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Restoring generational balance in Canada

Foreword

For many years, IRPP has expressed its concern that the chronic deficits and the enormous accumulated debt generated by the structural imbalance in Canada's public finances would curtail governments' freedom and compromise the financial security of Canadians. We argued that existing policies were unsustainable in the long term and that corrective measures had to be implemented urgently. All our research pointed to the need for change not only to satisfy financial markets, but also to ensure fairness among generations. It became clear that if Canadians lived beyond their means and accumulated an enormous debt, someone would eventually have to pick up the tab. Hence our decision to assess the potential magnitude of this intergenerational transfer and the implied sacrifice for future generations.

Simply looking at the accumulated annual deficits is not enough. Indeed, certain existing policies that do not have an impact on annual cash deficits may well result in large net losses for future generations. For instance, deficits cannot account for the increased public expenditures that will be required to provide elderly benefits to the baby boomers when they retire. An alternative approach, called generational accounting, is clearly more appropriate. It is forward looking and takes into account both the government borrowing done in the past and the borrowing that would be required in the future should current policies be maintained.

In this publication, two experts use generational accounting to assess the repercussions for future Canadians if our fiscal policy is not altered soon, and the magnitude of the change that would have to occur in order that our fiscal policy be ultimately sustainable. Laurence J. Kotlikoff, a professor of economics at Boston University and an associate of the National Bureau of Economic Research, and Philip Oreopoulos, a graduate student at the University of British Columbia and a former junior analyst at IRPP, conclude that the consequences of trying to maintain the status quo would be severe for Canadians in the future.

Using generational accounting, Oreopoulos and Kotlikoff contend that if the existing fiscal structure remains in place for Canadians alive now, future generations could face net tax payments more than twice the current amount for the government to be able to pay its bills. Such increases would likely prove difficult to impose because of economic and political considerations. The authors also find that the measures announced by the federal government in its 1995 budget will reduce the extra financial burden on future generations only by about one quarter. Greater tax hikes, transfer cuts and/or reductions to government purchases are still required to ensure that future generations are not saddled with very large tax burdens.

Using the 1995 federal budget ratio of seven dollars of spending cuts to one dollar of tax hikes, Oreopoulos and Kotlikoff suggest that one possible way to ensure a sustainable fis-

cal policy would be to permanently reduce government purchases by 17.7 percent, cut all existing transfers by 2.7 percent and raise all tax revenues by 1.4 percent. Provided that future policy decisions are adequately funded, no further corrections would be required by the government to meet both its current and future bills.

However, significant changes to fiscal policy will have to be implemented soon, before the required actions become politically unfeasible. If policies geared to remove the need for future net tax increases are delayed by only five years, the authors estimate the permanent tax revenue increases or spending cuts required would have to be about 20 percent greater than if the changes were introduced now. If the policy changes are delayed by 10 years, the figure increases to 45 percent more.

This ground-breaking study is an important contribution to the debate on public finances in Canada. We all know by now that the current structure of Canada's fiscal policy is unsustainable from an economic standpoint. It is also immoral. We simply cannot continue borrowing against the future of our children. As Oreopoulos and Kotlikoff have demonstrated, the magnitude of change required immediately is significant, but remains possible.

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Introduction

There is mounting concern in Canada that the current state of fiscal policy is unsustainable. The rapid rise in government debt over the last decade and its attendant interest payments is placing strong pressure on all government sectors to curb their spending. The government's finances will be further strained as elderly transfer recipients grow in number relative to taxpaying workers. What will be the consequences to future generations if the government tries to maintain its existing programs and spending? Moreover, just how much will fiscal policy have to change in order for it to be ultimately sustainable?

Generational accounting, developed by Alan J. Auerbach, Jagadeesh Gokhale and Laurence J. Kotlikoff, is a relatively new method that attempts to address these questions.[1] Unlike conventional deficit accounting, generational accounting directly measures the degree to which future generations will face a higher fiscal burden than living generations. The technique was originally developed for the United States, but has since been applied to Italy, Norway, Germany, Sweden and New Zealand.[2] This paper introduces generational accounting for Canada. It assesses both the repercussions for future Canadians if government policy is not altered soon and the magnitude of change required to achieve generational balance.[3]

Section I makes the case for generational accounting, explaining why conventional deficit measures provide little or no guide to the true stance of fiscal policy. Section II briefly describes how the accounts are constructed and includes a simple numerical example. Section III presents the Canadian accounts, including a look at what impact the proposals in the 1995 federal budget will have on living and future generations. This section also compares the Canadian and US generational accounts. Finally, section IV summarizes and concludes the paper.

