International Tax and Public Finance, 4, 201–228 (1997)

Generational Accounting in New Zealand Is There Generational Balance?

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Abstract

This paper uses a recently-developed technique, called *generational accounting*, to assess New Zealand's long-term fiscal position. Generational accounting has become a popular alternative to traditional deficit accounting, because it provides a more accurate picture of the intergenerational distribution of fiscal burdens and the associated macroeconomic effects, particularly in the presence of demographic transitions and large unfunded public transfer programs. Past studies have suggested the existence of significant generational imbalances in several countries.

We find that behind New Zealand's projected budget surpluses, there is indeed a sound fiscal picture. Even under the base case scenario, which entails substantial short-run tax reductions, the burden on future generations (relative to income) is projected to fall slightly below that on current newborns. New Zealand appears to have avoided the large fiscal imbalances plaguing the United States and other OECD countries not by placing large tax burdens on young current generations, but by limiting the size of its commitments.

I. Introduction

This paper uses a recently-developed technique, called *generational accounting*, to assess New Zealand's long-term fiscal position. Generational accounting determines the fiscal burden that a country's current policies will impose on different generations, and whether these current fiscal policies are sustainable—whether they can be maintained without requiring future generations to pay higher net taxes (taxes paid net of transfers received) over their lifetimes than existing policy would require. It measures the degree to which current policies impose generational imbalances, summarized by the extent to which the burdens projected for future generations exceed those of current generations. Past studies have sug-

gested the existence of significant generational imbalances in several countries, included the United States (Auerbach et al. 1995), Italy (Franco et al. 1994) and Norway (Auerbach et al. 1993).

Generational accounting has become a popular alternative to traditional deficit accounting, because it provides a more accurate picture of the intergenerational distribution of fiscal burdens and the associated macroeconomic effects, particularly in the presence of demographic transitions and large unfunded public transfer programs. In such circumstances, short-run budget deficits may provide a very inaccurate picture of the viability of a country's current fiscal policy.[1]

The next section describes the New Zealand economy and provides an overview of its fiscal policies. Section III describes the method of generational accounting. Section IV summarizes the data used to construct the accounts. Section V presents the accounts, discusses their implications and sensitivity to assumptions, and provides comparisons with generational accounts for the U.S. and other OECD countries. Section VI summarizes findings and draws conclusions. A data appendix provides additional detail about sources and calculations.

II. The New Zealand Fiscal Situation

In the 1993/94 fiscal year, New Zealand recorded its first "real" budget surplus, that is a surplus unaided by asset sales, since 1977/78. In the year ending June 1995, the surplus is estimated to grow to about 3 percent of GDP, with ever-increasing surpluses in coming years, given current economic conditions and policy settings. The government has announced its intentions to earmark surpluses toward reducing debt to prudent levels, currently defined as below 20 percent of GDP, while providing substantial tax cuts in the near future. Under current projections, it is expected that debt will fall from the current 37.9 percent of GDP to below 30 percent by the end of 1996/97.

The strong fiscal position results, in large measure, from strong economic growth and firm spending control. In the two years ending March 1995, the New Zealand economy grew by more than 11 percent in real terms with inflation averaging less than 2 percent, earning New Zealand periodic mention in the business press as a model of sound economic and fiscal management. This kind of economic performance is relatively new for New Zealand, and it did not occur overnight. In order to understand New Zealand's current fiscal situation, it is necessary to understand a bit of recent economic history, particularly the reforms which began in 1984, were reinforced in 1991 and are continuing today.

From its early days, the government played a dominant role in New Zealand's economy, owning major enterprises in many sectors of the economy including transport, communications and finance, and restricting other sectors with stifling regulation. Until the mid-1980s, the domestic economy was sheltered from international competition with extensive import and capital restrictions, and domestic industry was supported with a range of subsidies. The government operated a generous social welfare system and provided universal health care and education. The two oil shocks of the 1970s dealt severe blows to New Zealand's terms of trade, as did Britian's entry into the EEC iin 1973, which ended New Zealand's favorable export arrangement with the mother country. The reaction of the government to

the second oil shock exacerbated New Zealand's fiscal problems as the government sought to ease the crisis with old-fashioned Keynesian stimulus, financing major infrastructure and energy projects, while increasing subsidies to domestic businesses.

This spending, in combination with higher social welfare spending and interest on the burgeoning debt, increased financial net expenditure (which excludes lending activities) from 25.6 percent of GDP is fiscal 1973/74 to 38.1 percent in 1983/84. Part of this spending was financed through higher taxes, as revenue increased from 26.6 percent of GDP to 31.7 percent, but much was financed through borrowing, as the financial balance swung from a surplus of 1.0 percent of GDP to a deficit of 6.5 percent. Net debt grew from just 4.5 percent of GDP in 1973 to 31.3 percent in 1984.

As the fourth Labour government took office in 1984, the New Zealand economy was performing poorly. Real growth had averaged only 2 percent per year from 1973 to 1984. Inflation was enjoying a brief, but temporary respite from double digit rates, and short-term interest rates were about 14 percent. The New Zealand dollar had fallen from US$1.48 in 1973 to below US$0.47 by the end of 1984.

The incoming government instituted a series of reforms designed to reduce the deficit, stabilize the economy, and improve efficiency. In its first budget, the government announced cuts in subsidies and reform of the tax system. These measures were designed both to reduce the deficit and to increase economic efficiency.

In terms of macroeconomic stability, the government directed the Reserve Bank to reduce inflation. The Reserve Bank Act of 1989 formalized the requirement that the Reserve Bank's sole focus should be the achievement and maintenance of price stability.

The government set out to improve the performance of the public sector by setting clear goals for public sector managers and giving greater flexibility for their achievement, including the right to set their own salary structures.

The government also introduced major tax reforms aimed at broadening the tax base and reducing marginal rates. A comprehensive goods and services tax (GST) was introduced. Personal tax rates were reduced to 24 percent for income up to $30,875 and 33 percent above. Tax rebates created an additional effective marginal rate of 15 percent up to $9,500. Corporate tax rates were set at 33 percent.

The government also undertook a major deregulation effort, particularly with regard to the financial services sector. The new-found freedoms may have contributed to a speculative bubble on the share market, and when the stock market in New York crashed in 1987, repercussions were deeply felt in New Zealand. While the after-effects of the crash were relatively minor around the world, in New Zealand the crash coincided with the beginning of a sustained period of difficult times; the New Zealand stock market was the last OECD market to recover. At the end of September 1992, the level of GDP was about even with that of December 1987.

In October of 1990, a new National Party government took office and embraced the Labour reforms, adding new reforms of their own. The Employment Contracts Act of 1991 substantially removed regulation of the labor markets. The 1991 Budget introduced sweeping changes, including reductions in social welfare benefits, introduction of the "user pay" principle, and restructuring of the provision of health, education, and housing benefits.

The Budget also introduced new anti-evasion and avoidance measures and increases in taxes on alcohol and tobacco.

In 1994, the Fiscal Responsibility Act was passed to enhance fiscal performance over time. The Act requires, among other things, that New Zealand's net debt be reduced to "prudent" levels and that the operating balance remain in surplus over time. The Act also requires future budgets, beginning with 1994, to use generally accepted accounting principles (GAAP). The new GAAP measures include accrual-based operating statements and balance sheets with cash-based cash flow and borrowings statements. The new data set allows for a more comprehensive view of the Crown's finances and more sophisticated control.

Through the difficult period of adjustment from 1983/84 to surplus in 1993/94, net financial expenditure initially increased from 38.1 percent of GDP to its high-water mark of 40.8 percent of GDP in 1989/90, before falling off to 35.7 percent in 1993/94. Revenue followed the same path, increasing from 31.7 percent of GDP to a high of 39.5 percent in 1989/90, before falling off to 36.7 percent in 1993/94. The adjusted financial balance rose from a deficit of 6.5 percent of GDP to a surplus of 1.0 percent of GDP in 1993/94. Net debt increased from 31.3 percent of GDP in 1983/84 to a peak of 52.1 percent in 1991/92. With some assistance from asset sales, net debt fell to 43.4 percent of GDP by the end of 1993/94.

A full assessment of New Zealand's fiscal situation requires that we consider the implications of the past debt accumulation and the projected future spending on the tax burdens of current and future New Zealanders. This intertemporal analysis must take into account the time-value of money (i.e., it must discount future taxes, transfers, and spending) as well as projected demographic change and economic growth. Such long-term fiscal analysis needs to be guided by a clear economic question. In the case of generational accounting, the question is "are current fiscal policies sustainable, or will they entail higher net tax burdens on young and future New Zealanders?" Note that the answer to this question cannot be determined simply through knowledge of the current size of New Zealand's government debt or its immediate change (the current deficit), since these variables tell us nothing about future spending, the taxes that current New Zealanders will pay in the future to help cover these liabilities, how much remains to be paid by future New Zealanders, and over how many of them this burden will be spread.

