

ABSTRACT

This paper discusses measures of the adequacy of retirement incomes developed by the Retirement Income Modelling Task Force and applies those measures to a number of alternative retirement income streams. It concludes that the most appropriate measure is the replacement rate of pre-retirement consumption expenditure. This is because it measures most directly how well people are able to maintain their pre-retirement living standards into retirement. It also concludes that people will be able to achieve a better retirement income where they draw down on the capital of their investments rather than seeking to live on the earnings of those investments alone.

MEASURING THE ADEQUACY OF RETIREMENT INCOMES

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MEASURING THE ADEQUACY OF RETIREMENT INCOMES

OVERVIEW

This paper discusses measures of the adequacy of retirement incomes developed by the Retirement Income Modelling Task force and applies them to a range of retirement income streams. It looks at how the measures affect assessments of the effectiveness of retirement income policies in maintaining a person's living standards in retirement.

The paper concludes that we must use a rigorous and consistent base for calculating replacement rates, based on economic concepts of income, consumption and saving. We cannot rely on taxation or social security measures of income as a basis for calculating replacement rates because these measures do not employ a consistent basis for measuring income from different sources. The paper concentrates on two bases for measuring replacement rates:

- replacement of pre-retirement disposable income, where income is measured as the individual's *economic* income rather than income for tax or social security purposes; and
- replacement of pre-retirement net consumption expenditure, where consumption expenditure excludes financial saving before retirement and includes drawdowns from capital (ie dissaving) in retirement.

These two measures are related, with the difference between disposable income and net consumption expenditure being the amount the person saves or dissaves in each period.

The paper concludes that the most appropriate basis for measuring the effectiveness of retirement income policy in maintaining a person's living standards into retirement is the replacement rate of pre-retirement net consumption expenditure. This is because it takes better account of pre-retirement savings and the role dissaving in retirement should play in maintaining a person's living standards. Replacement rates based on income tend to understate the extent to which retirement savings maintain living standards. This is because they overstate living standards prior to retirement by including saving and, if based on *economic* income, ignore the role of drawdowns of capital in maintaining living standards in retirement. In effect, measures based on economic income ignore the aim of retirement saving, which is to defer consumption from a person's working life into retirement.

Finally, the paper shows how a person's choices about retirement income streams can affect that person's standard of living in retirement. The paper uses RIMHYPO, the RIM Task Force's individual hypothetical model, to analyse a range of retirement income streams arising from the investment of a superannuation accumulation accumulated under the Government's retirement income policy settings.

REPLACEMENT RATE CONCEPTS

In modelling retirement incomes, we are concerned with how well retirement income policies enable people to maintain their living standards into retirement and how cost effective they are in doing this. Most modelling of retirement incomes has looked at the extent to which people are able to replace their pre-retirement disposable incomes. However, replacement of pre-retirement disposable income may not be the best indicator of how well a person maintains their living standards into retirement.

Broadly, we could base our replacement rate measures on the following:

- *replacement of pre-retirement disposable income*, where we can measure income using:
 - assessable income for taxation or social security purposes; or
 - economic income concepts; or
- *replacement of pre-retirement net consumption expenditure*. That is disposable economic income less saving but including any dissaving. In retirement this measure takes account of the role of dissaving in maintaining living standards.

Replacement rate of disposable income based on tax or social security definitions

We could base a replacement rate of pre-retirement disposable income measure on assessable income for taxation or social security purposes. However, such a measure would suffer because it would not employ consistent definitions of income where a person derives income from different sources. For instance, a retired person may have the choice of investing in two investments with identical pre-tax returns, one being an interest bearing account, the other a share investment. In the case of the interest bearing account the person will pay tax on the full nominal yield from the interest bearing account as it accrues. In the case of the share investment, the person will pay tax on the dividends on an accrual basis. However, the person only pays tax on the capital gain when the asset is sold and then only the real component of the capital gain is assessable for tax. From this we see that while the investments yield an identical amount of income, the amount of income measured for tax purposes and the timing of that measurement may differ considerably depending upon the source.

In retirement similar discrepancies occur between different retirement income products. For instance, only *drawdowns* from allocated pension accounts are assessable income. However, a person who invests directly in similar investments to those underlying the allocated pension account will pay tax on the full assessable income from those investments on an accruals basis. Discrepancies also arise between the definitions of income for Tax and the Social Security purposes. For instance, the Social Security income test seeks to assess the full yield on share investments on accrual for income test purposes and has more generous definitions of UPP for rollover annuities and allocated pensions than the Tax Act. The move to a greater use of deeming for Social Security purposes announced in the 1995-96 Budget¹ may lead to even greater differences between a person's economic income and income measured for Social Security purposes.

The tax and social security definitions of income are not well suited to measuring replacement rates because they do not employ a consistent conceptual definition of income for different sources of

¹See Baldwin (1995) for details.

income. This means we cannot use them to compare replacement rates from alternative investment vehicles.

Replacement rate of disposable economic income

To determine the replacement rate of disposable income from investing in different investment vehicles, we need to employ a rigorous definition of income. The income definition we should endeavour to employ is economic income:

- Economic income includes a person's net earnings from all sources, including:
 - wages and salaries;
 - the full yield on all investments, including by way of dividends, rents or other cash return and by way of any change in asset values in the period; and
 - the value of any transfer payments received, such as social security.
- We can define economic income in a period as the maximum *potential* level of consumption the person could maintain over the period without any erosion of the value of the person's total assets².
- Disposable economic income is economic income less taxes.

We can calculate the replacement rate of disposable income in retirement as being equal to:

$$\frac{\text{Disposable } \textit{real} \text{ economic income in retirement}}{\text{Average working life disposable } \textit{real} \text{ economic income}}$$

We could calculate this replacement rate as an average over the whole of a person's retirement or for each year of retirement. Similarly, we could calculate average working life disposable income over the whole of a person's working life or for a selected period, eg the last 5 or 10 years of a person's working life. We would use a selected period if we thought that period is more representative of the living standard the person would wish to maintain in retirement.

If we base our measure on the person's whole working life average real disposable income, we may overstate the replacement rate we calculate relative to the person's *final* real disposable income. This is because of the effect of real wages growth, either due to promotions or to improvements in the general level of real wages. This is a factor we should keep in mind in interpreting replacement rates calculated this way.

Replacement rate of net consumption expenditure

An alternative replacement rate measure we could use is the replacement rate of pre-retirement net consumption expenditure. In a model such as RIMHYPO where we are modelling savings processes, including superannuation, non-superannuation financial saving and eventually housing

² We could expand this definition of economic income to take account of the effects of inflation and depreciation in eroding the *real* value of assets. These tend to reduce the person's real economic income which is the amount of consumption the person can maintain without eroding the real value of the person's total assets. For the purposes of this paper, I concentrate only on nominal economic income.

acquisition, net consumption expenditure equals the person's earnings from all sources, net of tax, less the amount saved in each period. In retirement we assume the person is either dissaving or has at least ceased to save. In that case, net consumption expenditure equals the total amount drawn down from investments, less income tax paid. The difference between disposable economic income and net consumption expenditure is the amount the person saves or dissaves in the period, ie:

$$\text{Total earnings} - \text{Tax} - \text{Consumption} = \text{Saving (Dissaving)}$$

We can calculate the replacement rate of net consumption expenditure in retirement as being equal to:

$$\frac{\text{Net consumption expenditure in retirement}}{\text{Average working life net consumption expenditure}}$$

As with the replacement rate of pre-retirement disposable income, we can calculate the replacement rate of consumption expenditure either for each year of retirement or as an average over all years of retirement. We could also base average working life net consumption expenditure on a range of periods, from the person's full working life to a range of years prior to retirement. For instance, we could make a good argument for basing the replacement rate on a range of years prior to retirement (eg 5 or 10 years) because those years are most likely to be the ones most strongly influencing a person's retirement income expectations. Also, as with the disposable income measure, a replacement rate base on a person's whole of life average consumption expenditure could overstate the replacement rate because of the effects of improvements in real earnings and living standards.

