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Can Automatic Tax Increases Pay for the Public Spending Effects of Population Ageing in New Zealand?

John **Creedy** and Norman **Gemmell**

[Provisional – Do Not Quote]

Abstract

This paper examines the extent to which projected aggregate tax revenue changes, association with population ageing over the next 50 years, can be expected to finance expected increases in social welfare expenditures. Projections from two separate models, dealing with social expenditures and income tax and GST revenue, are used. The results suggest that the modest projected required increase in the overall average tax rate over the next 50 years can be achieved automatically by adjusting income tax thresholds using an index of prices rather than wages. Based on evidence about the New Zealand tax system over the last 50 years, comparisons of average and marginal tax rates suggest that such an increase may be feasible and affordable. The paper discusses the range of considerations involved in deciding if this automatic increase in the aggregate average tax rate, via real fiscal drag of personal income taxes, is desirable compared with alternative fiscal policy changes.

Paper presented to the Treasury Long-Term Fiscal "External Panel of Experts"

11th March 2013

1 Introduction

This paper is concerned with the potential sustainability of current fiscal and social expenditure policy settings in New Zealand, in the light of the anticipated continued demographic transition involving population ageing and, in particular, the ageing of the aged. Since many categories of social expenditure per capita vary systematically with age and gender, and in view of the variation in income (and forms of income) and expenditure over the life cycle, population ageing is likely to have implications for the time profile of aggregate tax revenue and social expenditure. However, the relevant relationships are highly complex and involve many elements that are essentially endogenous. For example, changes in the composition of the labour force are likely to have implications for factor and goods prices, which in turn affect labour force participation, earnings, saving patterns, and so on.

Faced with the impossibility of modelling time profiles of all the elements involved, and given the considerable uncertainty associated with the future, it seems useful to explore separate projection models of taxation and social expenditure, in which a range of components are treated as exogenous (such as labour force participation rates, fertility, mortality, migration and unemployment rates by age and gender, and productivity change). The use of such projections, while clearly involving much suspension of disbelief, provides a starting point for further discussion of possible future fiscal pressures. In making projections, the usual approach is to hold current policy settings unchanged (insofar as these can be modelled explicitly). Faced with projected future disparities between revenue and expenditure projections, discussion can then concentrate on potential policy adjustments and the question of whether endogenous adjustments are likely to exacerbate or ease those differences.

The present paper concentrates on a range of policy variables, using social expenditure and tax projection models, by Creedy and Makale (2012) and Ball and Creedy (2012) respectively, referred to below as CM and BC. Important policy settings concern the way in which various social expenditures (such as unemployment benefits and New Zealand Superannuation) and income tax thresholds (particularly the income levels at which marginal tax rates increase) are indexed. Indexation typically involves rules based on some measure of prices, wage rates, or earnings (pre- or post-tax). The precise indexation method is particularly important in the context of long-term projections, where small annual differences can eventually imply very different benefit or tax levels.

The two projection models are discussed further in Sections 2 and 3. The BC model yields projections for the share of personal income tax (PIT) and GST revenues in personal income, while the CM model projects ratios of various social expenditures to GDP. Both models also permit assessment of some distributional characteristics of the tax and social expenditure system to be examined, such as the changing age distribution of the tax burden associated with the population ageing process. When examining policy settings, the focus here is on the PIT case in which income tax thresholds are indexed to prices over the long-run. The resulting tax revenue-to-income values from BC can be compared with the social expenditure-to-GDP ratios emerging from the CM model. Hence the role of fiscal drag is examined: this is the process whereby an income tax structure with rising marginal rates generates revenue growth faster than income growth, due to individuals crossing into higher marginal rate tax brackets if thresholds are adjusted at less than the rate of increase of nominal incomes.

Based on historical data on aggregate effective personal income rates from McAlister *et al.* (2012), Section 4 compares projected tax revenues over the next 50 years, using the current set of tax rates, with estimates of aggregate income and indirect tax rates over the past 50 years. On the basis of this comparison Section 5 discusses the potential for raising real effective average income tax rates, via real fiscal drag, to fund the projected expansion in social welfare spending (mainly health and Superannuation) over the next 50 years in New Zealand. Brief conclusions are in Section 6.

2. Social Expenditure

The basic structure of the CM model is based on Creedy and Scobie (2005) and is shown in Figure 1. Using historical evidence on the mean and variance of per capita expenditures for a set of thirteen different social expenditure categories, the CM model then applies various labour productivity, participation rate, unemployment rate, and so on, assumptions to derive stochastic projections of aggregate social expenditures and GDP. Variables for which input data are required are shown in shaded boxes, while the model's outputs are shown in white boxes. The model uses input data on fertility and migration from *Statistics New Zealand (SNZ)*, together with data on mortality and initial (2010) population levels from the *Treasury Long-Term Fiscal Model* (*LTFM*) to derive population projections to 2060. Data on unemployment rates and labour force participation rates (separately for males and females) from *SNZ* yield numbers of workers, which are combined with initial (*LTFM*) productivity levels, and assumed 1.5% per annum growth, to yield GDP projections.

Total social expenditures are obtained from data on initial (2010) social expenditure per capita, by age and gender, for thirteen separate categories. [1] These may be grouped as follows: *Health* (personal; public; mental; 'DSS 65+'; 'DSS <65')[2]; *Education* (primary/secondary; tertiary); *NZ Superannuation*, and *Welfare Payments* (Domestic Purposes and Widow's Benefit; Invalid's and Sickness Benefit; Family Assistance; Accommodation Supplement; Unemployment Benefit).

The categories of total public spending that are excluded from the model comprise mainly of Law & Order spending and Debt Interest payments. According to an update of Treasury (2012a: External Panel 1 *Summary*, Table 2), in 2010 these four social spending categories listed above represented 24.3% of GDP with a further 9.5% of GDP accounted for by remaining spending. That is, social spending represents over 70% of total Crown spending.

The model combines per capita social expenditures with population and participation rate data and projects forward using the population and labour force estimates. Confidence intervals around the central (mean) projections for total social expenditure categories are obtained from observed variances for the main per capita social expenditure categories, and unemployment, over the period 1960-2000 (1980-2000 for unemployment). This permits examination of trends over time in age- and gender-specific social expenditure-to-GDP ratios, with associated confidence intervals.

Figures 2 and 3 show two of the important input data components of the CM model: respectively, labour force participation rates, and per capita expenditures for the four expenditure sub-aggregates (health, education, NZS, welfare payments), by age. It can be seen that the participation rates follow the typical pattern of rapidly rising rates in the 15-25 age range and rapidly falling rates in the 55-65 age range, with a plateau between. Female participation rates are generally lower than males, especially but not exclusively during the child-rearing age range of around 25-45. The distribution of social spending by age in Figure 3 unsurprisingly reveals the sharp rise in NZS expenditures at age 65 and also reveals the initially gradual rise in per capita health spending from childhood, but with an accelerating rise, especially from around age 55. Welfare benefit payments by contrast taper off from a maximum around age 30 to small amounts by age 65, when NZS generally becomes available.

[1] Data on the four main categories are obtained from: health (*LTFM*); education (Schools - *Treasury*, based on *Ministry of Education* administrative data; Tertiary - SNZ); NZS and welfare payments (Household Economic survey (HES), and Treasury's personal tax/transfer simulator, *TaxWell*).

[2] DSS = Disability Support Services.

An alternative approach to projecting social spending is Treasury's Long-Term Fiscal Model, *LTFM*; see Bell et al. (2010) and Rodway (2012). This projects social expenditures forward using a somewhat different, and more aggregate, procedure than the CM approach. In particular, the LTFM's social expenditures are less disaggregated by gender and are based on fewer social welfare payment categories, and the model does not incorporate stochastic aspects.

Furthermore, the LTFM uses the Treasury short-term forecasting model to forecast relevant variables over the first five years and adopts its longer-term projection assumptions thereafter. Thus, for example, whereas CM use data for 2010 to provide the starting point for projections, the LTFM involves a 'return to trend' process during the forecast period (2012-16) and then projects forward from the final forecast year. One consequence is that the CM benchmark results are based on a starting unemployment rate of 6.6% whereas the LTFM projections start from a lower projected unemployment rate of 4.7% in 2016. The latter might be expected to be closer to an 'on-trend' value.

Figure 4 shows a benchmark simulation for total social expenditures as a ratio of GDP over 2010-60. The central estimate (black unbroken line) and the 50% (grey unbroken lines) and 95% (black dotted lines) confidence intervals are shown. Beginning at around 24.6% in 2010, the central estimate projects a value of 28.2% of GDP in 2060 but with this rise largely being achieved over the period 2020-40, with a relatively flat profile otherwise. However, applying the estimated variances over such a long period generates a wide range of possible outcomes: by 2060 the 50% confidence interval is 24-42% and the 95% confidence interval is 20-37%. Importantly it appears that the period when baby-boom effects dominate, during 2020-40, accounts for almost all of the projected increase in social expenditures. This aspect is discussed further below when comparing results across models.

Figure 5 compares the mean outcome for this benchmark simulation with two other equivalent simulation model outcomes: the Treasury LTFM projection (Treasury, 2012a, Table 2, p.5) and the equivalent projection made by Creedy and Scobie (2005). This last projection was based on a 2001 starting point with projections to 2051. As a result it has a confidence interval around its central estimate for 2011 which provides a convenient comparator against which to assess the latest observed (2010) values.

