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# Population Aging and Financing of Government Liabilities in New Zealand

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As New Zealand's population ages, the government must look to health care and pension policies to curb the government's rising liabilities.

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## Summary findings

In New Zealand in the next 50 years, an aging population is expected to elevate government liabilities and weaken the government's fiscal position. To maintain fiscal balance, the government must either substantially pre-fund future increases in its liabilities or significantly raise taxes in the 2030s–40s, following few small possible tax cuts in the next 10 to 15 years.

Expected fiscal problems are related to the increasing costliness of publicly providing for health care and

retirement. Moreover, the aging population's negative effects on the fiscal balance could be exacerbated by any slackening in economic performance or in fiscal prudence.

Long-term fiscal projections for the country, and literature on the problem, indicate that the most effective way to contain the expected rise in government liabilities is to reform health care and pension policies.

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This paper — a product of the Country Operations Division, Country Department II, Europe and Central Asia — is part of a larger effort in the department to advise countries on reforming the role of state, drawing on best practice worldwide. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Hana Polackova, room H11-013, telephone 202-473-0182, fax 202-477-1692, Internet address [hpolackova@worldbank.org](mailto:hpolackova@worldbank.org). February 1997. (58 pages)

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# **Population Aging and Financing of Government Liabilities in New Zealand**

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## **1. Introduction**

This paper explores the long-term fiscal effects of an aging population in New Zealand and considers several options available to government for containing and financing its future liabilities. Using the New Zealand Treasury long-term fiscal model, the paper analyzes the baseline fiscal outlook and its sensitivity to several economic, demographic, and policy assumptions. The results are presented from two different perspectives: In a balanced budget-tax rate (or zero net debt) approach, which shows the dynamics in the annual tax revenues that would be needed to balance future budgets; and in a constant tax rate (or tax smoothing) approach, which shows the dynamics in the government financial position when tax rates are held constant.

Based on the survey of international literature and the sensitivity tests, the paper derives several policy options for alleviating both the demographic pressures on the future fiscal balances and the problem of government financing in the long term. Attention is given to a calculation of the government gross implicit pension debt, to the tradeoff between a pre-funding of future spending and future tax increases, and to the fiscal and behavioral implications relating to the level of New Zealand Superannuation (NZS) benefits.

## **2. An Aging Population**

An aging population is an international phenomenon of growing concern to governments and multilateral institutions. Studies have examined issues relating to the public provision for retirement, in particular the implications of pension promises for future government liabilities and for economic efficiency and national saving.

### **2.1. Implicit Public Pension Liabilities**

Because of the increasing difficulty of maintaining fiscal balance in an aging society, recent studies by the OECD, IMF, and World Bank have advised governments to consider and periodically measure implicit public pension liabilities for current and future generations (OECD 1993 and 1995; IMF 1996a; and Kane and Palacios 1996.) The studies have concentrated on countries with large social security systems and direct

unfunded commitments to pay defined-benefit pensions to individuals, which may require very high contributions in order to be sustained as the population ages.<sup>1</sup>

Quantifying and reporting the government's pension commitments make public pension financing more transparent, promote fiscal responsibility, and allow for timely adjustments to the program. For these purposes it is sufficient to calculate the discounted value of total public pension benefits to be paid in the long term. Analysis of the cost of replacing a pay-as-you-go (PAYG) system with a fully funded scheme requires separate calculation of the value of pension commitments to existing pensioners and the value of pension commitments "accrued" by current workers (based on past contributions, years of employment, or age).<sup>2</sup>

The implicit gross public pension liability can be calculated for both a limited and an unlimited time period starting at any point in time. It is usually expressed in its present value as a percentage of GDP estimated at the starting year:

$$GPPL = \frac{PV(r, \sum_{i=a}^{i=b} n_i)}{GDP_{i=a}}$$

where  $GPPL$  is the implicit gross public pension liability,  
 $r$  is the discount rate,  
 $n_i$  is the nominal public pension expense in year  $i$ ,  
 $a$  is the starting year,  
 $b$  is the ending year, and  
 $GDP_{i=a}$  is current GDP at year  $a$ .

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<sup>1</sup> The largest and least transparent public pension liabilities arise in the pay-as-you-go (PAYG) systems. Governments' claims that their pension promises are not liabilities in the legal sense have been already challenged in several countries (World Bank 1994). Government liabilities also arise from implicit guarantees that it will protect pensioners against the default or failure of private pension schemes.

<sup>2</sup> In some cases, the government could benefit by legally committing itself to protecting the elderly from poverty. For moral and political reasons, most governments will ensure that a minimum pension is paid. By making this commitment legally binding the government could emphasize that public pensions are part of social safety net and that individuals must save privately to maintain their standard of living after retirement (World Bank 1994).



Given the baseline assumptions (see section 3.3.) and a discount rate of 5 percent, the gross implicit New Zealand Superannuation (NZS) liability faced by the government of New Zealand for the period 1995-2050 comes to about 236 percent of 1995/96 GDP. Although this value is relatively high, it compares favorably with most OECD countries. (For international comparisons, see IMF 1996a.)

**Table 1. Baseline estimates of gross liabilities of public pension systems in selected industrial countries**

(percent of 1995 GDP)

<b>Country</b>	
United States	206
Japan	261
Germany	456
France	523
Italy	559
United Kingdom	148
Canada	214
Sweden	291
New Zealand	236
<b>Average</b>	<b>322</b>

Source: Estimates by IMF staff and the NZ Treasury fiscal model.

The sensitivity of gross public pension liabilities to the underlying economic assumptions varies by type of pension scheme (e.g. an earnings-related versus a flat-pension). For the NZS, the sensitivity of the gross liability is weak. With respect to productivity, for example, a forecasted 2 percent productivity growth a year brings the gross liability to about 266 percent of 1995/96 GDP, whereas a forecasted 1 percent productivity growth a year implies the gross liability of about 211 percent of 1995/96 GDP. This difference is caused mainly by the wage indexation of NZS benefits, which causes higher productivity growth to lead to greater NZS expense in nominal terms (even though the expense remains constant as a percentage of then-current GDP).

## **2.2. Saving and Public Pension Adequacy**

Most international time-series studies confirm that possible adverse behavioral effects of public pensions are correlated with the expected generosity of the plan (see the literature surveys in World Bank 1994 and IMF 1996a, b). Arguments against any

public provision of pensions are weak as long as public pensions serve as a pure safety net (subsistence level of support) for people in long-term poverty and unable to save, and as insurance against failures in the capital and insurance markets and in personal asset management. The effects of the mere existence of a public pension scheme on private saving are ambiguous (see Box 1).<sup>3</sup>

There is no evidence that the replacement of a PAYG system by other forms of provision for retirement would significantly boost national saving. An IMF study concluded that there is "no strong theoretical argument or compelling evidence for the view that the replacement of a PAYG defined-benefits public sector plan by a defined-contributions plan along the lines of the Chilean system will increase aggregate saving. ... Similarly, there is no compelling reason to believe that the addition of a second tier in the form of a defined-contributions plan to the public system should increase saving" (1996b).<sup>4</sup>

Analysis of the fiscal effects of an aging population by the IMF (1996a, b) and the World Bank (1994) has suggested that governments should gradually shore up the existing PAYG systems while shifting more responsibility for provision for retirement to the private sector. Countries with small pension schemes in place have been advised to move toward fully funded systems as part of a comprehensive reform policy to develop a multi-pillar pension system.<sup>5</sup> For countries with large public pension

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<sup>3</sup> Other arguments concerning public provision for retirement relate to the relative depth of the domestic capital market, possible misallocation of capital (if the government attempts to pre-fund its future pension expenses), high taxes (if public pensions are generous, the population is aging and the PAYG system is maturing), tax evasion (if taxation is high and the link between taxes and the pension benefit is blurred), large deficits (if rising old-age and system-dependence ratios increase expenses on pensions, health and welfare), and excessive intergenerational transfers during demographic transition.

The hypothesis that demographic factors themselves strongly affect saving, and predictions of a substantial drop in both private and national saving as a result of population aging have not been supported by empirical studies (OECD 1995). The observed drop in national saving correlated with aging appears to be associated primarily with the deterioration in government saving.

<sup>4</sup> The U.S. experience suggests that development of private pension plans in addition to a PAYG system may have a positive impact on private saving. For a discussion see World Bank (1994) and IMF (1996a, b).

<sup>5</sup> The multi-pillar approach was developed by the World Bank (1994) to separate the redistributive and saving aspects of a pension system. The three pillars in this approach are: an obligatory universal public pension scheme guaranteeing a basic flat pension, an obligatory enrollment in a private pension saving plan, and additional private saving on a voluntary basis. Private saving obligation is important primarily for societies that cannot afford to pay from government budget for an adequate universal flat pension. It requires, however, that several conditions be met (such as development of the financial infrastructure and a reasonable ratio of administrative costs) and is not suitable for every country. For comparison of the administrative costs of the different pension schemes, see Valdes-Prieto (1994).

schemes, however, attempts to “privatize” the existing PAYG schemes and explicitly recognize the accrued public pension liabilities could pose significant fiscal risks. In these countries reform proposals have recommended limiting the level of and eligibility for public pension benefits within the existing system.

To deal with the expected rise in government pension liabilities the IMF (1996b) has advised governments to (a) shift indexation of pensions to prices rather than wages, provided that the adequacy of pension benefits is reviewed periodically; (b) raise the minimum retirement age rather than reduce pension benefits; and, if possible, (c) adopt a sensible immigration policy rather than active employment policies to boost participation rates and reduce unemployment. Because of the possible effect on unemployment of the increase in the retirement age pension reform should be undertaken in conjunction with liberalization of the labor market. The World Bank (1994) has suggested that indexation of pensions to the arithmetic average of the movement in wages and prices would both protect the elderly from poverty and reduce the fiscal effect of population aging.

Testing pension adequacy and setting an optimal public pension level is problematic because of cross-country differences regarding the function of public pensions and the range of methods for measuring income adequacy. Comparing the different income adequacy measurements in New Zealand, Brashares (1993) noted that the relative earnings related measure (65 percent of net average ordinary time weekly earnings, which had been accepted for setting the floor of the NZS) implies the most generous income adequacy level. Moreover, as income differentiation and the spread between average and median earnings rises, the comparative generosity of this standard increases.<sup>6</sup>

Rigorous analysis of the link between private saving and government provision of pensions is beyond the scope of this paper. The literature survey in Box 1 offers a short summary of the most recent findings.

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<sup>6</sup> For the recent developments in income distribution in New Zealand, see Barker (1995).

**Box 1. The Effect of Government Provision of Pensions on Saving: A Survey of Literature**

Most studies of the impact of public pension plans on private saving have found little evidence to support the contention that social security or public provision for retirement has reduced saving.<sup>1</sup>

In the United States, Italy, Sweden, and Japan, where publicly provided pensions were particularly generous, rising social security benefits did seem to depress private saving. The offset effect of public pension plans on private saving was significantly less than 100 percent, however. Thus, if public pensions are financed by taxes rather than by government borrowing, the increase in public saving associated with the public pension scheme is likely to exceed any reductions in private saving.

In Canada, India, Sri Lanka, Chile, Singapore, and, to a lesser extent, Great Britain and France, development of public pension systems has been correlated with an increase in voluntary private saving and, possibly, with economic growth.<sup>2</sup> (For references to specific country studies, see IMF 1996a, b; Corsetti and Schmidt-Hebbel 1995; Vittas and Iglesias 1992.)

The differences in the effect of the introduction and development of a public pension scheme on voluntary private saving may be partly explained by the initial conditions (the initial saving rates and the pre-existing mechanism of support for retirement) as well as by the level of social development within different countries. In developing countries, for example, industrialization, urbanization and the resulting break-down of traditional networks of transfers may bring about the need to create a social safety net and to increase individual private saving.

Cross-country comparisons of the effect of public pension schemes on private saving levels reveal stronger effects than do time-series studies. The observed differences in both saving and public provision for retirement may thus be caused by the same factors (such as traditional social preferences about both saving and the role of government). The impact of public pension schemes on private saving may thus be idiosyncratic to the traditions and the overall nature of policies within societies, a conclusion supported by Jaeger (1994) in his two-equilibrium interpretation of the overlapping-generations model.<sup>3</sup>

<sup>1</sup> For a comprehensive list of references, see World Bank (1994) and IMF (1996 a, b).

<sup>2</sup> For an explanation of this effect see World Bank (1994) and IMF (1996). The most common explanation is that government discussion of providing a minimum pension to the elderly against poverty makes people more aware that they should make provisions toward their own old age (*recognition effect*).

<sup>3</sup> The IMF (1996c) concluded that "offering a general conclusion - one that applies across countries - on the impact of pensions on saving is not possible." Changes in the friendliness of the existing tax system to household borrowing may outweigh the saving effects of pensions policies, for example.

### **3. The Fiscal Impact of Population Aging in New Zealand**

#### **3.1. The Model**

The long-term fiscal model describes the major fiscal consequences for the pension system of future demographic pressures. Economic growth in the model depends on population, the labor force, the unemployment rate, average hours worked per week, and output per hour. The economic forecast, which is identical to the official Treasury forecast for the first three years, is used as an input to the fiscal forecast. Revenues are estimated from the effective tax rates and tax bases. Expenditures are divided into social spending, reflecting the number of beneficiaries and the average benefits, and discretionary spending, including the core government administration and security services. To calculate social spending the model breaks out six age groups and estimates the cost of spending on health care, education, and social welfare for each group.

The model makes no assumptions about the effects of an aging population on the real economy or markets, the economic and behavioral effects of taxation and government programs, or indirect linkages among macroeconomic variables. Thus, the model has been used mainly to study the sensitivity of the baseline fiscal outlook with respect to small changes in the baseline assumptions. To show greater divergence from the baseline assumptions would require a comprehensive ex ante economic analysis and multiple exogenous adjustments in the underlying variables.<sup>7</sup>

#### **3.2. Analytical Approaches**

This paper presents the analysis of the modeling results from two perspectives, the balanced budget tax rate perspective and the constant tax rate perspective. These two analytical approaches are used to study the baseline outlook, sensitivity tests, and selected scenarios.

The balanced budget tax rate (or zero net debt) approach is used to determine the tax revenues required each year to balance the budget. It focuses fully on the dynamics in government expenses (recorded at the accrual basis), and treats tax

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<sup>7</sup> For a detailed description of the model, see Treasury (1996).

revenues as an endogenous variable (total expenses minus non-tax revenues). By disregarding the exogenous pressures on revenue and avoiding government accumulation of financial assets, this approach insulates the fiscal forecasts from the cumulative effects of debt service and non-tax revenue.<sup>8</sup> The shortcoming of this approach (treated in section 4.2) is its assumption of instantaneous adjustment of revenue to expenses.

The constant tax rate (or tax smoothing) approach is used to show the dynamics in government revenues, expenses, and financial assets under the assumption that initial tax rates remain constant in the long term. This approach illustrates the fact that demographic pressures affect both revenues and expenses. Future fiscal effects under the different scenarios are shown through the trends in government financial assets.<sup>9</sup>

### **3.3. Baseline Assumptions**

The model's baseline is built on the projections provided by the New Zealand Department of Statistics and the New Zealand Treasury and is based on the following assumptions:

#### ***Long-term demographic assumptions***

Mortality:	Medium
Fertility:	Medium
Immigration:	15,000 a year until 1999, 5,000 a year thereafter

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<sup>8</sup> The self-enforcing fiscal impact of the debt service and the revenue from financial asset management make the modeling results highly sensitive to the initial fiscal stance.

<sup>9</sup> The figures in the paper report gross financial assets, which represent the sum of the net financial assets and the gross debt. In New Zealand it is more intuitive to observe assets rather than debt since, according to the baseline under the constant tax rate approach, the government is expected to hold a positive financial asset position in the long term. Gross, rather than net, financial assets illustrate the size of the problem of government financial asset management.

When the government is indebted its official policy target is net debt. Consistent with current government policy, the baseline assumes that the public debt will be retired as quickly as possible. Beginning in 2008 the government finds itself in a positive financial asset position. No official policy target applies in such case.

The model arbitrarily sets 20 percent of GDP as the gross debt target with respect to the smooth functioning of the domestic financial market. It is presumed that government paper serves as the benchmark for interest rates and as an inexpensive and relatively risk-free instrument of domestic monetary policy. In addition, governments may periodically face the need to issue debt. Government borrowing cost are generally assumed to be lower when the government issues debt on a regular rather than an ad hoc basis. The target for the gross debt in the model does not affect the modeling results to any significant extent. It should be noted that comprehensive net worth would represent the most meaningful fiscal indicator if it were incorporated into the model (Bradbury, Brumby, and Skilling 1996).

### **Long-term economic assumptions**

Growth in output per hour:	1.5 percent a year <sup>10</sup>
Unemployment rate:	6.0 percent
Participation rate:	77 percent of working age population
Average weekly hours:	39.9
Labor share in output:	45 percent <sup>11</sup>

### **Long-term policy assumptions**

Real growth in per capita health spending:	2 percent a year <sup>12</sup>
Real growth in per capita education spending:	2 percent a year
Real growth in per capita social welfare spending:	1.5 percent a year
Real growth in discretionary spending:	Set equal to productivity growth <sup>13</sup>
Pension benefits:	As designed in the Accord <sup>14</sup>

Under these assumptions, the government would have to cope with significant demographic pressure on spending in the future. The old-age dependence ratio clearly reflects the increasing share of the elderly in New Zealand, the ratio of which to the working-age population would more than double by 2050 (figure 1). (For historical figures, see Annex 1.)

The increasing share of the elderly in the population has important implications for tax payers, who, on average, will have to support twice as many pensioners in the

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<sup>10</sup> This assumption is comparable to the OECD and IMF (1996a) forecasts for industrial countries. In most industrial countries, the labor force is expected to shrink, and the assumption of 1.5 percent annual growth in output per hour implies average annual real GDP growth of 1.4 percent. Under the baseline assumptions, the labor force in New Zealand would continue to grow and 1.5 percent growth in output per hour in New Zealand would generate real GDP growth of about 2.6 percent a year between 1995 and 2010 and about 1.8 percent a year between 1995 and 2050.

<sup>11</sup> More weight is placed on recent changes in the labor market in New Zealand and on continuity of current labor market policies. The recent reforms have brought about a significant reduction in the share compensation of employees in output.