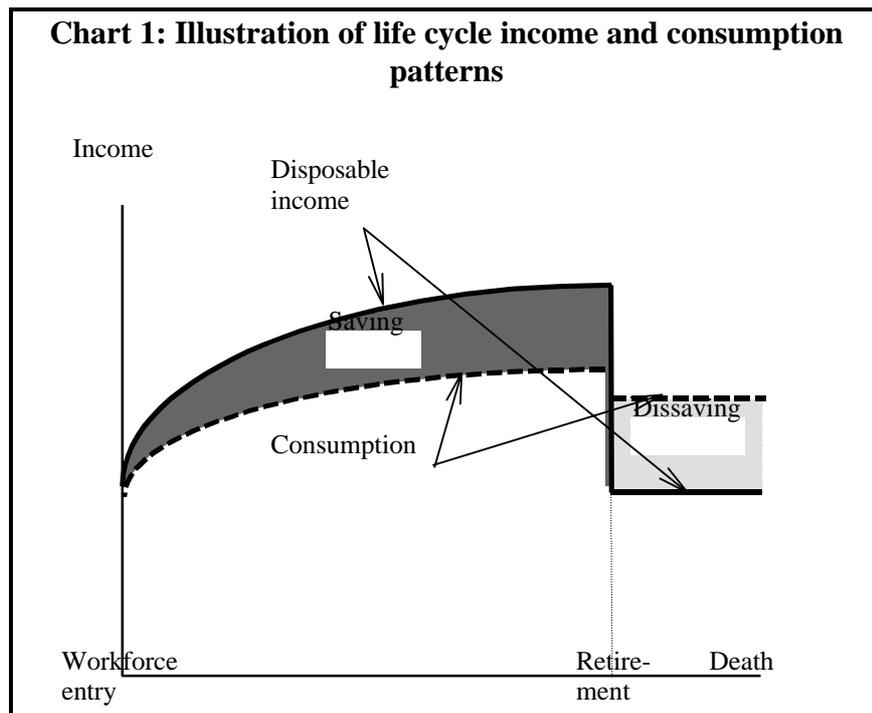
DISPOSABLE INCOME VS CONSUMPTION

As noted above, our purpose in constructing replacement rate measures is so we can assess how well retirement income policies or products enable people to maintain their living standards into retirement. To date most modelling has concentrated on measures based on the replacement rate of pre-retirement disposable income (however defined).

However, disposable income may not be a good measure of the extent to which people are able to maintain their living standards into retirement. Arguably, the living standards people enjoy relate more to their level of consumption of goods and services. Saving involves forgoing current consumption (and therefore living standards) in return for a higher level of consumption in the future than would otherwise be possible. In the case of retirement income policy, people forgo consumption during their working lives in order to finance greater consumption in retirement.

Chart 1 illustrates the pattern of life cycle income and consumption we might expect to see over a person's lifetime. Typically, we could expect to see that, with some fluctuations due to family formation, people will be net savers during their working lives. This should be particularly true in those working years preceding retirement but after children have left education and become financially independent³. In retirement, we could expect that most people will experience a considerable drop in disposable income as they no longer earn income and commence to live off their accrued savings (whether superannuation or otherwise).

³ We should also regard home purchase as part of the saving process in which the person's savings take the form of acquiring equity in the home. The analysis in this paper concentrates on financial savings and does not explicitly take account of savings in the form of housing equity.



If we use the replacement rate of disposable income as the benchmark for assessing a person's standard of living in retirement, we will need to adjust our assessment to take account of the shift from pre-retirement saving to the post-retirement dissaving phase. This shift reduces the person's disposable income requirement because as they enter the (planned) dissaving phase, they no longer require that part of their disposable income they previously used to finance retirement saving. This is one reason why defined benefit pension schemes and the national pension plans in many countries often aim to provide replacement rates of around 50% of final gross salary⁴. This figure makes allowance for differences in tax payments and a person's reduced income needs in retirement.

Replacement rates based on replacement levels of net consumption expenditure will provide a more direct measure of how well people maintain their living standard in retirement. As Chart 1 illustrates, this is because they provide a more direct comparison of pre and post retirement living standards. Such a measure requires less interpretation to assess how effectively people are able to maintain their living standard in retirement.

There will also be some people who chronically *dissave* prior to retirement and who need to use their superannuation savings to extinguish debt once retired. These people are likely to face a larger decline in living standards in retirement than people who save before retirement. A replacement rate measure based on consumption expenditure will show this more clearly than one based on disposable income, again because it takes into account the amount of income the people actually apply to maintaining their standard of living.

⁴ For instance, the Commonwealth Superannuation Scheme provides a maximum pension benefit of 52% of final average salary. See Senate Select Committee on Superannuation (1992) or FitzGerald (1993) for a summary of details of retirement income benefits in 21 selected countries.

COMPARISONS OF REPLACEMENT RATES FOR DIFFERENT RETIREMENT INCOME PRODUCTS

In this section, I illustrate the application of the two replacement rate concepts to different retirement income products. In all the examples, I use the RIM individual hypothetical model, RIMHYPO, with the following assumptions:

- the person modelled is a single male who joins the workforce at the beginning of 1992 at age 25 and works continuously for 40 years on a salary equal to male average weekly earnings before retiring just before age 65 at the end of 2031;
- the person receives employer SGC superannuation, makes member co-contribution of up to 3% of salary and receives the 3% Government contribution. The examples assume all contribution rates are phased in either as legislated or as announced in the 1995-96 Budget⁵;
- the person takes benefits as shown in each example with no dissipation of the accrued superannuation benefit;
- the person survives for his life expectation at retirement (18 years for a male retiring at age 65 at the end of 2031); and
- there is 3% inflation and 4% AWE growth in all the projection years and the superannuation fund has gross earnings of 7%.

The cases modelled in the examples are a person who takes all superannuation benefits in the following forms:

- 100% as a rollover annuity;
- 100% as an allocated pension with:
 - minimum drawdowns;
 - maximum drawdowns;
- 100% as a lump sum, all invested in fixed interest securities with:
 - interest only drawdowns;
 - an annuity drawdown pattern in which the person draws the account balance down to zero at life expectancy.

I assume the fixed interest securities have an earning rate 1% below those used in the annuity and allocated pension accounts, each of which earn 6%.

In each case, I calculate replacement rates for each year of retirement and on average over the full retirement period, based on the person's experience in the last 10 years of working life. Basing the replacement rates on the last 10 years of working life should be more representative of the person's

⁵See Willis "Saving for our Future" (1995) for details of the arrangements introduced in the 1995-96 Budget.

recent pre-retirement living standards. The average replacement rates in retirement are simple averages of the replacement rates for each year of retirement.

Rollover annuity

Where a person purchases a lifetime rollover annuity, they exchange a capital amount for the right to receive an income stream for life and, possibly, the life of their spouse or other dependants. Payments from the annuity consist of payments of income and a return of the original capital used to purchase the annuity. The taxation system recognises this by allowing the person an exclusion from assessable income each year for an amount equal to the non-concessionally taxed component of the purchase price (the Undeducted Purchase Price or UPP). The annual exclusion is calculated as the nominal UPP divided by the number of years the annuity is expected to be payable and does not vary (in nominal terms) over the period the annuity is paid.

This method of determining the taxable income from an annuity is, however, only an approximation of the income component of the annuity payments. If we knew how long a person would live (an assumption we can incorporate into our models) we could determine the income and capital components of an annuity by determining, each year, the net present value (NPV) of the remaining annuity payments. This would give the value of the annuity asset at the end of each year⁶. The change in the NPV of the annuity from year to year would then equal the amount the person dissaves each year the annuity is payable. Deducting this dissaving from the annuity payment each year then leaves us with the income component of the annuity payment.

Chart 2 shows the run down in the value of an annuity over a range of expected payment periods, along with the pattern of annuity income and capital payments that corresponds to the normal life expectancy case. The value of the annuity in this example depends upon how long the person expects it to be payable. Chart 2 shows that for a person who expects to live to normal life expectancy at retirement, the initial value of the annuity is very close to its purchase price. However, a person with a shorter life expectation would place a much lower initial value on the same annuity than a person with a longer life expectation. Chart 2 shows the value of an annuity for people who expect to live to normal life expectancy at retirement as well as for those who expect to live 5 years less and 5 years more than life expectancy. Chart 2 shows that people who expect to live longer have a greater incentive to purchase an annuity while those with short life expectations may not expect to receive value for money.

⁶An alternative method of valuing an annuity each year (which I have not adopted here) would be to revalue the annuity paid each year using an the annuity pricing factor for the person's age in that year.