At a deeper level, because government "debt" does not provide the answer to a well-posed economic question, its definition is arbitrary. Consider, for example, a pay-as-you-go social security system like that of the United States, in which social security contributions are used to finance current social security benefits. These contributions could just as well be called "loans" to the government rather than "taxes" and social security benefits, rather than being called transfer payments, could be called "repayment of those loans with interest" (combined with an old-age tax or transfer if benefits did not exactly equal principal plus interest on past contributions). This alternative fiscal nomenclature would produce an entirely different measure of debt and deficit, while providing the same answer to the economic question raised by generational accounting.

III. Methodology[1]

Generational accounting is based on the government's intertemporal budget constraint. This constraint, written as Equation (1), requires tha the future net tax payments of current and future generations be sufficient, in present value, to cover the present value of future government consumption as well as service the government's initial net indebtedness.[3]

$$\sum_{s=0}^{D} N_{t,t-s} + \sum_{s=1}^{\infty} N_{t,t+s} = \sum_{s=t}^{\infty} G_s(1+r)^{-(s-t)} - W_t^g \tag{1}$$

The first summation on the left-hand side of (1) adds together the generational accounts (the present value of the remaining lifetime net payments) of existing generations. The term $N_{t,t-s}$ stands for the account of the generation born in year $t-s$. The index s in this summation runs from age 0 to age D, the maximum length of life.[4]

The second summation on the left side of (1) adds together the present value of remaining net payments of future generations, with s representing the number of years after year t that the generation is born. The first term on the right hand side of (1) expresses the present value of government consumption. In this summation the values of government consumption in year s, given by G_s, are discounted by the pre-tax real interest rate, r. The remaining term on the left hand side, W_t^g, denotes the government's net wealth in year t—its assets minus its explicit debt.

Equation (1) indicates the zero sum nature of intergenerational fiscal policy. Holding the present value of government consumption fixed, a reduction in the present value of net taxes extracted from current generations (a decline in the first summation on the left side of (1)) necessitates an increase in the present value of net tax payments of future generations.

The term $N_{t,k}$ is defined by:

$$N_{t,k} = \sum_{x=\max(t,k)}^{k+D} T_{s,k} P_{s,k} (1+r)^{-(s-t)} \tag{2}$$

In expression (2) $T_{s,k}$ stands for the projected average net tax payments to the government made in year s by a member of the generation born in year k. The term $P_{s,k}$ stands for the number of surviving members of the cohort in year s who were born in year k. For generations who are born prior to year t, the summation begins in year t. For generations who are born in year k, where $k > t$, the summation begins in year k. Regardless of the generation's year of birth, the discounting is always back to year t.

A set of generational accounts is simply a set of values of $N_{t,k}$, one for each existing and future generation, with the property that the combined present value adds up to the right hand side of equation (1). Though we distinguish male and female cohorts in the results presented below, we suppress sex subscripts in (1) and (2) to ease notation.

Note that generational accounts reflect only taxes paid less transfers received. With the exception of government expenditures on education, which are treated as transfer payments, the accounts do not impute to particular generations the value of government's purchases of goods and services because it is difficult to attribute the benefits of such purchases. Therefore, the accounts do not show the full net benefit or burden that any generation

receives from government policy as a whole, although they can show a generation's net benefit or burden from a particular policy change that affects only taxes and transfers. Thus generational accounting tells us which generations will pay for government spending, rather than telling us which generations will benefit from that spending. Another characteristic of generational accounting that should be understood at the outset is that, as its name suggests, it is an accounting exercise that, like deficit accounting, does not incorporate induced behavioral effects or macroeconomics responses of policy changes. As a corollary, it does not incorporate the deadweight loss of taxation in its measure of fiscal burden, again following the tradition of budget incidence analysis.

Assessing the Fiscal Burden Facing Future Generations

Given the right-hand-side of equation (1) and the first term on the left-hand-side of equation (1), we determine, as a residual, the value of second term on the right hand side of equation (1), which is the collective payment, measured as a time-t present value, required of future generations. Based on this amount, we determine the average present value lifetime net tax payment of each member of each future generation under the assumption that the average lifetime tax payment of successive generations rises at the economy's rate of productivity growth. (This makes the lifetime payment a constant share of lifetime income.) Leaving out this growth adjustment, the lifetime net tax payments of future generations are directly comparable with those of current newborns, since the generational accounts of both newborns and future generations take into account net tax payments over these generations' entire lifetimes.

Note that our assumption that the generational accounts of all future generations are equal, except for a growth adjustment, is just one of many assumptions one could make about the distribution across future generations of their collective net payment to the government. We could, for example, assume a phase-in of the additional fiscal burden (positive or negative) to be imposed on future generations, allocating a greater share of the burden to later future generations and a smaller share to earlier ones. Clearly, such a phase-in would mean that generations born after the phase-in period has elapsed would face larger values of lifetime burdens (the $N_{t,s}s$) than we are calculating here.

IV. Assumptions Underlying Generational Account Calculations

To produce generational accounts for New Zealand, we require projections of population, taxes, transfers, and government expenditures, an initial value of government wealth, and a discount rate. We consider the impact of total, not just national, government.

Populations Projections

The projections used to compute the generational accounts were based on GAAP Budget projections made with Treasury's long-term fiscal model. In order to extend the time horizon

to 2200, special very-long-term demographic projections were prepared by Statistics New Zealand, extending their medium fertility, medium mortality, 5,000 net immigration series to the year 2200.

Fiscal Projections

For government wealth, we use the measure of government's net financial assets, equal to financial assets less gross debt. We do not include productive government assets in this measure, because the flows associated with these assets (both revenues and expenses) are already incorporated in government spending and revenue projections. Government purchases are generally assumed to grow at the same rate as GDP.[5]

Taxes are categorized as wage income taxes, non-wage income taxes, corporate income taxes, Goods and Services Tax (GST), excise taxes, and local property taxes. Transfer payments are categorized as superannuation benefits, health, unemployment insurance, family and housing benefits, education, and other benefits. Our general rule regarding tax incidence is to assume that taxes are borne by those paying the taxes, when the taxes are paid: income taxes on income, consumption taxes on consumers, and property taxes on property owners. The one major exception we make to this general rule, in the base case, is to assume that corporate income taxes are borne in proportion to the receipt of wage and salary income. This assumption is motivated by the size and openness of New Zealand's economy. For a small open economy, it makes sense to assume that taxes on mobile corporate capital are borne by local, fixed factors—in this case, labor.[6]

We begin by estimating tax and transfer profiles using Statistics New Zealand's Household Expenditure and Income Survey (HEIS), a survey of about 4,600 New Zealand households, following procedures discussed below. We then benchmark these profiles so that, in the aggregate, they square with current GAAP budget levels. In order to perform this reconciliation, it was necessary to make a number of adjustments to the GAAP numbers. New Zealand social welfare benefits are generally taxable, and the GAAP transfer numbers are gross of tax. These taxes were removed from both the income tax and transfers because transfers are recorded net in the HEIS. Similarly, certain governmental outputs are recorded gross of goods and services tax (GST), which was netted out from GST receipts and departmental spending. Finally, generational accounts abstract from interest payments and receipts.

The projections were all done in nominal dollars and then converted into constant 1992/93 dollars, the base year for the HEIS, and the base year for the accounts. For the first three years of the base case projection, the generational accounts projections of (non-interest) expenditures are identical to the budget. Beyond the three year period, health and education spending are assumed to increase with population served, inflation and productivity growth. Social welfare benefits are assumed to increase in line with New Zealand Superannuation (NZ Super). Under current law, NZ Super benefits increase with inflation, provided that the couples' benefit falls within a range of 65 percent to 72.5 percent of the average ordinary after-tax wage. If the floor or ceiling is reached, then benefits are increased with either wages or inflation, depending upon which is needed to keep benefits within the range. The 65 percent floor will be reached within the next 1–3 years, depending upon assumptions

made, so in effect, social welfare benefits increase with population served and wage growth, which is assumed to equal inflation and productivity growth. Non-demographically driven spending—including government purchases—and taxes are assumed to increase in line with GDP.