Two features stand out from Figure 5. Firstly, the LTFM and CM benchmark simulations start (2010) and finish (2060) at almost identical ratios but follow quite different paths in between. Secondly, the Creedy and Scobie (2005) projections for 2011-2051 reveal a similar pattern to the benchmark case but, in effect, with a delay of 10 years. For example, Creedy and Scobie (2005, p.27) projected an almost unchanged social expenditure-to-GDP ratio from 2001-2011 (not shown in Figure 5) and this is repeated by CM for 2010-2020. Similarly both models project a rapid rise in the ratio after the first decade of projections and a relatively flat profile for the last decade.

Considering 2010, Figure 5 also suggests that the Creedy and Scobie (2005) central projection of an unchanged social expenditure/GDP ratio at around 23% over 2001-11 appears to have been below the actual value, but is within the 50% confidence band. The period in fact saw substantial increases in social expenditures, for example associated with policy initiative such as Working for Families. Nevertheless, the evidence of a rising ratio when previous projections expected this to be constant suggests caution in interpreting projections of a constant or declining (LTFM) value over the next decade.

The Treasury LTFM projects a decline in the social expenditure ratio over 2010-2020 and a steady rise thereafter to 2060. The initial decline appears to result mainly from the LTFM's use of the Treasury forecasting model over the first five years. Since the New Zealand economy in 2011-16 is expected to transition from below-trend towards on-trend values of key macroeconomic variables (such as unemployment, social welfare payments and GDP levels), this largely explains the decline in social expenditure/GDP ratios over the next decade from their 2010 values. By abstracting from short-term fluctuations, especially the 2010 below-trend values, the Benchmark projection may over-estimate the 2020 social expenditure/GDP ratio.

A more detailed breakdown of the LTFM-CM benchmark differences reveals that, apart from the 2010-20 period, social expenditure trends are almost identical in the two models. However, GDP trends differ. Figure 6 shows an index of GDP for each model (2010 = 1.0) on the left-hand axis, and the percentage difference between the two model GDPs on the right-hand axis. This shows clearly that differences between the two models are minor except for the last two decades when the benchmark GDP is around 5-10% higher than the LTFM case. GDP projections so far into the future, by either model, embody large margins of error which could well substantially exceed the 5-10% difference between the models such that these differences do not carry much statistical confidence. Nevertheless, it is interesting that such relatively small trend GDP differences can generate such different trends in social expenditure/GDP ratios over the 2040-60 period; one model projects a rising ratio while the other projects a constant or declining ratio. It also suggests that model results may be quite sensitive to assumptions about future labour force participation rates (especially among the elderly), the main source of difference between the LTFM and Benchmark GDP trajectories.

Figure 7A provides a decomposition of the total social expenditure/GDP ratio into the four main sub-aggregates (health, education, NZS, and 'Non-NZS' welfare benefits), while the right-hand panel (7B) shows the equivalent ratios produced by the LTFM. Figure 7A shows that the flattening of the total social expenditure profile after 2040 is largely caused by a flattening of the health and NZS expenditure tracks. These in turn reflect the model projections of reduced ageing effects on these spending categories, as ratios of GDP, due to the projected increase in participation rates for older individuals. The LTFM, on the other hand shows continuing upward trends in those two spending categories after 2040.

To examine the sensitivity of the benchmark simulations to assumptions regarding spending trajectories, Figure 8 shows alternative scenarios for health and welfare benefit spending. A plausible argument suggests that per capita real health costs may grow faster than the assumed 1.5% p.a. productivity increase. Treasury (2012b), for example, assumes that health costs rise over time due to slower public sector productivity growth compared to the economy as a whole, and 'volume growth' due to non-demographic factors between 0.8% and 2.0% p.a. In the simulations in Figure 10, the benchmark value of 1.5% is increased to 2% p.a. Secondly the assumed 1.5% real growth in (non-NZS) welfare benefits exceeds that which is written into current legislation, and historical patterns. The legislation specifies benefit levels indexed to prices only, while evidence on actual total welfare benefits payments suggests that over the last 20 years these have growth faster than consumer prices but slower than nominal incomes, that is, some real increase but less than real productivity/wages. Simulations in Figure 8 report the effect of reducing the real annual welfare payment growth rate from 1.5% to 1.0%.

The increased health cost assumption generates a pattern that begins to resemble the LTFM case: the post-2040 pattern now shows an upward trend, albeit less than during the 2020-40 period. The trend in welfare payments is now downward over 2020-60 rather than approximately constant, being about 1 percentage point of GDP lower by 2060 compared with the benchmark. These results suggest that identifying the most relevant policy settings and the profile of health costs could be important for conclusions regarding the expected future cost of providing these social services via the public budget. In the case of health for example, the benchmark rise of only around 1.5 percentage points, 2010-60 (6.9% to 8.4%) becomes a rise of almost 4 percentage points (6.9% to 10.7%) over the same period, when health costs are assumed to rise faster than economy-wide productivity by 0.5% per year.

The impact of NZ Superannuation settings (for example, age of eligibility, indexation of NZS levels) continues to be a controversial issue in debates over the future pension costs of ageing. The CM model can be used to examine this by, for example, allowing labour force participation rates to change in response to a higher NZS eligibility age. Of course, increasing the NZS eligibility age could be implemented in several ways involving, for example, a shorter or longer transition period. Figure 9 shows the impact of two hypothetical simulations. In 9A & B, the model is rerun 'as if' (i) the NZS age had been raised in 2010 from 65 to 70 (for males and females); and (ii) the new age of eligibility of 70 is introduced, and fully implemented, in 2020 (that is, there is no transition period where the age increases gradually for different age cohorts). Neither of these scenarios is realistic of course, but they provide a sense of the boundary impacts that a large NZS age-related change, over a short time frame, could produce.

Figure 9A shows NZS expenditure and 9B shows total social expenditure: non-NZS spending and GDP are affected by assumed participation rate changes in response to the age change. In particular, the model assumes that the participation rates for males and females rise especially in the 65-69 age range, with smaller increases in the 55-64 and 70-74 age ranges; see Figure 10.

Figure 9A shows that, had the age change to NZS been introduced in 2010 this would have reduced NZS spending by about 2 percentage points of GDP in 2010 (from 5% to 3%), rising to almost 3 percentage points by 2060. Introducing the change in 2020 has a smaller immediate effect in that year (to 5.3% instead of 5.9%). But the longer-term effect is also smaller: by 2060 NZS expenditure is around 6.6% instead of 7.4%. This small effect, compared with the case of a 2010 NZS change, largely reflects the fact that many of the baby-boomer retirees retain retirement eligibility under the 2020 option and the associated participation rate and productivity gains are lost. Hence NZS costs relative to GDP are noticeably higher when the increased retirement age is delayed by a decade.[3]

The effects of these NZS change scenarios on total social expenditures are shown in Figure 9B. This indicates a fall in the total social expenditure to GDP ratio in 2020 by around 3 percentage points (from 25% to 22%) when NZS age is increased in that year. This 3 percentage point difference is generally maintained throughout 2020-60 so that social expenditure is projected to be approximately 25% of GDP instead of 28% by 2060. That is, these mean estimates suggest that the NZS increase in the age of eligibility largely compensates for the increase in social expenditures that is otherwise projected to occur.

[3] These cost simulations are based on 'steady-state' or 'full implementation' assumptions and hence should not be interpreted as capturing expected actual NZS cost changes under more likely implementation scenarios.

However, as the comparison of 2010 and 2020 implementation of a 5-year increase demonstrates, delays in implementing an NZS age increase could have a large effect on this conclusion, as the potential near-term cost savings and participation improvements are foregone.

3 Tax Revenue Modelling

The Ball-Creedy (2012) analysis is a deterministic projection model of PIT and GST revenue and personal income growth for a specified set of hypothesised values for labour force participation, population age structure, and so on. In addition to specifying the basic income tax structure (based on 2012 settings) the model is based on estimated gender-specific age-income profiles for employment and self-employment income. Using pooled HES data for five years, 2007-11, BC obtain average single-year-of-age values for individuals aged between 20 and 65. Combining the average wage for each individual with average hours worked by the relevant cohort then yields taxable labour incomes.

Fitted age-income profiles for males and females are shown in Figure 11. This reveals the usual hump-shaped pattern of male earning with age, with female age-income profiles behaving similarly except that a downturn in average female earnings beyond 40-45 years in the labour force is not evident. Figure 12 illustrates the resulting process of overtaking whereby the average real income of a given birth cohort is higher at each age for more recent cohorts. Hence someone joining the labour force at age 15 in 2010, though he/she has lower average real earnings that a 25 year old in 2010, he or she will have higher average real earnings in 2020 than did the previous 25 year old in 2010. As a result, though the ageing process involves some slowing of earnings growth (and downturn in the case of males), over time, average earnings are rising due to the 'overtaking', reflecting the tendency for productivity growth over succeeding cohorts to be reflected in average wage rates.

The BC model incorporates age-specific and gender-specific average benefit income, measured net of tax, which is added to average disposable income. Furthermore, age-profiles of average capital income (for those with positive capital income), along with profiles of the proportion of each age and gender group receiving some positive capital income, are used to obtain the average capital income for each cohort for each projection year. A capital income tax rate of 30 per cent was applied to this income, and the resulting net income was added to average disposable income for each cohort and gender in each year. Finally, applying an age-profile of saving (and, for those in older age groups, dis-saving) rates gives expenditure and hence GST for each cohort and gender in each year.