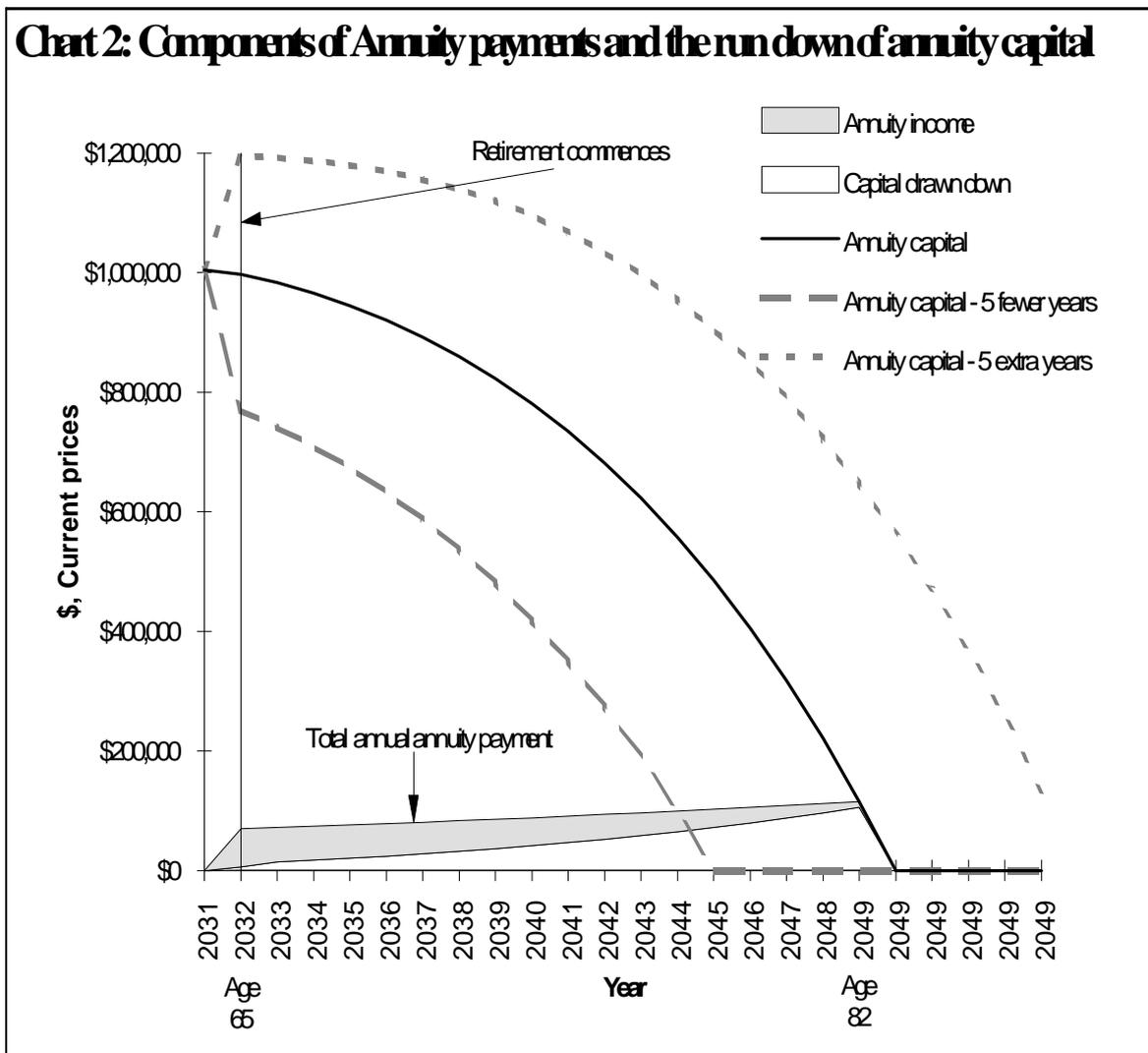


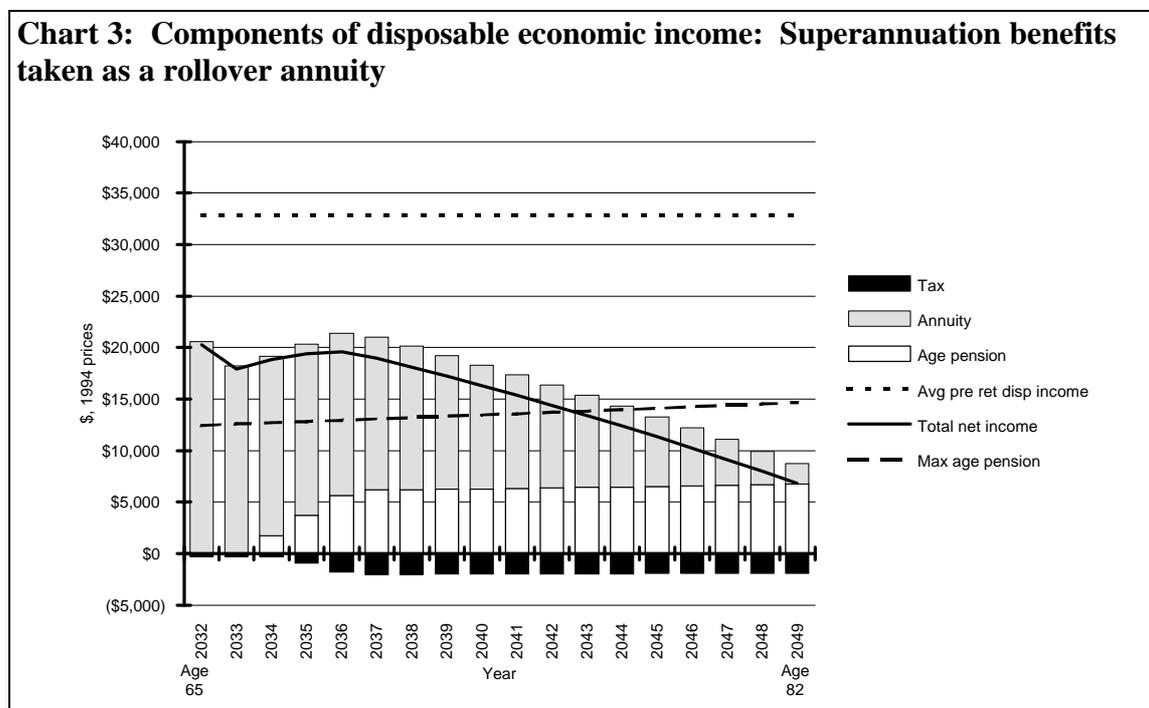
Chart 2 shows that annuity payments are mostly income in the early years the annuity is payable. However, with time the payments progressively comprise less income and a greater return of annuity capital. We can contrast this with the undeducted purchase price exclusion allowed for tax and social security, which run down the UPP component of the annuity purchase price on a straight line basis. This overcompensates people for the return of capital in the early years an annuity is payable and under compensates people later on. This excessive weighting of UPP deductions towards the early payment years effectively provides a tax concession for annuities.

Chart 3 shows the components of a person's *disposable economic income* in retirement where they take all their superannuation benefits as a rollover annuity. I have calculated the economic income from the annuity in Chart 3 as outlined above and all values are in constant 1994 prices.

Chart 3 shows that the total net disposable economic income from the annuity declines the longer the annuity is payable, reflecting the decline in the value of the underlying annuity asset value.

Chart 3 also shows the impact of fluctuations in tax and social security payments on the person's disposable income. We can see the impact of the age pension assets test in the denial of the age pension for the first 2 years of retirement. The impact of the assets test lasts until the sixth year when the income test takes over in limiting age pension payments. The effect of the assets test declines as the *nominal* value of the annuity is written down on a straight line basis. Chart 3 also

shows that the tax payable is not related to the economic income from the annuity, but instead is based primarily on annuity payments. Initially the person's tax is limited to the Medicare levy because of the impact of the 15% rebate on taxable income from the annuity. However, their tax liability increases as they receive a greater entitlement to the age pension, which is included in taxable income.



Overall, the annuity income stream provides an average 45% replacement rate of pre-retirement disposable income over the person's retirement period.