For our base case simulations, we then further adjust individual income taxes each year as required to generate surpluses as a percent of GDP equal to 3.6, 2.0 and 1.0 during the fiscal years 1995/96, 1996/97, and 1997/98, respectivley, and a balanced government budget thereafter.[7] As discussed above, current law projections are for growing short-run budget surpluses. Thus, our base case assumption of balanced annual budgets involves a substantial short-run reduction in individual income taxes from current law. With no tax reductions, the projected surpluses as a percent of GDP in these next three fiscal years would be 3.6, 5.6 and 7.7, a scenario we refer to below as the "no policy change" case. Other simulations are based on alternative assumptions regarding the fiscal policy path.

Most of the tax and transfer profiles were developed from the HEIS. In general terms, taxes and transfers were aggregated by age, separately for males and females. Universe estimates were obtained by multiplying representative individuals by their population weights. Average dollar amounts were used to develop indices, where males and females of different ages could be compared to males aged 40, whose index value equalled 1.0.

The method of constructing tax and transfer profiles depended on the nature of the data. In the survey, income tax payments are allocated to individual taxpayers, so allocation of income taxes was relatively simple. Like taxes, transfers are also allocable to individuals. For GST, consumption is attributed at the household level, so it was necessary to make intra-household allocations of GST payments. For goods whose end users are readily identifiable, GST would be attributed to the indivdual. For example, GST on women's clothing was attributed to women in the household. For items whose end user was unidentifiable, GST was allocated evenly for couples with no children, and in households where children were present, adult equivalence scales were used.

Data from the HEIS were noisy, particularly for individuals over 70, whose numbers were, by necessity, limited. Polynomial regression curves were fitted through the data, and extreme outlier observations were manually adjusted to fall a maximum of one standard deviation from the fitted curves. The smoothed indices were then renormalized so that 40-year-old males again equalled 1.0.

In New Zealand, health and education are provided in kind, and were thus not included in the survey. For these categories of expenses, profiles were developed from administrative data. The Ministry of Health provided profiles of average spending by age and sex, which were easily converted into indices. Education profies were constructed from administrative data for numbers of students and level of education. For example spending for primary education was allocated evenly to male and female children attending primary school. Pre-school, secondary and tertiary spending was allocated similarly. These age-sex profiles were then converted into indices.

Discount Rates

The appropriate discount rate for calculating the present value of future amounts depends on whether or not these amounts are known with certainty. Future government receipts and expenditures are risky, which suggest that they be discounted by a rate higher than the real rate of interest on government securities. On the other hand, government receipts and expenditures appear to be less volatile than the real return on capital, which suggests that they be discounted by a lower rate than that.[8] The base case calculations assume a 5 percent real discount rate, which is approximately equal to the government's assumed borrowing rate. Alternative simulations were performed with real discount rates of 3 percent and 7 percent.

V. Findings

We begin with detailed consideration of base case results, followed by sensitivity analysis and alternative scenarios.

Basic Results

Tables 1 and 2 present the basic generational accounts for males and females in New Zealand, for the base year of 1993, and the base case assumptions of a 5 percent real discount rate (r) and a 1.5 percent productivity growth rate (g). For each of several cohorts ranging in age from 0 to 90 in 1993, each table lists the total per capita generational account and the breakdown of this account into the components of household payments and receipts. Figures 1 and 2 graph these accounts for males and females, respectively, along with their overall tax and transfer components.

The row at the bottom of each table labeled "future generations" provides the generational account, adjusted for economic growth, for the representative male or female of each future generation. As discussed above, this account for future generations is calculated as a residual, based on the assumption that current policy will continue to hold for existing generations and the requirement of intertemporal government budget balance.

Looking at the first column of Table 1, we observe that the generational account for newborn males is \$61,600. The generational account rises steadily until age 25, and falls thereafter. The initial rise is due to the fact that the heaviest taxpaying years loom closer and closer as one ages from childhood to young adulthood. The fall in the generational account occurs thereafter as more taxypaying years fall into the past and the receipt of old age pensions and health benefits approaches. The typical 40-year-old has an account of \$147,300, while a 65-year-old, entering years of peak transfer receipt, has an account of −\$57,200. Interpreting this pattern, it is important to remember that a generation's account equals the present value of its *remaining* lifetime net tax payments to the government. Thus, one cannot directly compare the accounts of different current generations to determine their relative *lifetime* burdens.[9]

Table 1. The composition of male generational accounts ($r = .05$, $g = .015$) base case projections.

		Present Values of Receipts and Payments (thousands of dollars)											
		Tax Payments						Transfer Receipts					
Generation's Age in 1993	NET PAYMENT	Wage Income Taxes	Nonwage Income Taxes	Corp. Income Taxes	GST	Excise Taxes	Prop. Taxes	Super-Annuat.	Health	UI	Family & House	Edu-cation	Other Benefits
0	61.6	48.4	16.3	31.7	44.3	11.8	6.6	7.8	27.0	6.6	4.0	44.9	7.1
5	79.3	54.2	19.0	37.6	48.5	14.1	8.0	9.3	23.2	8.0	4.8	48.2	8.5
10	104.0	60.5	22.0	44.5	52.2	16.9	9.7	11.1	24.6	9.6	5.7	40.7	10.2
15	134.9	68.5	26.1	52.6	54.8	20.2	11.7	13.0	26.2	11.5	6.8	29.5	12.1
20	169.0	78.3	30.0	60.3	57.0	22.9	14.3	15.6	27.7	13.0	7.9	15.6	14.0
25	195.6	87.5	35.2	67.1	60.7	25.2	16.7	19.6	31.1	11.8	8.7	9.5	16.1
30	187.1	83.2	36.2	62.9	56.9	23.7	16.8	22.3	31.5	9.1	7.9	6.7	15.0
35	174.1	78.0	38.1	57.8	54.5	22.5	17.2	26.9	33.8	7.3	7.0	4.9	14.1
40	147.3	68.4	39.2	49.2	51.1	20.6	16.9	32.5	36.5	6.1	5.9	3.4	13.7
45	109.1	55.2	39.4	38.2	46.5	18.2	16.1	39.1	39.6	5.3	4.6	2.1	13.9
50	67.4	40.2	39.0	26.6	41.5	15.5	15.1	47.5	40.7	4.5	3.5	.9	13.4
55	26.1	25.9	37.7	16.3	35.8	12.6	13.8	57.7	42.1	3.1	2.5	.0	10.6
60	−13.2	14.5	35.1	8.1	29.6	9.7	12.4	70.4	43.7	1.5	1.6	.0	5.3
65	−57.2	4.9	31.5	2.1	23.6	7.0	10.8	89.3	46.7	.0	1.1	.0	.0
70	−62.5	.1	27.3	.0	18.2	4.8	9.3	78.2	43.2	.0	.8	.0	.0
75	−60.8	.0	22.4	.0	13.6	3.1	7.7	64.7	42.5	.0	.6	.0	.0
80	−54.6	.0	17.1	.0	9.9	1.9	6.0	53.3	35.8	.0	.5	.0	.0
85	−52.2	.0	11.5	.0	7.0	1.2	4.2	43.2	32.5	.0	.4	.0	.0
90	−44.8	.0	5.9	.0	4.9	.8	2.9	33.8	25.1	.0	.3	.0	.0
Future Generations	52.5												
Percentage Difference (relative to newborns)	−14.7												

Table 2. The composition of female generational accounts ($r = .05$, $g = .015$) base case projections.