Tax simulations combine employment/self-employment and capital income data with the 2010-11 income tax structure, and 2010 income distribution data to obtain income tax revenue projections, which also assume 2% annual price inflation, 1.5% annual real wage growth. Simulations can be obtained based on no indexation of income tax thresholds or indexation of thresholds to prices of nominal incomes. Indexation to nominal incomes effectively removes all fiscal drag from projections.

Income tax threshold adjustment in the simulation model is a vital policy choice. New Zealand income tax legislation does not specify automatic adjustment of thresholds in association with either price inflation or nominal income growth. However with non-indexed thresholds, typically observed rates of inflation of 2-3% per year, and average real income growth of around 1.5% per year (equivalent to 3.5-4.5% nominal income growth) can readily lead to all taxpayers being on the top marginal tax rate within a 50 year projection period. Historical evidence suggests that New Zealand governments tend to adjust income tax thresholds from time to time which serves to partially counteract, but not completely reverse, the nominal fiscal drag. Without full (nominal) indexation of thresholds, *average* income tax rates rise over time in association with income growth even though the existing marginal rate structure is unaltered.

A plausible argument for long-run tax policy setting is that thresholds would at least be indexed to price inflation, though this need not be specified as a year-to-year adjustment. However an income tax system that failed to index thresholds to prices over the long-run implies an increasing average income tax rate over time applied to a *given* real income. For example a low-income individual earning $10,000 in 2008 faced a marginal income tax of 12.5%, but the same real income and tax structure in 2058 could face a 39% marginal income tax rate.[4] It is doubtful whether such a process is politically sustainable over several decades.

To simulate GST revenues, the BC model adjusts the simulated disposable incomes (gross incomes less income tax) described above for age-related savings, and dis-savings, rates (estimated from HES data) to obtain individual's expenditures.[5] Applying the current GST rate of 15% yields individuals' and aggregate GST payments.[6]

A merit of the BC model is that it allows average PIT and GST rates to be projected over time, for different assumptions about the tax structure, alongside a decomposition of the tax

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[4] The 2010 reforms changed those rates to 10.5% and 33% respectively.

[5] The BC model allows for non-taxable income, such as some benefit payments, to estimate disposable income, before calculating expenditures for GST payments.

[6] Given the broad base in NZ, GST is treated as a proportional tax on all expenditure in the BC model.

paid by each overlapping cohort. This allows, for example, estimates of the distribution of the tax burden between age groups such as between the under-65s and over-65s, or NZS-recipients and non-NZS recipients. In addition, both the tax and social expenditure models can accommodate a variety of policy change scenarios, such as changing in age of eligibility for NZ Superannuation whilst allowing for any flow-on effects to labour force participation rates etc.

The starting point for tax simulations is the 2011 HES; hence the one-year later start date compared with social expenditure simulations. This allows various average tax rate, ATR, measures to be constructed. To compare projected changes in ATRs with changes in social expenditure/GDP ratios also requires a suitable personal income/GDP ratio. For example, for 2010, Inland Revenue personal taxable income data, and Treasury LTFM data on GDP suggest a ratio of taxable income to GDP of around 0.63.[7] Hence a given ATR (say, 0.3) can be converted to a tax revenue-to-GDP ratio by multiplying by 0.63, to give 0.19, under the assumption that the taxable income/GDP ratio remains unchanged.

Table 1 shows projections of ATRs for PIT and GST combined in 2011, 2031 and 2061 under three PIT threshold indexation assumptions: none; indexation to prices; and indexation to nominal incomes. Indexation to nominal incomes effectively removes the fiscal drag effect on income tax revenue and Table 1 reveals that the combined PIT+GST ATR rises from 27.2% in 2011 to 28.3% in 2061 for this indexation case. This 1.1 percentage point increase cannot therefore arise from fiscal drag, but rather reflects a larger fraction of taxable income becoming liable to GST as an ageing population dis-saves relative to 2010 values.

Table 1 shows that allowing for some fiscal drag has a noticeable impact on projected ATRs. By 2060, indexation to prices (that is, keeping *real* thresholds constant) generates a 4.4 percentage point rise in the ATR to 31.6%, while no threshold indexation at all generates a 7.7 percentage point rise in the ATR to 34.9%. Whether average tax rate increases of these orders of magnitude are likely to be acceptable in some sense is unclear. However since in the price indexation case income tax has no impact on real after-income-tax living standards, such a policy might be acceptable to taxpayers, especially as real incomes rise over the next 50 years. However these real income rises mean an increasing fraction of taxpayers moving into higher ATR brackets, as a consequence of their higher real incomes.

To see how far ‘real bracket creep’, with price indexation, may affect taxpayers in future, Inland Revenue data on taxable incomes in 2010 can be projected forward at the rate of real

[7] See http://www.ird.govt.nz/aboutir/external-stats/revenue-refunds/inc-dist-of-ind/ (Accessed on 30-01-13)

income growth assumed in the projection model (1.5% p.a.). Table 2 shows the four tax brackets and marginal rates applicable since 2011, applied to 2010 taxable income data (the latest complete year available). This shows that in 2011 approximately 27% of taxpayers, representing 15% of taxable income, faced a marginal PIT rate of 10.5%. at the other end of the income scale, 10% of taxpayers (with 39% of taxable income) faced a 33% marginal tax rate. Average taxable income was around $34,000.

By 2061, after allowing for 1.5% real income growth for all taxpayers over 50 years, average real income has approximately doubled to over $72,000. This implies that the share of taxpayers in tax brackets below the highest have all fallen, while the top rate (33%) bracket would contain around 34% of taxpayers, representing 75% of all taxable incomes. The question arises of whether this is feasible. There is obviously no definitive answer, but with all taxpayers' ATRs rising over the 50 years, no taxpayer faces a MTR greater than 33%, which is relatively low by current OECD standards. Around 25% of taxpayers in 2061 would face marginal PIT rates of between 18% and 30%. Given the much higher real incomes experienced by all taxpayers in this scenario, it does not seem unduly optimistic to believe that such average and marginal PIT rates could be acceptable to voters. As discussed further below, even if *feasible,* it does not necessarily follow that it would be *desirable* to let ATRs rise in this manner.

The acceptability or otherwise to taxpayers of projected changes in ATRs is likely to be a function of how the burden of any ATR rise is shared across the population. In particular, with an ageing population, where older individuals may have different labour and capital income-earning and spending characteristics compared with younger individuals (who comprise a declining share), the age-distribution of tax burdens may become an important influence on policy preferences.

The increases in ATRs reported in Table 1 represent the combined effects of fiscal drag, where relevant, the ageing process and the assumed participation rate changes over time. Decomposing the ATR change into those three components reveals that only a small fraction is due to the ageing and participation effects. For example, turning off the ageing aspect of the BC model, by holding the age structure constant at 2011 values, leads to a small reduction in the 2061 ATR in the no-indexation case, from the 34.9% value shown in Table 1 to 34.1%; that is, 0.8 percentage points lower. Thus, the 2011-61 rise in the ATR becomes +6.9 percentage points instead of +7.7 percentage points. If, instead, labour force participation rates are held constant at 2011 values, this leads to a 2061 ATR of 35.5% instead of 34.9%; that is, 0.7 percentage points higher. For the price indexation case these ageing and participation effects are commensurately smaller, producing a difference from the 2011-61 benchmark increase of +4.4 percentage points, of around +/– 0.4 percentage points. These results suggest that most of the increasing income tax and GST revenues are due to the fiscal drag and other properties of the tax structures rather than ageing per se, or the assumed, though plausible, increase in labour force participation over the next 50 years. In this sense, the tax revenue projections are not primarily age-driven, and would be expected even in the absence of the anticipated demographic ageing.

The age-related components of the BC model also allow changes in the age distribution of the tax burden over time to be investigated. An example is given in Figure 13, which shows the percentage of total income tax revenue paid by age for females in 2011, 2031 and 2051 (the male profiles look similar – see Ball and Creedy, 2012). This reveals that in 2011 the 'peak' ages for payment of income tax are around 40-55, with steady increases and decreases leading up to, and beyond, those ages respectively. At ages 40-55 each annual cohort pays around 3-3.5% of the total PIT burden; that is up to around 50% of the total (15 years *x* 3.5%). The (female) over-65s pay around 3.3% of total PIT revenues in 2011.

Projections for 2031 and 2051 show little change in the PIT shares of those under age 35, but a noticeably lower tax share for the 35-55 age group balanced by a higher tax share for the over-55s. Most of this change occurs by 2031. The female over-65s contribute 5.6% of PIT revenue by 2031 and 6.0% by 2051.

The simulations reported in section 2 indicated that the arithmetic mean social expenditure projections involve a 3-4 percentage points of GDP increase over the next 50 year or so, albeit with large confidence intervals. On tax revenues, results in this section suggest that, with price indexation of income tax thresholds, combined PIT and GST revenues as a percentage of taxable income are projected to rise by around 4-5 percentage points. Using the earlier value of 0.63 for the ratio of taxable income to GDP translates these ATR increases into a tax revenue/GDP ratio rise of between 2.5 and 3.2 percentage points of GDP over the next 50 years. Hence, the two 'best guesses' are not far apart. In judging whether price indexation is politically feasible, it is useful to place the implied tax rates in historical perspective. This is considered in the next section.