Chart 4 shows the components of *net consumption expenditure* in retirement. The chart shows that net consumption expenditure is much greater and more stable than the person's disposable income in retirement and the person has a much higher level of consumption than economic income. Consequently, the replacement rate of pre-retirement net consumption expenditure is nearly twice the replacement rate of disposable economic income, averaging 84% over the person's retirement years.

Chart 4 shows that variations in the age pension and taxation are the main influences on the person's net consumption expenditure in retirement, with net consumption expenditure rising as the person becomes eligible for a greater age pension payment.

Chart 5 compares the replacement rates of disposable income and net consumption expenditure over the person's retirement years. The chart shows that the replacement rate of net consumption expenditure is much more stable than the replacement rate of disposable economic income.

Allocated pensions

An allocated pension is essentially an investment account in which a person invests a rolled over superannuation benefit. The account accrues earnings based on the investment performance of an underlying portfolio of investments and the account balance at the end of any given period equals the

opening balance, plus earnings, less drawdowns and fees. The person cannot draw in excess of the account balance and the account ceases once it is exhausted. The investment earnings in this account are, however, exempt from tax and the law requires the person to draw down from the account at least annually an amount that is between prescribed minimum and maximum amounts. The amount drawn down, less the annual UPP deduction (calculated in a similar manner to a rollover annuity) is included in the person's assessable income.

The *economic income* arising from an allocated pension is equal to the investment earnings of the account while *consumption expenditure* equals the amount drawn down in the year. Both tax and social security use the drawdowns from the account rather than economic income as the base for assessing income.

Minimum drawdowns

Chart 6 shows the *economic income* arising from an allocated pension investment where the person draws down from the account at the *minimum* drawdown rate.

Chart 6 shows that the economic income from the allocated pension declines steadily over the person's retirement period but increasing age pension payments later on compensate for this decline. As with the rollover annuity, the person is initially assets tested off the age pension. With minimum drawdowns, however, this effect lasts longer, with no pension being payable until the sixth year of retirement. The assets test continues to have an impact until the eleventh year when the income test takes over in limiting age pension payments.

We should also note that with minimum drawdowns the person does not exhaust the allocated pension capital at life expectancy. This means some capital remains to provide for additional years of life or the person could pass it on to an estate.

Overall the replacement rate of pre-retirement disposable income for the allocated pension with minimum drawdowns is 53%, somewhat higher than for the rollover annuity.

Chart 4: Components of net consumption: Superannuation benefits taken as a rollover annuity

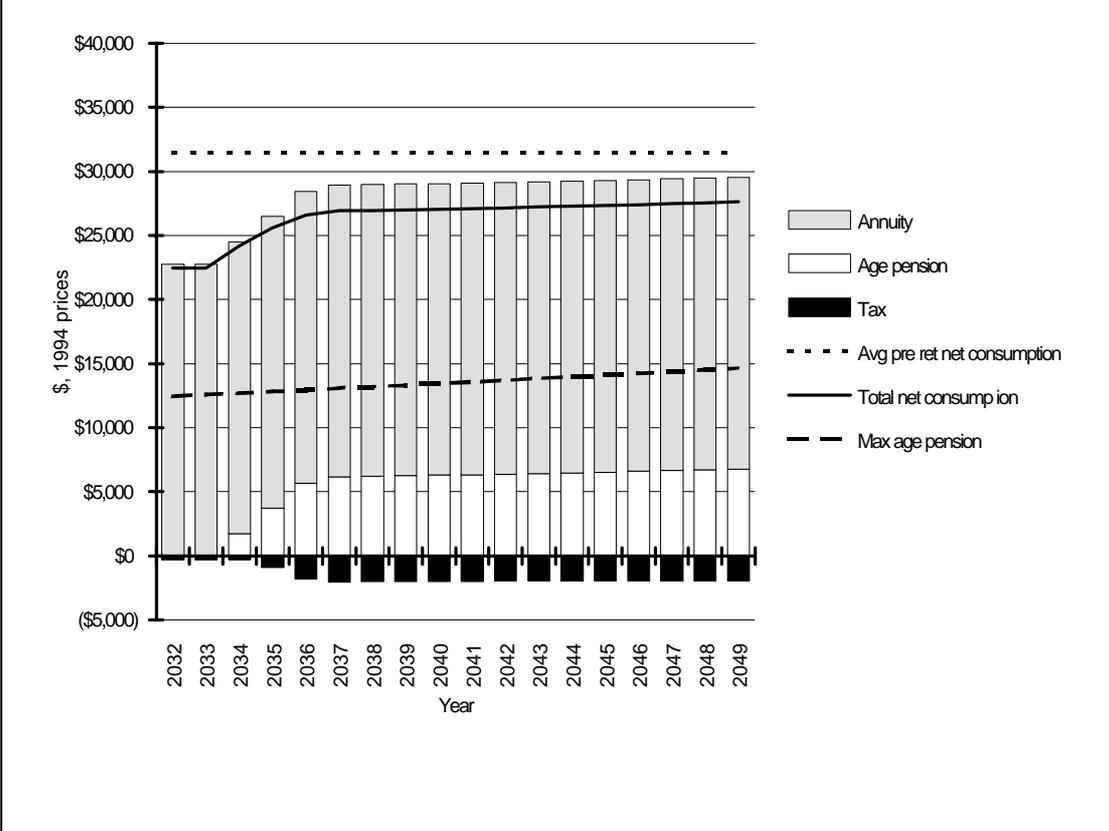


Chart 5: Replacement rates over the person's years of retirement: All benefits taken as a rollover annuity

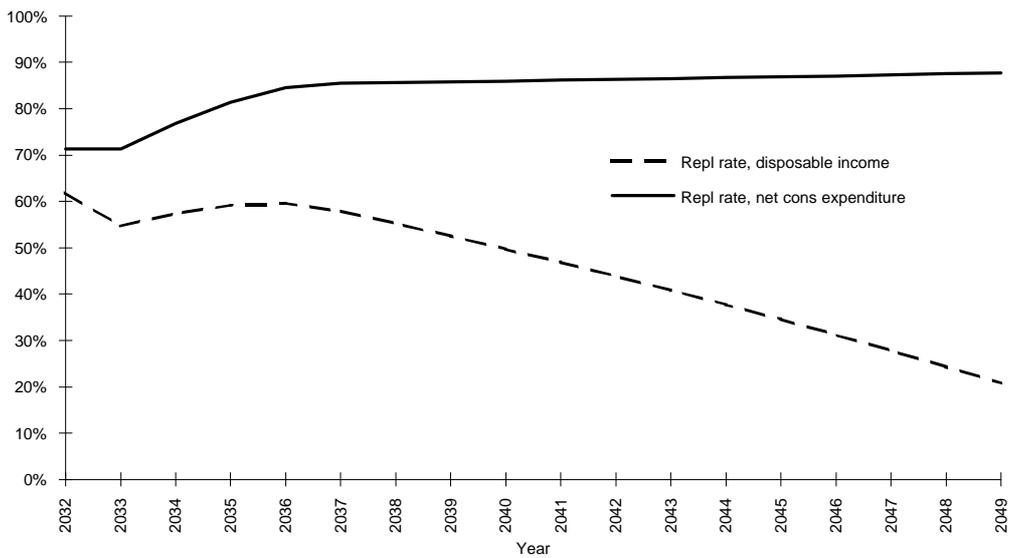


Chart 6: Components of disposable economic income: Superannuation benefits taken as an allocated pension with minimum drawdowns