		Present Values of Receipts and Payments (thousands of dollars)											
		Tax Payments						Transfer Receipts					
Generation's Age in 1993	NET PAYMENT	Wage Income Taxes	Nonwage Income Taxes	Corp. Income Taxes	GST	Excise Taxes	Prop. Taxes	Super-Annuat.	Health	UI	Family & House	Edu-cation	Other Benefits
0	−10.7	26.0	12.2	17.4	46.2	8.1	7.8	13.2	36.3	3.4	9.8	44.7	21.0
5	−6.3	29.3	14.2	20.6	51.0	9.8	9.5	15.8	35.7	4.1	11.8	48.1	25.1
10	3.8	32.7	16.6	24.5	55.0	11.7	11.5	18.9	39.4	4.9	14.0	41.1	30.0
15	17.7	37.3	19.8	28.8	57.9	13.9	14.0	22.3	43.4	5.8	16.5	30.3	35.6
20	36.4	42.7	22.3	32.0	60.6	15.5	17.0	26.6	44.9	6.4	19.0	16.7	40.2
25	45.6	44.0	25.3	33.1	64.0	16.3	19.8	33.0	48.0	4.6	19.7	11.4	40.0
30	45.3	39.5	25.7	29.8	59.8	14.8	19.5	37.1	45.4	3.1	16.1	9.0	33.1
35	42.8	36.5	27.3	27.3	57.4	13.8	19.6	44.3	45.2	2.6	12.2	7.4	27.3
40	34.4	32.7	28.9	23.8	54.1	12.6	19.3	53.4	45.4	2.4	8.4	5.6	21.8
45	18.3	27.2	30.2	18.9	49.9	11.2	18.7	64.1	45.6	2.1	5.7	3.4	16.8
50	−7.6	20.0	31.2	13.0	45.0	9.7	18.0	77.8	46.9	1.6	4.1	1.4	12.5
55	−40.9	12.0	31.2	7.2	39.5	8.0	17.1	94.4	48.6	1.0	3.3	.0	8.8
60	−78.0	5.6	30.0	3.1	33.6	6.3	15.8	113.9	50.4	.5	2.7	.0	4.9
65	−101.4	1.7	27.2	.7	27.4	4.6	14.1	122.2	52.6	.0	2.2	.0	.0
70	−100.7	.0	23.3	.0	21.7	3.1	12.0	110.2	48.8	.0	1.8	.0	.0
75	−92.9	.0	18.5	.0	16.8	2.0	9.6	91.7	46.6	.0	1.5	.0	.0
80	−80.1	.0	13.2	.0	12.7	1.3	7.1	74.9	38.2	.0	1.3	.0	.0
85	−69.9	.0	8.0	.0	9.5	.9	4.6	60.0	31.7	.0	1.1	.0	.0
90	−55.4	.0	3.8	.0	6.8	.6	3.0	45.2	23.6	.0	.9	.0	.0
Future Generations	−9.1												

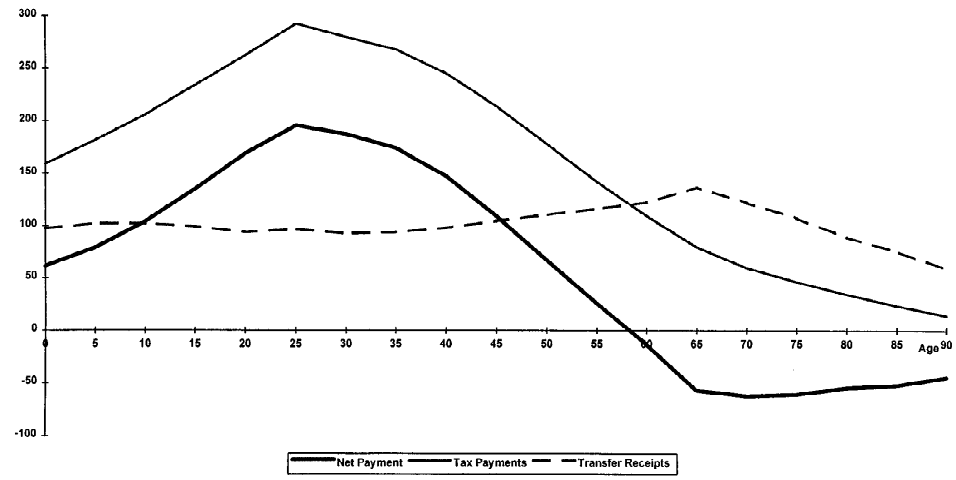

Figure 1. Generational Accounts: Males.

Perhaps the most salient general observation to make about these accounts is that they indicate that future generations will bear a *lower* lifetime net tax burden than current newborns.[10] That is, under the base case assumptions, it will be necessary to reduce taxes on or increase transfers to future generations in order to satisfy the government's intertemporal budget constraint. The reduction in lifetime tax burden—14.7 percent of that faced by current newborns, or $9,100 for males—is not enormous, but the result stands in marked contrast to those for other countries, which have generally indicated that future generations would face a substantially higher burden than current generations.

A second important observation to make about these base case results is the distinction between males and females. Though males and females have the same general pattern of generational accounts that first rise, and then fall, with respect to age, the accounts for females at each age are considerably lower than those for males of the same age. While today's newborn males face a lifetime net tax burden of $61,600, females face a burden that is *negative*, −$10,700. That is, they will receive transfers and government educational spending that, in present value, exceeds the taxes they will pay during their lifetimes. As is true for men, the accounts do rise initially with age and then fall again, being positive for women between ages 10 and 45. An average forty-year old woman has an account of $34,400, while a 65-year-old woman has an account of −$101,400, both considerably below those of their male counterparts.

Comparing the individual columns of Tables 1 and 2, we can see that these results come from a combination of women's lower tax payments and higher transfer receipts. The lower tax payments are due in large part to women's lower projected labor force earnings, which in turn reduce their relative burdens of labor income taxes and corporate income taxes (the latter due to our assumption about the incidence of such taxes being on labor). The higher transfer payments come in part from the fact that social welfare benefits during child-raising

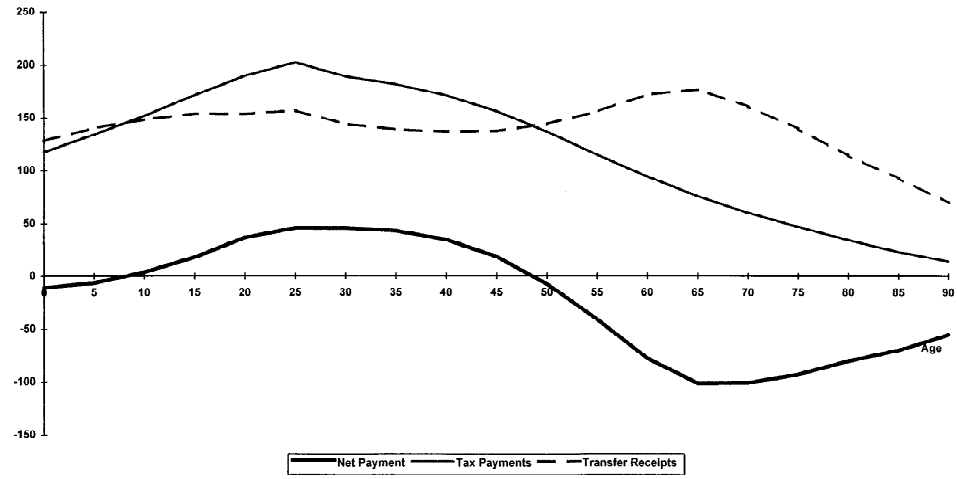

Figure 2. Generational Accounts: Females.

years go primarily to women, but even more from women's greater share of superannuation benefits and health benefits in old age, a result due to a greater female life expectancy.

Tables 1 and 2 also permit a number of other interesting observations regarding the New Zealand fiscal system. One is the importance of indirect taxes. For newborn males, over one-third of all lifetime taxes take the form of indirect taxes (GST plus specific excise taxes); for females, this share is nearly one-half. On the receipts side, the largest program for both men and women is education. While, in absolute terms, pension benefits are larger, they occur much later in life and hence have a smaller present value than education benefits.

Sensitivity Analysis

How sensitive are these base case results to plausible variations in economic assumptions? To find out, we first consider the impact of variations in assumed rates of discount and productivity growth. We then evaluate the importance of some of our incidence assumptions.

Table 3 presents nine sets of calculations, corresponding to three real, before-tax interest rates (3, 5 and 7 percent) and three rates of multifactor productivity growth (1.00, 1.50 and 2.00 percent). The center column corresponds to our base-case assumptions of a 5 percent rate of interest and a 1.50 percent rate of productivity growth. For each discount rate-productivity growth rate combination, we present the generational accounts for newborn males and females, the corresponding accounts for future generations of males and females, and the percentage difference between current newborns and future generations.[11]

As we move from left to right in the table, we observe that, for newborn men, a rising interest rate uniformly lowers the generational account. For women, though, the genera-

Table 3. Sensitivity analysis.