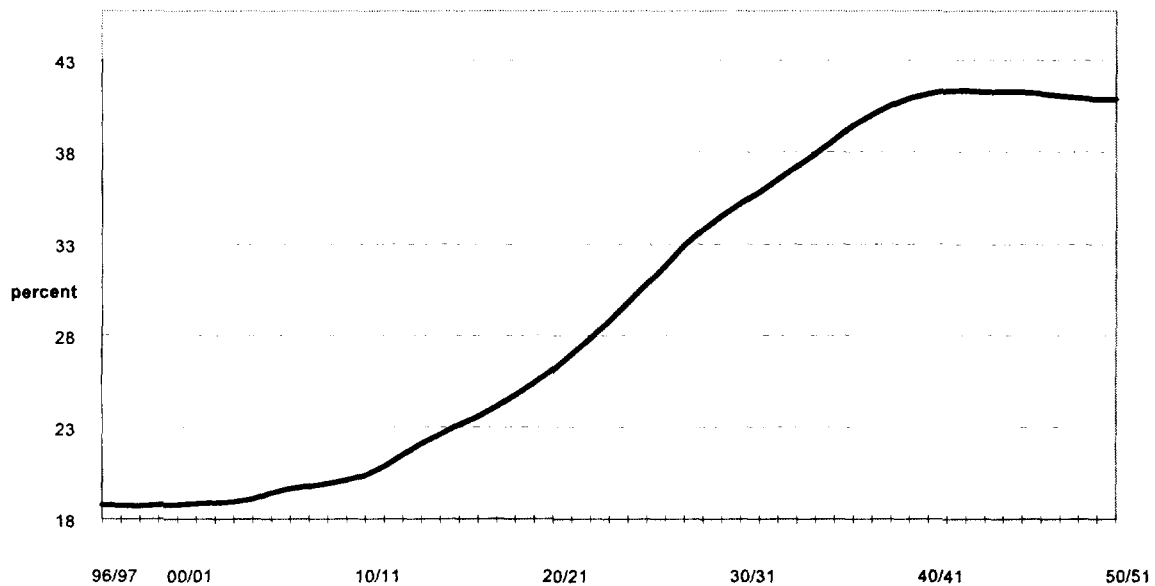
<sup>12</sup> Baseline figures reflect both historical and international spending trends. They appear high compared with recent years but low compared with historical data for the past 40 years in New Zealand, and given current and expected pressures on social spending in New Zealand and other OECD countries (Bagrie 1996).

<sup>13</sup> It is assumed that public administration and defense expenditure would grow only if compensated for by efficiency gains, thus at the rate of productivity growth. As a result of the productivity indexation of discretionary expenses and the rising labor force, the share of discretionary expenses in GDP would decline by half by 2050.

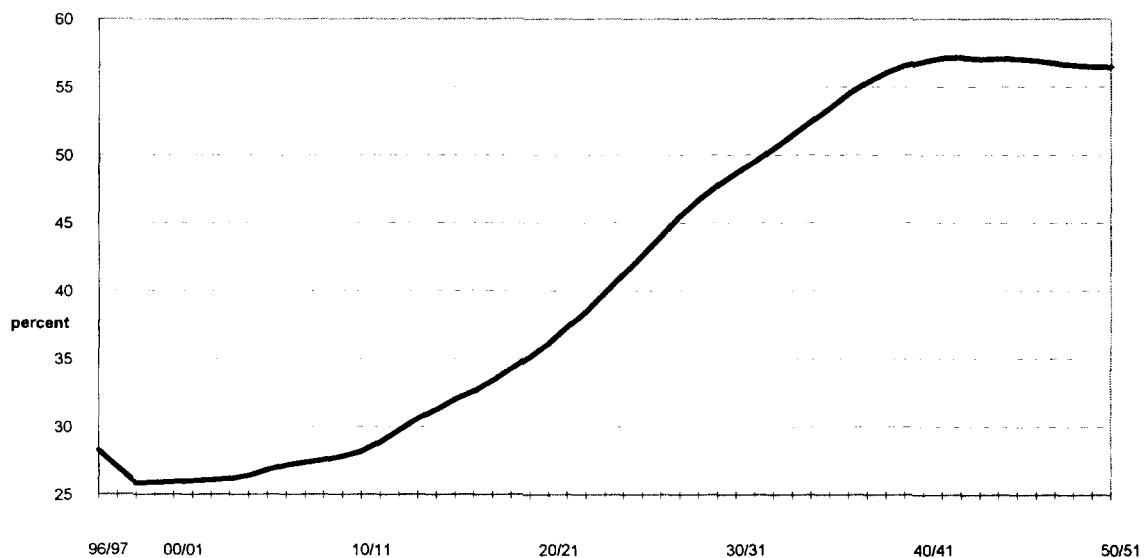
<sup>14</sup> The model assumes that the retirement age is gradually increased over the next few years and that the level of pension benefits remains between the floor (65 percent of average after-tax ordinary time weekly earnings) and the ceiling (72 percent of the average after-tax ordinary time weekly earnings) specified in the New Zealand Superannuation Accord for a couple. Under the baseline assumptions the price indexation of the NZS benefit would be automatically replaced by its wage indexation at the floor level in the long term.

2040s as they will between 2000 and 2010. This doubling of the system dependence ratio is shown in figure 2.<sup>15</sup>

**Figure 1. Old age dependency ratio (ratio of population 65+ to 15-64)**



**Figure 2. System dependency ratio (ratio of NZS beneficiaries to employed)**



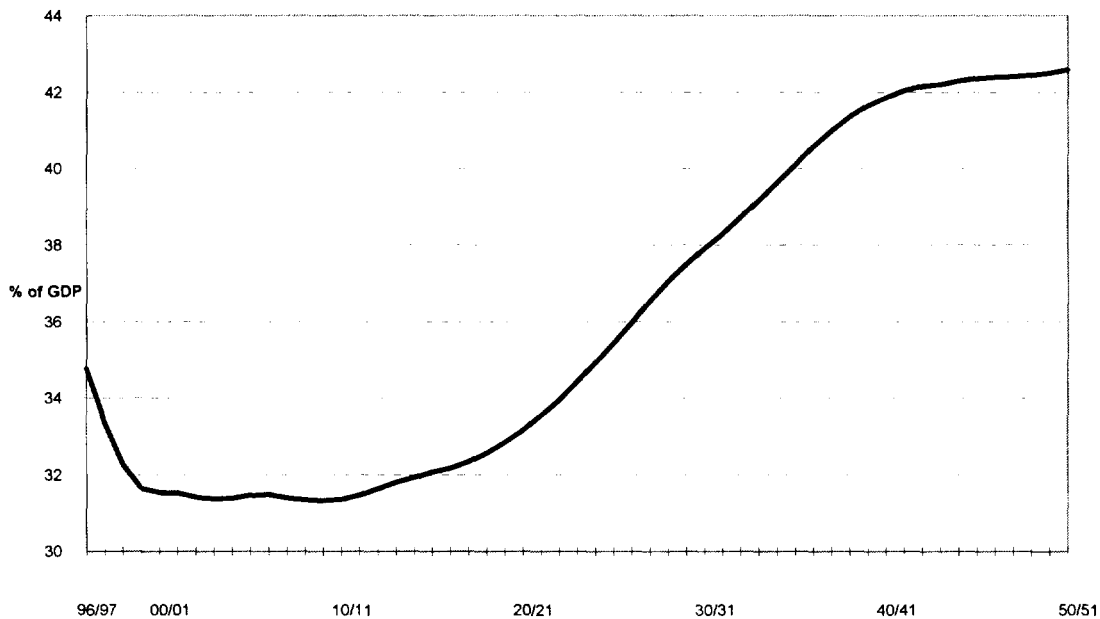
<sup>15</sup> The old age dependency ratio is defined as the ratio of persons of age 65 and older to the working age (15 to 64) population. The system dependency ratio is defined as the ratio of the NZS beneficiaries to employed. The number of beneficiaries of the NZS reflects the scheduled increase in the retirement age.



### 3.4. Aggregate Fiscal Outcome

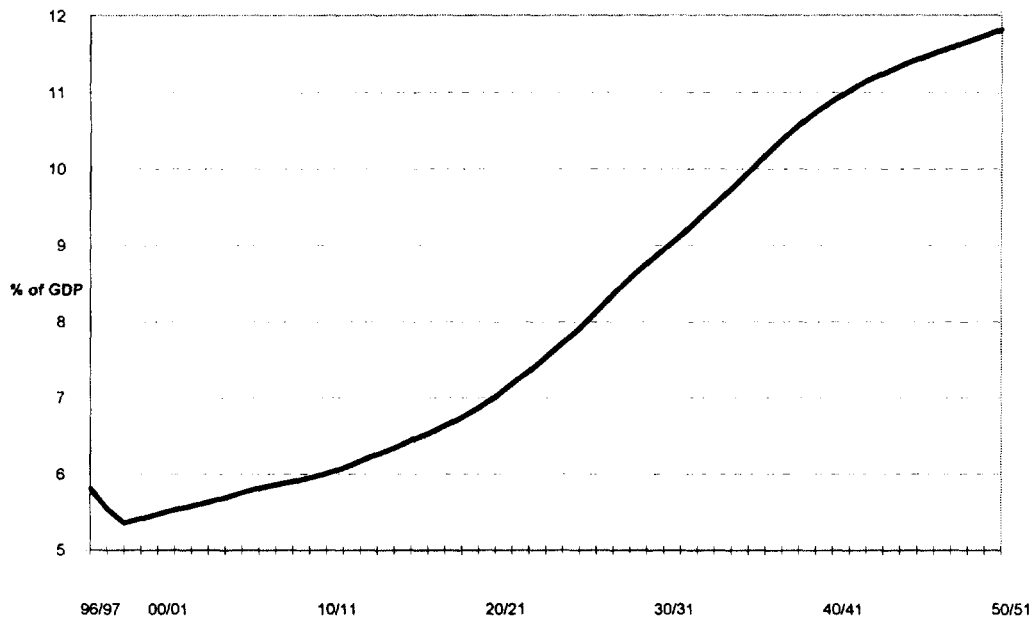
Under the baseline assumptions demographic pressures would increase significantly future government spending as a share of GDP. As figure 3 suggests, the government would be able to reduce its total expenses to 32 percent of GDP by the end of the century and maintain this spending level for about 15 years, after which expenses would rise and exceed 42 percent of GDP in the 2040s. (For historical data see Annex 1.)

**Figure 3. Total government spending: Baseline case**

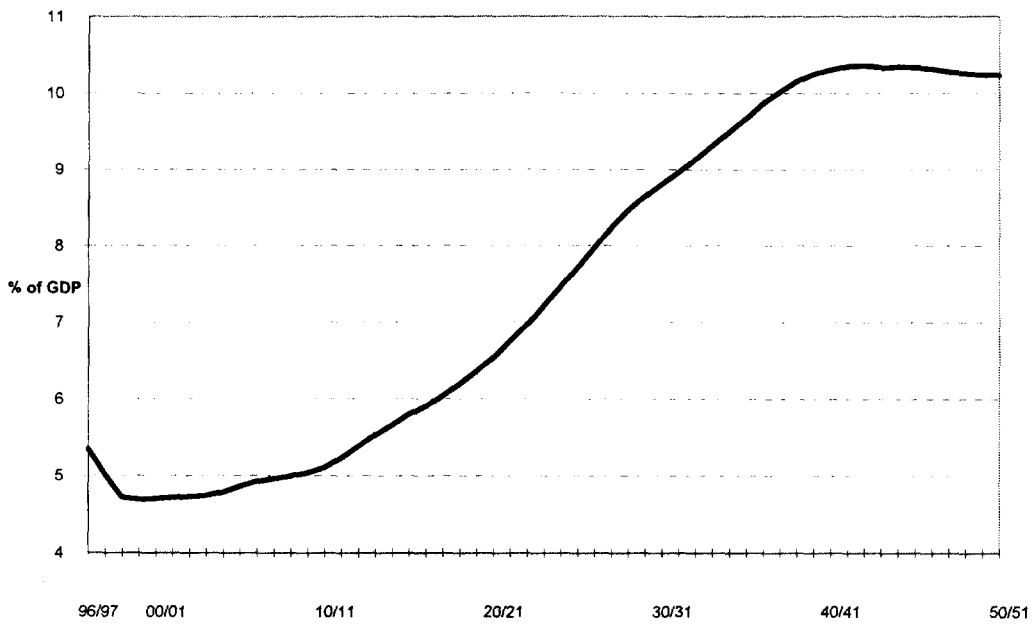


The increase in government expenses associated with an aging population reflects mainly increased costs of health care and pensions. Health spending as a percentage of GDP would increase to almost 12 percent of GDP by 2050, and the cost of NZS would exceed 10 percent of GDP by the 2030s. Table 2 and figures 4 and 5 project government expenses through 2050; table 3 compares the cost of the NZS with public pension schemes in other industrial countries.

**Figure 4. Health care spending: Baseline case**



**Figure 5. NZS spending: Baseline case**



These projections indicate that under the baseline assumptions population aging would have strong effects on fiscal balances in the long run. Annual education expenses would stabilize below 5.5 percent of GDP; total annual expenses on social benefits would remain below 8 percent GDP. The exogeneity of social spending (rather than its direct linkage to the productivity or real GDP growth in the model) reflects the fact that social spending can often be driven by demand or political discretion.

**Table 2. Baseline projections of public expenditures on selected items**  
(percent of projected GDP)

Expense	1995/96	2000/01	2010/11	2030/31	2050/51
NZS	5.7	4.7	5.1	8.8	10.2
Health	5.9	5.5	6.0	9.0	11.8
Education	5.6	5.3	5.4	5.3	5.7
Unemployment	1.4	1.1	1.1	1.1	1.1
Domestic purposes	1.5	1.5	1.5	1.5	1.5
Other social welfare	5.0	4.8	4.7	5.1	5.3
Defense	1.1	1.0	0.9	0.9	0.9
Debt interest	4.0	1.5	1.3	1.2	1.2

Source: New Zealand Treasury fiscal model.

**Table 3. Baseline projections of public pension spending in selected industrial countries** (percent of projected GDP)

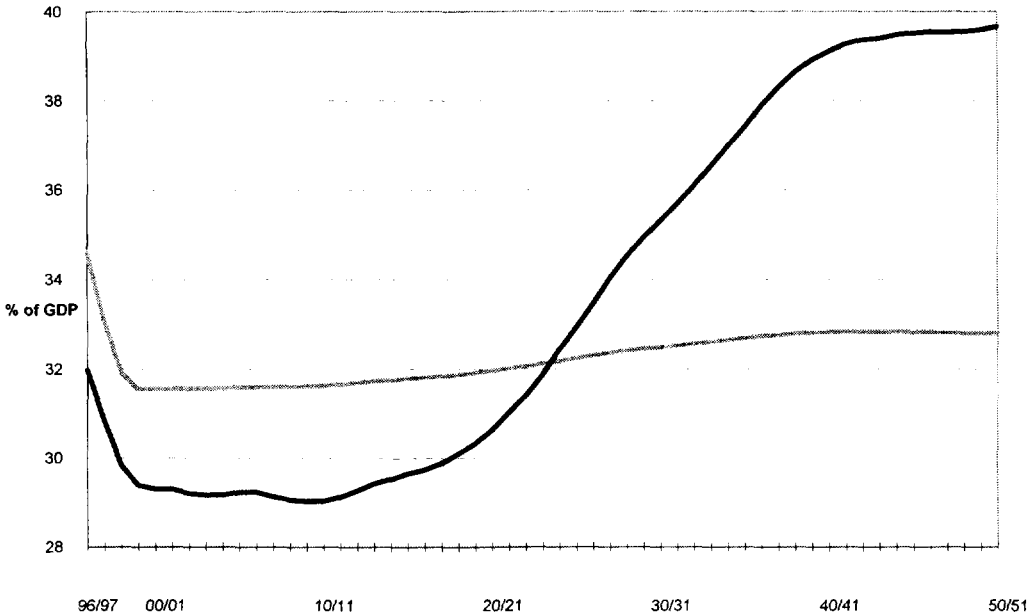
Country	1995	2000	2010	2030	2050
United States	4.4	4.3	4.2	7.4	7.7
Japan	5.7	6.5	7.5	8.9	10.7
Germany	10.0	11.1	11.0	18.4	18.7
France	12.5	12.0	12.6	19.4	21.3
Italy	16.0	17.1	15.2	23.3	25.7
United Kingdom	4.4	4.3	4.6	4.7	3.4
Canada	4.4	4.5	4.9	7.5	7.1
Sweden	8.5	8.2	8.1	9.2	7.4
New Zealand	5.7	4.7	5.1	8.8	10.2
Average	7.9	8.1	8.1	12.0	12.5

Source: Estimates by IMF staff and the New Zealand Treasury fiscal model.

To illustrate the options for financing future government spending, figure 6 plots the required balanced budget tax revenue against the constant tax rate tax revenue. The constant tax rate for the tax-smoothing approach has been set (using two small tax cuts during 1998-2000) so that it allows the government to accumulate sufficient

financial assets to withstand future demographic pressures and reach the year 2050 with net debt converging to zero. As figure 6 shows, with the constant tax rate the government would receive more tax revenues than are necessary to balance the annual budgets and would thus accumulate financial assets through 2025. After 2025 demographic factors would cause deficits, which would be financed by the previously accumulated financial assets.<sup>16</sup> (For the financial asset position, see section 4.1.)

**Figure 6. Balanced budget tax revenue versus constant tax rate tax revenue:  
Baseline case**



The value of the gross financial assets accumulated in the constant tax rate approach to pre-fund the expected growth in liabilities and deficits until 2050 would need to approach about 100 percent of GDP by the early 2030s. (The dynamics in government financial assets and the pros and cons related to such pre-funding are discussed in section 4.)

<sup>16</sup> Allowing for the necessary pre-funding of the growth in government liabilities the constant tax rate approach would thus implicitly transform NZS from a pure PAYG scheme into a partly funded scheme.

### 3.5. Sensitivity Analysis

Sensitivity analysis can be performed by examining the effect of changes in selected economic, demographic and policy assumptions.

#### ***Long-term economic assumptions***

Productivity growth: 1.0%, 1.5%, 2.0%

GDP share of employees compensation: 39%, 45%, 51%

Unemployment rate: 5%, 6%, 7%

Participation rate: 75%, 77%, 79%

#### ***Long-term demographic assumptions***

Net migration since 2000: 5,000, 15,000

Fertility/mortality: low/low, medium/medium, high/high

high/low, medium/medium, low/high

#### ***Long-term policy assumptions***

Health care (real growth in per capita spending): 1.5%, 2.0%, 2.5% a year

Education (real growth in per capita spending): 1.5%, 2.0%, 2.5% a year

Social welfare (real growth in per capita spending): 1.0%, 1.5%, 2.0% a year

Pension benefits (NZS floor): 52.5%, 65%, 72.5%<sup>17</sup>

#### ***3.5.1. Changes in economic assumptions***

##### **a) Productivity growth**

The share of government spending in GDP is very sensitive to the growth in output per hour. This sensitivity stems mainly from the differential between productivity growth and the real growth in per capita social spending.<sup>18</sup> In the sensitivity testing, the

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<sup>17</sup> Modeling of the floor levels is the most convenient way for showing the fiscal impact of alternative pension benefits levels. In the selected range 52.5 percent of the after-tax average ordinary time weekly earnings reflects the current level of unemployment benefits. The 72.5 percent level represents the existing NZS ceiling. The upper level thus illustrates the effects of pensions reaching the level of the existing NZS ceiling. This situation may occur as a result of a policy decision or a lack of productivity growth, which would allow NZS benefits to become inflation-indexed and grow faster than earnings.