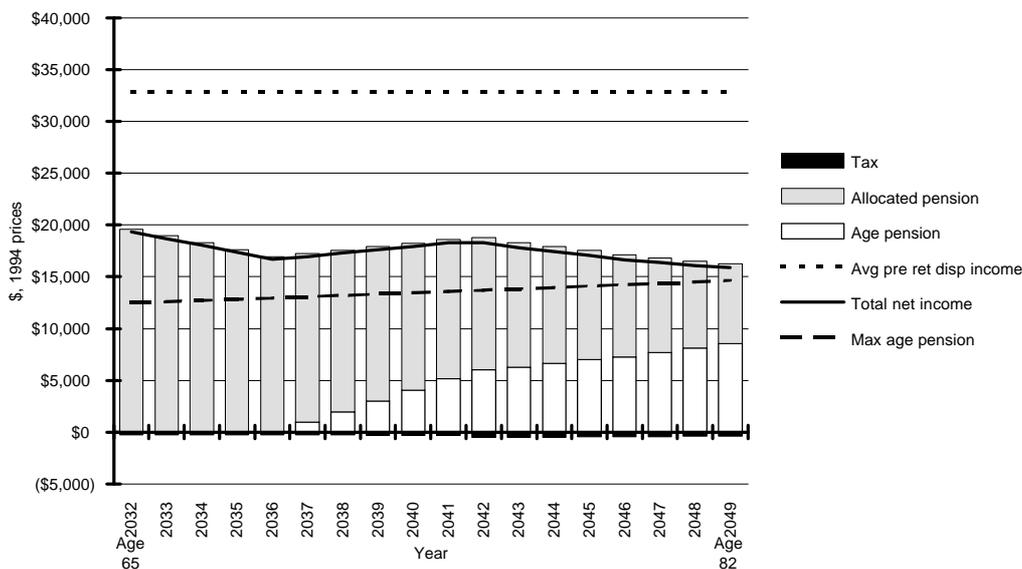


Chart 7: Components of net consumption: Superannuation benefits taken as an allocated pension with minimum drawdowns

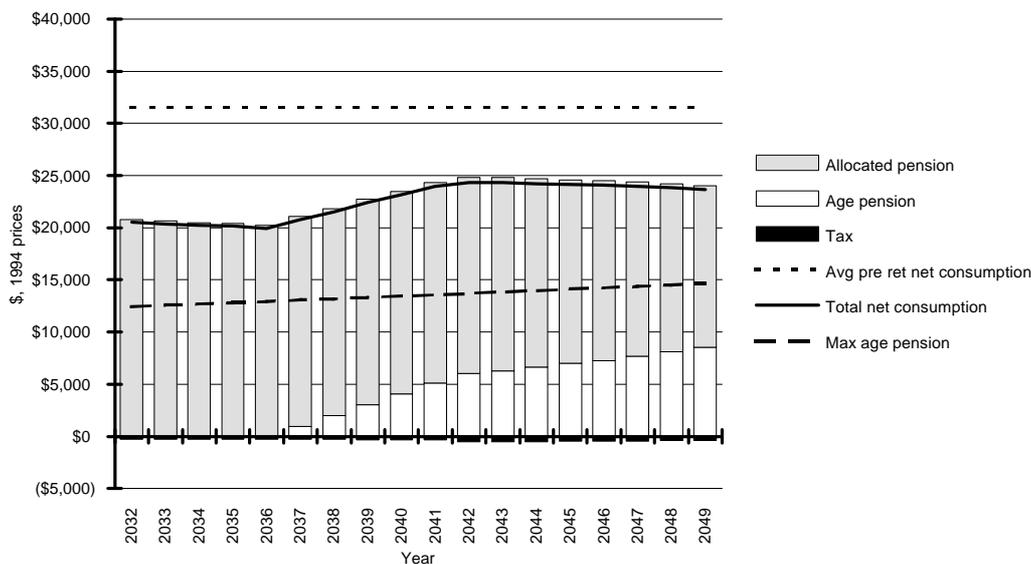
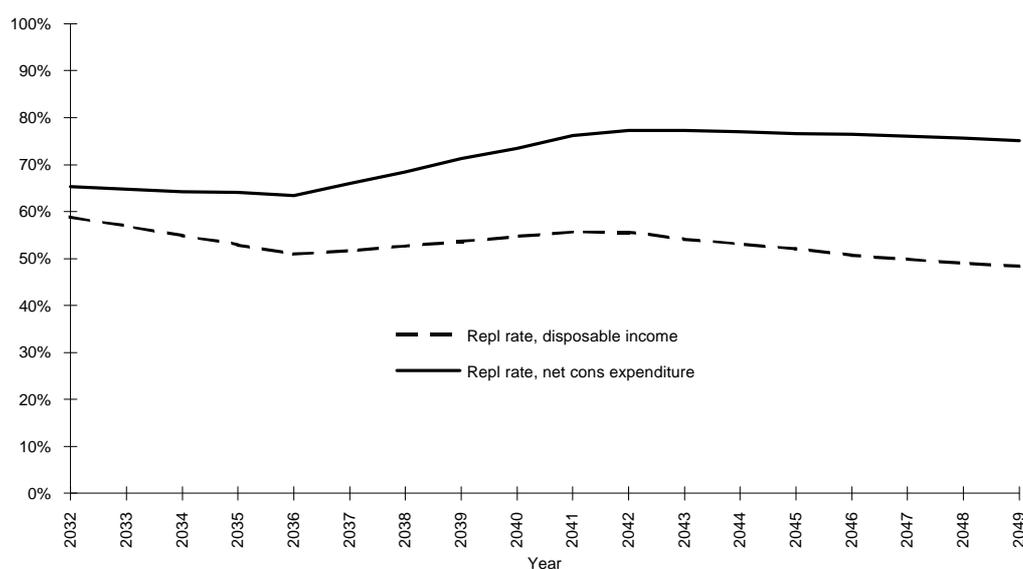


Chart 7 shows the *net consumption expenditure* arising where the person invests in an allocated pension and makes *minimum* drawdowns.

Chart 7 shows a similar pattern of net consumption from an allocated pension to that arising from a rollover annuity, but with a lower overall replacement rate (72% compared with 84%). The lower overall replacement rate for the allocated pension arises because the person receives a smaller overall age pension entitlement, because the level of draw down declines in real terms over time as the capital in the account runs down and because, assuming the person only lives to life expectancy at retirement, the person does not exhaust the allocated pension capital in retirement.

Chart 8 shows the replacement rates for allocated pensions with minimum drawdowns for each year of retirement. As with rollover annuities, the replacement rate of net consumption is higher than the replacement rate of disposable income. However, we should note that while the replacement rate of disposable income for the allocated pension with minimum drawdowns is slightly higher than for a rollover annuity, the replacement rate of net consumption is not. This reflects differences in tax and social security and the fact that the person does not completely dissave the allocated pension capital over life expectancy.

Chart 8: Replacement rates over the person's years of retirement: All benefits taken as an allocated pension with minimum drawdowns



Maximum drawdowns

Chart 9 shows the *economic income* arising from an allocated pension investment where the person draws down from the account at the *maximum* drawdown rate. In this case the economic income from the allocated pension falls rapidly as the person depletes the allocated pension capital, with virtually no economic income being received from the allocated pension after age 80. However, because the age pension income test uses drawdowns as the basis for assessment, the income test is the main influence determining the level of age pension payments. Consequently age pension payments jump sharply to the maximum rate after age 80, once the person exhausts the allocated pension and can no longer draw down from the account.

Similarly, because income tax is assessed on allocated pension drawdowns the real value of tax assessed declines as the real value of allocated pension drawdowns decline.

The overall replacement rate of disposable income in this case is 35%.

Chart 9: Components of disposable economic income: Superannuation benefits taken as an allocated pension with maximum drawdowns