4. Historical Evidence on Aggregate Marginal and Average Tax Rates

This section considers how common historically are average rates of PIT and GST in the region of 32% – the combined ATR projected within 50 years with only price indexation of income tax thresholds? When assessing the revenue, welfare and other consequences of taxation, effective marginal and average tax rates often provide an initial barometer by which to judge the merits of the structure. Many behavioural responses to taxation depend on those average and marginal rates. The current New Zealand system of PIT and GST involves marginal PIT rates of 10.5% to 33% and a marginal tax exclusive GST rate of 15% on expenditure (equivalent to a 13% tax-inclusive rate). Like marginal rates, average PIT rates rise with taxable incomes and in aggregate across all income tax payers were around 21% in 2010, while the aggregate average rate of GST as a proportion of taxable income was almost 12%.[8]

McAlister *et al*. (2012) reported various marginal personal income tax rates for the New Zealand income tax since 1907, and calculated the associated income-weighted average marginal rate (AMTR) based on annual income distribution data. The AMTR provides a population-wide measure of the marginal rates faced by income taxpayers. Being income-weighted, it is a measure of the extent to which personal incomes face different effective marginal tax rates (EMTRs). The EMTRs were estimated from statutory marginal rates of income tax (MTRs) plus any additional explicit or implicit additional tax payable (or receivable in the form of subsidies) at the margin. Figure 14, adapted from McAlister *et al.* (2012), shows the top statutory income tax rates (top MTR), the top effective marginal tax rate (top EMTR) and the income-weighted AMTR, from 1922-2010.[9]

This shows the sharp rise in both statutory and effective top MTRs leading up to World War II (WWII) and the gradual decline in these from the mid-1940s in the case of the top EMTR. The top statutory rate of income tax remained around 60% from 1940 to the late 1980s before falling to the 33-39% range since the major 1980s tax reforms. However, the AMTR provides a better measure of the marginal rate across all taxpayers. This can be seen to have risen steadily since 1922 (and especially during WWII) until the early 1980s, reaching around 40% in the mid-1980s. Reforms thereafter have steadily reduced that value to the current AMTR of about 24%.

This decline in marginal rates of income tax in New Zealand since the 1980s is a common phenomenon across OECD countries, especially for the top rate; see Loretz (2008). It is often thought to reflect economists' arguments, and policy-makers concerns, about the adverse economic effects of high marginal tax rates. In considering historical evidence on

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[8] This is based on GST revenue in the LTFM spreadsheet of $13,708 million for 2010/11, and IRD-sourced taxable income for 2010 of $118,051 million.

[9] Due to lack of consistent data these effective tax rates do not include an allowance for the abatement of social welfare payments where relevant; see McAlister *et al.* (2012; pp. 2, 24-25).

ATRs and AMTRs, and how these may compare with future projections, it is not necessarily the case that high rates regarded as feasible and/or desirable in the past are feasible and/or desirable in future. This aspect is discussed further in section 5.

Estimating historical aggregate average rates of income tax and GST for New Zealand is not straightforward due to limited data in disparate sources. However using data assembled from a variety of sources (such as Goldsmith (2008) for 20th Century data, and Inland Revenue/Treasury for more recent years) it is possible to construct 'implicit' average PIT and GST rates from data on tax revenues, aggregate taxable income and GDP. Figure 14 shows the resulting estimates for PIT and GST revenue/GDP ratios at ten-yearly intervals from 1920 to 2010. Based on the model simulations described above, Figure 14 also shows the equivalent projected ratios for 2060. GST is shown from 1990 (after its introduction in 1986); clearly other similar indirect (usually sales) taxes prior to the introduction GST could be added to the PIT/GDP ratios for earlier years but suitable and comparable data are not readily available.[10]

Figure 15 shows that, like the AMTR series for personal income taxes, average PIT rates increased from the 1920s to 1980s (from 7% in 1920, to 15% in 1970 and 22% in 1980) and especially during the 1940s and 1970s. The major change by 1990 was the replacement of a fraction of income tax revenue by GST, with a slight increase in the overall average, from 22% in 1980 to 24% in 1990. In addition to the years 2000 and 2010, Figure 15 shows the tax ratios for 2007. 2010 partially reflects the aftermath of the relatively large effects of the global recession on tax revenues, whereas 2007 is the most recent pre-recession year in New Zealand. This confirms that during the 2000s, the combined average tax ratio to GDP remained around the 1990 level of 23-24%, with a drop to 20% in 2010.

The Figure also shows the projected change in the tax/GDP ratios to 2060, based on the projected increases in average tax rates from the B-C model discussed earlier.[11] These are converted from ratios of taxable income to ratios of GDP using the 2010 taxable income/GDP ratio of 0.625, and added to the 2010 tax/GDP ratios in Figure 15 to arrive at the 2060 values shown. The resulting projected rise in PIT revenue/GDP is just over 3 percentage points by 2060 and a fall in the equivalent GST ratio of about 0.5 percentage points. Overall therefore

[10] Goldsmith (2008) for example, records revenue from 'indirect taxes' but this includes revenue from excises, such as on tobacco and alcohol, that remained after GST was introduced, and which for consistency are not included in the tax rates shown for any year.

[11] From Table 1, the BC model projects a 4.4 percentage point increase in the combined PIT + GST average tax rate (as a % of taxable income, including capital income) over 50 years from 2011. This is composed of a +5.2 and -0.8 percentage point change for PIT and GST respectively.

the expected ratio of combined revenue to GDP, at 23-24% in 2060, is similar to the ratios observed over the 1990s and 2000s, but with slightly greater PIT and smaller GST contributions.

One important factor in considering whether such ‘automatic’ future tax increases via fiscal drag could finance increase social expenditures that is not considered here is the issue of timing. In particular, the CM model projections suggest upward pressures on spending over the 2020-2040 period with a levelling-off thereafter. This contrasts with the Treasury fiscal model projections. Under the same conditions (for example, constant GDP growth rates), fiscal drag-related increases in average tax rates occur smoothly. As a result, even if increased average tax rates over the whole 2010-60 period could feasibly fund spending increases over this period, there may be funding issues over the near-term to be resolved with tax revenues growing more slowly relative to social spending.

Nevertheless, these results do not suggest future income tax and GST revenue to GDP ratios that are wildly different from those experienced historically. As discussed below, that does *not* mean that these average rate increases are to be recommended since, for example, past high income tax rates in particular have been criticised. However it does suggest that future funding of public spending increases based on these automatic PIT and GST rate changes are worthy of discussion as possible revenue sources since they are clearly not unprecedented.

5 Is Tax Change Desirable?

Faced with population ageing and other factors that are expected to create pressures for increased public expenditure over the next 40-50 years, the question of whether automatic average tax rate rises are preferred to discretionary tax policy changes is complex and requires careful analysis. It cannot be adequately addressed in this paper. Furthermore, the evaluation of any policy change cannot escape the role of value judgements. This section addresses some of the issues that any evaluation of the desirability of long-term tax increases would need to take into account.

Firstly, the government budget can be described as a ‘closed system’, summarised by the government budget constraint. This is an identity linking aggregate levels of tax revenue, public expenditure and budget deficits. Any change in one element of that constraint must involve an equal and opposite change in one or more other components. As a result no individual tax revenue change, whether due to automatic factors or discretionary policy change, can be evaluated without simultaneously considering the other fiscal changes that will either adjust automatically or would need discretionary action. Similarly, a proposed increase in one public spending category, financed by a specified tax increase, must be evaluated in comparison with alternative uses of the relevant expenditures or tax revenues.

These various alternatives are likely to have complex and potentially quite different interaction, or general equilibrium, effects and hence a suitably comprehensive evaluation framework is required. Analyses may be of the ‘political economy’ type, in which different voting rules are applied, or they may be of the ‘welfare economics’ form. In the latter case, economists often work with a form of evaluation, or welfare, function which involves an explicit description of value judgements imposed by a hypothetical decision-maker or independent judge.[12] Whatever framework is adopted, tax changes to finance an increase in social expenditure such as those that may arise from population ageing must be evaluated against, for example, counteracting public expenditure decreases, different tax changes, or a change in the extent of deficit financing.

Secondly, many evaluations of alternative tax proposals take a given revenue requirement and compare the impacts of each policy. In the present context this can be thought of as first deciding on the level of public expenditure to be financed and then considering the merits of alternative tax revenue-raising options. This in turn would imply first considering whether age-related increases in NZS, health or other social spending, expected in the absence of policy change, should be counteracted by countervailing policy change, such as changing the age of eligibility for NZS. This would then determine the level of total spending to be financed. However, such an approach ignores the likelihood that the choice of optimal expenditure levels may be conditional on the costs of raising different levels of tax revenue. For example, if the welfare costs of higher income tax or GST revenues are thought to be small, the case for compensating cuts in public spending would be weaker.

Thirdly, on the specifics of alternative tax financing options, allowing fiscal drag to raise average income tax rates slowly over time may be compared with a number of options such as discretionary changes to particular income tax rates and/or thresholds, changing the rates or structure of GST, extending the income tax base, or introducing new tax bases such as a

[12] Recognition that several dimensions are usually involved and trade-offs must be specified explicitly, the New Zealand Treasury (2011) has recently proposed a ‘Living Standards Framework’, which encourages quantification of a number of criteria against which to evaluate the outcomes of a policy change; see Karacaoglu (2012).

tax on land (or some types of land). Treasury (2012b – LTFS tax chapter draft) considers some of the pros and cons of those options.[13]

An argument often made against higher income tax rates is that these have especially high disincentive or other adverse welfare costs, for example by discouraging labour supply or encouraging the diversion of income into tax-favoured forms, or overseas. Some economic literature suggests possible adverse effects of high income tax rates on GDP growth rates, investment or household savings. These often relate to high marginal tax rates, but in the case of location decisions, involving for example investment or labour migration, average rates of income tax are potentially more relevant.