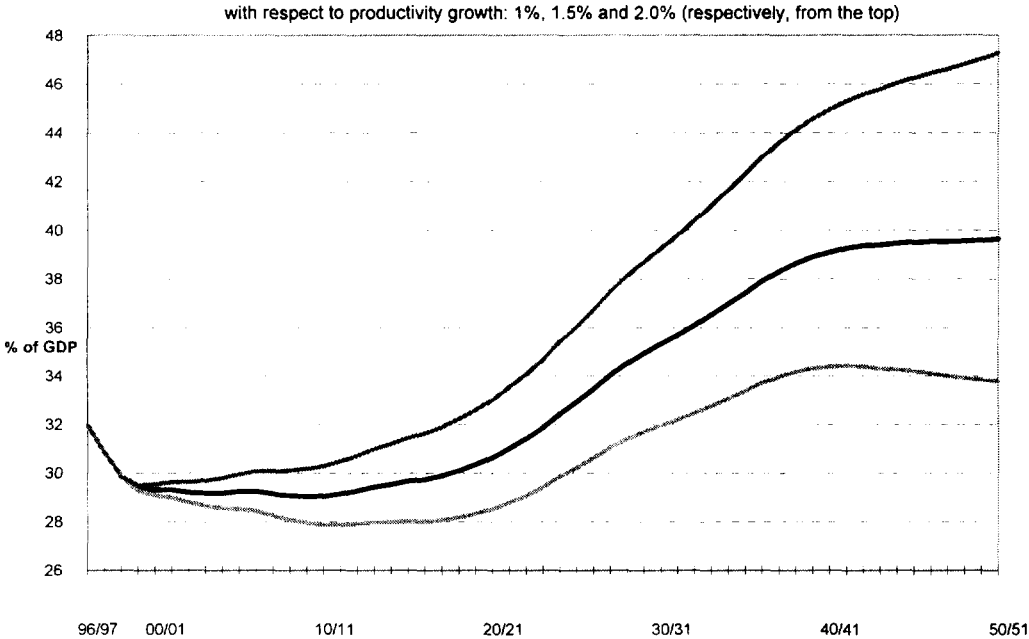
For other assumptions the ranges for the sensitivity tests are set to reflect the possible deviations based on historical and international data. Ideally, the sensitivity ranges for each variable would be calibrated to one standard deviation either side of the baseline assumption. Calibration based on a comprehensive analysis of the historical and international data is, however, not likely to diverge substantially from the ranges set here and is not likely to reverse the interpretation of the sensitivity tests.

<sup>18</sup> Since discretionary expenditure is growing at a rate set equal to productivity growth (and the baseline labor force is steadily increasing), government discretionary spending is declining as a share of GDP in both the low- and

baseline assumption of 2 percent real growth in per capita social spending (excluding the NZS) is retained for both the low and high levels of productivity growth. As a result the observed share of government spending rises under the low growth assumption.<sup>19</sup>

Figure 7 shows the effect of changes in productivity. An increase in the long-term productivity growth to 2 percent a year would allow the government to finance its projected expenses and even introduce tax cuts while maintaining a positive financial assets position in the long run. A decrease in the long-term productivity growth to 1 percent a year would force the government to increase taxes significantly in order to prevent the projected decline in its financial assets or to reduce spending.

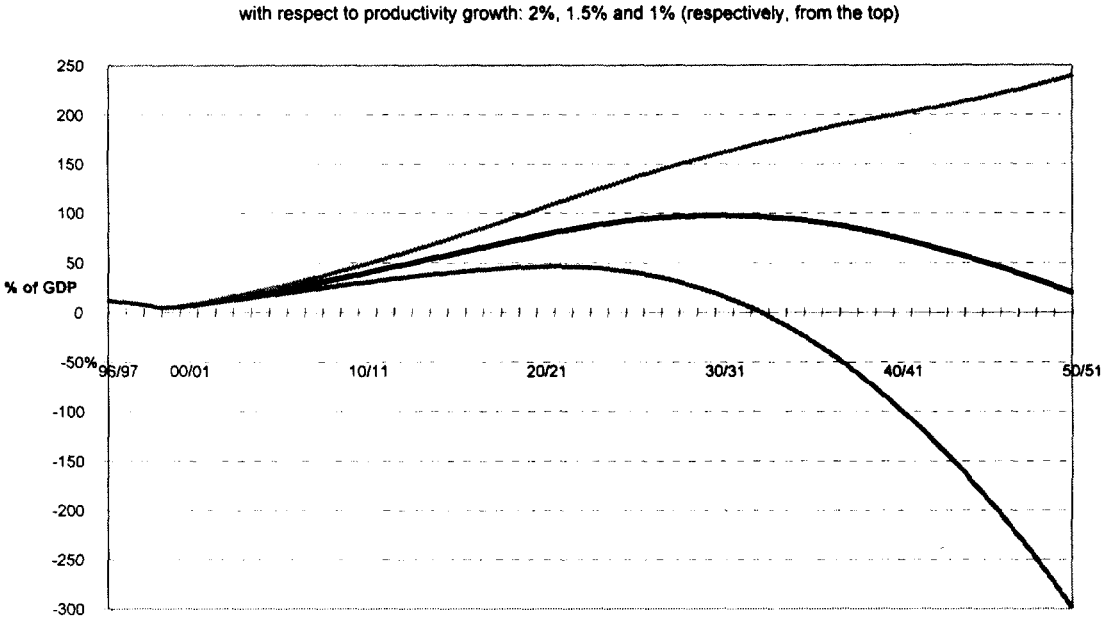
**Figure 7. Effects of changes in productivity on balanced budget tax revenue**



high-growth cases. (With productivity growth of 1 percent, the resulting long-term average real GDP growth would reach about 1.3 percent.)

<sup>19</sup> The share of employees' compensation in GDP is assumed to remain at its baseline level of 45 percent during the entire period. There is, however, historical evidence that even in the long run periods of higher growth are correlated with higher shares of profits and declining shares of returns to labor, and long-term periods of slow growth are correlated with declining profits and a larger total wage bill as a percentage of GDP. Thus, in modeling different growth scenarios attention should be given to analysis of the likely shifts in the coefficients of the Cobb-Douglas production function. This paper shows the sensitivity of total government expenditure and NZS cost with respect to changes in the returns to labor.

**Figure 8. Effect of changes in productivity on gross financial assets**



**b) Relative returns to labor**

Held constant at the baseline level of 45 percent, the share of compensation of employees (COE), is low to reflect the experience of New Zealand and other industrial economies and to accommodate scenarios for slow economic growth. In the long term the GDP share of the total wage bill is both cyclical and irregular. Moreover, the aging labor force can affect the relative returns on labor.<sup>20</sup> (The figures in Annex 2 illustrate that the baseline level of 45 percent is low compared with the historical data for New Zealand and other OECD countries and that this baseline level is more likely in a high-growth than in a low-growth scenario.)

<sup>20</sup> The argument used in discussion of Cutler et al. (1990) that starting with “the standard hypothesis that relative wages reflect relative marginal products and that the projected aging will raise future productivity as more workers move into their high-productivity years” would particularly apply in a slow-growing economy with less technological progress. A fast-growing economy with greater technological progress is more likely to “displace” older workers, who are less adaptable to the new technologies, and to prevent their productivity from benefiting from their long-term work experience.

To enhance the quality of the assumptions about the GDP share of COE, which are crucial for forecasting the future NZS cost in both the baseline and the low/high-growth scenarios the possible trends and international convergence in the ratio of returns on labor and to the returns on capital should be researched.

On the fiscal front changes in the level of the GDP share of COE would affect revenues as well as expenses. Since the tax rate applied on COE is higher than the rate applied on other income, government revenue increases automatically when the GDP-share of COE rises. Thus, if individual tax rates remain constant, the *average* income tax rate would increase as income shares shift from capital to COE.

On the expenditure side the main effect would come from the wage indexation of the floor and ceiling of the NZS. Government expenses on the NZS would increase as the share of COE in GDP rose. Should the share of COE in New Zealand return to its historical levels or converge to the levels of Australia or the United States, the future cost of the NZS would rise by about 1 percent of GDP a year. (The 51 percent level conforms to the historical average in Australia and is significantly below the ratio of COE to GDP in the United States during the past 50 years.)

**Figure 9. Effect of changes in GDP share of employee compensation on NZS spending**

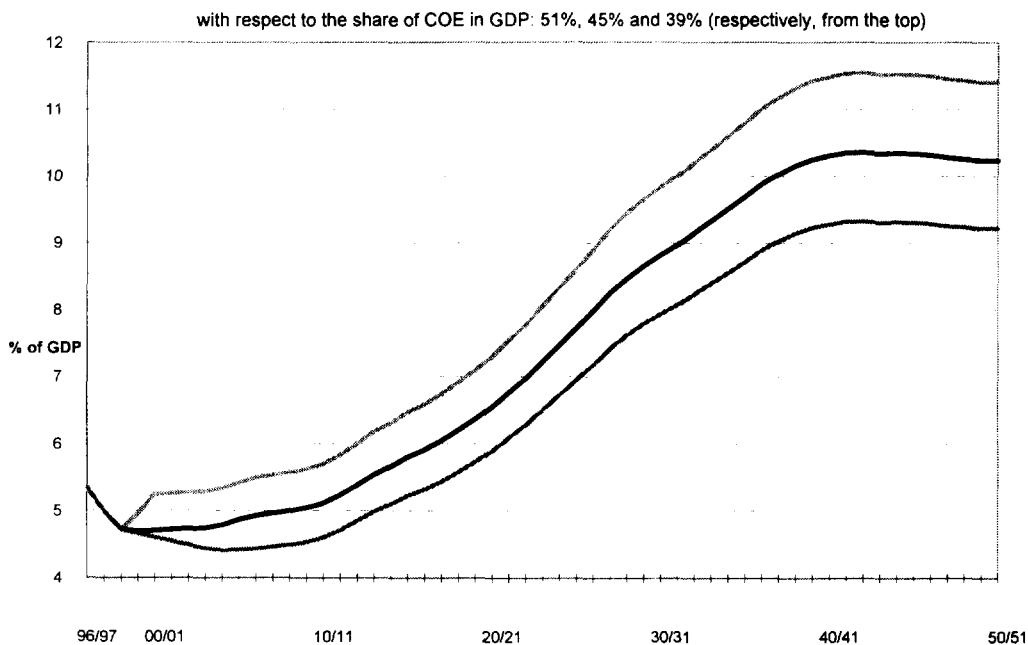
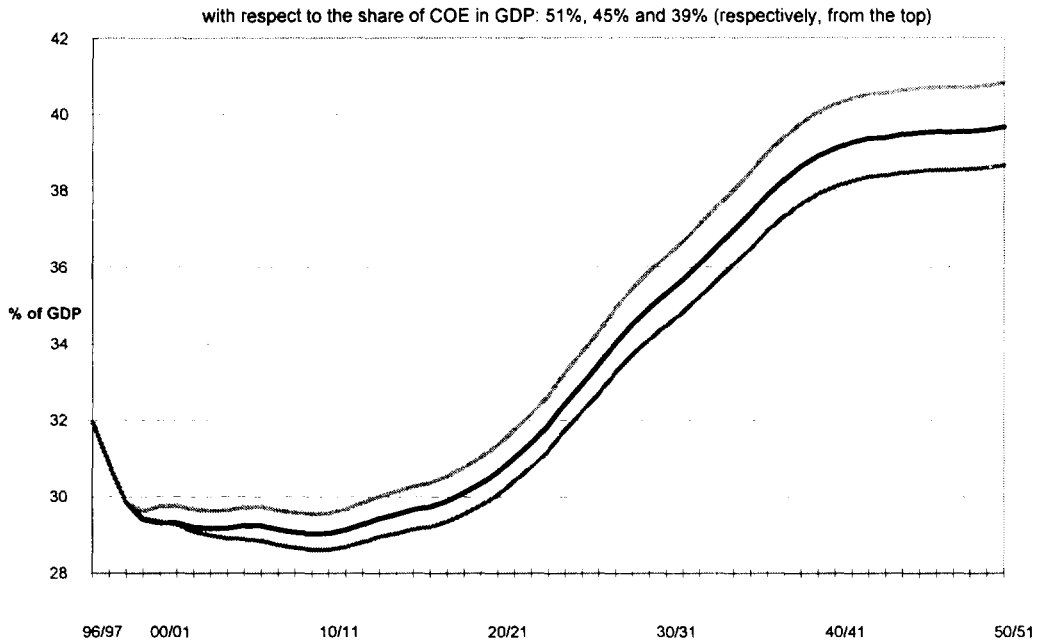


Figure 10 shows that the government would need to raise more revenue as a percentage of GDP in order to finance the higher cost of wage-indexed benefits.

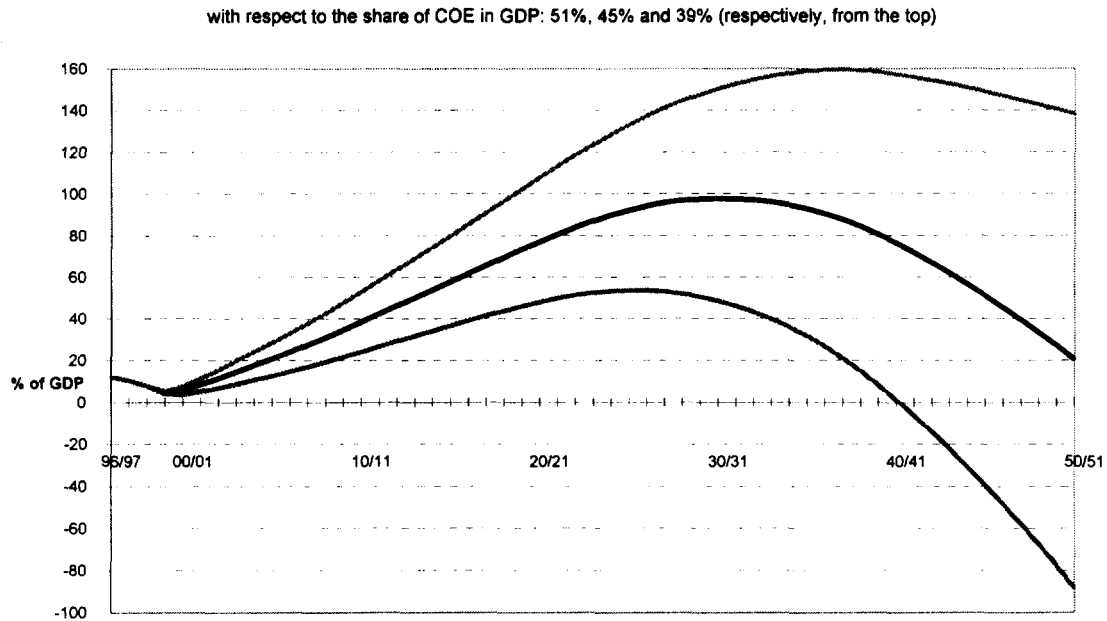


**Figure 10. Effect of changes in GDP share of employee compensation on balanced budget tax revenue**



The constant tax rate approach indicates, however, that the revenue gain from the increase in COE would exceed the increase in government expenses. With a higher COE, the share of government spending in GDP and the average income tax in the economy would rise. Individual income tax rates, however, could be cut if net debt were to converge to zero by 2050.

**Figure 11. Effect of change in GDP share of employee compensation on gross financial assets**

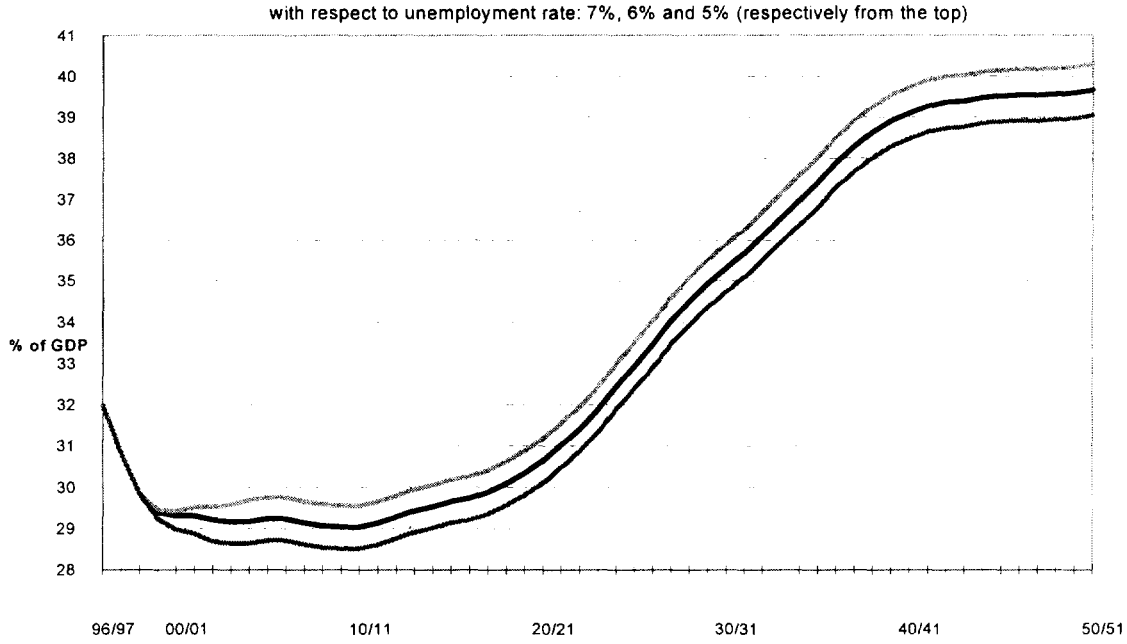


**c) Unemployment rate**

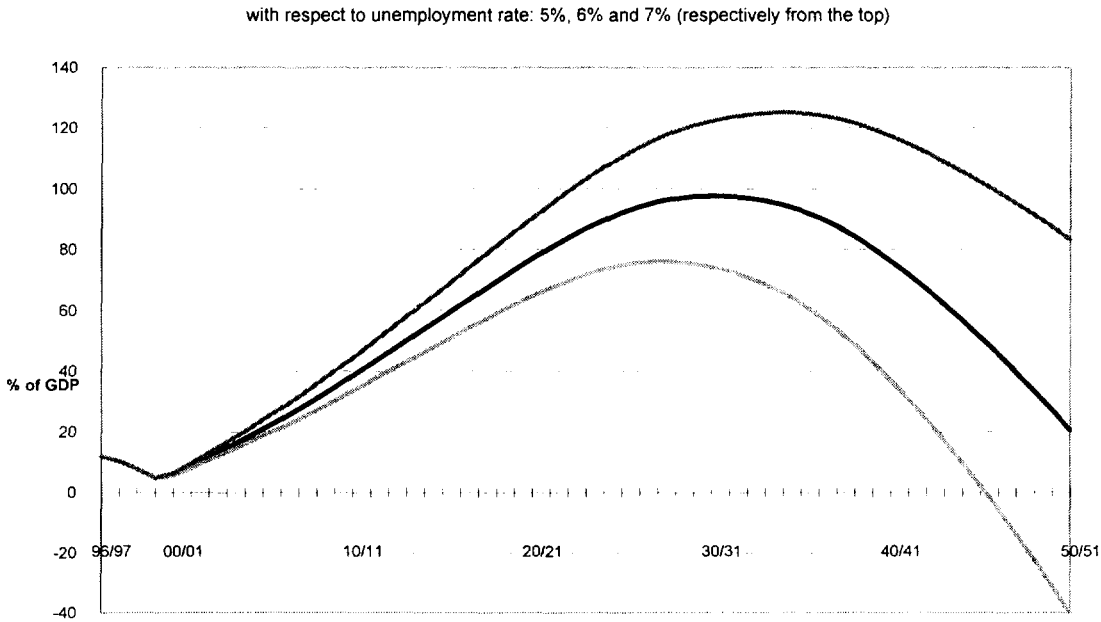
Higher unemployment would exacerbate the government’s fiscal position directly, by increasing expenses on unemployment benefits, and, indirectly, by reducing GDP growth. By raising the system dependency ratio a higher unemployment rate would also increase the per taxpayer burden of the NZS.