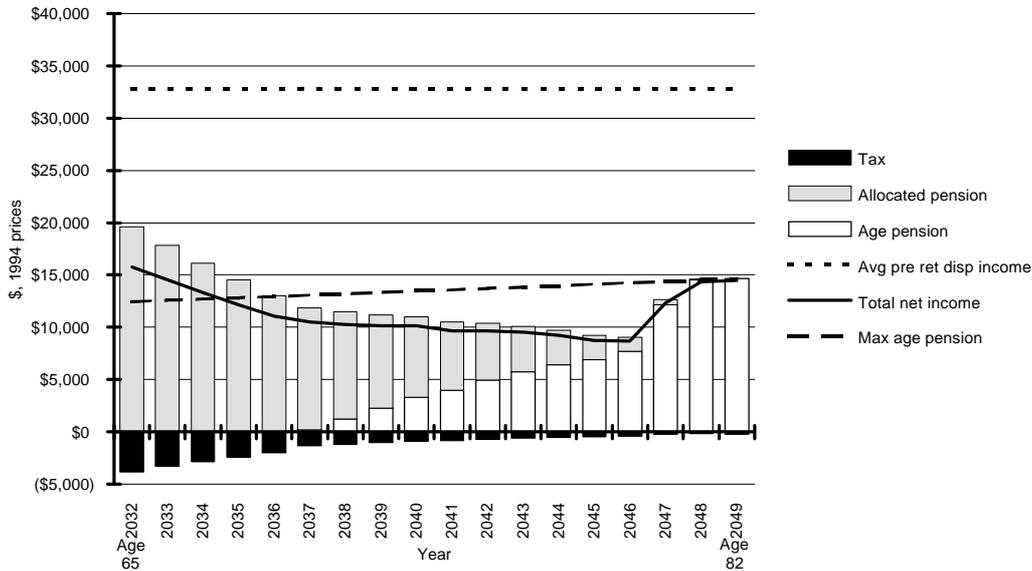
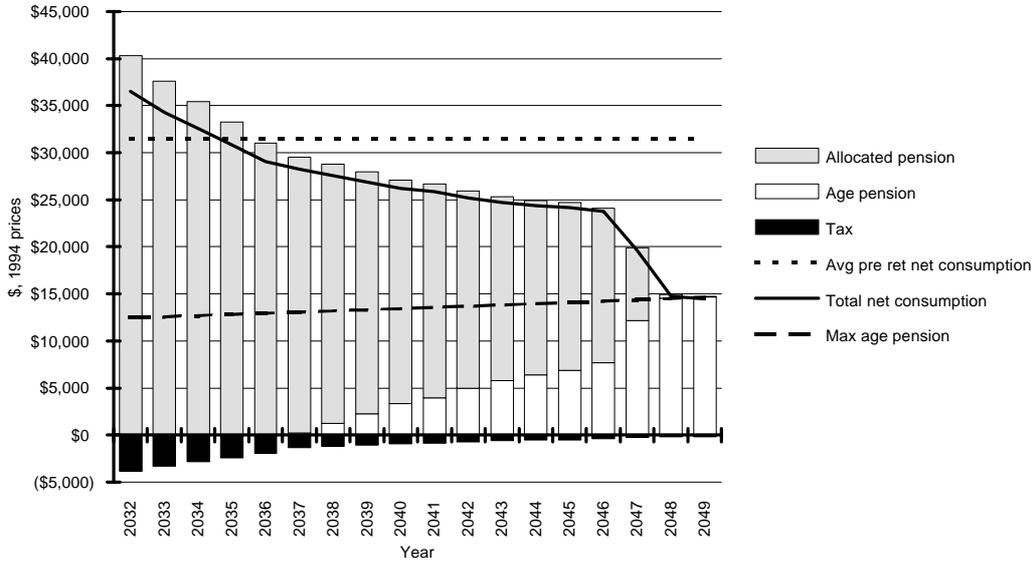


Chart 10 shows the components of *net consumption* from the allocated pension account with *maximum* drawdowns.

Chart 10 shows that *if* the person makes maximum drawdowns from the allocated pension, they would commence with a very high level of real net consumption expenditure. In the example, this initial level of net consumption expenditure is above pre-retirement levels. However, net consumption expenditure declines significantly over their period of retirement as the person exhausts the allocated pension capital. At age 80 net consumption expenditure falls sharply, to a level less than half its initial level, as the account balance is exhausted and they become full rate age pensioners. At this point the levels of disposable economic income and net consumption are the same.

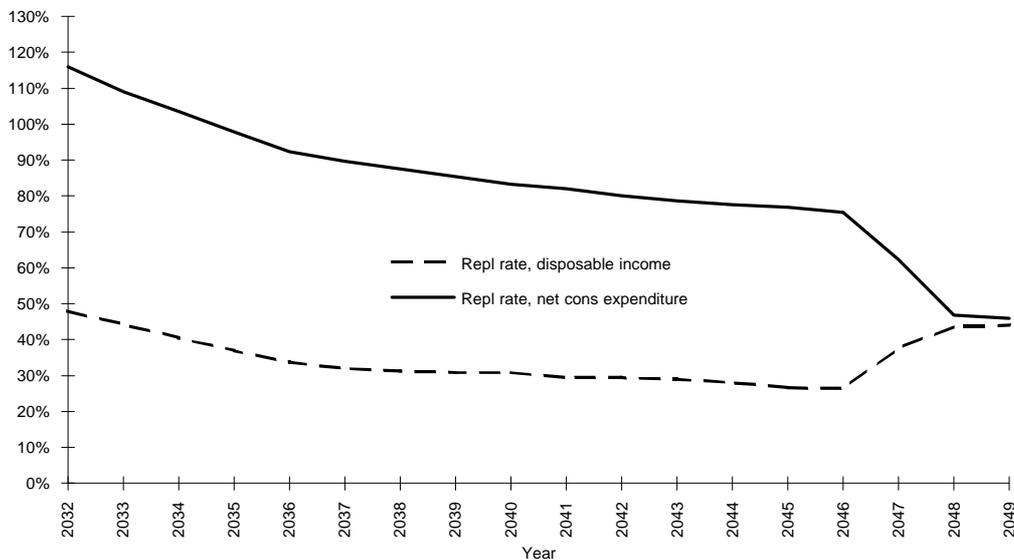
Chart 10: Components of net consumption: Superannuation benefits taken as an allocated pension with maximum drawdowns



Overall, the replacement rate of pre-retirement net consumption in this case is 83%, significantly higher than in the case of minimum drawdowns and only slightly less than for the rollover annuity.

Chart 11 shows the replacement rates for the allocated pension with maximum drawdowns in each year of retirement. We can see from the chart that the two replacement measures converge as the level of allocated pension assets, earnings and drawdowns decline. They do not converge to the same level, however, because the bases for each measure differ by the level of pre-retirement saving assumed in the model.

Chart 11: Replacement rates over the person’s years of retirement: All benefits taken as an allocated pension with maximum drawdowns



Interest bearing deposits

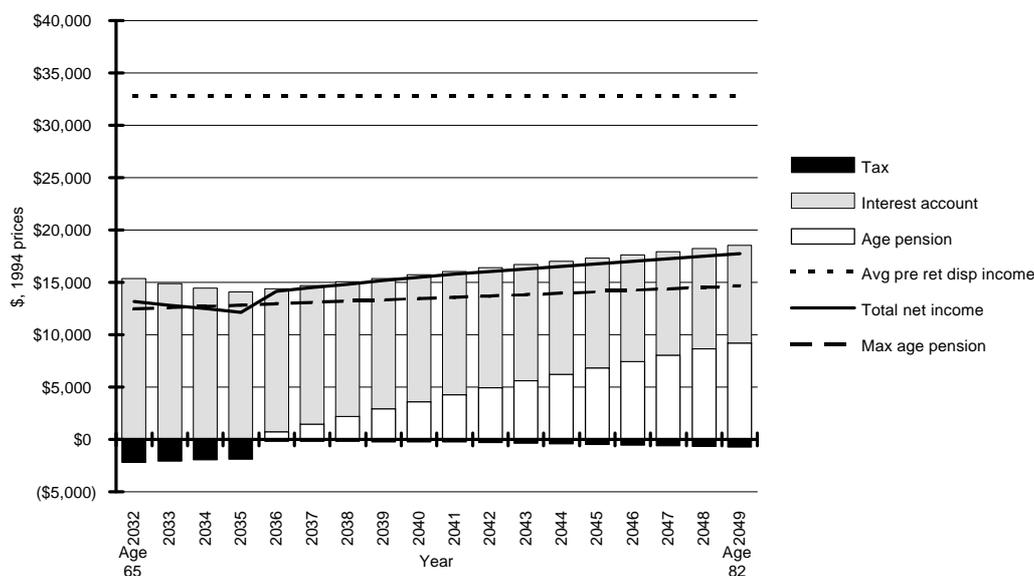
An alternative retirement income option open to a person is not to roll over their final superannuation benefit, but rather to pay ETP tax and use the net ETP to finance a non-rollover investment. One option open here is to invest the net ETP in an interest bearing deposit. In this case I will examine two options, the first is where the person chooses to draw down only the interest payments from the investment and preserves the nominal capital of the account. The second option is the person choosing to draw down from the account a series of payments, indexed to the CPI, that will exhaust the capital at the person's life expectancy. The second option is a very similar drawdown pattern to an indexed rollover annuity.

In the case of the interest bearing deposits, the economic income is equal to the interest earned each year and the consumption expenditure is equal to the amount drawn down each year. With interest only drawdowns there is no difference between the disposable income the person derives and their net consumption.