Interest Rate:	3.00	3.00	3.00	5.00	**5.00**	5.00	7.00	7.00	7.00
Productivity Growth Rate:	1.00	1.50	2.00	1.00	**1.50**	2.00	1.00	1.50	2.00
Generational Account for:									
Males:									
Current	119.5	147.3	169.9	47.5	**61.6**	73.8	14.0	20.8	26.7
Future	102.6	131.8	145.2	34.5	**52.5**	68.2	NC	21.0	28.5
Females:									
Current	−12.4	−17.7	−27.6	−11.7	**−10.7**	−10.6	−14.7	−13.8	−13.0
Future	−10.6	−58.7	−23.6	−8.5	**−9.1**	−9.8	NC	−14.0	−13.8
Percentage difference:	−14.2	−15.8	−14.5	−27.4	**−14.7**	−7.6	NC	1.3	6.5

NC - Not calculated (see text for discussion)

tional account is higher (less negative) for a discount rate of 5 percent than for either a 3 or 7 percent discount rate, regardless of the assumed growth rate. Hence, the relationship between the net-payment burden and the rate of interest may not be monotonic. The intuition for this result is as follows. For women and men alike, annual net tax payments are positive during middle age and negative during old age. Hence, as the discount rate rises, there are offsetting effects on the generational account, as the present values of both middle-age net taxes and old-age net transfers fall in absolute value. However, due to the compounding of the discount factor, the present value of old age net transfers falls faster. For men, transfers are sufficiently small relative to taxes that the reduction in taxes always dominates the calculation. For women, transfers are relatively larger, and the effect of the discount rate change on transfers dominates at low discount rates, raising (making less negative) the generational account. However, at higher discount rates, the relative present value of transfers is less important and the effect on taxes comes to dominate.

Changes in the assumed rate of productivity growth raise projected levels of both taxes (which depend directly on the level of economic activity) and transfers (through indexing arrangements). This raises the generational accounts of men, as their tax payments exceed their transfer receipts by so much, to begin with. For women, the effects roughly offset, with the impact depending on the discount rate following the same intuition as above. At a low discount rate, the growth of the net transfers received in old age dominates. At higher discount rates, the growth of net taxes paid in middle age dominates.

We turn finally to the effects of change in r and g on the percentage difference betwen the accounts of newborn and future generations. Given the interaction of the complex effects just discussed, there is no general pattern observed. For the base case productivity growth rate of 1.5 percent, a reduction in the discount rate from 5 percent makes the imbalance slightly more negative, and an increase in the discount rate makes the imbalance slightly positive. However, at a higher rate of growth, the imbalance grows more positive with an

Table 4. Sensitivity analysis.

		Incidence Assumptions (males)		
age in 1993	base case	corporate tax on capital	education in gov. consumption	social welfare bens. to children
0	61.6	43.0	106.5	49.3
5	79.3	57.6	127.5	71.5
10	104.0	78.8	144.6	100.9
15	134.9	105.8	164.4	135.4
20	169.0	137.5	184.6	171.1
25	195.6	165.7	205.1	197.9
30	187.1	166.1	193.8	189.0
35	174.1	164.5	179.0	175.6
40	147.3	151.9	150.7	148.4
45	109.1	129.4	111.2	109.9
50	67.4	103.1	68.3	67.9
55	26.1	74.1	26.1	26.4
60	−13.2	41.9	−13.2	−13.1
65	−57.2	−0.1	−57.2	−57.2
70	−62.5	−9.8	−62.5	−62.5
75	−60.8	−17.0	−60.8	−60.8
80	−54.6	−21.4	−54.6	−54.6
85	−52.2	−30.5	−52.2	−52.2
90	−44.8	−34.2	−44.8	−44.8
future gens.	52.5	30.7	100.5	39.2
percentage difference	−14.7	−28.7	−5.6	−20.5

increase *or* a reduction in the discount rate. At the base discount rate of 5 percent, raising the rate of growth reduces the relative burden on future generations; but this result does not hold at a 3 percent discount rate.[12] Thus, the exact difference is quite sensitive to the values of r and g used in the calculations, and it is possible that the imbalance is slightly positive (as at a discount rate of 7 percent and a growth rate of 2 percent). But the basic message doesn't change. Under an the base case assumptions of annual budget balance, policy is either roughly in balance, or else on a path that will permit a small percentage reduction in the burdens on future generations.

Next, we turn to a consideration of alternative incidence assumptions, with the results given in Table 4 (men) and Table 5 (women). Each table provides the results of four simulations, all based on the intermediate discount rate/growth rate assumption ($r = 5.0$, $g = .015$) the first of which is simply the base case analyzed in Tables 1 and 2.

As discussed above, we have assumed in the base case simulations that the corporate income tax is borne by labor, in proportion to labor income. This assumption is consistent with the view of New Zealand as a small open economy. However, it differs from the assumptions made in the past for other countries, notably the United States, for which corporate taxes have generally been attributed to owners of capital. Thus, it is important

Table 5. Sensitivity analysis.

	Incidence Assumptions (females)			
age in 1993	base case	corporate tax on capital	education in gov. consumption	social welfare bens. to children
0	−10.7	−17.3	34.0	−13.4
5	−6.3	−13.9	41.8	−2.7
10	3.8	−4.8	44.8	14.4
15	17.7	8.1	48.1	34.5
20	36.4	27.6	53.1	56.8
25	45.6	41.2	57	64.2
30	45.3	47.5	54.2	59.4
35	42.8	53.2	50.2	52.2
40	34.4	54.8	40.0	39.5
45	18.3	49.8	21.7	21.3
50	−7.6	35.0	−6.2	−5.8
55	−40.9	10.3	−40.9	−39.8
60	−78.0	−23.4	−78.0	−77.7
65	−101.4	−49.5	−101.4	−101.4
70	−100.7	−56.6	−100.7	−100.7
75	−92.9	−60.0	−92.9	−92.9
80	−80.1	−59.4	−80.1	−80.1
85	−69.9	−60.5	−69.9	−69.9
90	−55.4	−52.6	−55.4	−55.4
future gens.	−9.1	−12.3	32.1	−10.7

to know how much the results for New Zealand depend on this difference in assumption, rather than differences in underlying fiscal structure.

The second simulation presented in Tables 4 and 5 allocates corporate income taxes according to capital, rather than labor, income. As one would expect, the effect of this change in assumptions shifts a part of each year's tax burden from the young to the old. This has two effects on generational burdens. The first is to shift more of the tax burden on current generations from the young to the old. The second is to shift some of the burden from future generations onto current generations, lowering the net tax burden on future generations significantly. The net result of these two changes is to widen the relative and absolute gap between current newborns and future generations, even though current newborns are better off than under the base case assumptions. Thus, the small open economy assumptions we have used in the base case actually work against our generally optimistic finding about the relative burdens on young and future generations.

A second difference between the base case assumptions and those we have used in the past relates to educational expenditures. Here, we have allocated the benefits of these expenditures to individual generations.[13] In some other work, we have simply lumped these expenditures in with other government purchases, not allocating them as negative components of the generational accounts. Leaving educational expenditures out of the generational account calculations clearly would raise the level of the accounts, as the final columns in Tables 4 and 5 show. The accounts rise the most for the young and future

generations who will benefit from educational spending. Thus, this alterntative assumption changes the age profile of generational accounts for existing generations. However, it has relatively little impact on the absolute size of the imbalance between current newborns and future generations.

Finally, there are instances in which the generational pattern of benefit receipt is unclear, perhaps most notably in the case of Domestic Purposes Benefits (DPBs). In our base case, we allocate these to adult recipients. As an alternative, one can imagine these benefits as going directly to children. Doing this (see the Data Appendix for more discussion), we obtain the results presented in the final columns of Tables 4 and 5. As expected, this change raises the generational accounts of adults, particularly women, and lowers the accounts of young children and future generations. However, again, there is little change in the absolute gap between current newborns and future generations.

Thus, neither changes in discount and growth rates nor alternative incidence assumptions alter the qualitative picture offered by our base case results.

Generational Balance Under Alternative Policies

A fundamental challenge in the computation of generational accounts is the need for a complete specification of current fiscal policy, including the path of policy variables into the future. Without this specification, we cannot evaluate existing policy. But there are many plausible interpretations of what the term "current policy" means. Our base case assumptions are that income taxes will be adjusted up or down in each future year as is necessary to maintain annual budget balance. This requires a reduction in income tax rates from their present levels in the short run. Were no such tax cut introduced, the generational imbalance in favor of future generations would be enormous. Under our basic interest rate and growth rate assumptions, for example, the burden on current newborn males (females) would rise from \$61,600 to \$82,100 (−\$10,700 to \$1,900), with the required burden on future generations going from \$52,500 to −\$99,100 (−\$9,100 to −\$2,200).

In this section, we consider the impact of several more reasonable alternative policies on the conlcusion we have reached thus far about generational burdens and fiscal balance. The generational accounts for each of these alternative policies are presented in Tables 6 (males) and 7 (females), with the base case simulations repeated for the sake of comparison in the first column of each table. All simulations are based on a 5 percent discount rate and a 1.5 percent productivity growth rate.