Figures 12 and 13 compare the required balanced budget tax revenue and the constant tax rate financial position of the government for unemployment rates of 5 and 7 percent, with the baseline rate of 6 percent (estimated to be just 0.5 percent above the current estimate of the New Zealand NAIRU). This simulation shows that future fiscal balances are not very sensitive to unemployment rates. However, should unemployment rise, taxes would have to be increased in order to maintain government financial assets above zero.

**Figure 12. Effect of change in unemployment rate on balanced budget tax revenue**



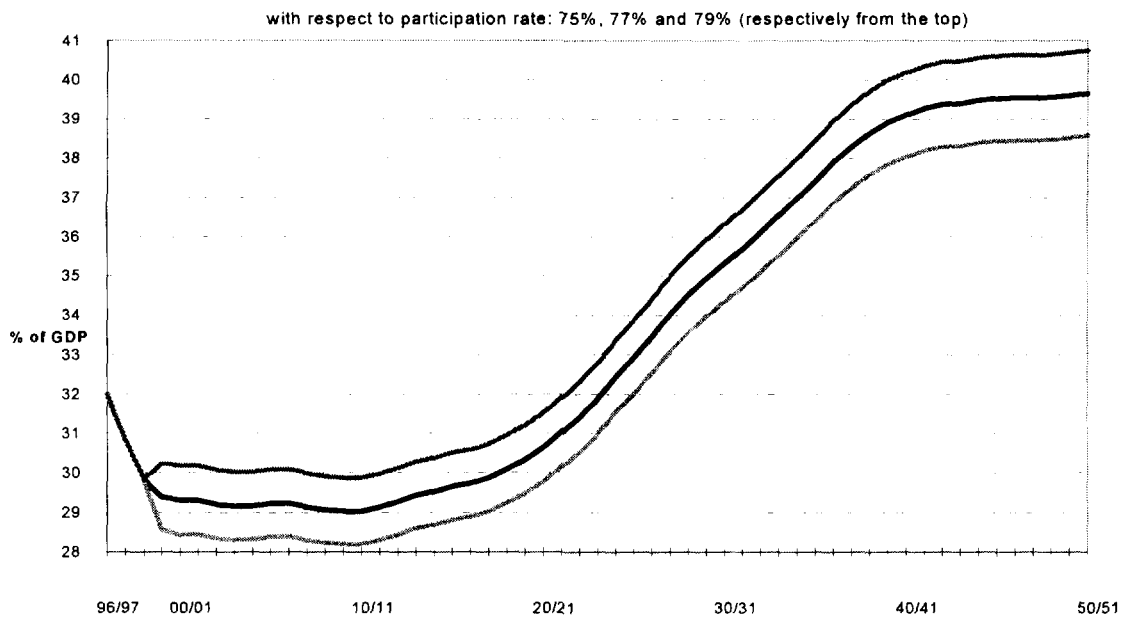
**Figure 13. Effect of change in unemployment rate on gross financial assets**



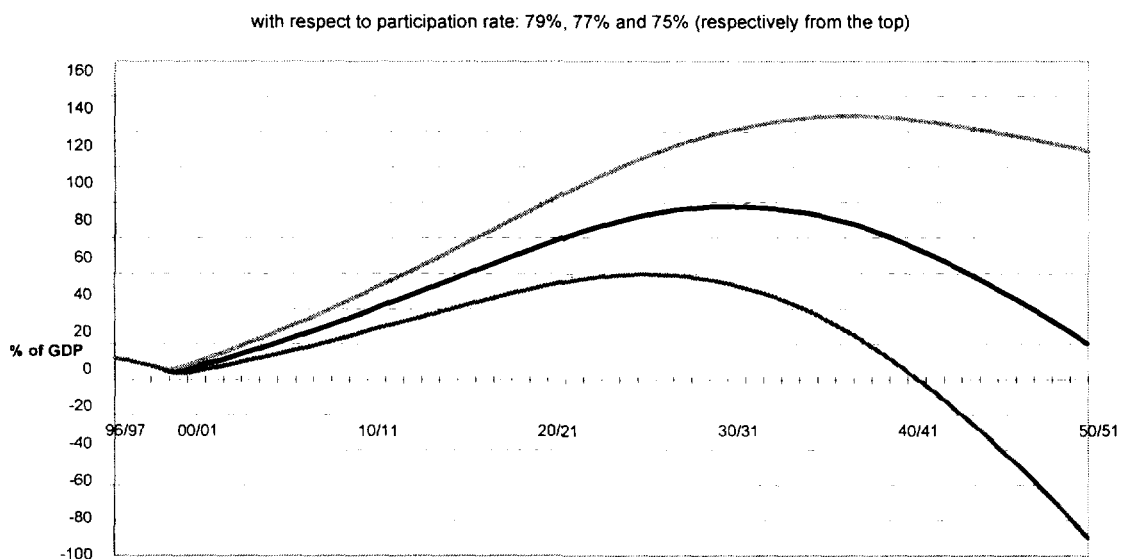
**d) Participation rate**

The effect on fiscal balances of changes in the participation rate is similar to the effect of unemployment. Figures 14 and 15 show the fiscal outlook with respect to the participation rates of 79 and 75 percent, compared to the baseline level of 77 percent.

**Figure 14. Effect of change in the participation rate on balanced budget tax revenue**



**Figure 15. Effect of change in the participation rate on gross financial assets**



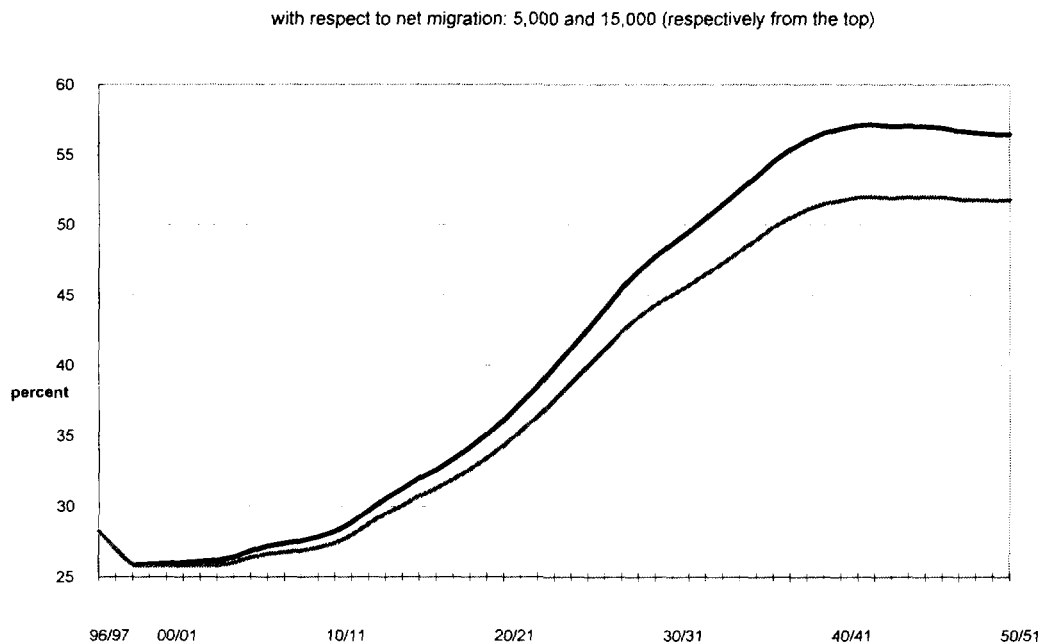
### 3.5.2. Changes in demographic assumptions

#### a) Net migration

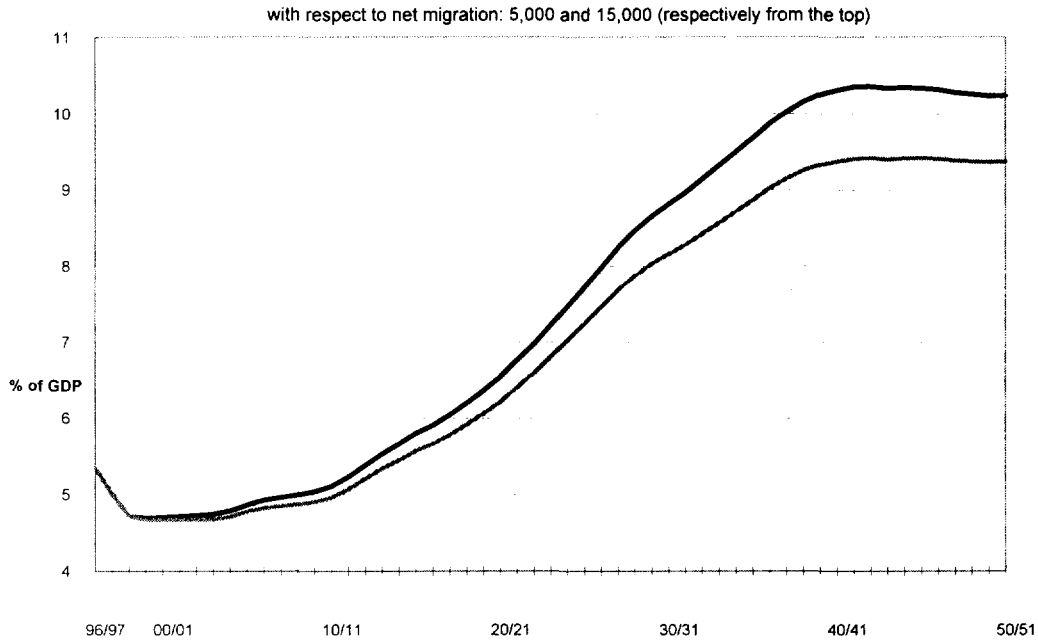
Figures 16 - 19 demonstrate that higher net migration may mitigate the negative fiscal consequences of an aging society because of the expected age distribution of migrants who are more likely than the resident population to be of working age. They compare the fiscal effects of immigration of 15,000 a year throughout the entire time period with the baseline annual immigration 15,000 until year 1999 and 5,000 afterwards (according to data available in the New Zealand Department of Statistics).

Relative to the resident population migrants would contribute more in taxes than they receive in services and would thus reduce the system dependency ratio and the per taxpayer cost of the NZS. Because immigrants' skills are assumed to match the needs of the economy, both the baseline case and the sensitivity tests assume that migration does not alter any economic variables (such as the unemployment rate).

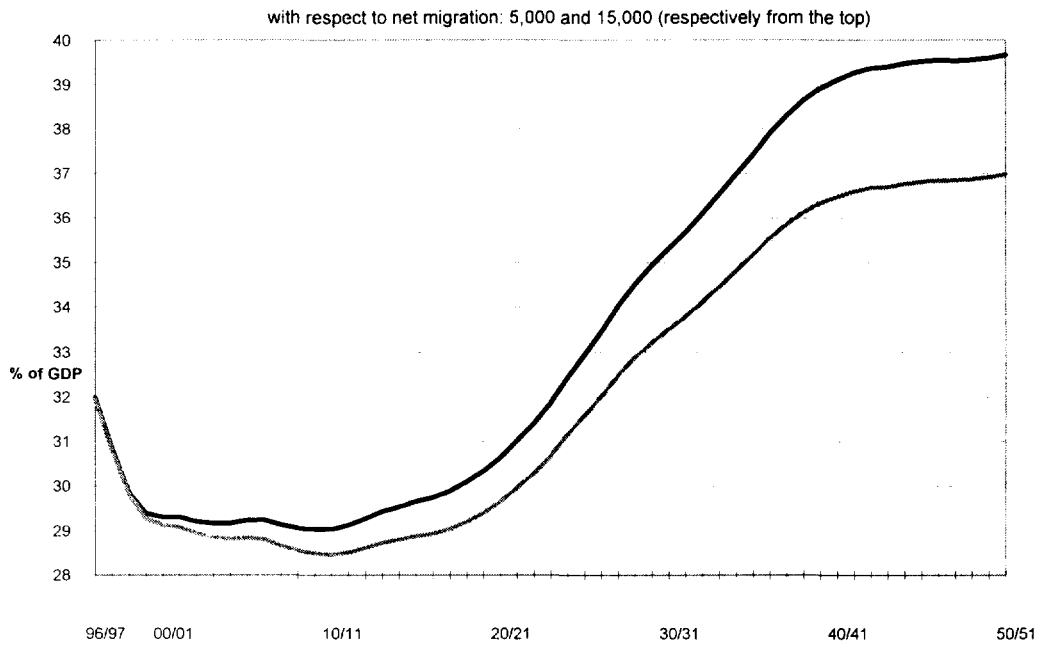
**Figure 16. Effect of change in net migration on system dependency ratio**



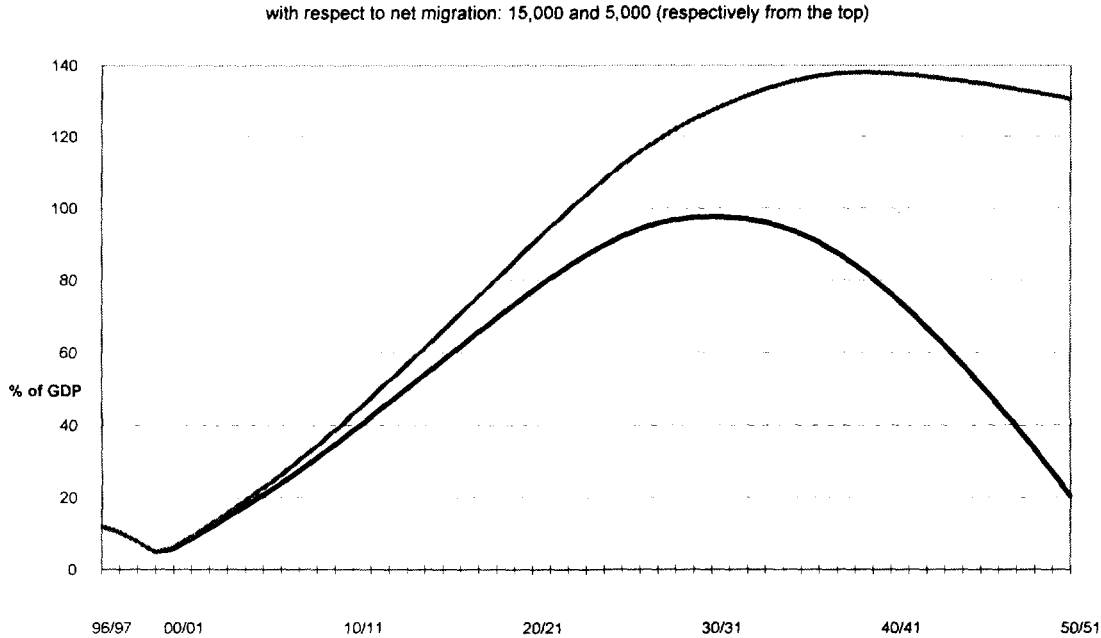
**Figure 17. Effect of change in net migration on NZS spending**



**Figure 18. Effect of change in net migration on balanced budget tax revenue**



**Figure 19. Effect of change in net migration on gross financial assets**



**b) Fertility and mortality**

Rates of fertility and mortality negatively affect fiscal balances if they lead to higher proportions of children and the elderly (and a lower proportion of the working population).

The sensitivity tests indicate that fiscal balances are strongest when both fertility and mortality rates are high. Compared with the baseline, low fertility/low mortality and high fertility/low mortality worsen the future fiscal position.<sup>21</sup> Low mortality (high life expectancy) is the leading factor weakening the fiscal stance since spending on the elderly exceeds spending on children.

The worst fiscal imbalance would result under the low fertility/low mortality scenario, under which the system dependency ratio would approach 70 percent (nearly

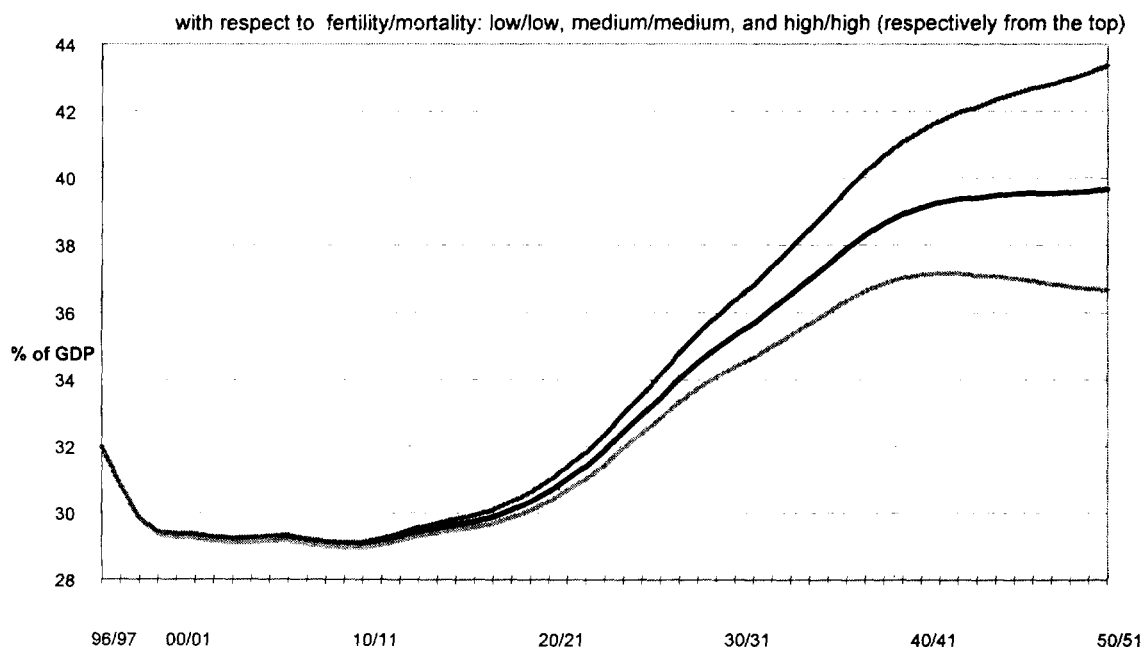
<sup>21</sup> All of these alternatives assume the baseline immigration figure (15,000 until 1999 and 5,000 thereafter) and had been provided by NZ Department of Statistics. Mortality rates reflect mainly life expectancy at birth. Low mortality assumes an increase in life expectancy of about seven years; high mortality assumes an increase in life expectancy of about 3 years by the year 2050.

three times its current level, the cost of health care would rise to more than 13 percent of GDP, and the cost of the NZS would rise to more than 12 percent of GDP by the 2040s.

The second worst case is high fertility/low mortality, which combines a relatively high share of long-living elderly with a relatively high share of children. In the long run high fertility increases the size of the labor force, thus partly offsetting the impact of low mortality on the system dependence ratio and the fiscal accounts.