Interest only drawdowns

Chart 12 shows the components of both disposable income and net consumption where the person makes interest only drawdowns. In this case the real value of the income/payments stream declines gradually with inflation over the person's retirement period. The person does not receive any age pension until the fifth year of retirement because of the assets test. The effect of the assets test only declines gradually as the real value of the person's capital declines over time. When the person becomes eligible for the age pension, tax paid falls sharply because the person becomes eligible for the age pensioner rebate. This happens because the rebate is income tested and the person's taxable income entitles them to a large part of the rebate as soon as they become eligible for any part of the age pension. With the person's age pension entitlement substantially reduced by the pension assets test, the rebate offsets more than just the tax payable on the age pension paid.

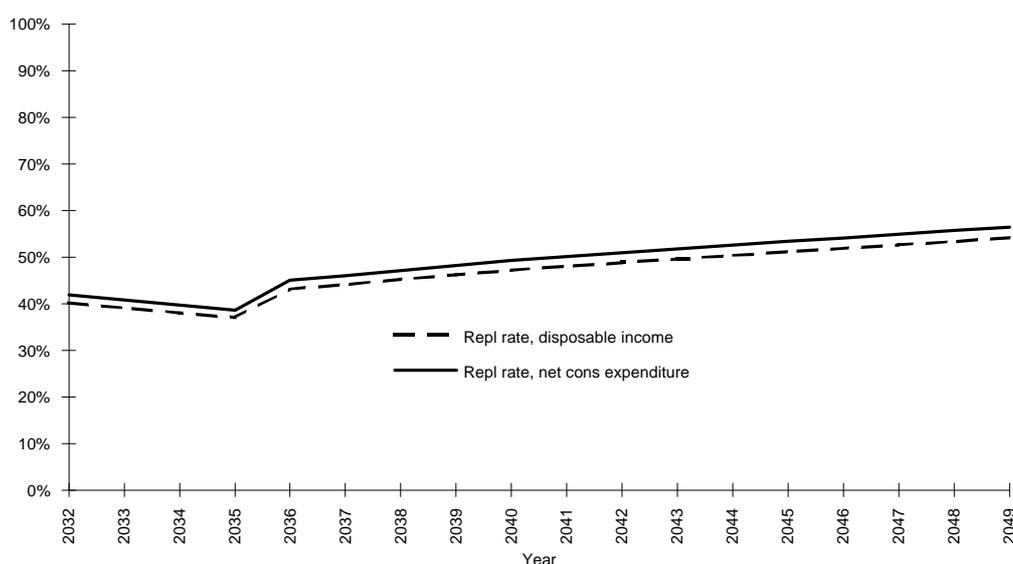
Chart 12: Components of disposable economic income (and consumption): Superannuation benefits taken as an ETP and invested in interest bearing securities with interest only drawdowns



The average replacement rate of pre-retirement disposable income where the person invests a net ETP in interest bearing securities and only draws down the interest is 47% while the replacement rate of net consumption is 49%. This represents a high replacement rate of pre-retirement disposable income but quite a low replacement rate of net consumption. The low replacement rate of net consumption expenditure arises both because the person does not dissave any of the *nominal* capital of the investment and because the strategy effectively minimises the person's age pension entitlements.

Chart 13 shows the replacement rates in each year of the person's retirement for the investment of the net ETP in fixed interest with interest only drawdowns. The Chart shows that the person's replacement rates decline initially as the real value of payments decline, before rising as their age pension entitlements increase. The difference between the two replacement rate lines is solely due to the differences in the pre-retirement bases that they use. The net consumption base is smaller than the disposable economic income base, giving rise to the higher replacement rate observed in the Chart.

Chart 13: Replacement rates over the person's years of retirement: All benefits taken as an ETP and the net ETP invested in interest bearing securities with interest only drawdowns



Annuity drawdown pattern

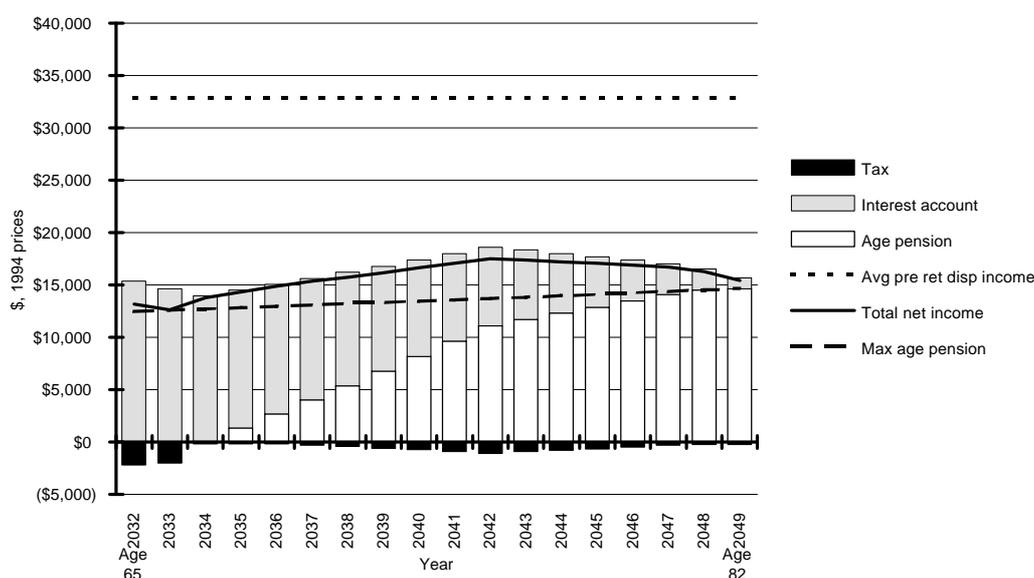
With the annuity drawdown pattern from an interest bearing deposit account, the person makes annual CPI indexed drawdowns that exhaust the account capital by *life expectancy*. This drawdown pattern looks very similar to the pattern of income and capital receipts for a rollover annuity, illustrated in Chart 2, except that payments cease once the person exhausts the account. The drawdowns commence at a level that just exceeds the earnings on the account but as the time passes the income component of the drawdown declines and the amount of capital dissaved increases.

Chart 14 shows the components of *disposable economic income* arising from an annuity drawdown pattern from the interest bearing security account with an annuity drawdown pattern.

Chart 14 shows that with the annuity drawdown pattern the person's economic income from the interest bearing account declines, eventually to zero, as the account balance declines. The person becomes eligible for the age pension more rapidly in this case than in the interest only drawdown

case. Further, the age pension payable rises much more rapidly as the assets test impact falls as the person dissaves. This rise in the age pension continues after the income test takes over from the assets test because the person has less income to count for the age pension income test. The person finally becomes a full rate age pensioner in the second last year of retirement. A similar effect also applies for taxation, with the tax payable declining gradually at first as the value of interest payments decline, then falling sharply in the third year as the person becomes eligible for a part age pension and acquires an age pensioner rebate entitlement. After that the effect of the increasing age pension entitlement combines with the declining interest receipts to determine the tax payable each year.

Chart 14: Components of disposable economic income: Superannuation benefits taken as an ETP and the net ETP invested in interest bearing securities with an annuity drawdown pattern



Overall this drawdown pattern provides an average replacement rate of disposable economic income in retirement of 54%, virtually the same as for the interest only drawdown pattern. The similar replacement rate arises entirely because increased age pension entitlements offset the impact of lower economic income from the interest bearing investment as the person dissaves.

Chart 15 shows the components of *net consumption* where the person invests a net ETP in interest bearing securities and uses an annuity drawdown pattern.

Chart 15 shows that with an annuity drawdown pattern that exhausts the account at life expectancy, the person's net consumption expenditure increases strongly as the person's age pension entitlement increases. In this case the person has a much higher level of net consumption later in retirement than is possible early in retirement. The average replacement rate of pre-retirement net consumption in this case is 100%, the highest of any of the retirement income streams examined so far. This arises principally because the person receives a substantial age pension entitlement in this case and fully exhausts the capital of the account in retirement. We should note that if the person survived for any additional years, the net consumption expenditure would fall sharply in those years to equal the age pension only.