I. The Purpose Behind Generational Accounting

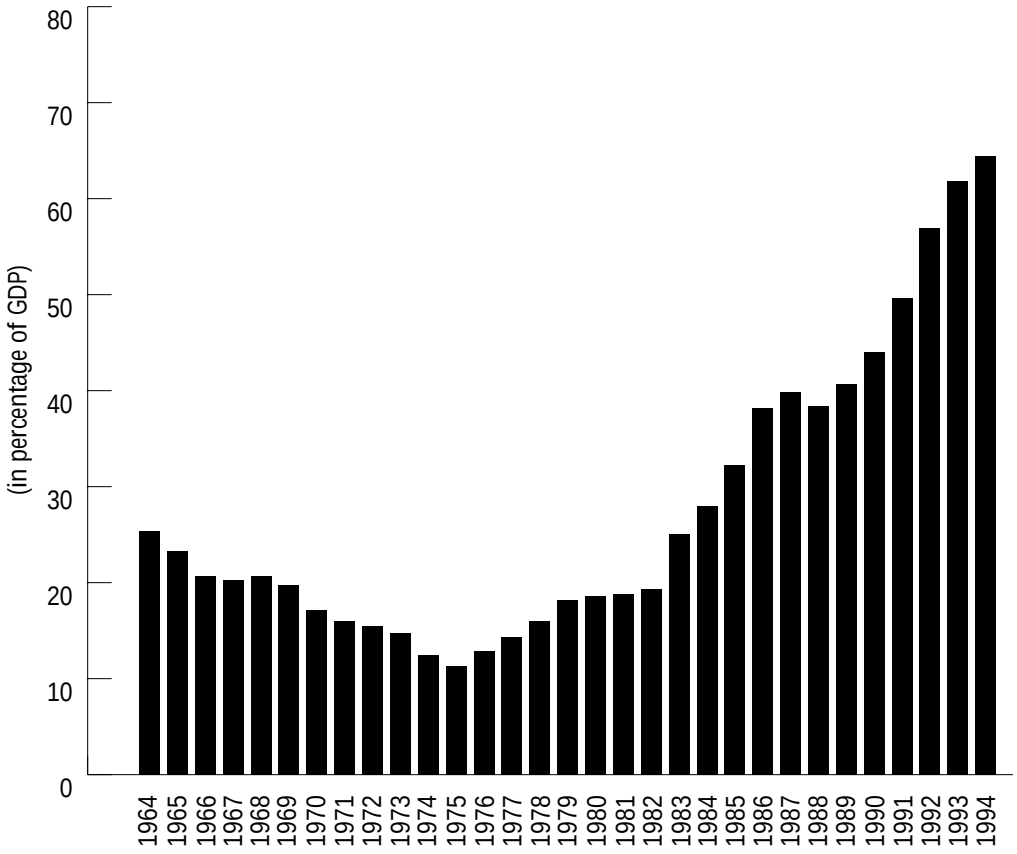
Before beginning a discussion on generational accounting, it is worthwhile reviewing why the growth in government debt has caused such concern. Chart 1 outlines how the net debt for the consolidated public sector has risen over the last two decades in proportion to the growth of the Canadian economy. As shown, net debt-to-GDP, measured on a national accounts basis, has increased significantly since the early 1980s.[4] During the sixties and seventies, this ratio was relatively stable and had even declined for some years. Total government net debt-to-GDP bottomed out in 1975, at 11.3 percent. However, as revenue growth began to slacken and expenditure growth increased throughout the next two decades, the government responded

Chart 1

Net Debt-to-GDP in Canada

(measured on a National Accounts Basis)

1964-1994



Sources: Statistics Canada, *National Income and Expenditure Accounts: Annual Estimates, 1985-1994*, 1995, catalogue no. 13-201; *Balance Sheet Accounts: Annual Estimates, 1995-1994*, 1995, catalogue no. 13-213.

by borrowing. By the end of 1994, net debt-to-GDP had climbed to almost 65 percent.