In comparing the alternative tax increases canvassed above, an important advantage of the real fiscal drag option, *based on the current income tax structure*, is that it does not involve a general increase in marginal tax rates. Some taxpayers, by moving into higher tax brackets as their incomes rise, do face higher marginal rates but the highest marginal rate remains at 33%. In addition, where taxpayers do experience an increase in their MTR via moving across tax brackets, this simply implies that when a lower income taxpayer today obtains the same (higher) real income levels experienced by a high income earner today, the former will face the same MTR as the latter. On average, of course, taxpayers are paying higher marginal tax rates, but these never exceed 33%.

By contrast, raising the top income tax rate (to yield similar revenue increases as the fiscal drag option), would raise marginal tax rates for a substantial group of taxpayers above those currently experienced. Raising the rate of GST effectively raises the marginal tax rate on labour income for all taxpayers. A GST increase effectively taxes existing wealth when accumulated savings are spent. This involves differential impacts on different generations, which may be compared with implicit intergenerational transfers involved in pay-as-you-go financing of NZS.[14] However, as shown by the BC model, many wealthy current and future retirees are expected to have significant capital income which would be subject to the income tax regime.[15] Hence evaluating the merits of different tax-financing options would require a careful analysis of these and other factors that are likely to affect taxpayers.

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[13]See : http://www.victoria.ac.nz/sacl/about/cpf/events/long-term-fiscal-external-panel/panel-session-3

[14] For more on these inter-generational aspects of tax and retirement income policy, see Coleman (2012).

[15] For example, the BC model projects a rise in the ratio of capital income tax revenue to taxable income from 1.1% in 2011 to 3.1% by 2060.

6 Conclusions

This paper has used projections, over the next fifty years, from two separate models, dealing with social expenditures and income tax and GST revenue. The emphasis was on the question of whether projected aggregate tax revenue changes in association with population ageing can be expected to finance projected increases in social welfare expenditures. Important policy settings in the models concern the indexation of benefits and income tax thresholds. If benefits are indexed to wages, the results suggest that the modest projected required increase in the overall average tax rate over the next 50 years can be achieved automatically by adjusting income tax thresholds using an index of prices rather than wages. Based on evidence about the New Zealand tax system over the last 50 years, comparisons of average and marginal tax rates suggested that such an increase may be feasible and affordable. However, in making a policy choice regarding such a limited use of fiscal drag, rather than other fiscal policy adjustments, many considerations are relevant. The paper discussed some of the elements involved, but a more extensive, rigorous comparison of each alternative policy option would be required prior to any specific policy reform recommendations.

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Figure 1 The Creedy-Scobie Social Expenditure Model

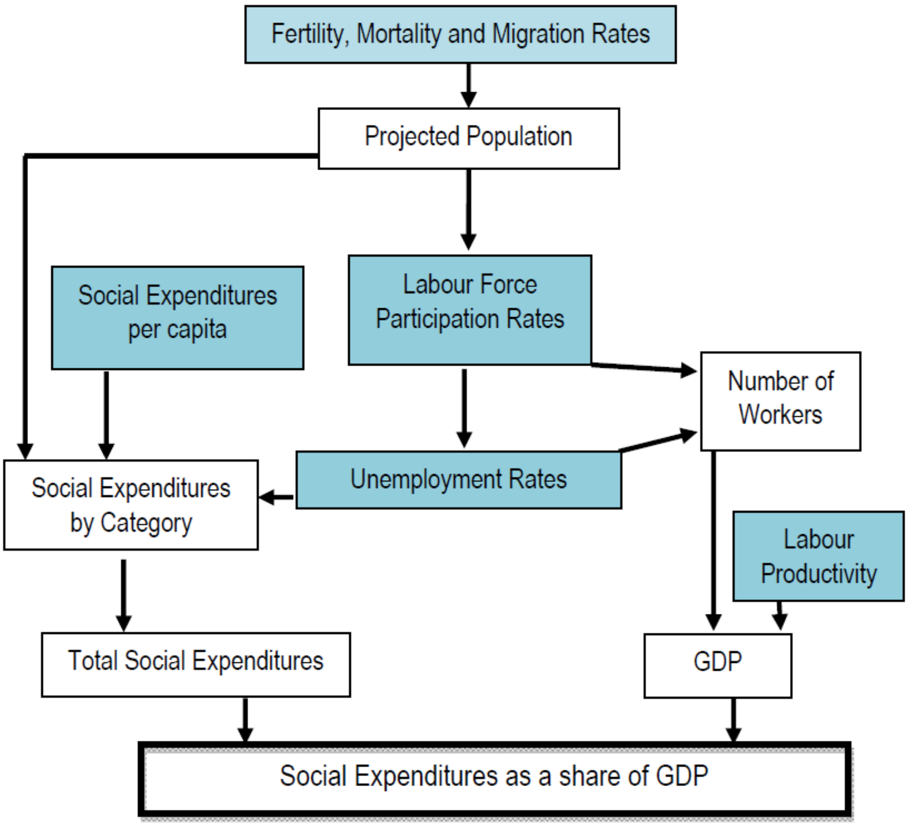


Figure 2 Labour Force Participation Rates by Age

Figure 3 Per Capita Social Expenditures by Age (Males)