The first alternative simulation presented in the tables assumes a budget surplus equal to 1 percent of GDP, rather than the base case assumption of a zero surplus, with income taxes again adjusted to accomplish this target each year. Having a surplus requires higher income taxes in the short run than under the base (although still lower than those implied by recent tax rates) which raises the generational accounts of most generations. Those below age 10 actually experience a slight reduction in their generational accounts, as the accumulation of surpluses eventually reduces debt service by more than 1 percent of GDP, allowing income tax rates to drop *below* their levels in the base case simulation. However, the accumulating surpluses reduce the burdens on future generations by substantially more, widening the gap between current and future generations.

Table 6. Alternative fiscal paths (males).

age in 1993	base case	surplus/GDP ratio = 1%	tax/GDP ratio = 30%	general tax cuts	higher ed. & health	'91 benefit levels
0	61.6	60.6	54.7	59.3	61.3	62.0
5	79.3	78.9	75.4	78.1	82.7	79.8
10	104.0	104.6	104.4	104.7	112.4	104.7
15	134.9	136.6	140.1	138.0	148.4	135.7
20	169.0	171.6	178.3	173.9	185.0	170.3
25	195.6	199.1	208.6	202.0	212.6	197.5
30	187.1	190.8	200.9	193.6	201.9	189.2
35	174.1	177.8	188.1	180.5	186.4	176.1
40	147.3	150.8	160.4	153.0	156.4	149.0
45	109.1	112.1	120.5	114.0	115.0	110.3
50	67.4	69.9	76.9	71.5	70.1	68.3
55	26.1	28.1	34.0	29.9	26.0	27.2
60	−13.2	−11.5	−6.8	−9.4	−15.6	−11.9
65	−57.2	−55.9	−52.2	−53.9	−60.5	−56.0
70	−62.5	−61.5	−58.6	−59.8	−66.2	−61.6
75	−60.8	−60.1	−58.0	−58.9	−64.1	−60.2
80	−54.6	−54.2	−52.8	−53.3	−57.4	−54.2
85	−52.2	−51.9	−51.2	−51.4	−54.1	−51.9
90	−44.8	−44.7	−44.3	−44.4	−45.9	−44.7
future gens.	52.5	45.1	30.8	51.0	44.8	52.4
percentage difference	−14.7	−25.6	−43.7	−14.1	−27.0	−15.5

A similar outcome occurs under the second alternative simulations, under which the tax-GDP ratio is held constant at 30 percent and income taxes adjusted annually to ensure this. This scenario involves higher taxes than the base case in the short run, and hence positive budget surpluses, even though the tax-GDP ratio actually has exceeded 30 percent in recent years. As a result, the generational accounts of older generations are higher. However, the accounts for those under age 10 (for men; 15 for women) are, again, lower than in the base case simulation. This is because the base case assumption of zero surplus requires a tax-GDP ratio below 30 percent in the short run, but higher than 30 percent in the future. Stabilizing the tax rate at 30 percent, therefore, helps younger generations whose tax payments occur primarily in the future. While this scenario does not involve raising taxes in every year, taxes remain at levels above those in the base case for a long enough period that existing generations as a whole face a higher tax burden. Thus, the residual burden on future generations is substantially below that of the base case. It is also much lower than that imposed by the 1-percent-surplus policy.

The third alternative policy imposes the same balanced-annual-budget assumption as the base case simulation, but adjust all taxes proportionally, rather than just income taxes, to achieve this result. The result is that burdens on older generations are a bit higher, and those on younger generations a bit lower, than under the base case. To understand this result, recall that the condition of zero annual surplus requires that taxes be reduced in the

Table 7. Alternative fiscal paths (females).

age in 1993	base case	surplus/GDP ratio = 1%	tax/GDP ratio = 30%	general tax cuts	higher ed. & health	'91 benefit levels
0	−10.7	−11.3	−15.7	−15.0	−18.4	−12.1
5	−6.3	−6.5	−9.5	−10.2	−11.7	−8.0
10	3.8	4.3	3.3	0.9	1.9	1.8
15	17.7	18.9	20.0	16.0	19.6	15.4
20	36.4	37.9	40.4	35.1	39.5	34.4
25	45.6	47.4	51.0	44.7	48.9	44.2
30	45.3	47.1	51.2	44.9	48.2	44.6
35	42.8	44.8	49.3	43.0	45.3	42.7
40	34.4	36.3	41.1	35.2	36.2	34.8
45	18.3	20.1	24.9	19.7	19.0	19.0
50	−7.6	−6.0	−1.4	−5.6	−8.3	−6.8
55	−40.9	−39.3	−34.6	−37.8	−42.9	−39.9
60	−78.0	−76.4	−71.7	−73.8	−81.2	−76.5
65	−101.4	−100.0	−95.8	−97.3	−105.2	−100.1
70	−100.7	−99.5	−96.0	−97.2	−104.8	−99.6
75	−92.9	−92.0	−89.3	−90.1	−96.4	−92.1
80	−80.1	−79.4	−77.5	−78.1	−82.8	−79.5
85	−69.9	−69.6	−68.4	−68.8	−71.7	−69.6
90	−55.4	−55.2	−54.6	−54.9	−56.4	−55.2
future gens.	−9.1	−8.4	−8.9	−12.9	−13.4	−10.2

short run and raised in the longer run. A short-run reduction in consumption taxes helps the youngest generations, who will not be earning income for several years, more than a reduction in income taxes would.

The remaining two simulations involve alternative assumptions about the level of benefits. In each case benefits are assumed to be higher than for the base case simulation, although we maintain the assumption of annual budget balance by adjusting income taxes. The first alternative benefit simulation simply raises education and health benefits by 25 percent above their base case levels. The final simulation restores social welfare benefits to their higher, 1991 levels. Both sets of assumptions require a substantial increase in income taxes, but they have different generational effects.

The increase in health and education benefits helps both the old and the very young, at the expense of the nonelderly adult population, reflecting the different populations that benefit from education and health spending and that pay income taxes. The gains are more pronounced for women, given their greater ratio of benefits to taxes. On the other hand, the general rise in social welfare spending has more neutral effects across the population, because such benefits are less concentrated among the young and elderly. Similarly, while the first of these benefit simulations also helps future generations (who are hit first with higher education benefits), the second has very little impact on the welfare of future generations. As these two simulations illustrate, it is possible to imagine a wide variety of different "balanced budget" policies that have rather different generational effects. The same holds for a comparison of the base case simulation with that in which general taxes were adjusted.

Achieving Generational Balance

What changes in taxes and transfers would be required in order to bring the generational accounts of newborn and future New Zealand generations into fiscal balance? By fiscal balance, we mean that the ratio of the net payment burden on future generations to that on newborns should be no higher than the rate of multi-factor productivity growth. Most of the simulations performed for our sensitivity analysis in Table 3, and all of the plausible scenarios presented in Tables 6 and 7, indicate that future generations will bear a somewhat lower burden than current generations. The implication is that imposing generational balance may require a shift in some of the fiscal burden from current to future generations, and is unlikely to require a shift in the other direction.

There are, of course, many different policies that could accomplish generational balance. Starting from the base case assumptions, we find that each of the following policies would succeed in doing so:

– a reduction of 1.4 percent in all income taxes;

– a reduction of individual income taxes by 2.2 percent;

– a reduction of GST by 2.7 percent;

– a reduction of GST and excise taxes by 2.1 percent;

– an increase in supreannuation benefits of 4.0 percent.

Comparing New Zealand and U.S. Generational Accounts

How do our findings for New Zealand compare to those for the U.S.? Table 8 presents comparative generational accounts for the two countries, for the base case interest and growth rate assumptions used for recent U.S. calculations (Auerbach, Gokhale, and Kotlikoff 1995), 6 percent and 1.2 percent, respectively.[14] The accounts are presented in terms of each country's own currency units. (For purposes of comparison, one should keep in mind that the New Zealand dollar is currently worth roughly 2/3 of a U.S. dollar.)

The New Zealand accounts are those given above for the base case in Tables 1 and 2, except that educational spending is included in other government spending, rather than treated as a transfer payment, and corporate taxes are allocated to capital owners. We treat educational spending and corporate taxes in this manner for the sake of comparison. Due to data limitations, the education component of government purchases has not been allocated by age and sex for the U.S.; the larger size of its economy has led to an alternative incidence assumption for corporate taxes. We have already discussed the impact of these assumptions above. It is also worth noting that the U.S. accounts incorporate the assumption that health care spending on the aged will grow rapidly for the next few decades, in contrast to the projections used in constructing the accounts for New Zealand.