There are two main problems associated with such rapid rises in a country's government sector debt. First, when the government borrows to finance expenditures or tax cuts, it reduces the payments required by current generations. When, in the future, the time comes to repay the interest from this borrowing, older generations that may have received benefits from such financing will not be around. The tax burden that would have been placed on these people to finance the government's expenditures will instead be passed directly to generations born in the future. In other words, by creating legal claims to uncertain future economic output, government borrowing transfers resources from one generation to another. Thus, debt can be viewed simply as postponed tax liabilities, where these liabilities are redistributed across generations.

The intergenerational transfer effects from government deficits would not be as bad were it true that the money collected was invested for the future so that it could eventually offset the higher taxes that those later on will pay. It is more likely, however, that most of the government's spending can be attributed to direct consumption, rather than capital accumulation. In Canada, the ratio of consolidated government investment in fixed capital assets to the rate of borrowing has steadily *declined* over the last two decades. In the middle of the 1970s, investment in fixed capital was about one and a half times larger than the size of the government's deficit, seven percent of total government expenditures. By the early 1990s, investment had declined to four percent of expenditures and was only a third of the amount borrowed by the government.[5]

Repeatedly shifting fiscal burdens from current to future generations leads us to the second reason for rising government debt often being cited as a worrisome concern. Financing programs with young and future generations' resources enables older generations to spend more than would have been possible had they to pay for these programs themselves. By relieving tax pressure from current generations, the government allows these people to consume more, with the consequence that the nation as a whole saves less. Lower national savings will in turn lead to reductions in either domestic investment or net exports. In both cases, national income will decline. Lower investment will reduce a country's capital stock, upon which technological and economic growth are based, while lower net exports will reduce the proportion of national output that, ultimately, is paid to domestic residents.[6]

Given the current state of Canadian policy and the political difficulties in initiating extensive change, the alarming trend portrayed by chart 1 is likely to continue. While both federal and provincial governments have addressed their rising indebtedness, mostly by reducing expenditures in the last few years, these policy actions have probably not been large enough to stabilize the fiscal situation. Furthermore, as the baby boomers begin to retire over the next 35 years, the costs of maintaining established social programs that are aimed mainly toward the elderly will rise, putting further strain on the government's finances.

Consider for example the treatment of health expenditures and old age security payments in Canada — where such payments are considered transfers at the time of distribution. At the moment, these expenditures are seemingly under control and are financed mainly through current taxation. However, if the proportion of elderly in comparison to the proportion of workers rises for these types of pay-as-you-go programs, a greater strain is placed on the gov-

ernment to obtain the required funds. This will indeed be the case for Canada. Aging baby boomers, coupled with declining fertility rates and longer life expectancies are dramatically transforming the country's demographic structure. Today, the number of senior citizens in Canada is about 20 percent of the total working-age population. By 2030, the number is expected to be almost 40 percent.[7] As the ratio between those who are retired and those who are working (the old-age dependency ratio) rises, the proportionately smaller labour force who must finance programs such as health care and old age security will have to pay significantly more.

Deficit measures do not integrate the long-term implications of existing fiscal policy. They cannot track how maintaining the same course will affect particular generations, nor can they account for changing demographic structure. Without these abilities, it is impossible to use deficits to identify the long-term financial burden that fiscal policy distributes across individuals. This is why generational accounting has been developed; so that the degree to which generations are hindered or aided by government policy can be measured directly. Using a dynamic approach, generational accounts look not only at the effects of government borrowing in the past, but also at a country's ability to maintain current fiscal policy into the future, given the changing population structure. In other words, they assess the ultimate consequences of both the past and expected growth of total government sector debt on living and future generations. They can also indicate what course of action must be taken in order to make a country's fiscal policy sustainable; something which year-by-year deficit measures simply cannot do.

II. Generational Accounting Methodology

Generational Accounts Defined

Generational accounts are the amounts of taxes paid, net of transfers, by an average member in a generation for the remaining portion of his or her life (the term *generation* is defined for our purposes as gender-specific members born in a particular year). These values are forward-looking in that comparisons can be made only between the accounts for newborns and for future generations, *rather than between specific living generations.* However, policy experiments that show how specific living and future individuals will be affected by changes to fiscal policy can be compared.