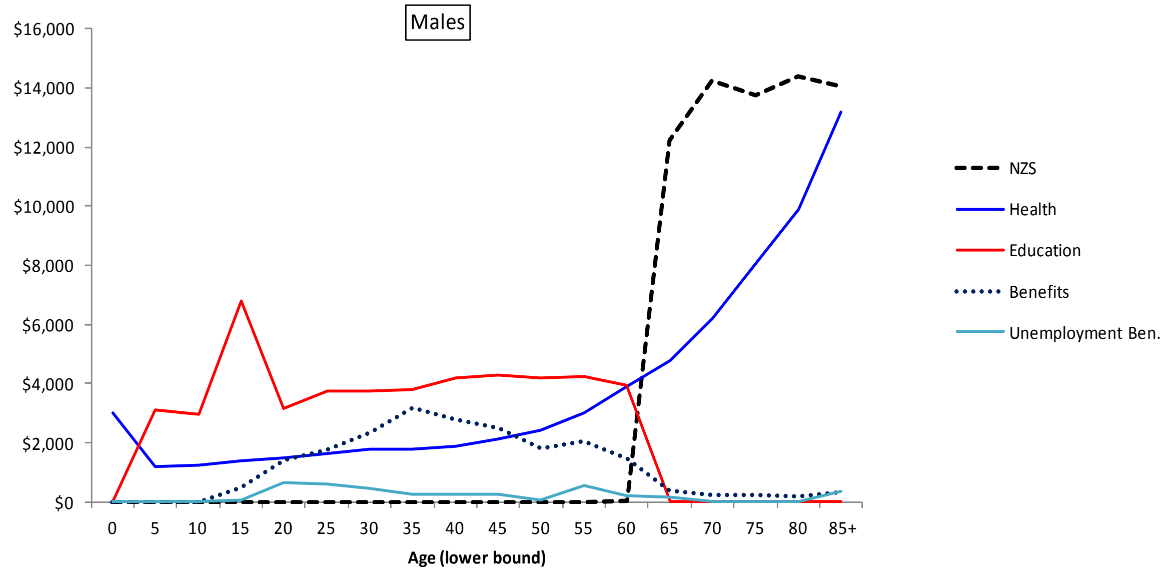


Figure 4 Social Expenditure/GDP Projections: Benchmark Case

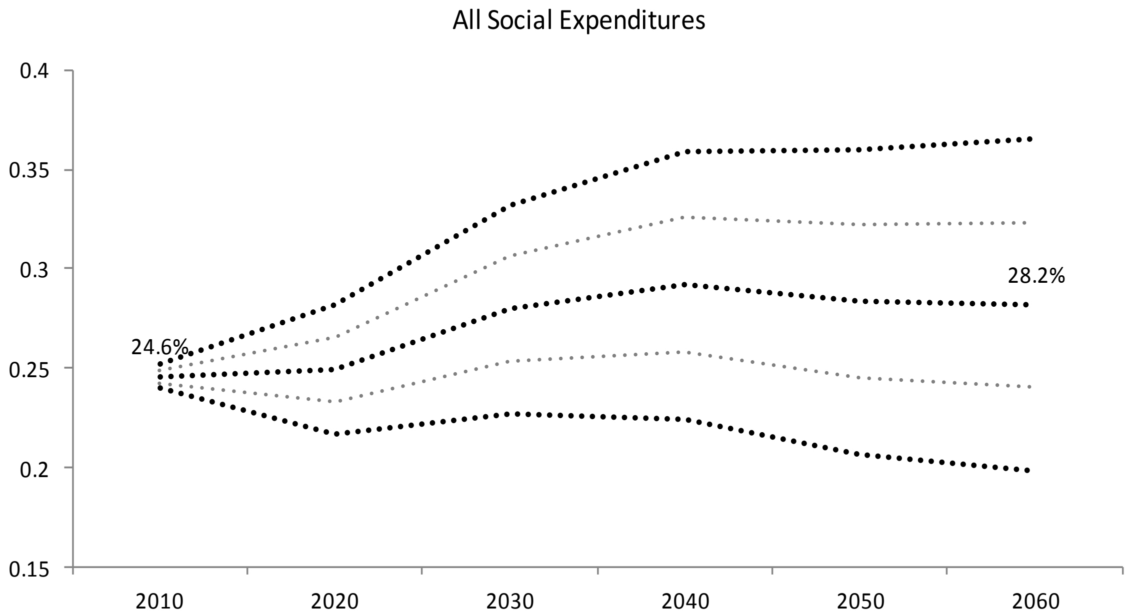


Figure 5 Alternative Social Expenditure Models

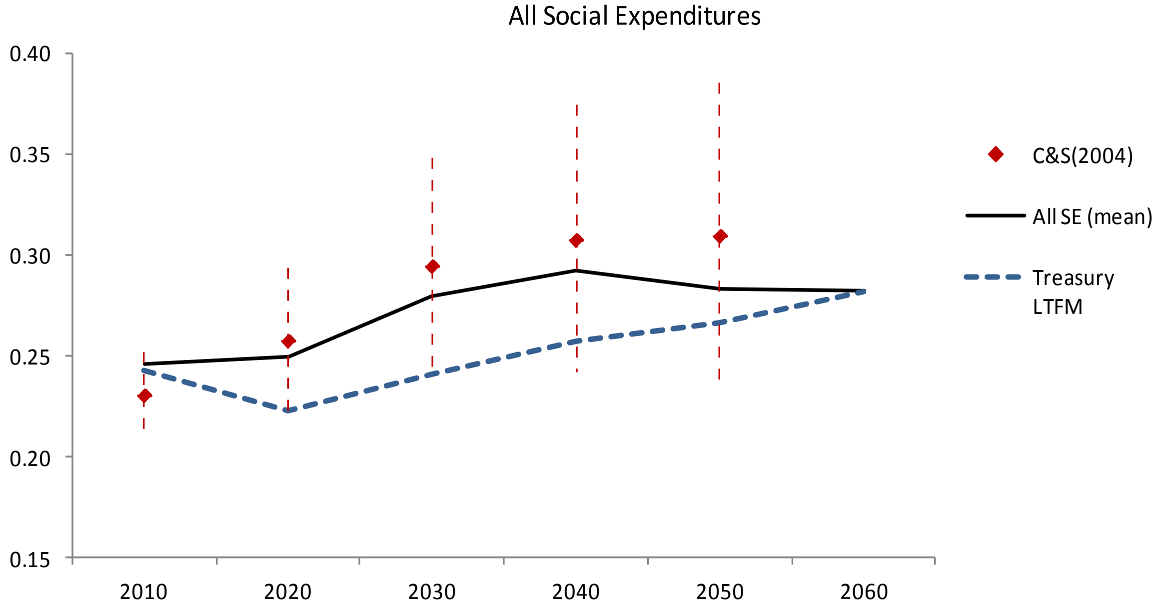


Figure 6 Differences between the Treasury LTFM and Benchmark Projections

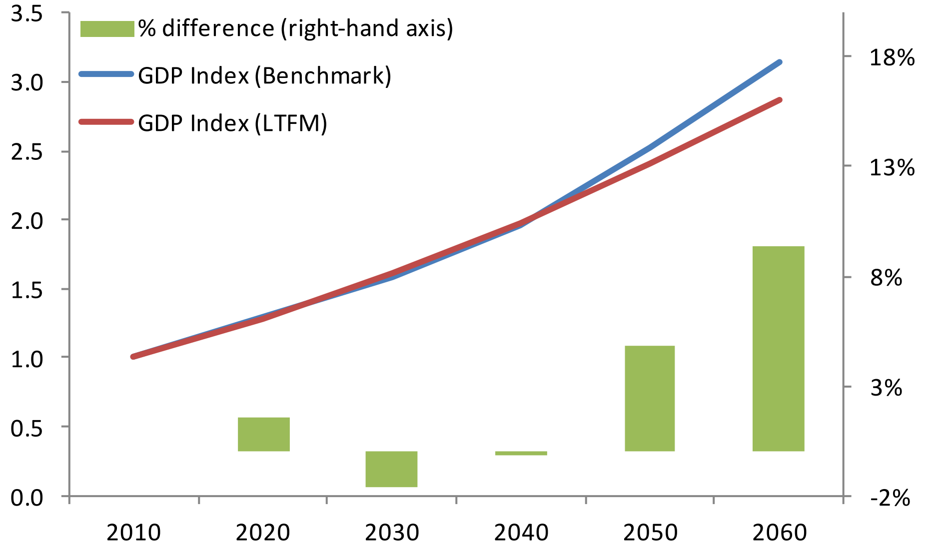


Figure 7 Decomposing Social Expenditure Trends

7A 7B

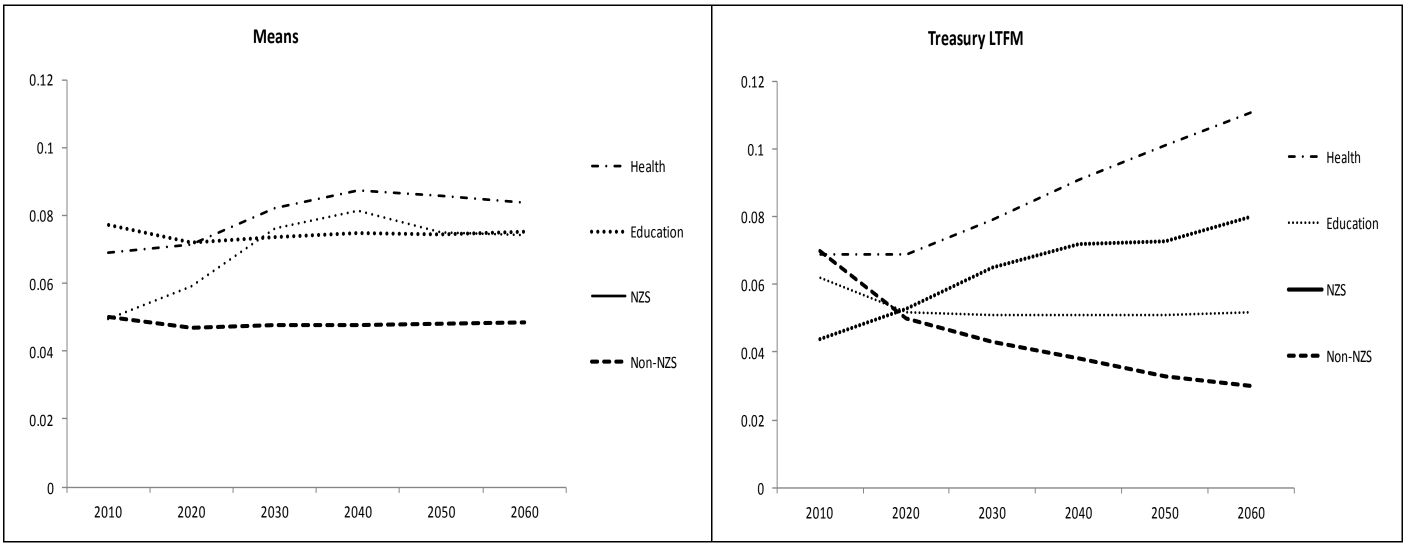


Figure 8 Testing Growth Assumptions

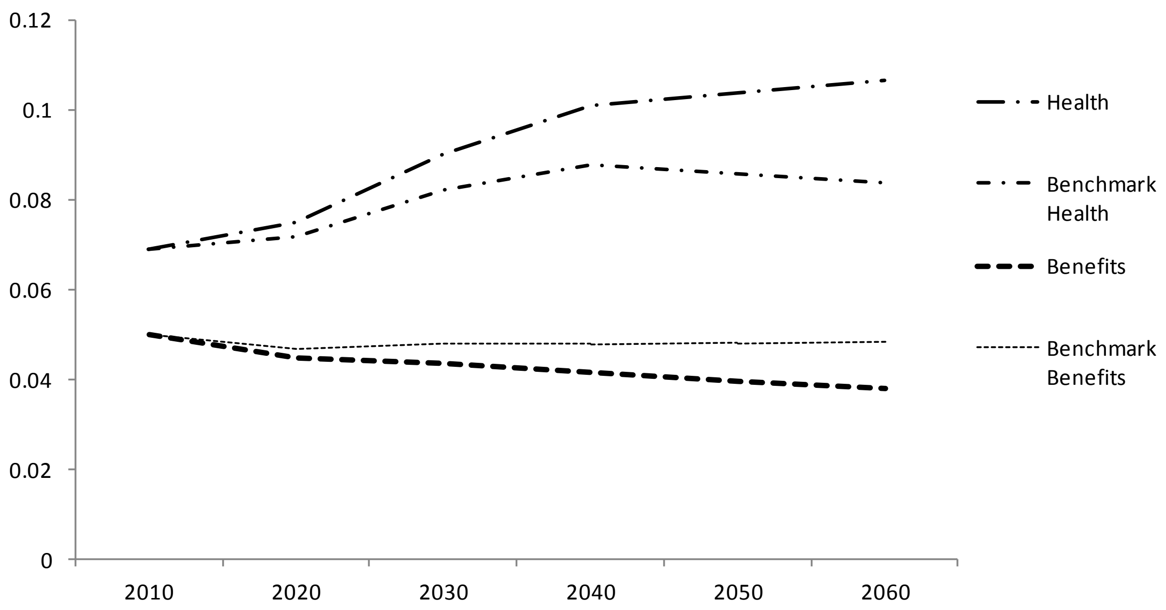
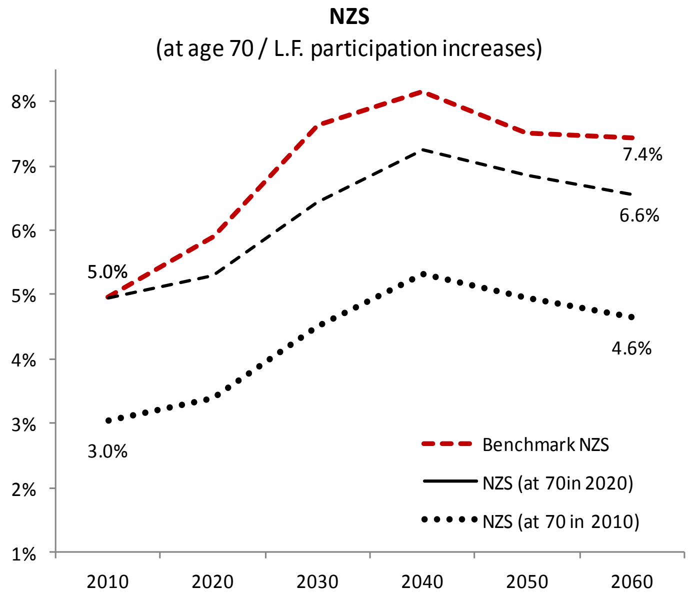