In addition to the overall accounts for each generation, the table presents separate totals for payments and receipts. Despite the various changes in assumptions in relation to the base case, the overall picture for New Zealand is quite similar to that projected by the

Table 8. The composition of generational accounts ($r = .06$, $g = .012$) New Zealand and the United States.

(for alternative education and corporate tax assumptions)
Present Values of Receipts and Payments
(thousands of dollars)

	United States						New Zealand					
	males			females			males			females		
Generation's Age in 1993	total	tax	transfer	total	tax	transfer	total	tax	transfer	total	tax	transfer
0	87.2	122.3	35.1	53.2	89.6	36.4	55.2	88.4	33.2	18.4	70.3	51.9
5	107.0	148.9	41.9	64.3	108.2	43.9	72.5	105.6	33.1	25.6	84.0	58.4
10	130.3	180.2	49.9	77.2	130.1	52.9	86.4	125.6	39.2	28.1	99.6	71.5
15	159.6	218.4	58.8	92.9	155.9	63.0	103.4	150.0	46.6	30.9	118.0	87.1
20	188.7	255.6	66.9	109.2	180.7	71.5	122.9	177.4	54.5	37.3	137.5	100.2
25	199.9	272.4	72.5	114.7	191.0	76.3	146.6	208.2	61.6	46.4	153.9	107.5
30	195.7	273.4	77.7	109.2	190.3	81.1	149.8	211.2	61.4	52.1	151.8	99.7
35	182.7	268.6	85.9	97.3	187.1	89.8	151.1	215.2	64.1	58.6	155.7	97.1
40	158.6	255.9	97.3	76.1	178.2	102.1	142.2	211.8	69.6	61.1	158.0	96.9
45	119.7	230.9	111.2	42.6	161.1	118.5	123.0	200.6	77.6	57.1	157.1	100.0
50	68.0	196.6	128.6	−0.3	138.1	138.4	99.8	185.3	85.5	43.8	152.6	108.8
55	7.1	155.4	148.3	−49.9	112.3	162.2	73.6	166.8	93.2	20.6	143.6	123.0
60	−57.0	113.3	170.3	−101.0	87.3	188.3	44.2	146.2	102.0	−11.9	130.8	142.7
65	−105.1	79.8	184.9	−139.1	65.6	204.7	2.9	123.4	120.5	−38.8	114.1	152.9
70	−108.3	58.3	166.6	−140.4	47.5	187.9	−7.0	102.9	109.9	−47.5	95.0	142.5
75	−100.8	40.0	140.8	−131.3	30.7	162.0	−14.4	84.7	99.1	−52.6	74.3	126.9
80	−86.3	23.7	110.0	−111.7	18.0	129.7	−19.0	64.9	83.9	−53.8	52.1	105.9
85	−76.2	9.3	85.5	−88.8	9.8	98.6	−28.6	44.0	72.6	−56.7	31.2	87.9
90	−58.9	7.4	66.3	−64.8	7.5	72.3	−32.9	24.3	57.2	−50.5	16.4	66.9
future gens.	215.5			131.5			51.3			17.1		
percentage difference	147.1						−7.1					

base case simulations: a small imbalance in favor of future generations. By comparison, the U.S. generational accounts indicate an enormous generational imbalance, with future generations projected to bear nearly two and one half times the lifetime tax burden (adjusting for income growth) as current newborns. Another difference between the two countries is the higher relative burden on older generations in New Zealand.

Some insight into the countries' underlying differences may be gained by comparing the age profiles of transfer components of the accounts. As age increases, the remaining present value of transfers rises much more rapidly in the United States than in New Zealand. Between age 0 and age 60, for example, the value of remaining lifetime transfers roughly triples for New Zealand males, while increasing nearly five-fold for U.S. males. This indicates that transfer payments are more heavily concentrated among the elderly in the United States than they are in New Zealand. A shift from the New Zealand pattern of transfers to the U.S. pattern, holding the level of annual transfer payments fixed, would shift the burden from old to young generations and from current to future generations.

Results for Other OECD Countries

How do the results for New Zealand and the United States compare to those for other countries? A recent study (OECD 1995) has provided generational accounts (again, taking account of all levels of government) for selected OECD countries for a variety of assumed growth and interest rates, including the combination used here in our base case ($r = .05$, $g = .015$), and the alternative assumptions about corporate tax incidence and education used in Table 8. The results for this set of assumptions are presented in Table 9, along with those for New Zealand under the same assumptions.[15] (The two cases for Italy correspond to different fertility projections, with Case A incorporating a sharper aging and population decline.) In keeping with the presentation by the OECD, all measures (including those for New Zealand) are expressed in U.S. dollars.

As the table shows, the imbalances present in the United States are by no means an extreme case.[16] Even under optimistic fertility assumptions, burdens facing future generations in Italy will be quite extreme, because of the country's substantial unfunded transfer programs. The relatively favorable position of future generations in New Zealand does not reflect higher net burden on current newborns. Indeed, in New Zealand, current newborns face net burdens lower than those in other countries—comparable to those in Italy. The key difference is that New Zealand has a much smaller overhang of existing liabilities than do other countries, in the form of both explicit government debt and commitments to existing middle-aged and older generations. Even the very high burdens facing current newborns in Germany and Sweden are not sufficient to offset the burdens of these liabilities. With very low birth rates, these countries still face fiscal imbalances.

VI. Summary and Conclusion

This paper has used generational accounting, a new tool for fiscal analysis and planning, to study New Zealand's long-term fiscal position. Generational accounting emphasizes the

Table 9. Generational accounts: A comparison of OECD countries ($r = .05$, $g = .015$; for alternative education and corporate tax assumptions) (in thousands of U.S. dollars).

Country	United States	Germany	Italy (A)	Italy (B)	Norway	Sweden	New Zealand*
Generational Account for:							
Males:							
Current	121	197	65	72	110	156	59
Future	243	250	354	213	208	204	55
Females:							
Current	72	90	17	24	37	81	18
Future	143	114	93	70	69	107	17
Percentage difference:	100	27	428	185	87	31	−7

Source (except New Zealand): OECD 1995
*New Zealand values converted to US dollars at .67 USD/NZD

importance of implicit as well as explicit government commitments. A key question for New Zealand is whether the country's apparent fiscal health masks large implicit burdens not captured in official debt and deficit measures.

We have found that behind New Zealand's projected budget surpluses, there is indeed a sound fiscal picture. Even under the base case scenario of annual budget balance for the foreseeable horizon, which entails substantial short-run tax reductions, the burden on future generations (relative to income) is projected to fall slightly below that on current newborns. This striking result is not materially changed by the adoption of alternative assumptions about economic or policy parameters. Without taking account of the benefits of direct government purchases and, indeed, other economic differences across generations, the generational accounts cannot provide a complete picture of their comparative welfare. However, it is still noteworthy that New Zealand appears to have avoided the large fiscal imbalances plaguing the United States and other OECD countries not by placing large tax burdens on young current generations, but by limiting the size of its commitments. Its fiscal health, therefore, is contingent on the maintenance of such spending discipline.

Data Appendix

This appendix provides additional detail on the construction of the generational accounts for New Zealand.

Population projections

All population projections are based on Statistics New Zealand's series 8, which assumes medium fertility (1.95 children per woman), medium increase in life expectancy (from 76 in

1991, the base year, to 80 in 2031 with slower increases to 2200) and 5,000 net immigration (roughly equal to the average over the last forty years).

Fiscal projections

All fiscal projections are from Treasury's long-term fiscal model of the New Zealand Budget, augmented with additional projections to account for the relatively small taxes and spending of local authorities. In the aggregate, local authorities' taxes and spending amount to less than ten percent of the national budget. In New Zealand, education, police, and fire services are funded at the national level, while local authorities are primarily involved in maintaining local infrastructure.

The New Zealand Budget is prepared on a GAAP basis. In order to make the data consistent with the allocation profiles, some netting adjustments were made. These adjustments were fiscally neutral and did not affect the GAAP fiscal balance. All projections were converted to constant 1992/93 dollars.

Nineteen different types of taxes and transfers were projected, although the tables in the paper collapse some of the smaller types together.

Individual income taxes include taxes on social welfare benefits. These taxes and benefits were removed from both taxes and benefits in order to square with the allocation profiles, which were prepared on a net basis. The remaining taxes were divided into wage and non-wage parts. All source deductions less refunds were assumed to be wage taxes, while all "other persons" taxes and fringe benefit taxes were assumed to be non-wage taxes.

Company income taxes were taken directly from the budget projections without further adjustment.