Generational accounts are measured in present value, a concept economists use when having to add together dollar amounts from different times. In the process of summing up tax payments over a generation's lifetime, we must take into account that a dollar today does not have the same value as a dollar tomorrow. Why? Since money can presently be invested to generate a rate of return in the future, its worth is greater to someone today than it is tomorrow. A person who had a choice of receiving $100 dollars right now or $100 a year later would naturally prefer to accept the money immediately. Even if he or she did not need the money right away, the amount could be invested to be worth even more in the future. Thus, money received later is worth less than money received today.

When calculating generational accounts, we have to add all the remaining amounts of taxes and transfers that generations

will pay now and in the future. But, as we have just seen, these receipts and expenditures are worth less to generations the longer they have to wait to pay or receive them. To calculate what future taxes and transfers are worth to generations in the present, we must reduce these amounts so that if they were invested today they would, through compound interest, be worth the original amount by the time they are actually distributed. This process of reducing the future value of money to its present value is known as *discounting*.

By discounting the value of tax payments that an average member in a generation will pay to the government for the remaining period of his or her lifetime, we can answer the question: what tax amount would a person pay the government today if afterwards s/he would never have to pay again? Similarly, the present value of total future transfers to individuals answers: how much money could the government give to a person today without having to give him or her any more in the future? By subtracting for an average member of a generation the present value of all remaining lifetime taxes from the present value of remaining lifetime transfers, we find his or her generational account. This value answers the question, what amount could a person pay today to the government so that s/he would never have to pay any more taxes or receive any more transfers in the future? We can calculate these values for each generation. It is these amounts which we use to compare intergenerational burdens and assess the level of generational imbalance.

The Government's Intertemporal Budget Constraint

Generational accounting is based on the principle that a government's public policy must be sustainable in the long run (i.e., indefinitely).[8] By sustainable we mean that the government is restricted in the amount it can spend now and in the future by the amount of revenue it can receive. This concept is known in economics as the *government's intertemporal budget constraint*. Simply stated, the constraint means that the government must be able to pay its bills by taxing either living or future generations. By discounting these bills and taxes to present value, we can describe this statement as a simple equation:

The present value of taxes paid by all living and future generations
- The present value of transfers received by all living and future generations
= The present value of government purchases on goods and services
+ Official government net debt as of now

All amounts in this equation are in present value for a particular base period (say for example, at this very moment). The left hand side represents the government's sources of revenue, net of transfers. The right hand side contains the government's bills. In order for the government to pay for its future purchases and cover its net debt, at least some generations will have to cover this cost. The ways in which the net taxes are distributed among the generations will determine the different burdens they will face from fiscal policy. To understand the implications of the above equation, let us separate

the left hand side between living and future generations:

The present value of remaining net tax payments of existing generations
\+ The present value of net tax payments of future generations
= The present value of government purchases on goods and services
\+ Official government net debt as of now

Note that the less existing generations pay in net taxes, the more future generations will have to pay, given that the size of the government's bills stay the same. This is the zero-sum nature of fiscal policy. If any one of these components from the intertemporal budget constraint is altered by a change in public policy, there must always be a corresponding change in at least one of the other components.

It is important to understand that the government's intertemporal budget constraint does not require that the national debt ever be paid off. It does, however, require that the government, through time, meet the interest and principal payments on all outstanding debt. Recall that we are dealing with amounts in present value. The succession of future interest and principal payments that a government is responsible for paying, when converted to present value, are equivalent to the original stock of debt. Lowering the debt level will lead to a smaller stream of payments and, consequently, a smaller net tax burden.

Calculating net tax burdens

The main purpose of generational accounting is to compare the present values of net taxes paid by current generations with those net taxes paid by future generations. We cannot calculate the present value of the future generations' net tax payments directly, but we can attempt to measure these values indirectly by using the government's budget constraint. The reader can see from the previous equation that if we add the present value of government purchases to the value of the net debt, and subtract from this total the present value of net taxes for living generations, the net tax payments for future generations will be left as a residual.

