for the baseline scenario where the superannuation fund real rate of return is 3.5% p.a. and real income growth averages 2% p.a. over the life-cycle. The absence from the workforce reduces the replacement ratio for the family, and the higher SGC has a similar (but slightly smaller) effect.

Household Scenario	9% SGC		12% SGC	
	Final Balance / Disposable Income (9%)	Replacement Ratio (9%)	Final Balance/ Disposable Income (12%)	Replacement Ratio (12%)
no workforce absence	7.87	0.57	10.86	0.79
one member absent from workforce age 31-40	6.92	0.50	9.54	0.70

(c) Older Workers

Here we consider the consequences for older workers whose superannuation balances reflect lower rates of contribution (during the time when the SGCs were 3% and 6%) and periods of non-contribution prior to the introduction of the superannuation guarantee.

We consider the cases of a 40 year old with current superannuation balance of \$40,000 and a 50 year old with current balance of \$50,000. The Table below shows the effect of an immediate increase in the SGC from 9 to 12 per cent. As would be expected, the replacement ratios are substantially lower due to the lower level of contributions and earnings to date. The increase in the SGC has a significant effect on the replacement ratio for the 40 year old, but a lesser effect in the case of the 50 year old, where there is less time before retirement for the increased contributions to have an effect.

Scenario	9% SGC		12% SGC	
	Final Balance / Disposable Income (9%)	Replacement Ratio (9%)	Final Balance/ Disposable Income (12%)	Replacement Ratio (12%)
40 year old with \$40,000 balance	5.17	0.38	6.63	0.48
50 year old with \$50,000 balance	3.34	0.24	4.17	0.30

(d) Deferral of the Introduction

In this section, we address the question of the consequences of deferral of the introduction of increased contributions. Specifically, we consider what would be the effect of deferral for four years for an individual currently aged 20 and entering the workforce. The table below illustrates for the benchmark scenario of real income growth rate averaging 2% p.a. and a super fund real earnings rate of 3.5% p.a. The effect is a reduction in the replacement ratio (ie living standard in retirement) of 2 per cent.

Scenario	Final Balance / Disposable Income (9%)	Replacement Ratio (9%)	Final Balance / Disposable Income (12%)	Replacement Ratio (12%)
Immediate introduction	7.87	0.57	10.86	0.79
Introduction in 4	7.87	0.57	10.56	0.77

years				
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Thus while the deferral of the introduction of the increase in the SGC for four years has relatively little effect on a 20 year old worker, as this is only a small part of a young worker's total working life, the impact on a 50 year old worker will be twice that at approximately 4 per cent.

(e) No Labor Cost Change and Savings Offset

The previous simulations have all assumed that employers bear the cost of increased superannuation contributions such that employees' disposable income is unchanged. The alternative polar extreme is where there is no change in employer labor costs, such that wages (net of super contributions) fall by the amount of the increase in the SGC. This reduction in employee disposable income can be expected to lead to some decline in other savings – creating a potential offset to the increase in superannuation savings.

We assume in this case that the voluntary savings rate (as a percentage of disposable income) is 4 per cent. It is assumed that voluntary savings generate a real return after tax which is less than that for superannuation, due to the favoured tax status of superannuation. Since the baseline scenario assumes an individual on a 15 per cent average tax rate, we assume a real return on voluntary savings of 3 per cent (compared to 3.5 per cent for superannuation). Compared to the baseline scenario (where disposable income is unchanged), the reduction in wages means that at age 67, disposable income is approximately \$78,000 compared to \$80,800 when employers bear the contribution cost. If there is no change in the voluntary savings rate, the replacement ratio is unaffected – but is based upon a lower pre-retirement disposable income. If the voluntary savings rate falls from 4 per cent to 2.8 per cent, the increase in the replacement ratio falls from 0.22 to 0.15. Overall, the decline in private savings is around 35 per cent of the increase in superannuation savings, giving a net increase in total savings of about 65 per cent of the increase in superannuation savings – which is consistent with previous empirical findings.

Final balances and replacement ratios inclusive of private savings				
Scenario	9% SGC		12% SGC	
	Final Balance / Disposable Income	Replacement Ratio	Final Balance / Disposable Income	Replacement Ratio
<i>Wages decline by amount of increased contribution and disposable income falls</i>				
Savings fall to 2.8% of disposable income	10.68	0.78	12.82	0.93
Savings remain at 4% of disposable income	10.68	0.78	13.66	1.00
<i>Disposable Income constant</i>	10.68	0.78	13.66	1.00

Conclusion

Providing adequate savings in retirement is a long-term issue which requires long-term planning and insight. With increased longevity and an increasing 'old age dependency ratio' (size of the older population to the working age population) the sustainability of the retirement system is under pressure. While there were five working-age people for each older person in 2007, by 2056 there will be less than three working-age people for every older person. Inadequate retirement savings will ultimately impact on costs to government as retirees seek to supplement their income and other needs from social security and other government sources.