Figure 9 Effects of Increasing NZS Age of Eligibility by Five Years

9A



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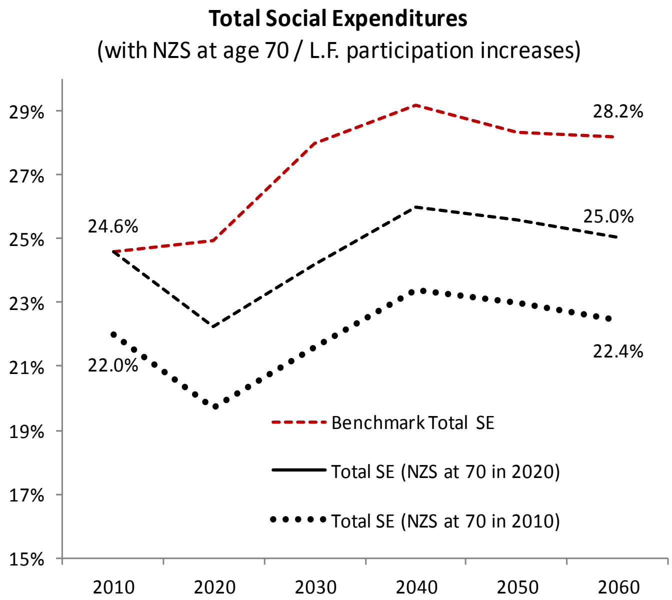