To calculate this residual, the generational accounts initially assume that the current structure of Canadian fiscal policy will remain unchanged for living generations' remaining lifetimes, while the fiscal policy for future generations will differ, in order that the intertemporal budget constraint be satisfied. Thus, if current government policy is unsustainable, it is imagined that the incidence of changes in fiscal policy to correct this imbalance will fall solely on future generations. For the purpose of comparison, this burden is distributed equally among future generations, with the exception that the net payments for each successive generation are augmented in relation to changes in their lifetime incomes (which we assume will grow at the same rate as productivity). This allows us to directly compare the net tax payments between newborns, assuming that they will face existing fiscal policy for the remainder of their lifetimes, and future generations, assuming that they will have to bear the changes to fiscal policy in order that it may be sustainable.

It is important to realize that by considering that only future generations will bear the brunt of tax changes to correct the generational imbalance we are not suggesting that those generations now living will not feel any burden themselves. Clearly the extra tax burden that results from a currently practised unsustain-

able policy can be distributed in an infinite variety of ways among generations living now and generations born in the future. The assumption that this burden is felt only by future generations is merely a reference point, made to show what would happen if current policy remained in place for living generations.[9] By assessing alternative experiments that will affect living and future generations differently, we can analyze the levels of change necessary if they come about earlier or later than our first assumption. One clear message from generational accounting is that the longer the government takes to remove an unsustainable fiscal policy, the greater the changes to remove it will have to be.

Calculating Generational Accounts for Existing Generations

Generational accounts require a number of data sets and assumptions in order to calculate the present value of remaining taxes and transfers for existing generations. The process first involves calculating average tax payments and transfer receipts among generations for one particular base year (1994 in our case). We do this by allocating total aggregated taxes collected and total aggregated transfers distributed among the various living generations according to age, sex and a generation's population. We then project these average payments and receipts forward, adjusting for productivity growth and current policy projections. Each future net tax payment for a particular generation is converted to present value and added together with the other net tax payments that an average member will incur over his or her remaining lifetime. By assessing the fiscal burden on a per capita basis, we also take into account changes to the demographic structure. (For a more technical discussion on how the accounts are calculated, please refer to appendix A.)

To form the generational accounts for current generations for our base year, 1994, we require (1) population projections by age and sex, (2) projections of average net taxes for each generation in each year in which at least some members of the generation will be alive and (3) a discount rate to convert future net taxes into present value and a growth rate to account for growth in productivity.

(1) Population Projections

Population projections were obtained from the Demography Division of Statistics Canada's Population Projections Section, using their medium projection assumptions up to 2041. The Division was commissioned to extend these projections to 2200 using the same fertility, mortality and immigration probabilities that were projected to prevail in 2041.

(2) Projections of Taxes and Transfers

Data containing information on the aggregate values of the various taxes and transfers were obtained from the *National Income and Expenditure Accounts* and *Public Sector Finance*.[10] The categories chosen for public revenues were personal income taxes, capital income taxes, commodity taxes, property taxes, Unemployment Insurance contributions (UI), Workers' Compensation contributions, pension contributions for public employees, contributions for the Canada/Quebec pension plans (C/QPP) and other miscellaneous taxes.[11] Transfer payment categories used were UI, elderly benefits, C/QPP Benefits, public employee pensions, health care expenditures, Workers' Compensation, Social Assistance, Child Tax Benefits and GST tax credits.[12]

Health care expenditures are normally classified in Canada as part of government purchases on goods and services. We have chosen, for the purpose of the generational accounts, to include health spending as an implicit transfer to age- and sex-specific generations. This spending constitutes an important part of generational-related fiscal policy. We include health spending here as an implicit transfer because of its importance as a benefit and because it allows us to make comparisons with the United States' generational accounts.[13]

The aggregate values of these categories (with the exception of health expenditures and other taxes) were distributed to age and sex groups according to profiles obtained from Statistics Canada's Social Policy Simulation Database and Model (SPSD/M). The model is based upon comprehensive survey-data regarding demographics, income sources and expenditure patterns on over 150,000 individuals in 60,000 families in Canada.[14] The age-sex profiles derived from the SPSD/M were used in allocating aggregate values of government expenditures and receipts for 1994 and all years thereafter.