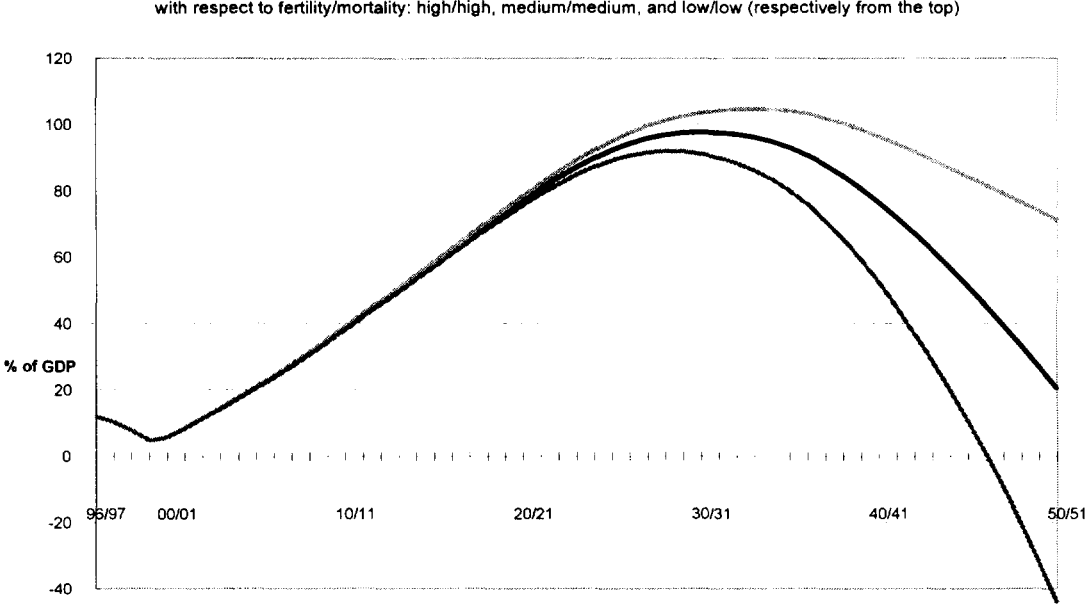
The low fertility/high mortality scenario begins to exert fiscal pressure on the system later than either of the low mortality scenarios, allowing the government to accumulate more financial assets through the 2030s. In the very long term (longer than the modeled time interval), however, low fertility would significantly reduce the size of the labor force and thus make the fiscal position of the government less favorable than under the baseline case (see figures 20 - 23).

**Figure 20. Effects of changes in fertility and mortality on balanced budget tax revenue**

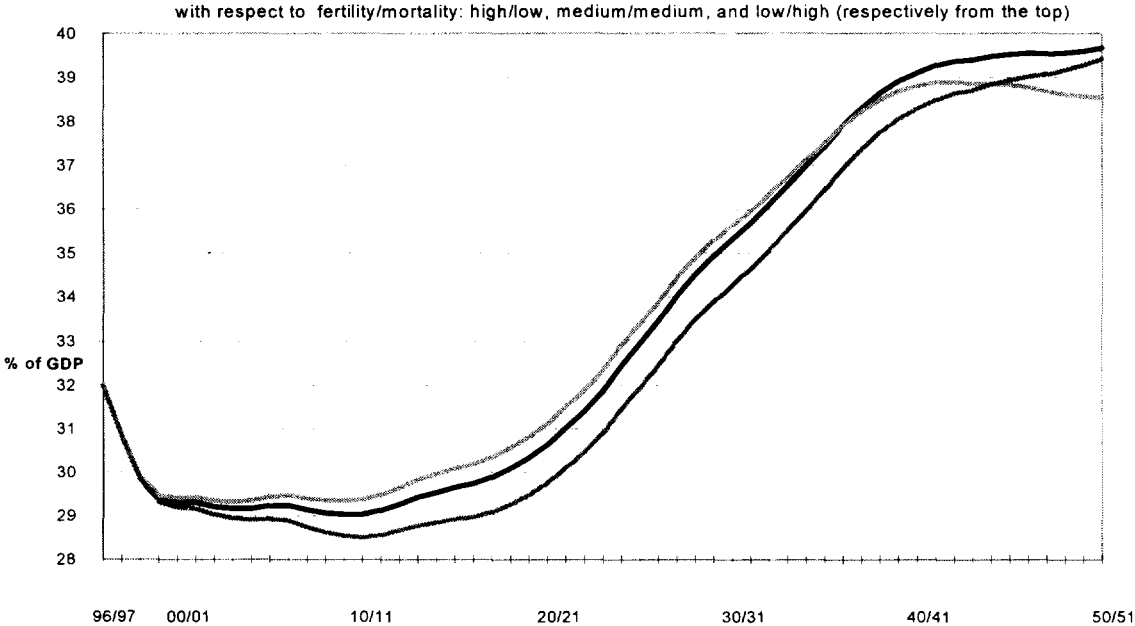




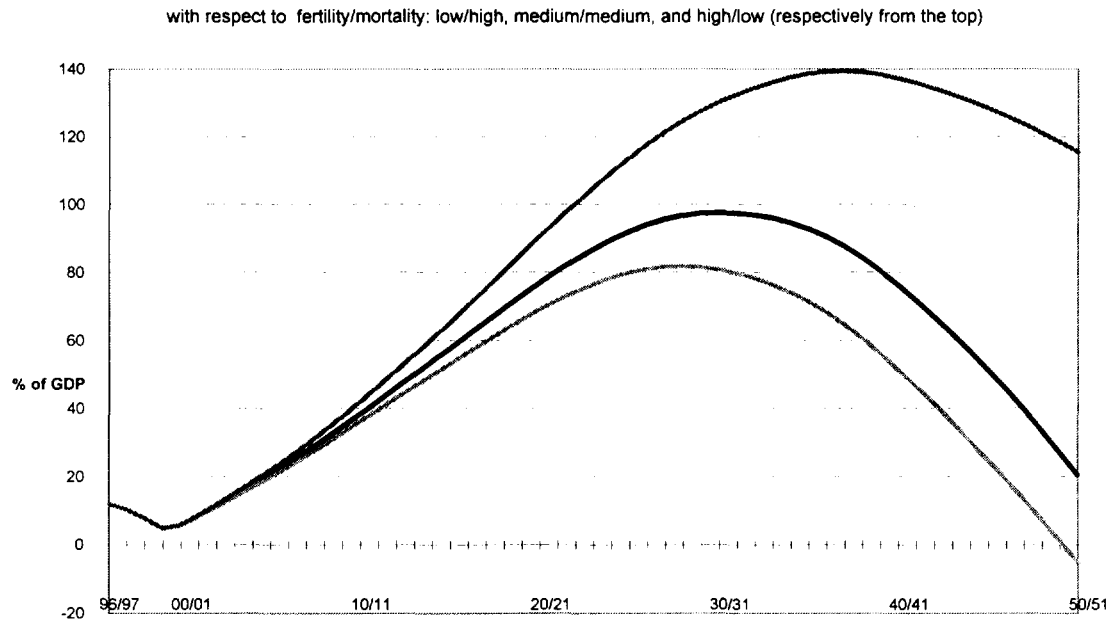
**Figure 21. Effect of changes in fertility and mortality on gross financial assets**



**Figure 22. Effects of changes in fertility and mortality on balanced budget tax revenue**



**Figure 23. Effects of changes in fertility and mortality on gross financial assets**



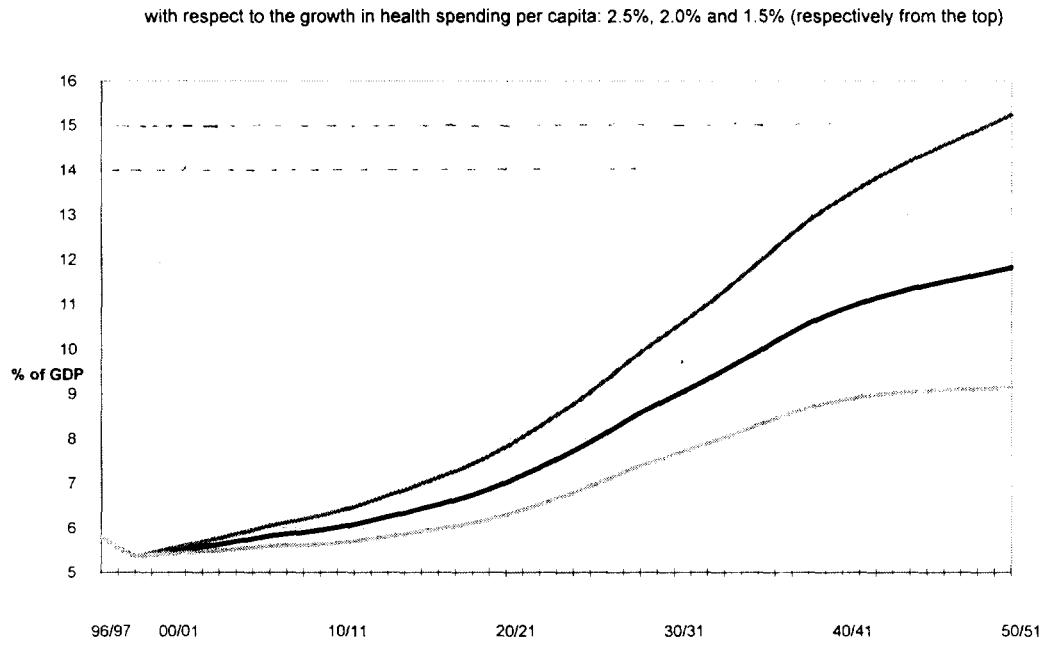
**3.5.3. Changes policy assumptions**

**a) Health**

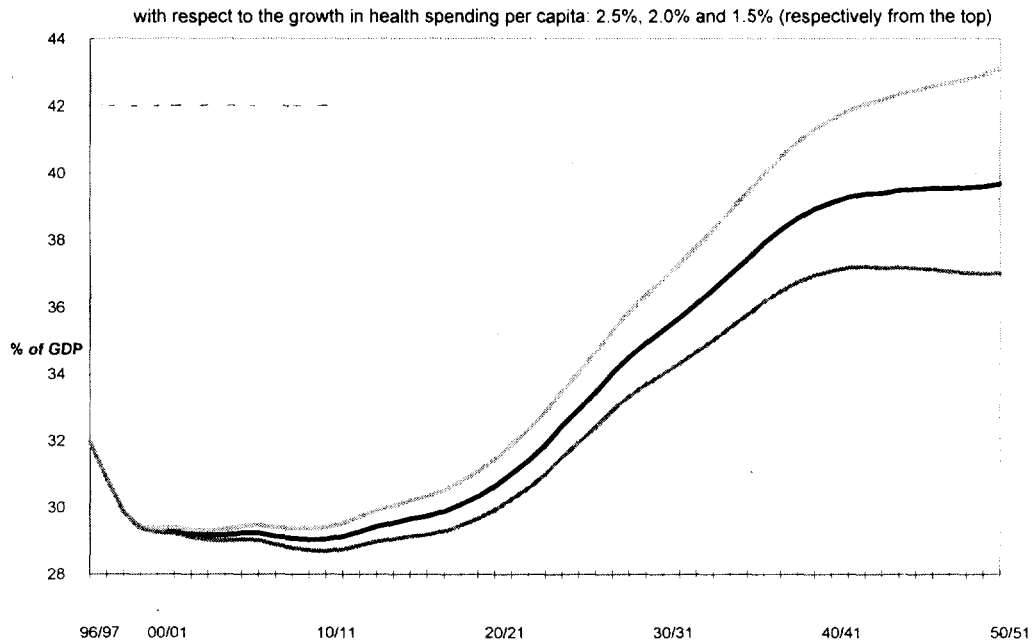
The sensitivity analysis reveals that small changes in the real growth of per capita health spending are magnified by demographic factors in the long term, as an increasing share of the population moves into the older age cohorts. A 0.5 percentage point change in the real growth of per capita health spending causes a shift in total health expenses of more than 3 percentage points of GDP by the 2050 (see figure 24).<sup>22</sup>

<sup>22</sup> In the aggregate baseline real growth of 2 percent in per capita health spending comes to about 3 percent average annual real growth in total public health spending. In the sensitivity test for health spending, the 1.5 percent per capita real growth leads to about 2.6 percent total real growth; the 2.5 percent per capita real growth brings about 3.5 percent real growth in total.

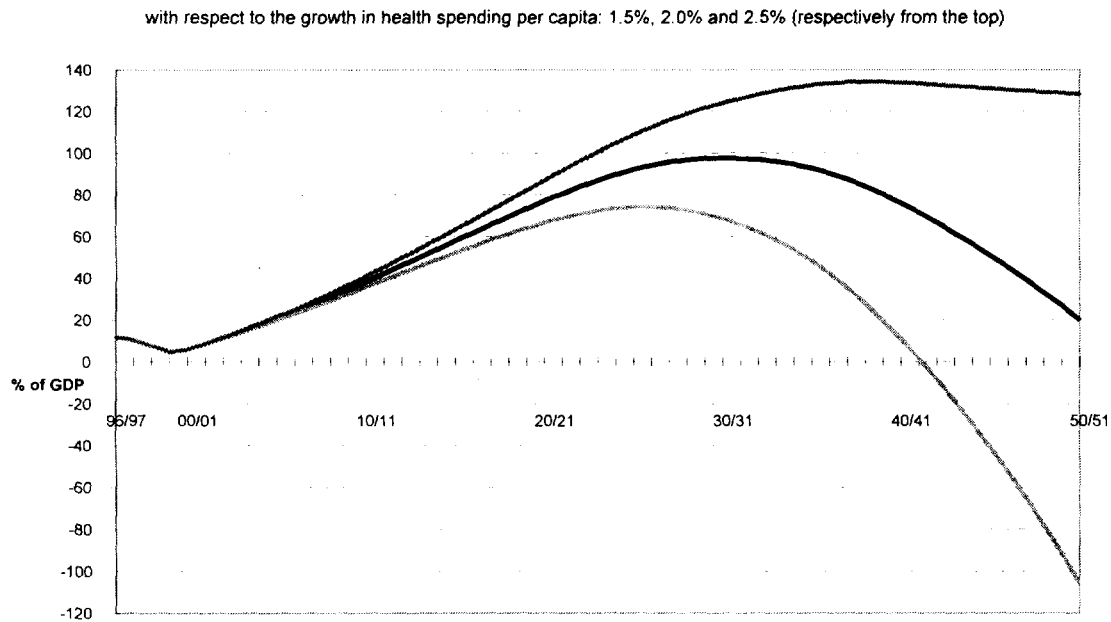
**Figure 24. Effect of change in real growth in per capita health spending on total health expenses**



**Figure 25. Effect of change in real growth in per capita health spending on balanced budget tax revenue**



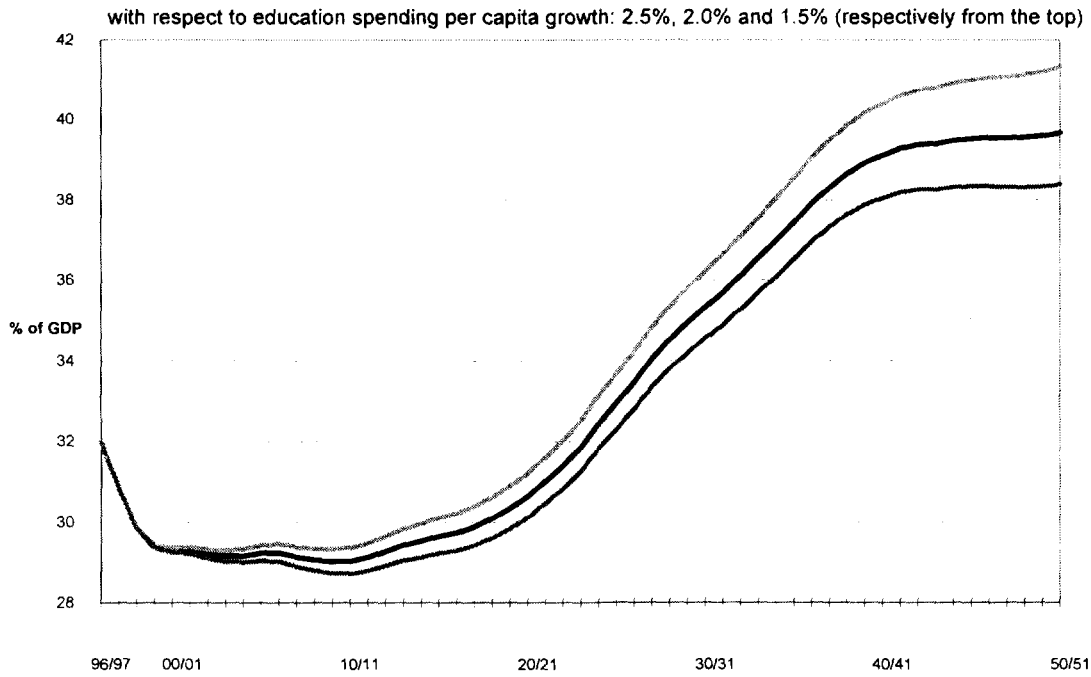
**Figure 26. Effect of change in real growth in per capita health spending on gross financial assets**



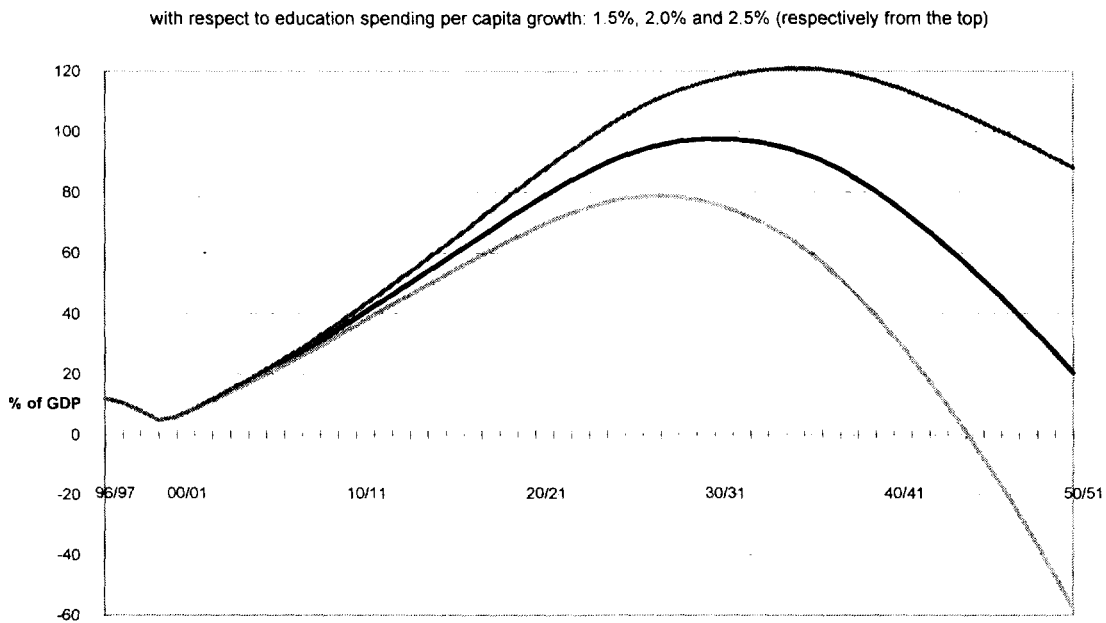
**b) Education**

The impact of demographic changes on education spending is relatively weak. A 0.5 percentage point change in real per capita growth of education spending is associated with a change in total education spending to GDP of 1.5 percentage points in the long term. Figures 27 and 28 show the effects of this change on balanced budget tax revenue and government gross financial assets.