Chart 15: Components of net consumption: Superannuation benefits taken as an ETP and invested in interest bearing securities with annuity drawdown pattern

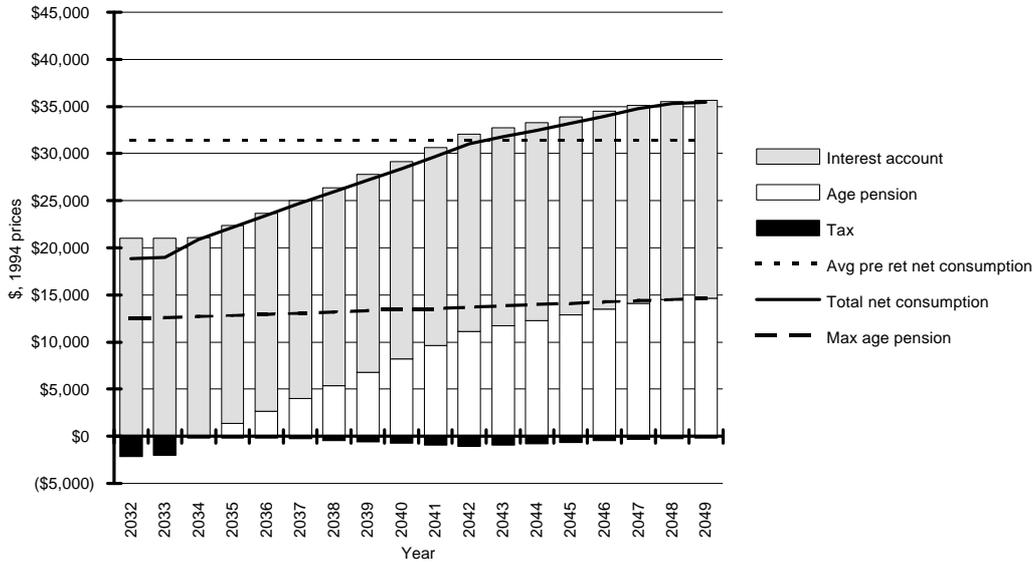
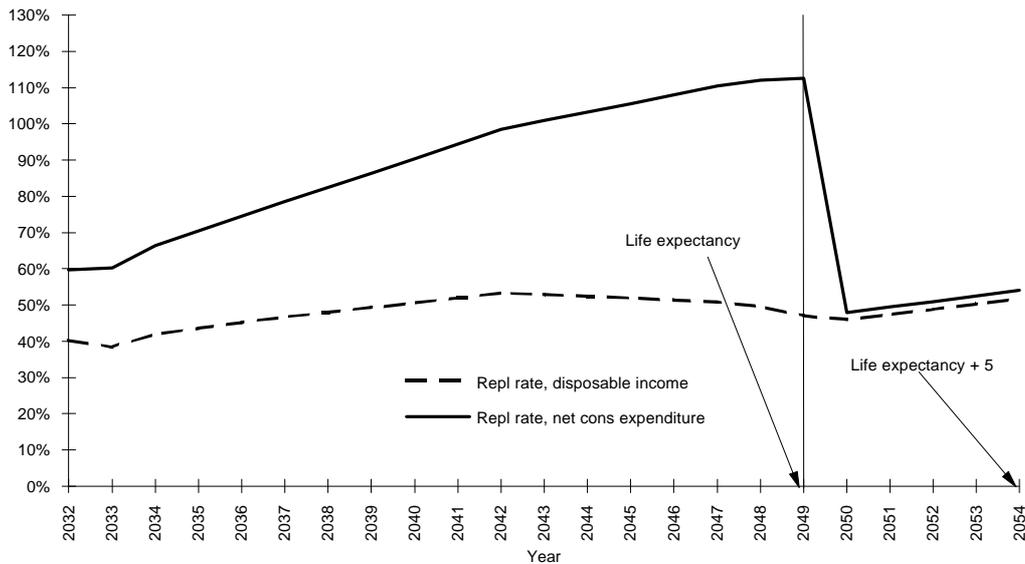


Chart 16 shows how the replacement rates vary over the person’s retirement period. It shows that while the replacement rate of disposable income is relatively steady, the replacement rate of net consumption rises strongly as the person ages. The Chart also shows the effects of added longevity and the sharp drop in replacement rate that occurs if the person survives beyond life expectancy at retirement.

Chart 16: Replacement rates over the period of the person’s retirement: All benefits taken as an ETP and the net ETP invested in interest bearing securities with an annuity drawdown pattern



SUMMARY AND CONCLUSIONS

We have seen that the replacement rate measures used in analysis can give quite different assessments of the adequacy of the retirement income streams arising from various retirement income products. The extent of the differences varies from product to product and depending upon the manner in which a person arranges draw downs.

We can see this from Table 1 below which summarises the average replacement rates over the person's period of retirement. These replacement rates examine the amount received by the individual and do not take account of the person's remaining assets at death. This is a major factor explaining some of the differences in replacement rates between different retirement income products below. The asterisks in Table 1 indicate that the person has fully expended their capital by the time they reach life expectation and have none of their original capital remaining. The table shows that these products generally provide less economic income than those products where no dissaving occurs. However, the table also shows that those products where the person dissaves provide the highest replacement rates of net consumption.

Table 1 and the preceding sections indicate that the replacement rate of pre-retirement net consumption may be a better basis for judging how well a person is able to maintain living standards into retirement. This is because consumption is a better indicator of a person's living standard, both before and after retirement. In many of the examples the person's disposable economic income varies in the opposite direction to net consumption over the course of the person's retirement and would give a picture of variations in the person's living standards completely at odds with their level of consumption. For instance, in the case of a fixed interest investment with an annuity drawdown pattern, looking at disposable economic income would indicate the person has a roughly constant living standard over retirement rather than a strongly increasing living standard as indicated by their pattern of consumption. Similarly, a rollover annuity is much more attractive if analysed in terms of replacement consumption than if analysed in terms of replacement rates of disposable economic income.

Table 1: Summary of replacement rate measures for different retirement income products

Product	Average replacement rate of pre-retirement disposable economic income	Average replacement rate of pre-retirement net consumption
1. Rollover annuity	45%*	84%*
2. Allocated pension		
(a) Minimum DD	53%	72%
(b) Maximum DD	35%*	83%*
3. Net ETP invested in interest bearing securities		
(a) Interest only DD	47%	49%
(b) Annuity DD	48%*	90%*
– <i>with 5 more years life</i>	48%*	81%*

* Indicates the person fully utilises their capital by the time they reach their life expectancy

Another point we can draw from the analysis in this paper is that in many cases, the person is able to strongly influence their living standard in retirement and the timing of income by their choice of retirement income product and how they draw down upon that product (where a choice is available). For instance, there is a large difference in the year to year living standards of a person who invests in an allocated pension, depending upon whether draw downs are at the minimum or maximum rate.

The person's choice as to whether they dissave is also likely to be a major influence on their standard of living in retirement, with a higher standard of living possible where the person dissaves. In this regard, we should remember that the objective of retirement income policies such as the SGC is to ensure people have a higher standard of living in retirement. The policy does not seek to force retirement saving so that people can leave larger bequests to their estates when they die.

The major issue surrounding whether people should draw upon the capital of their investments is whether they cover themselves against the risk of living *longer* than they expected at retirement. Of the retirement income products examined in this paper, the only one offering full longevity insurance is the rollover annuity. However, in the absence of compulsion, self-selection in the annuity market will *tend* to increase the cost of annuities and make them unattractive to most people. This comes about because the annuity market relies on a distribution of life expectancies to provide longevity insurance. If the only people who buy annuities are those who expect to live a long time then the 'longevity insurance' component of an annuity becomes more expensive.

The replacement rate of pre-retirement net consumption deals with dissaving in retirement more appropriately than the replacement rate of pre-retirement disposable economic income. This is because the consumption measure *includes* amounts dissaved post retirement in any measure of the adequacy of retirement income policy.

A person's lifetime saving and expenditure decisions also have an influence on how well a person is able to maintain living standards in retirement. A person who dissaves prior to retirement is much less likely to be able to maintain living standards in retirement than a saver. We can expect a replacement rate measure based on consumption to show this more clearly than one based on disposable income.

Finally, as noted at the outset, we should base any assessment on a measure that provides a consistent measurement basis across all forms of investment a person could utilise in retirement. For this reason, measures of income based on taxation or social security definitions of income are not suited to analysis involving income from a variety of sources.

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