As this study demonstrates, modest phased increases to 2019-20 in the SGC will yield major benefits to individuals ranging from a 40 per cent increase in retirement savings for a new entrant to the workforce, to a lesser amount of around 25 per cent for more mature workers. Young couples who have one partner out of the workforce for an extended period will also benefit from a similar increase in SGC.

Increasing the SGC improves retirement adequacy, reduces the burden on the public purse and ultimately adds to the store of national savings. Even allowing for some offset as individuals adjust savings to accommodate the additional compulsory superannuation contributions, net savings can be expected to increase.

APPENDIX

The Model

For simplicity we analyse the problem in real (ie inflation adjusted) terms. We consider the simple case of a single individual currently aged 20 with an annual wage income of y_{20} . Real income is assumed to grow at an average rate of g per cent. (If the growth rate were constant through the life-cycle income at age t is $y_{20}(1+g)^{(t-20)}$. However, we assume a tapering-off of the growth rate with age as explained later.) With a SGC of c per cent of income, the amount received by the individual's super fund in year t is:

$$\text{Contribution}_t = 0.85cy_t,$$

reflecting the 15 per cent tax rate applied to contributions.

The balance in the super fund at the end of year t is given by:

$$\text{Balance}_t = \text{Balance}_{t-1}(1+r_t) + \text{Contribution}_t(1+0.5r_t)$$

where r_t is the real after-tax rate of return within the superfund.

Other saving (S_t) by the individual is assumed to be a proportion s of current income such that $S_t = sy_t$.

If the SGC is raised by Δc from c to c^* , the possible effects on income and savings can be analyzed as follows.

First, the extent to which employers or workers bear the cost can be examined by assuming that current income (before super contributions are deducted) of the 20 year old changes from y_{20} to y_{20}^* = $y_{20}(1+\alpha \Delta c)$.

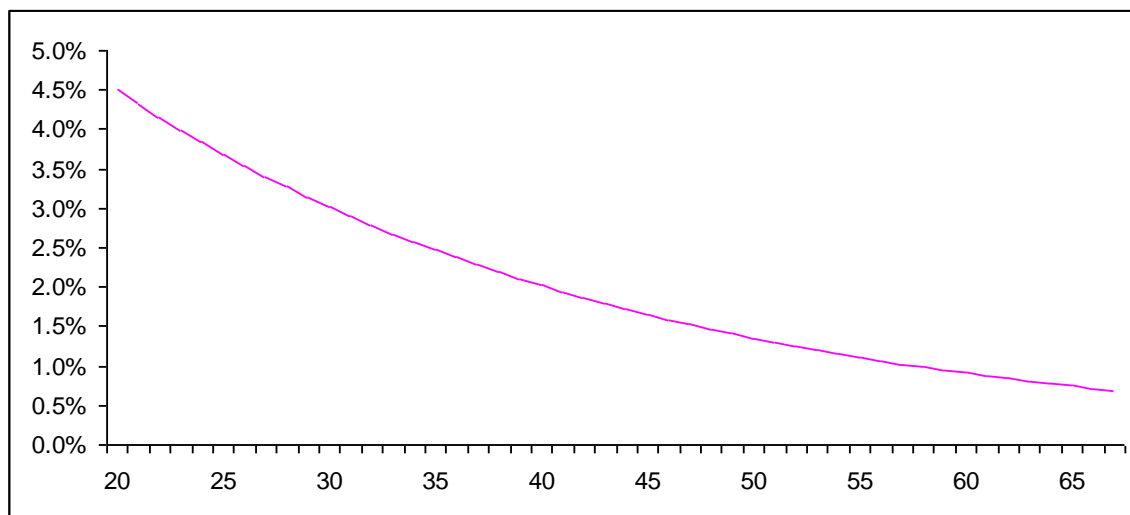
One polar outcome is that income of employees after super contribution deductions (denoted by $y_x = y - c$) remains unchanged, in which case all costs are borne by employers through higher wages. Since $y_x = 0.91y$ and $y_x^* = 0.88y^*$, equating pre and post change values $y_x^* = y_x$ gives $y^* = 1.0341y$. Thus $\alpha = 0.0341/0.03 = 1.136$ when employers bear the full contribution, and the income adjustment rate = 1.0341. If $\alpha = 0$, all contributions are borne by workers.

Second, the effect on other savings can be examined by assuming that the savings rate changes from s to $s^* = s(1-\beta \Delta c)$. If $\beta = 1$, the increase in contributions is offset completely by a reduction in other savings (if income is unchanged). If $\beta = 0$, the increase in contributions has no effect on the savings rate.

We model the annual real income growth over an employee's life-cycle by the following relationship:

$$g_t = \alpha \cdot e^{-\beta(t-20)} \tag{Equation 1}$$

where g_t is the annual growth rate in real income for an individual aged t , and reflects both individual ageing (experience) and macroeconomic productivity increases. Equation (1) assumes that the rate of real income growth tapers off as individuals age such as shown in Figure 1.



Assuming that the economy wide average for real income growth is 2% p.a., it is possible to derive parameters (α , β) which generate such an average. If it is assumed that there are equal numbers of employees of each age, values of $\alpha = 0.045$ and $\beta = 0.04$ are among the combinations which generate that outcome.