**Figure 27. Effect of change in growth of per capita education spending on balanced budget tax revenue**



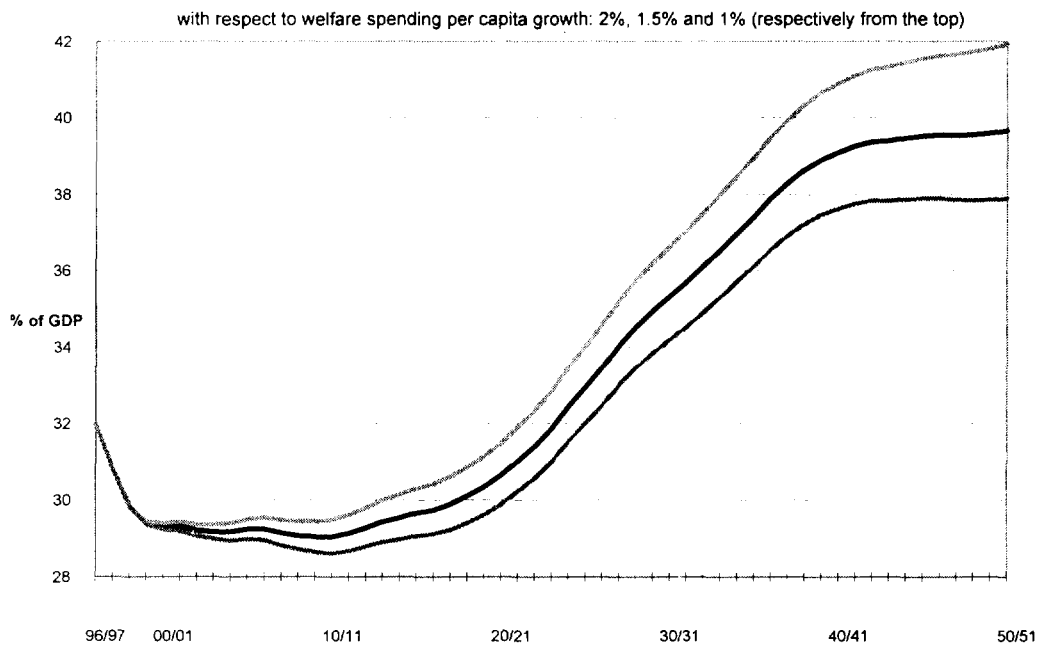
**Figure 28. Effect of change in growth of per capita education spending on gross financial assets**



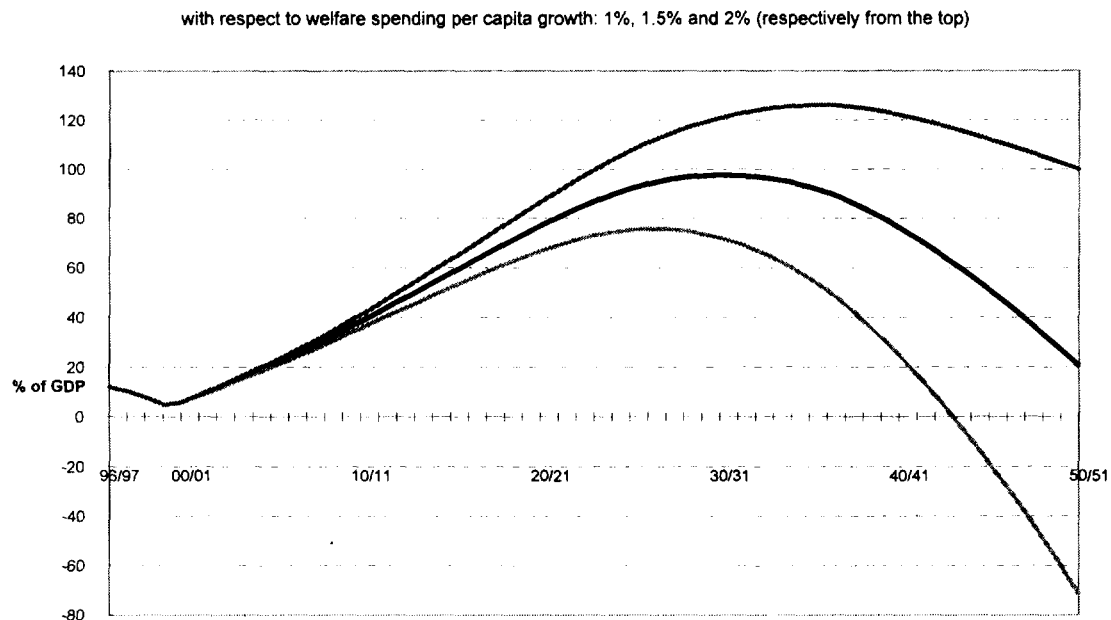
**c) Social welfare**

Figures 29 and 30 may appear to indicate that the government's future fiscal position is largely insensitive to changes in the real growth in social welfare (such as unemployment, domestic purposes and other) benefits. It should be noted that the level of social welfare benefits may have significant behavioral effects, however, which are not reflected in the model. The alternative benefit levels may affect economic growth and thus exacerbate the long-term fiscal impact.

**Figure 29. Effect of change in growth of per capita welfare spending on balanced budget tax revenue**



**Figure 30. Effect of change in growth of per capita welfare spending on gross financial assets**

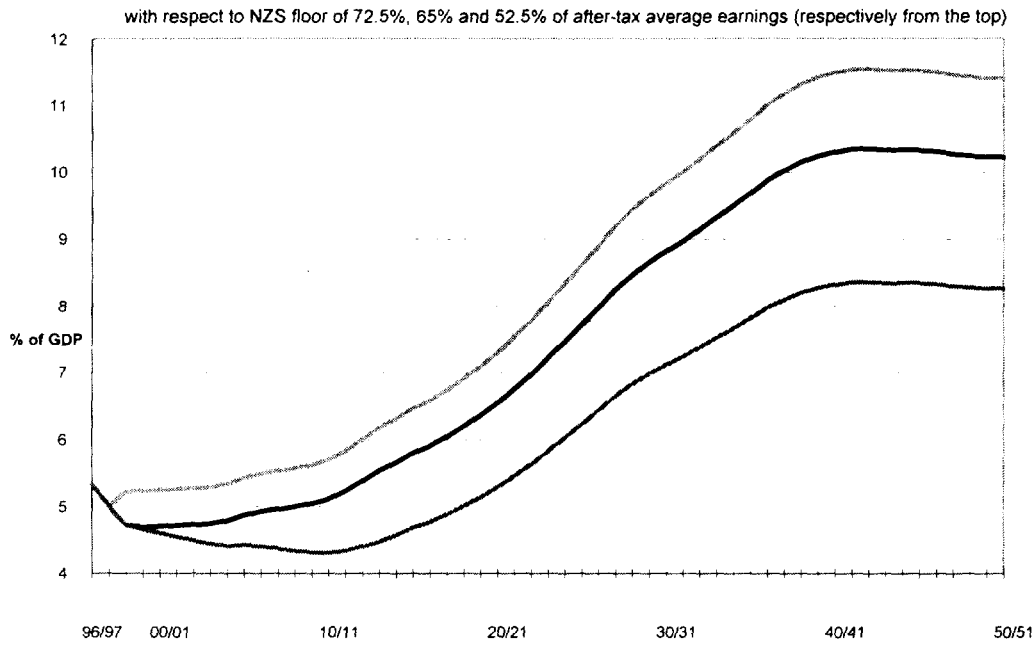


**d) Pensions (NZS Floor)**

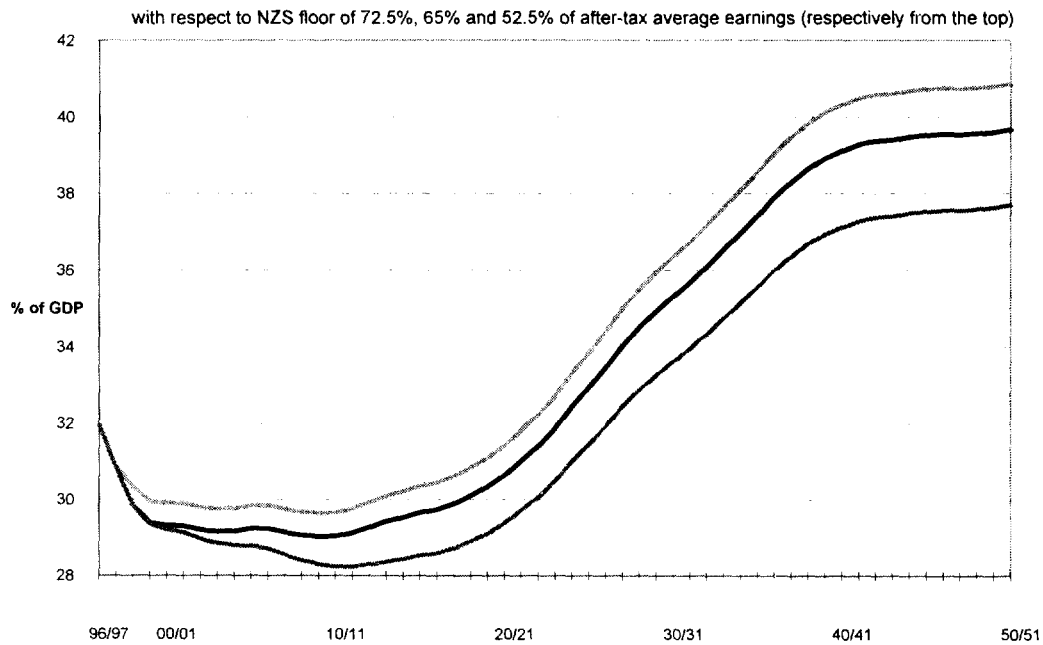
Adjustments to the NZS floor represent a powerful instrument with which the government can contain (or expand) its future liabilities.<sup>23</sup> The alternative floor levels are set at 52.5 and 72.5 percent of after-tax weekly ordinary earnings for a couple. The lower level reflects the current level of unemployment benefits in New Zealand; the upper level reflects the existing NZS ceiling. Figures 31 - 33 show the effects of changes in these levels on NZS expenses, the required balanced-budget tax revenues and gross financial assets.

<sup>23</sup> Pensions are indexed to prices until they hit the floor. Once they hit the floor they reflect the growth in wages. Theoretically, should inflation exceed productivity growth, pensions would grow relative to wages until hitting the ceiling.

**Figure 31. Effects of change in NZS floor on NZS expenses**

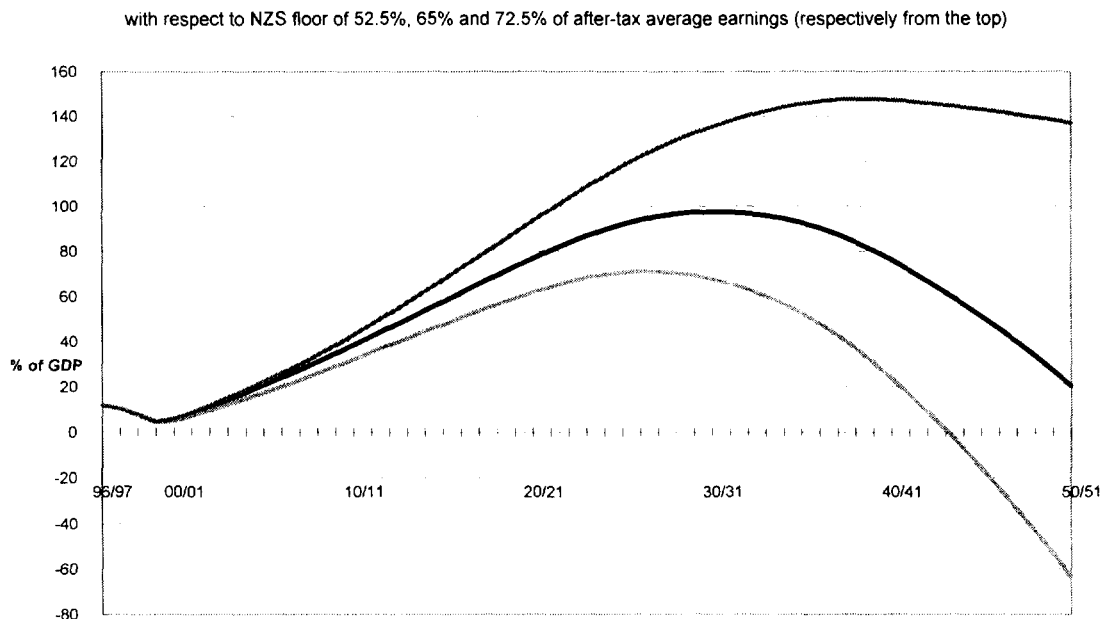


**Figure 32. Effects of change in NZS floor on balanced budget tax revenue**



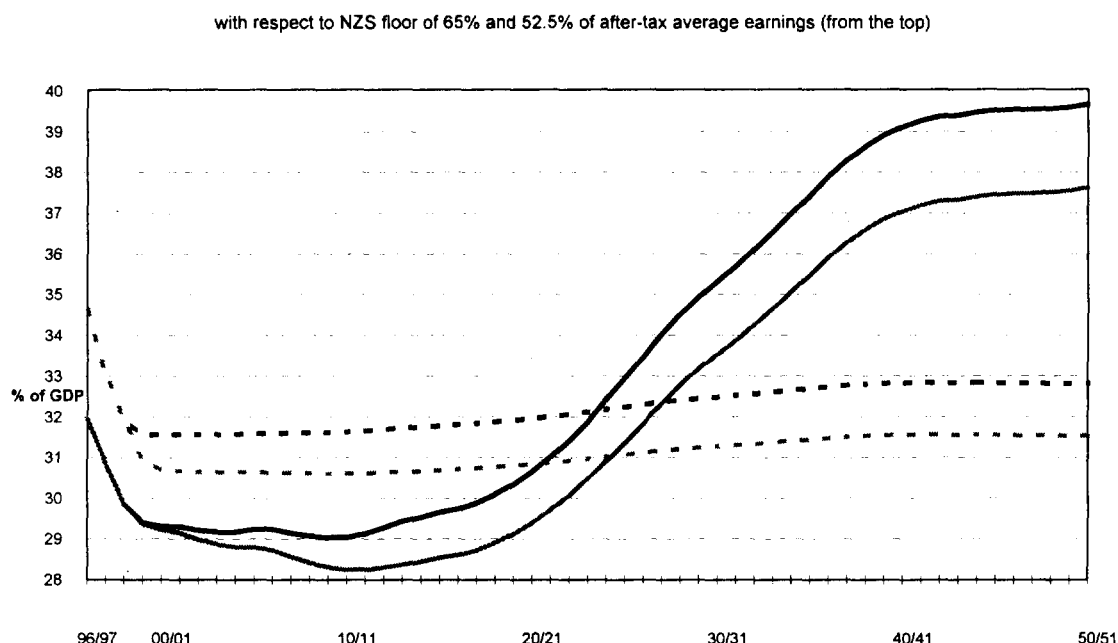


**Figure 33. Effects of change in NZS floor on gross financial assets**



The accumulation of gross financial assets under the 52.5 percent floor suggests that the government could cut taxes in the near future and still pre-fund its future liability increase. Figure 34 illustrates the size of the possible tax cut by plotting balanced budget tax revenue against constant tax rate tax revenues for 65 and 52.5 percent floors. To pre-fund future increase in liabilities given the lower floor the government would have to manage a smaller amount of assets than under the baseline case. The peak in the accumulation of financial assets needed by 2025-2030 would drop by about 10 percent of GDP.

**Figure 34. Effects of change in NZS floor on balanced budget tax revenue versus constant tax rate tax revenue**



### 3.5.4. Conclusions from sensitivity analysis

What conclusions can be drawn about the sensitivity of the future fiscal position of the New Zealand government?

1. *Sensitivity to a gap between productivity growth and real growth per capita in health spending* is very strong. A long-term economic slow down without a proportionate reduction in health and other social spending would cause a significant aggravation in the fiscal position.<sup>24</sup> Analysis of the historical and international data on trends in social spending may indicate the expected urgency of this matter.
2. *Sensitivity to net migration* is strong, suggesting that adoption of a sensible migration policy with respect to the age, skills, fertility, and mortality profiles of potential immigrants could partly offset future demographic pressures.

<sup>24</sup> Optimally, the linkage between social spending and productivity growth would be developed across business cycles. A year-by-year indexation of social spending to productivity growth would be sub optimal with respect to the demand for social spending, which rises during recession.

3. *Sensitivity to the pension floor level* is strong. The literature indicates that the level of public pension generosity may also affect private saving. Further study of the international and New Zealand experience with past changes in the level of public pensions could shed light on the full impact of the NZS benefit level.

4. *Sensitivity to the GDP share of employee compensation* is significant, mainly because of the eventual wage indexation of NZS benefits. Sensitivity of NZS spending to shifts in the GDP share of COE is obviously positively correlated with the level of the NZS benefit. Research on the possible impact of an aging labor force on the marginal productivity of labor and on the ratio of returns to labor to returns to capital may indicate the urgency of this factor.

5. *Sensitivity to the average unemployment and participation rates* is moderate. Increases in these rates would slow GDP growth, exacerbate future demographic pressures, and endanger future fiscal balances. Research is needed to evaluate the likely effects of an aging population and of increases in the retirement age on unemployment and participation rates.