Projections of withholding taxes (taxes withheld at source on interest and dividend earnings) were used without adjustment and were combined with nonwage income taxes for display purposes.

New Zealand's goods and services tax is levied on nearly every sale of goods and services in New Zealand. The only exceptions are financial services, which are difficult to tax because they can be hidden in interest flows, and rental payments, which are exempt in order to maintain a parity in tax treatment with "imputed" rent on owner-occupied premises. GST is levied on governmental outputs, which was netted off in order to treat GST on the same net basis as other taxes.

Excise taxes are levied on tobacco, alcohol, and motor vehicle fuels. Excise taxes are projected in a single aggregate, but were prorated into separate components for the purposes of the generational accounting calculations. Local taxes on motor fuels were added to the fuel component.

Other indirect taxes include customs duties, road user charges, motor vehicle fees, stamp duties, gaming duties, and energy resource levies. These taxes were divided among the other taxes, for which separate allocation profiles had been developed.

Property taxes (rates) are the largest category of local taxes. These taxes are projected as the balancing item in the local authority accounts. The local authorities are assumed to balance their books over the long run. Most local spending (except net interest) is assumed to grow in line with GDP. Other local taxes are also assumed to grow with GDP.

Profits of State Owned Enterprises, Crown Enterprises and local authorities were projected to grow with GDP. In the generational account calculations, these profits were offset against the net expenditure aggregate.

New Zealand Superannuation is the largest transfer program in the New Zealand budget. It is a non-contributory scheme, and benefits are the same for all retirees within benefit classes—married with qualified spouse, single living alone, etc. Beneficiaries with outside income pay a 25 percent surcharge on their outside income, up to a ceiling equal to 100 percent of the superannuation benefit.

New Zealand Superannuation, the unemployment benefit, and certain "other benefits" are reported gross of income taxes, including the surcharge in the case of New Zealand Superannuation. These taxes were netted off to maintain consistency with the allocation profiles, which were prepared on a net basis. "Other benefits" include the domestic purposes benefit, which is mainly paid to single parents, the invalids benefit, the sickness benefit, the accommodation supplement and a range of smaller benefit types. Family support, which is paid to working families on low incomes, takes the form of a refundable tax credit.

"Other benefits" were allocated into housing, family support, and "other" for the purposes of the generational accounts calculations.

Health spending includes spending on public hospitals, disability support, public health, and administrative expenses. Administrative expenses were netted out of health spending and included in discretionary spending instead. GST paid on health outputs was netted out of health and GST equally.

Education includes spending for early childhood education, primary education, secondary education, and tertiary education including university education and education at polytechnic institutions. As for health, administrative costs and GST were removed.

Government consumption includes discretionary spending by the national government, administrative expenses from health and education, and most local spending. Grants from the national government to local authorities are netted out to avoid double counting.

Interest paid and received was projected at both the national and local levels, but these projections are not used in the generational accounting calculations. They were important only to the extent that they helped determine the overall revenue needed to balance the budget, as was assumed in the base case.

Net debt, which is equal to gross debt less financial assets, was used as the measure of financial wealth.

Table A1 presents the values in our different tax and transfer categories for the fiscal year 1993/94.

Allocation profiles

Most allocation profiles were derived from the HEIS data for the year 1992/93. Profiles were derived separately for males and females aged 0–100+ for eight categories of taxes and six categories of spending. The tax categories were individual wage income, individual non-wage income, interest and dividend income, alcohol excise tax, tobacco excise tax, motor fuel excise tax, property tax (rates) and GST.

Table A1. General government taxes and transfers (billions of New Zealand dollars).

	1993/94
Taxes	
Wage income tax	8.1
Non-wage income tax	4.2
Company income tax	3.0
Excise and other taxes[1]	2.1
GST and other taxes[2]	6.9
Property taxes (rates)	1.7
Transfers	
NZ Superannuation	3.9
Unemployment benefits	1.2
Family and housing benefits	1.2
Health	4.2
Education	3.9
Government wealth	−35.4
Addendum:	
Nominal GDP	81.7

[1]Includes road user charges and motor vehicle fees.
[2]Includes direct taxes not allocated elsewhere.

In general we attributed taxes to the persons who paid the tax. However, in the case of company tax, we assumed that because New Zealand is a small open country with few restrictions on capital transfers, company tax is ultimately borne by labor. Thus, we allocated company tax with the wage income profile in our base case. In an alternative case, in order to use parallel assumptions with other countries, we allocated company tax to the owners of capital, using interest and dividend income as a proxy for capital. We would have used dividend income alone for this purpose, but the HEIS data were too thin at the individual age and sex level to do an adequate allocation.

We also used the HEIS to allocate six types of transfers: New Zealand Superannuation, the unemployment benefit, housing subsidies, family support, Guaranteed Minimum Family Income, and "other benefits". This choice of categories was dictated by the HEIS. A more useful allocation would have included a separate profile for the Domestic Purposes Benefit (DPB). In a separate exercise, we modified the "other benefit" profile using administrative data to analyze the impact of allocating DPB benefits to children rather than adults.

Other profiles were derived for education and health spending from administrative data. Because these benefits are provided in kind, they are not part of the household budgets surveyed by the HEIS. Allocating education benefits to children and young adults, as we did in our base case, reduces the net "taxes less transfers" amount considerably and increases the "tilt " in favor of future generations from 5.6% to 14.7%. However, this is mainly the result of using a smaller denominator in the latter calculation. The difference in dollar terms is much the same.

Acknowledgments

This research was financed by the New Zealand Treasury. The views expressed are those of the authors and do not necessarily reflect positions of the Treasury or the Congressional Budget Office. We are grateful to Jack Mintz and two anonymous referees for comments on an earlier draft.

Notes

1. See Auerbach, Gokhale, and Kotlikoff (1991, 1992a, 1992b, 1994) and Kotlikoff (1992) for further discussion and development of the method of generational accounting.
2. This section provides a brief description of the method of generational accounting. For more detail, see Auerbach, Gokhale, and Kotlikoff (1991).
3. The constraint does not assume that government debt is ever fully paid off, merely that the debt grows less quickly than the rate of discount—that it does not explode. Thus, it is consistent with the long-run existence of government deficits, as long as these deficits are smaller than the amount needed simply to service the level of outstanding debt.
4. Hence, the first element of this summation is $N_{t,t}$, which is the present value of net payments of the generation born in year t; the lst term is $N_{t,t-D}$, the present value of remaining net payments of the oldest generation alive in year t, namely those born in year $t - D$.
5. This accounting for government assets leaves out the value of assets that provide benefits without charge, such as park land, but inclusion of such assets would have no impact on fiscal balance, as it would also involve including in government purchases an offsetting flow of imputed rent on such land.
6. One might also imagine the burden being shifted to the owners of natural resources, but we do not distinguish the age-ownership profiles of natural resources from other assets.
7. The Fiscal Responsibility Act of 1994 requires that "on average, over a reasonable period of time, the total expenses of the Crown do not exceed the total operating revenues."
8. See Auerbach, Gokhale and Kotlikoff (1991) for further discussion on this point.
9. This point is also useful to keep in mind when considering the age pattern of different components of the generational accounts. For example, even though medical expenditures are concentrated in the latter years of life, the present values of health transfers *remaining* eventually decline with age because so few years remain.
10. This percentage is shown only in Table 1, as it is constrained by the calculation to be the same for males and females.
11. We omit the burdens on future generations for the discount rate/growth rate combination (7,1), because our results are not meaningful in this case. The sum of newborn male and female generational accounts (roughly, the sum of 14.0 and −14.7, divided by 2) is negative and very small in absolute value under these assumptions. Thus, the small reduction in the net tax payments that would be required of future generations for intertemporal budget balance would dictate large percentage *increases* in the generational accounts of both men and women.
12. Note that the percentage difference is adjusted for growth, and is calculated as $\{[N_f/((1+g)^*N_n)]-1\}\times 100$, where N_f is the net-payment burden on future generations and N_n is that on the current newborn generation.
13. Note that it does not matter whether these allocated expenditures are thought of as transfer payments or investments in human capital, for in each instance they benefit the recipient.
14. That paper did not present calculations for the base case growth rate/interest rate assumptions used here.
15. The U.S. results here are based on slightly older projections than those presented in Table 8, in addition to using different growth and discount rates.
16. A more recent study, by Oreopoulos and Kotlikoff (1996), finds that Canada faces a percentage gap between newborn and future generations quite similar to those of the U.S., although its assumptions are slightly different than those used for the simulations in Table 9.

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