Figure 10 Participation Rate Changes with NZS Eligibility at Age 70

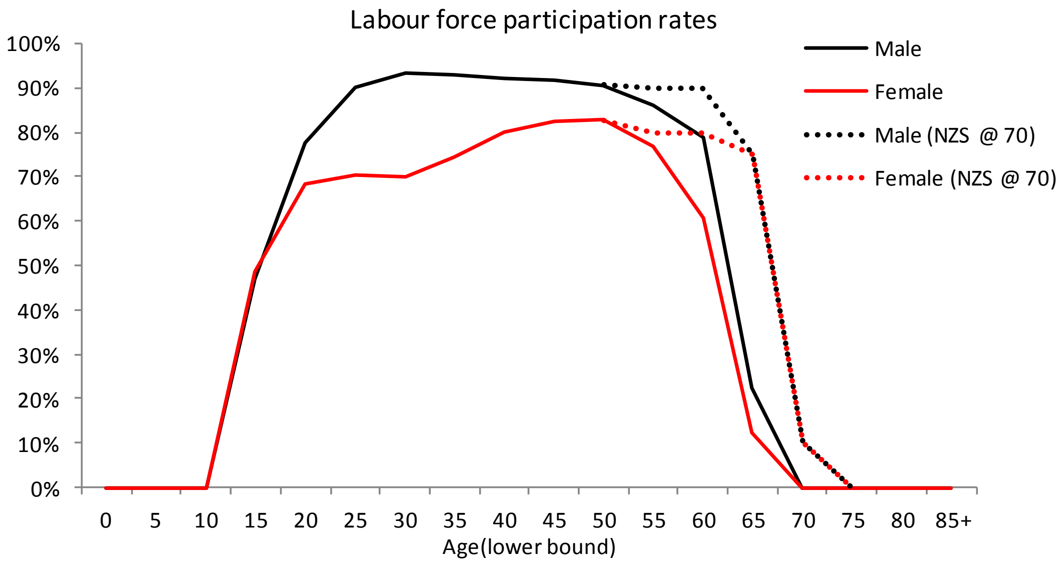

Figure 11 Male and Female Age-Income Profiles

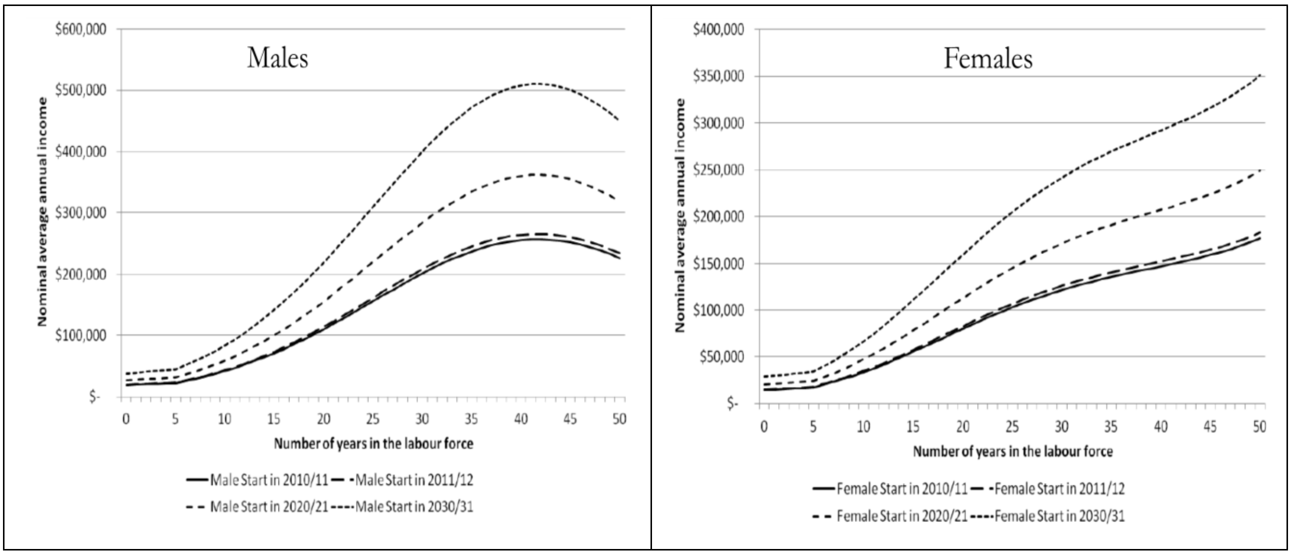

Figure 12 Time Profile of Average Incomes by Age Cohort: Males

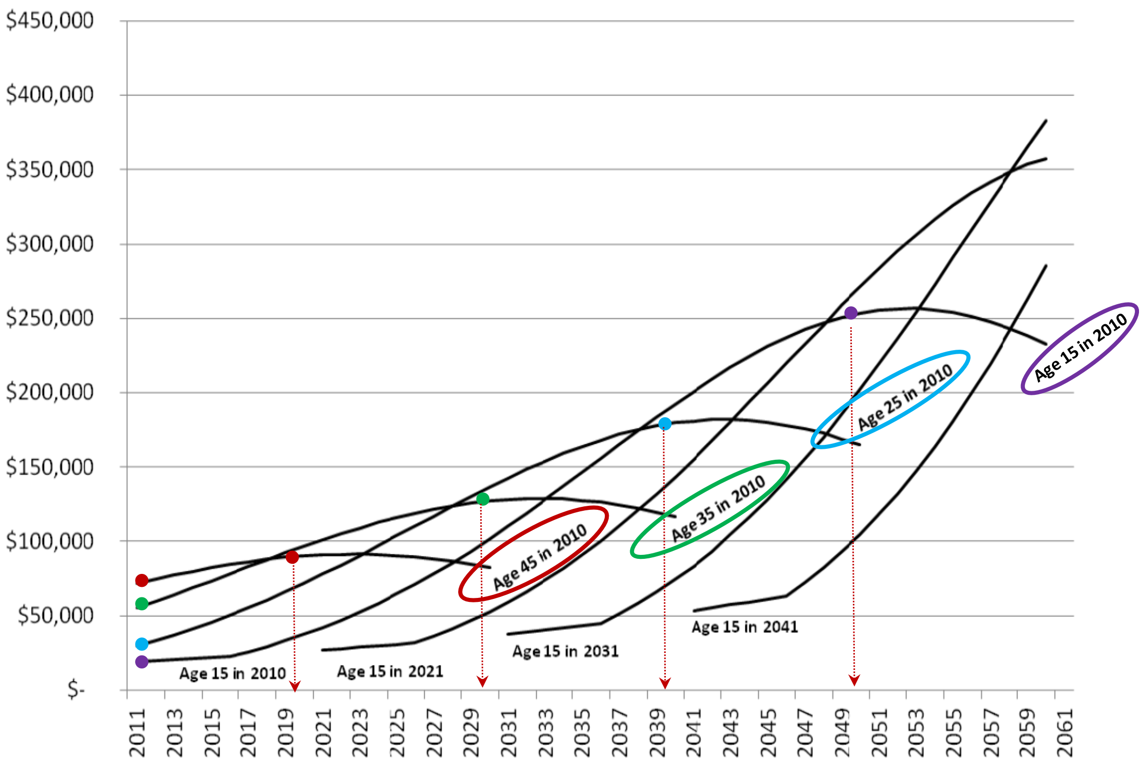

Figure 13 Proportion of PIT by Age (Females): 2011, 2031, 2051

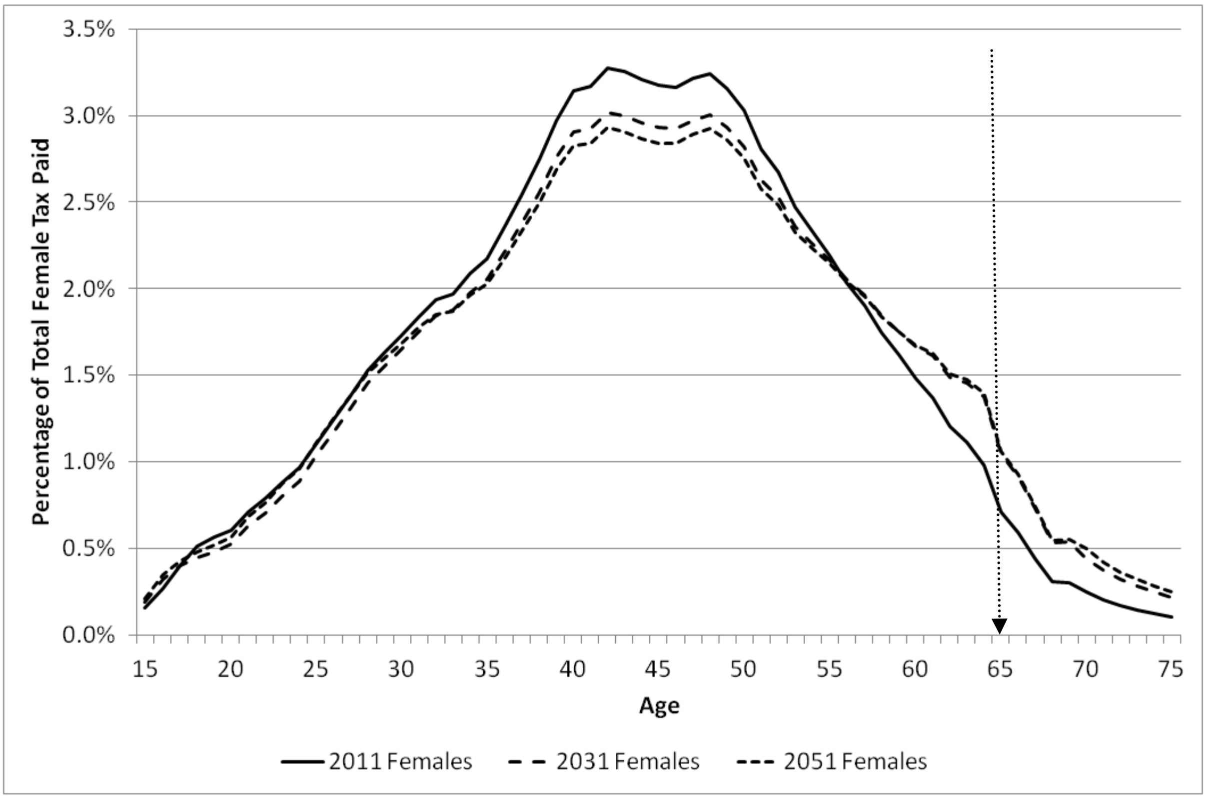

Figure 14 Personal Marginal Tax Rates in New Zealand since 1922

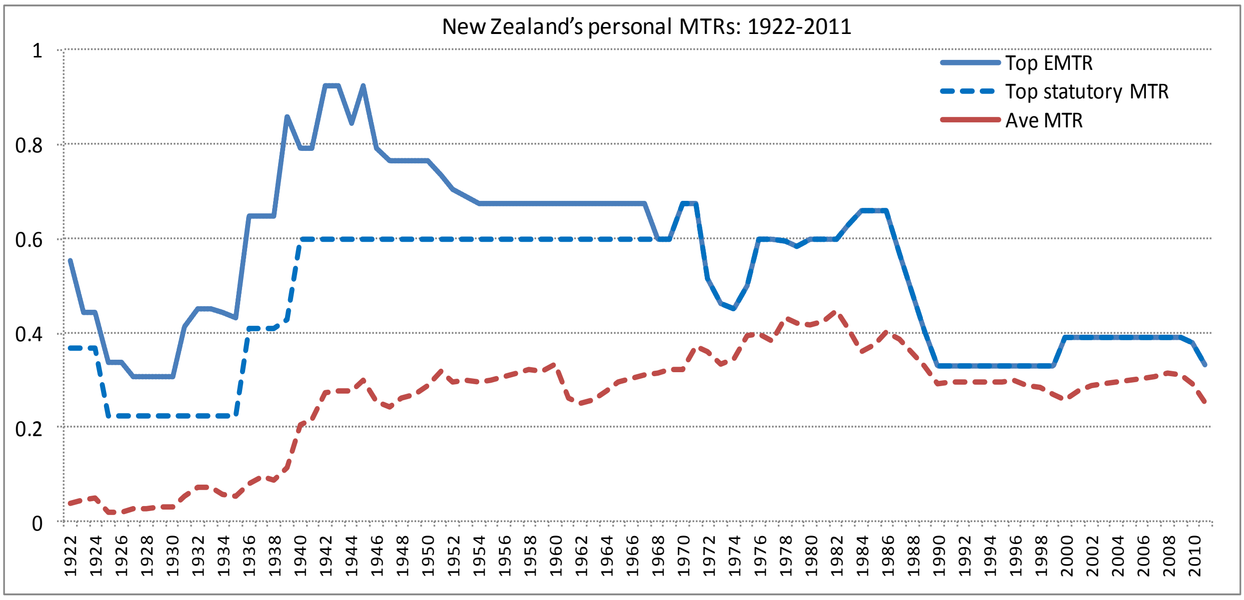

Figure 15 Historical and Projected Tax Revenue/GDP Ratios

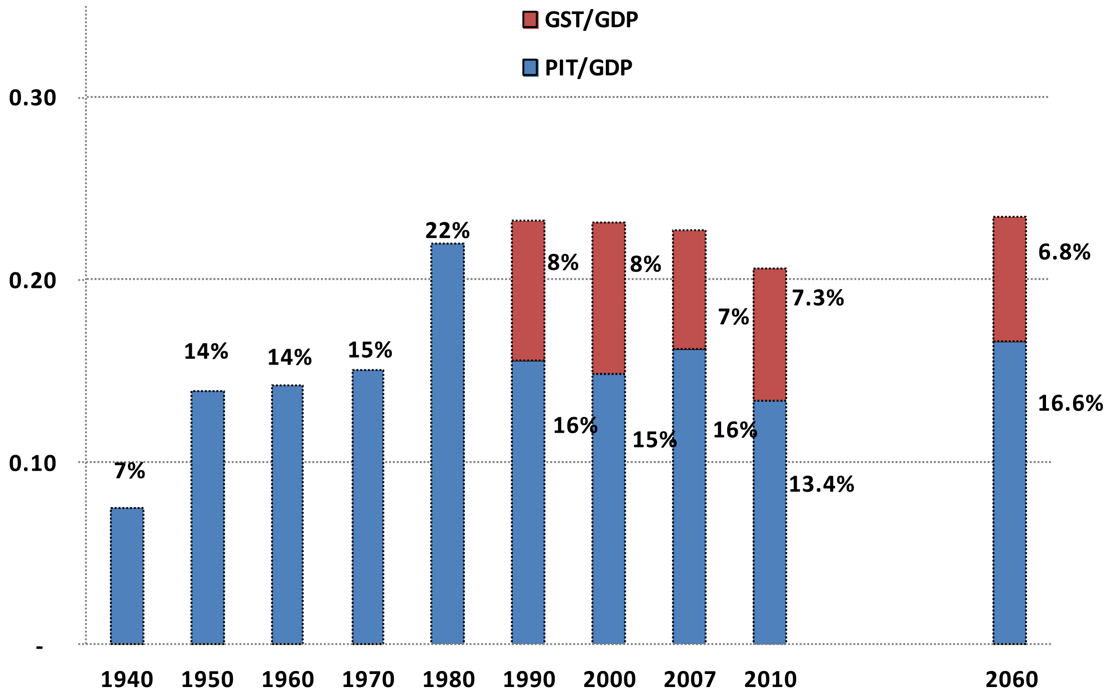

Table 1 Average PIT and GST Rates over Time

	Averate tax rate (%) : PIT + GST		
Thresholds adjusted:	No	with prices	with incomes
2011	27.2	27.2	27.2
2031	30.7	28.2	27.7
2061	34.9	31.6	28.3
Difference 2061 – 2011	**+7.7**	**+4.4**	**+1.1**

Table 2 The Distribution of Taxpayers and Incomes Across Tax Brackets, 2011-2061

Tax bracket ($000)	Tax rate	% of taxpayers 2011	% of taxpayers 2061	% of taxable income 2011	% of taxable income 2061
0-14	0.105	27%	15%	5%	1%
14-48	0.175	49%	34%	39%	15%
48-70	0.30	13%	11%	23%	9%
> 70	0.33	10%	39%	34%	75%
Ave. (real) taxable income				$34,356	$72,327

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