### **3.6. Selected Scenarios**

#### **3.6.1. An economic slow down**

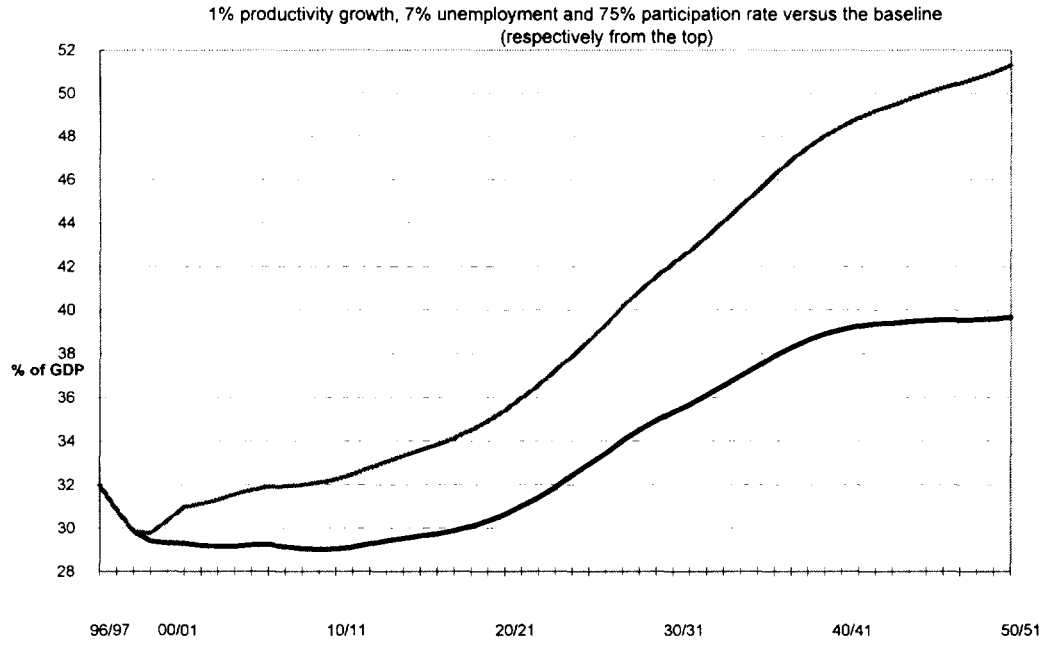
Since the fiscal model does not provide for less direct linkages between economic variables, a comprehensive economic analysis and multiple adjustments to the assumptions in the model are needed to simulate an economic slow down.<sup>25</sup> Slower economic growth is likely to be associated with both slower productivity growth and a higher unemployment and lower participation rate.

Figure 35 shows the significant effect of 0.5 percentage point drop in productivity growth to 1 percent, an increase of 1 percentage point in the unemployment rate to 7 percent, and a 2 percentage point drop in the participation rate to 75 percent. Holding other assumptions at their baseline levels, the negative fiscal consequences are quite large.

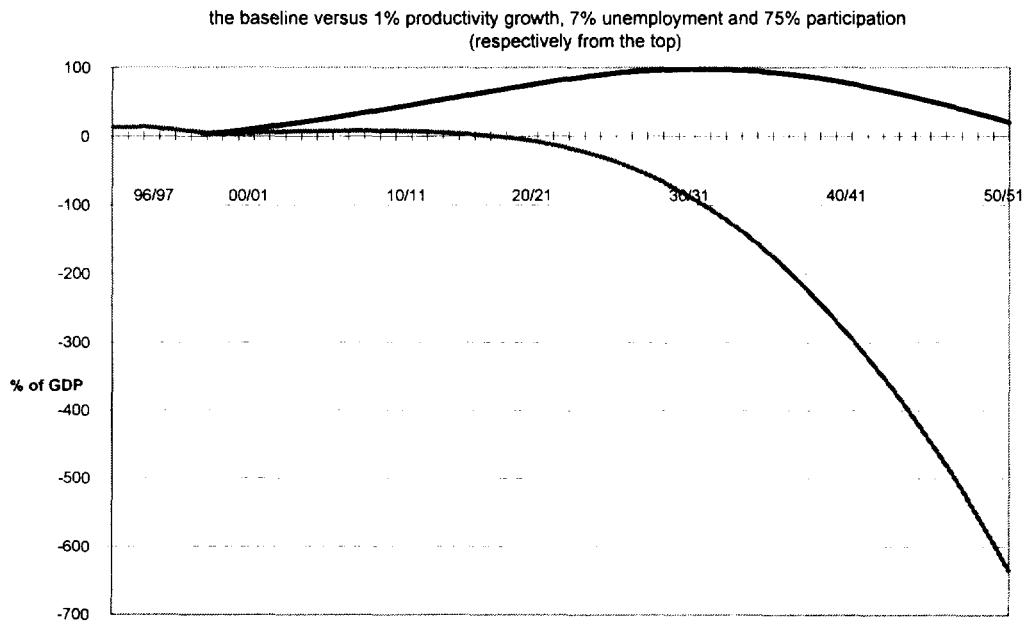
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<sup>25</sup> To develop the alternative scenarios in a consistent manner correlations between variables used within the model should be studied so that the assumptions used are internally consistent. For such an exercise, analysis of the relevant historical and international trends as well as “most likely policy” assumptions would be necessary.

**Figure 35. Effect of change in economic assumptions on balanced budget tax revenue**



**Figure 36. Effect of change in economic assumptions on gross financial assets**

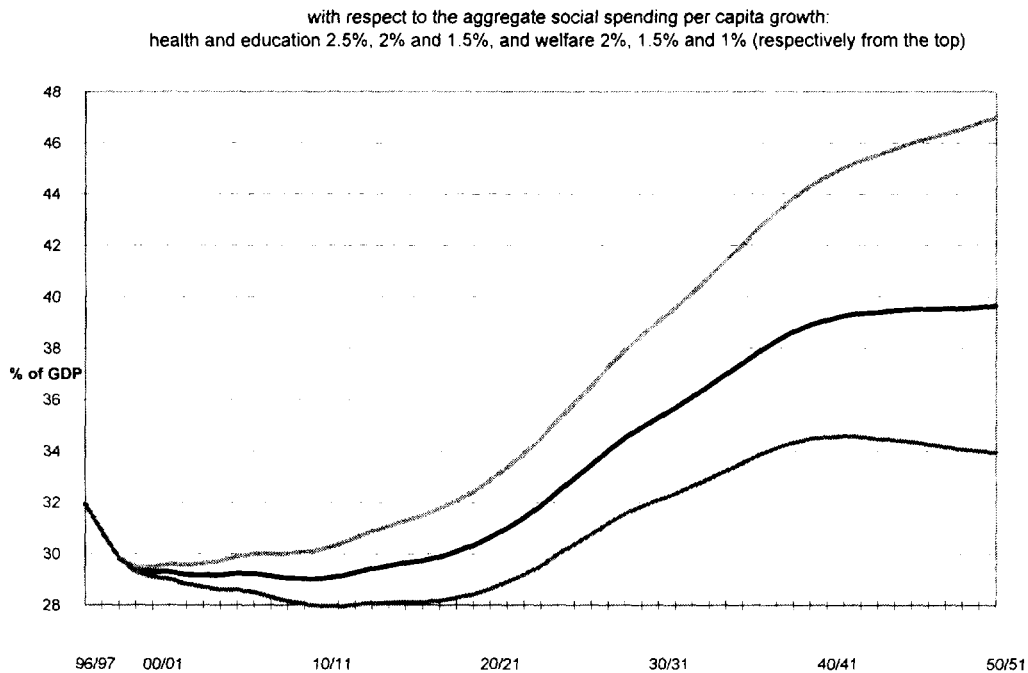


### 3.6.2. Social spending increase versus tightening

The effect of an increase in the growth of spending on health, education, and welfare is similar to that of a decrease in productivity growth (see section 3.5.1.a). This fact is consistent with the argument that it is mainly the difference between productivity growth and real growth in per capita government spending that affects the long-term fiscal position. In an aging society government spending policies thus may serve as an effective instrument with which to contain (or exacerbate) increases in liabilities.

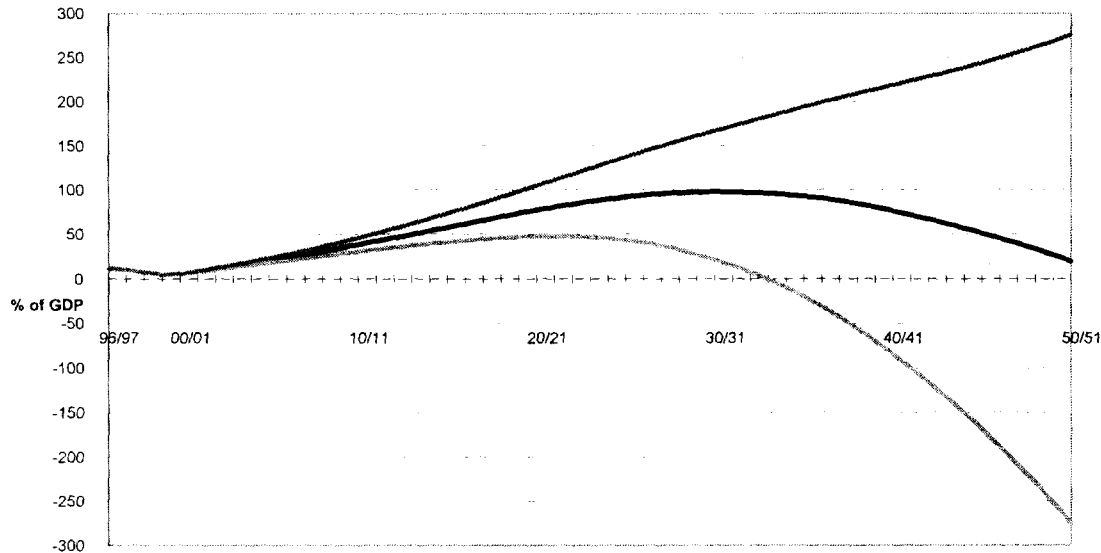
Figures 37 and 38 show, the fiscal outcomes associated with the alternative real growth rates in per capita aggregate social spending on health, education, and social welfare.

**Figure 37. Effect of change in real growth rate of per capita social spending on balanced budget tax revenue**



**Figure 38. Effect of change in real growth rate of per capita social spending on gross financial assets**

with respect to the aggregate social spending per capita growth:  
 health and education 1.5%, 2% and 2.5%, and welfare 1%, 1.5% and 2% (respectively from the top)



### 3.7. Conclusions from the Model

Results of the sensitivity tests and the various scenarios suggest that the forecasted fiscal position depends critically on the baseline assumptions. Less conservative baseline assumptions (such as 2 percent productivity growth a year) lead to much brighter fiscal outlooks. A detailed analysis of the baseline assumptions is thus necessary before the results of the model are interpreted. Similarly, since the model fails to link developments in key economic variables (such as unemployment, inflation, and productivity growth) or to reflect the possible behavioral and economic effects of government policies (such as the crowding-out effect), modeling of alternative future economic developments requires a comprehensive analysis of multiple adjustments in the assumptions.

Under the baseline assumptions the future fiscal position appeared highly sensitive to even small changes in the economic, demographic, and policy assumptions.

Government may limit the effect of future demographic pressures and prevent future risks of major fiscal imbalances by containing the growth of social spending, particularly spending on health, the NZS, and welfare. The sensitivity tests and scenarios suggest that linking real per capita growth in social spending to productivity growth across business cycles and reducing the level of NZS benefits (while favoring their indexation to inflation rather than to wages) would significantly reduce the problem of rising government liabilities.

#### **4. Financing Projected Spending**

The government of New Zealand could attempt to maintain tax rates at their current level and to partially pre-fund the future increase in liabilities. Alternatively, the government could cut taxes over the next 10-20 years and increase taxes in 30-40 years.

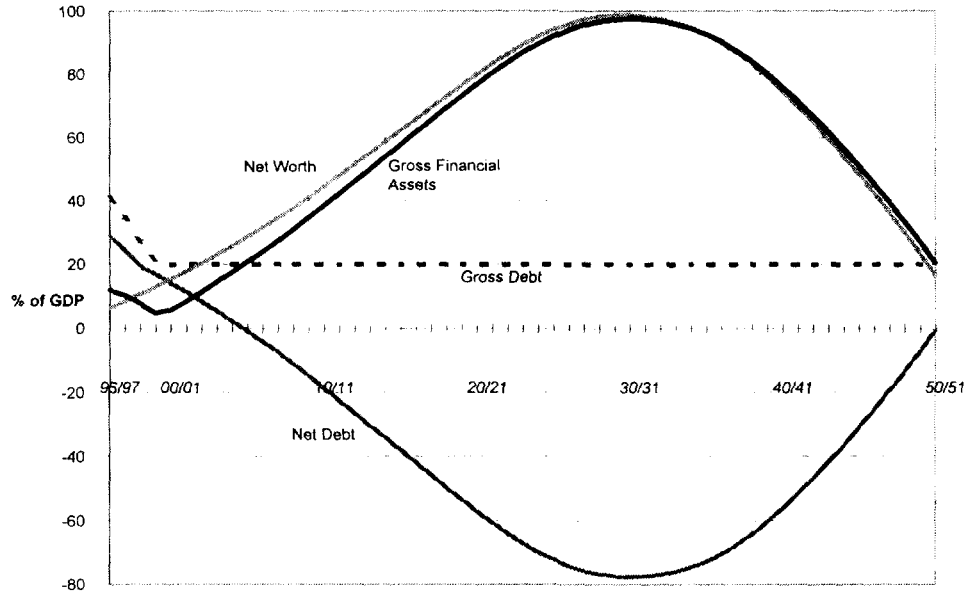
##### **4.1. Constant Tax Rate**

The pre-funding of the future increase in government liabilities needed under the constant tax rate approach would require the government to accumulate and manage gross financial assets of up to 100 percent of GDP (net financial assets of 80 percent of GDP).<sup>26</sup> Such an increase in public saving during the next thirty years, even if partly offset by a decrease in private saving, is likely to result in a higher level of national saving. The pre-funding approach would implicitly transform the existing NZS system into a partly funded scheme.

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<sup>26</sup> By releasing the 20 percent of GDP gross debt target, the government could reduce its maximum pre-funding requirement during the early 2030s to about 80 percent of GDP. (In the balanced-budget-tax-rate approach, net debt would remain at zero level, and gross financial assets would equal the gross debt, which is set a priori at the level of 20 percent of GDP.)

**Figure 39. Pre-funding the future increase in liabilities in constant tax rate approach: Baseline case**



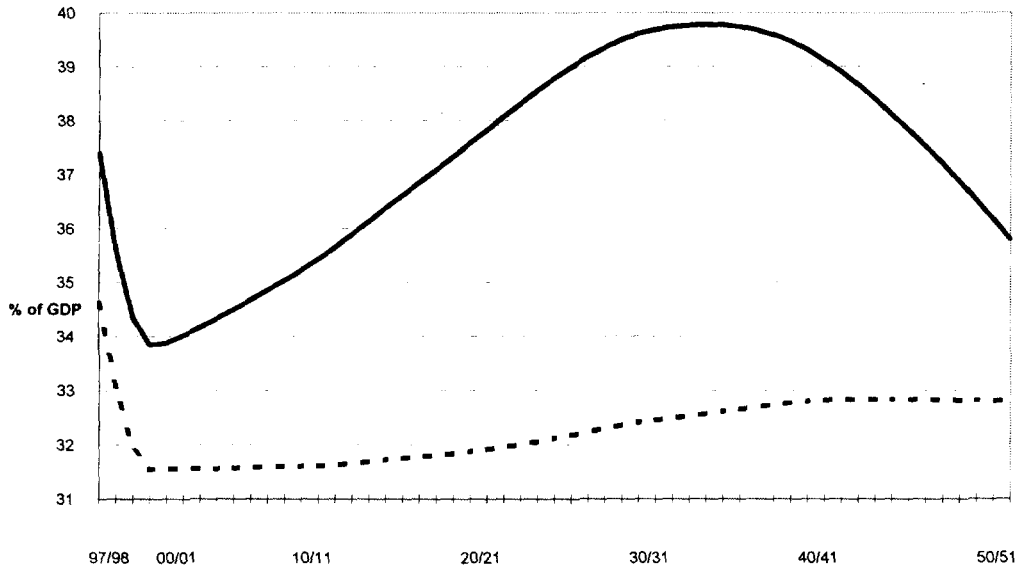
The size of the forecasted earnings to the government from managing these financial assets is illustrated in the dynamics of non tax revenues, which is shown as the difference between the government total and tax revenues (figure 40).

Empirical evidence suggests, however, that governments often fail to insulate their pension funds from political (mis)use and thus do not always manage their financial assets profitably.<sup>27</sup>

<sup>27</sup> Real returns on publicly managed pension reserves have been negative in most countries (World Bank 1994 and Mitchell 1993). The reasons include weak accountability and incentives, inefficient regulations and monitoring, political pressures to invest into public projects and government paper, low nominal interest rates, volatile inflation, and restrictions on international diversification (World Bank 1994 and Davis 1993). In many countries with a compulsory fully funded scheme the provident funds earned negative returns (World Bank 1994). For analysis of the associated risks, see also Bradbury, Brumby, and Skilling 1996.



**Figure 40. Total revenues versus tax revenues in constant tax rate approach: Baseline case**

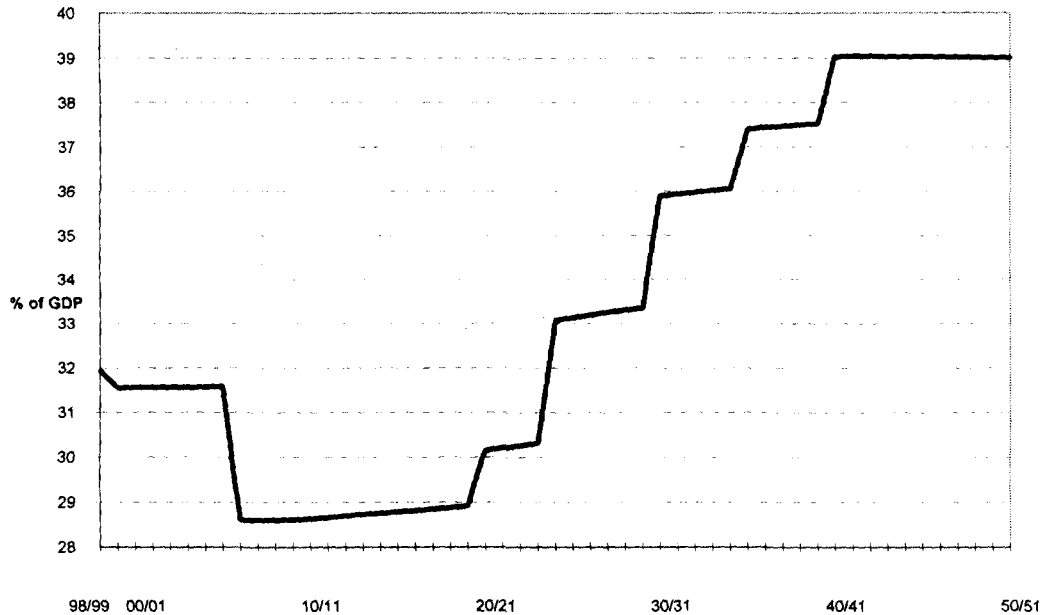


#### **4.2. Balanced budget tax revenue**

By balancing the budget every year the government would maintain zero net debt and accumulate zero net financial assets. This approach would allow taxes to be reduced over the next thirty years. Lower tax levels could bring about efficiency gains and higher economic growth and thus limit the need to increase taxes in the following years. The model, however, does not consider any possible efficiency gains. The financing scenario below thus corresponds to the baseline assumptions.

In the real world revenues do not change instantaneously to reflect spending, and tax rates would not be adjusted annually. To maintain balanced budgets, the government could introduce a series of tax cuts over the next ten to fifteen years and tax increases later on. Figure 41 shows a possible profile of the tax adjustments.

**Figure 41. Possible adjustments in tax revenue: Baseline case**

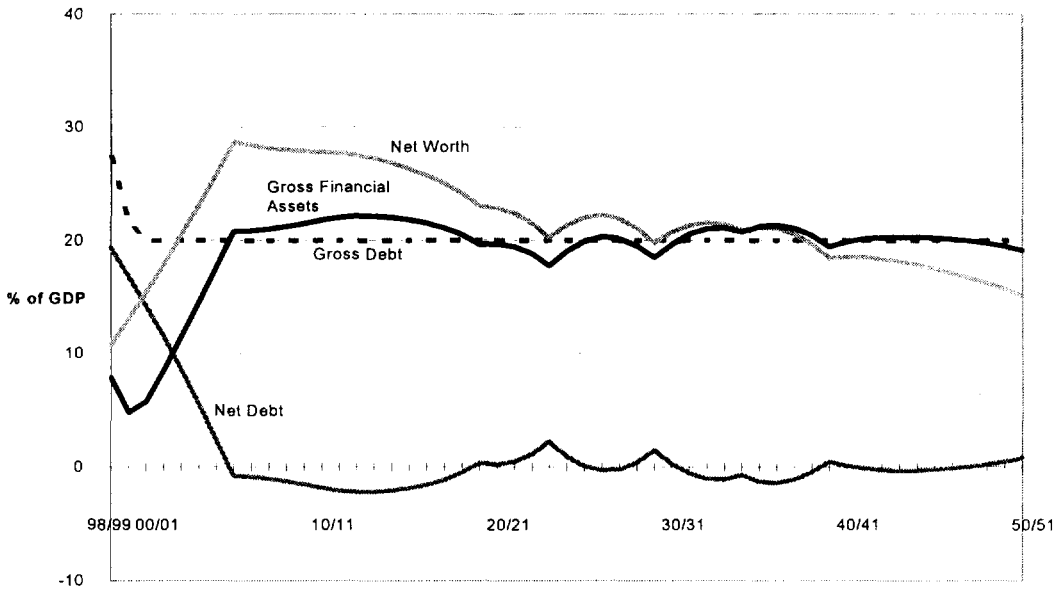


Under this quasi-balanced budget approach, the government does not raise significant non-tax revenues from financial assets. Tax revenue between 1995 and 2050 under this approach would thus be higher than the tax revenue needed under the constant tax rate approach. (This explains why the sum of the tax increases exceeds the sum of the tax cuts.)<sup>28</sup>

Figure 42 illustrates the government's financial position and its sensitivity to tax adjustments. (In the modeling of this situation, the objective was to simulate tax adjustments so that net debt remains near zero. The levels of gross financial assets thus converge to the gross debt target.)

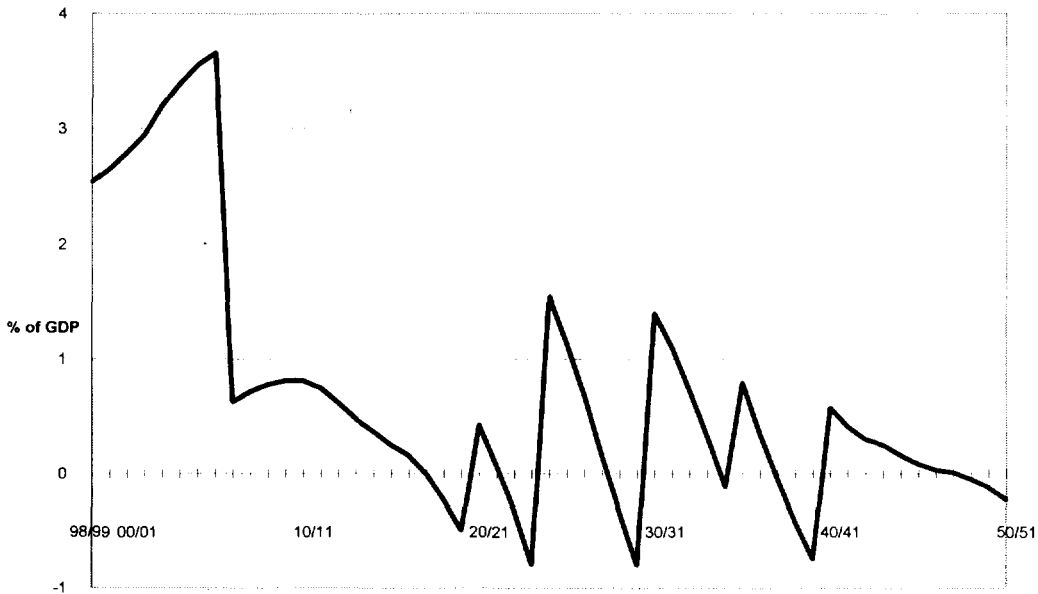
<sup>28</sup> No potential efficiency gains from the tax reductions are considered.

**Figure 42. Gross financial assets controlled to maintain net debt near zero**



The expected fiscal pressures are illustrated in the operating balance (figure 43). During the next fifteen years surpluses continue to increase following each tax cut. Beginning in 2020, however, deficits develop and prevail after each tax increase.

**Figure 43. Operating balance to maintain net debt near zero**



### **4.3. The Tradeoffs**

The possible tradeoffs between the two financing options warrant further research. Under the constant tax rate approach public and national saving increase and efficiency rises as a result of tax smoothing, but the government is left to manage large financial assets. Under the balanced budget tax revenue approach, private saving increases, efficiency rises as a result of low tax rates (during the next twenty years), and financial assets are managed by the private sector, but tax rate adjustments that may create uncertainty in the economy and be inequitable from an intergenerational perspective are necessary.

To examine intergenerational equity in the cost-benefit analysis of the different financing scenarios it may be advisable to apply the baseline assumptions and sensitivity tests to the New Zealand generational accounts (Kotlikoff 1995). A quick look at the tax cuts and tax increases under the balanced budget financing option suggests that the generation entering the work force at the end of this century would enjoy relatively low taxes, retire just in time to avoid the tax increases and enjoy a greater life expectancy with pensions as generous as the previous generation but financed from the higher taxes of following generation.

Options that would allow for tax smoothing at lower tax levels and without requiring the government to manage large public assets could be achieved by containing demographic pressures on future spending. The sensitivity tests and scenarios presented in the previous sections indicate that effective strategies for containing the fiscal effects of an aging population involve tight control over spending on health and pensions.

Policies that offer further tax cuts in exchange for a reduction in future benefits are also likely to bring economic gain. For example, international evidence (section 2) suggests that the expected size of public pensions is negatively correlated with private saving. Thus, a lower expected level of NZS benefits is likely to induce the current generation to use any additional disposable income from tax cuts for private saving for retirement. Individuals could invest their funds according to their own risk preference. The resulting investment level is likely to be higher (compared with the balanced budget

approach under a constant pension level) and the allocation of capital more efficient (compared with the constant tax rate, government pre-funding approach).

In addition, tax cuts in exchange for reductions in future pension benefits are likely to be fair from the perspective of inter generational equity. The current generation would enjoy lower taxes without burdening the future generations as much. This hypothesis could be tested by applying the assumptions described above to the New Zealand generational accounts (Auerbach, Baker, Kotlikoff 1995).

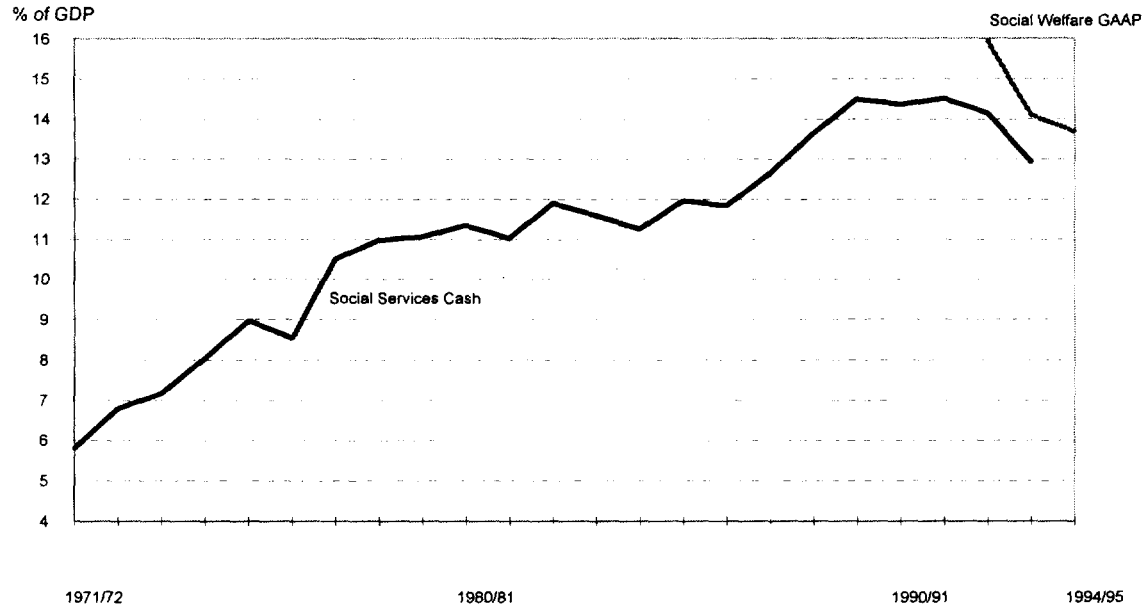
## **5. Conclusions**

The fiscal position of the government of New Zealand, like that of other OECD governments, will begin to feel the effects of an aging population as the cost health care and pension payments rise. A drop in productivity growth or an increase in social spending relative to the baseline case could exacerbate the negative effect on fiscal balances.

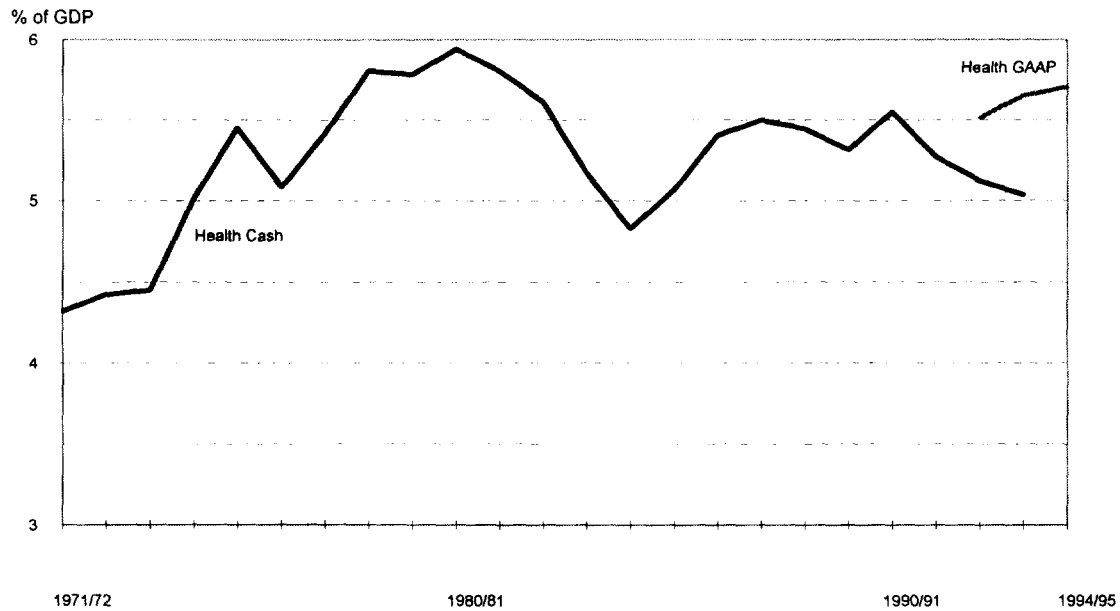
The financing of future liabilities presents major policy challenges. With tax rates maintained at current levels the government could pre-fund the future increases in its liabilities through 2050. Such pre-funding would mean that by the 2020s-30s the government would be managing net financial assets worth 80 percent of GDP, however. Under a balanced budget approach the government could cut taxes in the next 10 to 15 years but would have to increase taxes by even more twenty years later.

Sensitivity tests suggest that tight control over social spending will be necessary to reduce the fiscal burden of the aging population and the fragility of future fiscal balances. Cross-country experiences suggesting a negative correlation between public pension and private saving levels imply that reduction in the level of NZS benefits could bring about significant gains on the economic as well as the fiscal side. Transfer of responsibility for health care and pension provision to the private sector could allow for tax cuts without necessitating large tax increases later. Thus, the benefit of tax smoothing could be achieved at tax rates that are lower than the model's baseline rates, without relying on the government to accumulate and manage large financial assets.

**Annex figure 2. The aggregate social spending**



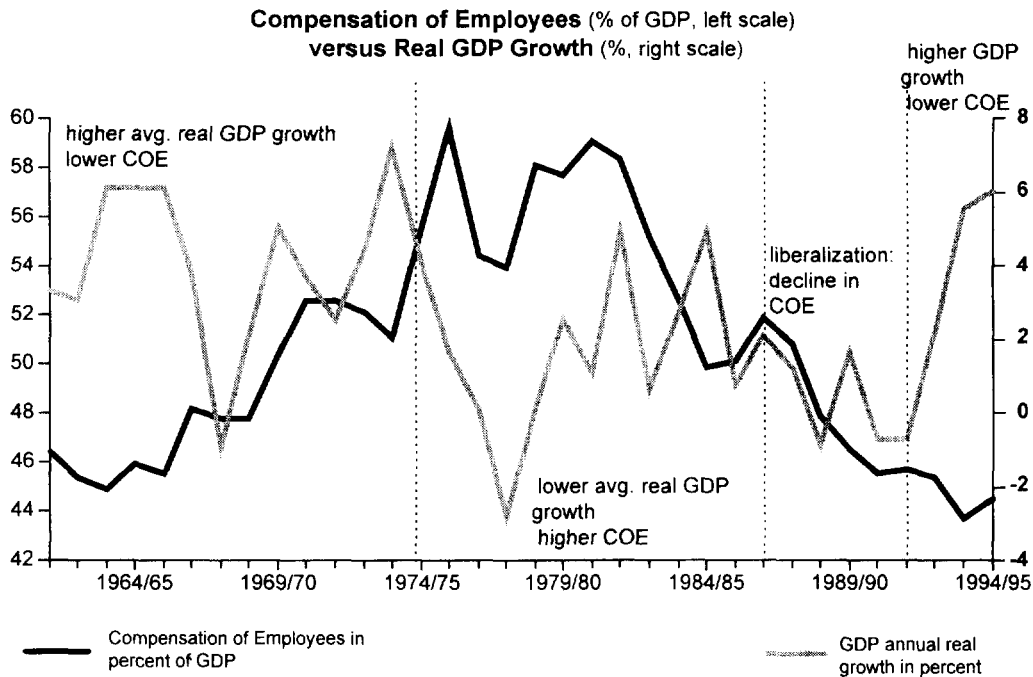
**Annex figure 3. Health spending**



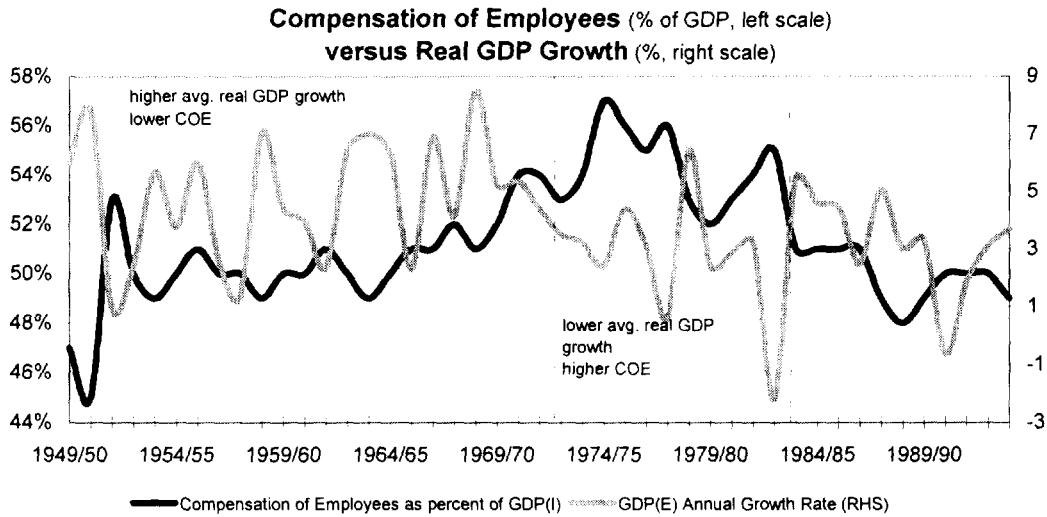
## 2. Compensation of Employees and Economic Growth

A comparison of figures on the compensation of employees (COE as percentages of GDP) suggests that today's level of employee compensation in New Zealand is relatively low both in international comparisons and from a historical perspective (see annex figures 6-8). In modeling the long-term cost of the NZS it may be beneficial to explore likely future developments in employee compensation in an aging society and under different assumptions about technological progress and GDP growth.

**Annex figure 6. Employees compensation in New Zealand:**

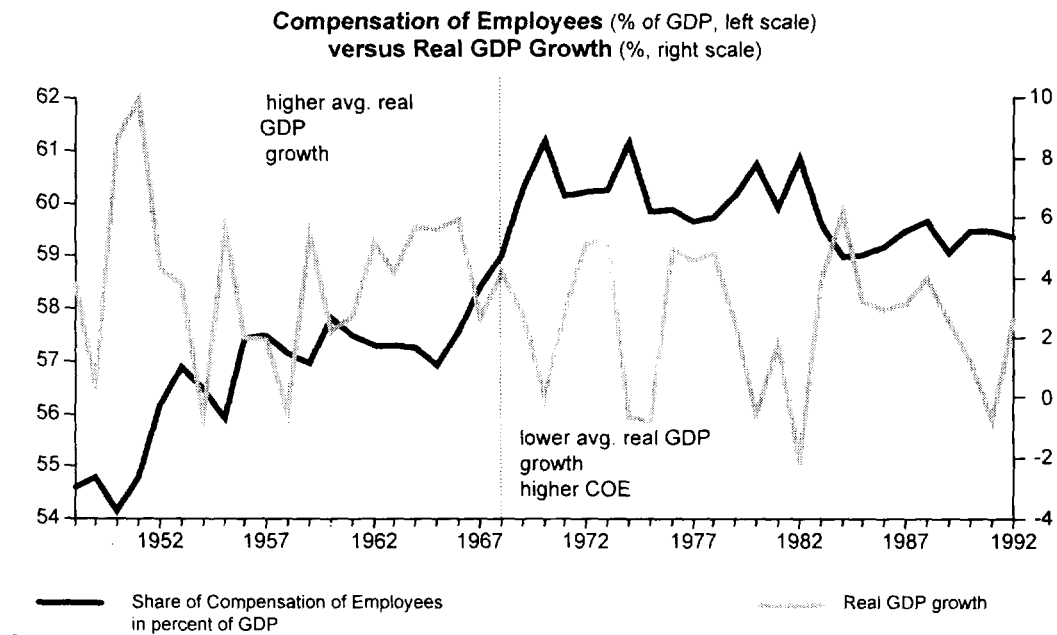


**Annex figure 7. Employee compensation in Australia**



The long-term average in compensation of employees in Australia is 51 percent of GDP. This value is still lower than any COE level in the US during the past 50 years.

**Annex figure 8. Employee compensation in the United States:**





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