Projecting taxes and transfers for future generations obviously involves a considerable amount of uncertainty. Ideally, in choosing these values for future years we should use official government projections such as those by the Office of Management and Budget[15] in the United States that project the impact current fiscal policy will have on future amounts of government revenue and receipts.[16] Since data for such expenditures and receipts are (as of yet) unavailable for Canada, we assume initially that all such taxes and transfers will grow to keep pace with demographics and productivity growth. However, since recent actions by federal and provincial governments have suggested a slower growth rate of public sector expenditures, we also measure the Canadian generational accounts under alternative, more conservative future expenditure paths for health care and government purchases.

(3) Discount and Productivity Growth Rates

When discounting to present value all future receipts and payments, baseline calculations for the Canadian generational accounts assume a productivity growth rate of 1.0 percent and an interest (discount) rate of 5.0 percent, which is about halfway between the relatively riskless government borrowing rate and the more risky rate of return from capital assets. These are the same rates as those used by the Office of the Superintendent of Financial Institutions and the Canadian Institute of Actuaries[17] in calculating specific unfunded liabilities for Canada. They are also similar to the rates assumed by other countries that used generational accounts.

Do the accounts depend largely on these assumptions? The actual values for the net tax payments of current and future generations do fluctuate quite significantly when these values are changed. The changes, however, do not influence the main result: that current fiscal policy is unsustainable and is placing a higher net tax burden on future generations. Moreover, the policy changes that would have to occur to place fiscal policy on a sustainable path are not very sensitive to these assumptions. We shall examine the size of these fluctuations in section III.

Calculating Generational Accounts for Future Generations

Once the generational accounts have been estimated for living generations, we need only (1) the present value of future government purchases and (2) the value of net debt at the beginning of our base year to be able to use the intertemporal budget constraint and find the net tax payment required by future generations.

(1) Future Government Purchases

We used the National Income and Expenditure Accounts to calculate public spending on net investment and goods and services for 1994, our base year. This amount included a number of small, miscellaneous transfers that could not be allocated to age-specific generations. Government purchases, for the purpose of the Canadian generational accounts, excluded health care expenditures, since these values were attributed to generations as implicit transfers when calculating the net tax payments of current generations.

Similar to projections for future tax and transfer amounts, government purchases for future years were estimated by extending 1994 expenditures, adjusting for productivity growth and population. We allocate these general expenditures evenly among all generations, with the exception of education expenditures which we assume are distributed to the portion of the population under the age of 25. In addition, with the concern that there may now be a slowdown in public sector growth, we examined the generational accounts under more fortuitous conditions of government purchases growth.

(2) Official Government Net Debt

The level of government net debt at the beginning of our base year (1994) was obtained from Statistics Canada's National Balance Sheet Accounts.[18]

Distortionary Effects of Changing Fiscal Policy

One of the more impressive aspects of generational accounting is that we can use this approach to estimate the magnitude of change required to achieve generational balance and a sustainable fiscal policy for any particular time. Raising the net tax burden on living generations will consequently lessen the burden for future generations. Caution must be taken, however, in interpreting the results of such policy changes. The percentage increases in taxes or the percentage decreases in transfers that are required to attain generational balance must be understood as reflecting *direct dollar change*. Generational accounts do not incorporate the distortionary effects that changes to policy may have on individual behaviour. In some cases, inclusion of these effects could generate positive side effects. For example, if a government's actions lead to lower rates of consumption for living generations, overall savings may rise. In consequence, investment may also rise, increasing the rate of future productivity. In other cases, the opposite may happen: a policy designed to reduce the generational imbalance by raising commodity taxes for currently living generations could lead to more people choosing not to buy products that bear this tax. The revenues expected from this policy may thus be overestimated, and the desired effect to lower future generations' tax burdens not fully realized.

This caution does not diminish the usefulness of policy changes on generational accounts. Feedback effects can be significant, but they generally occur over a gradual period of time, such that their impact on the discounted values used in the generational accounts may be small. Recent research has provided some evidence of this.[19] In addition, examining the degree of change required to achieve a sustainable fiscal policy can highlight the repercussions of delaying action.

The Normative Issue of Generational Equity

The question of whether or not future generations should have to pay more in net taxes than living generations is an ethical, not an economic, concern. The decision to appropriate resources from future to current generations will depend on the external benefits that those born in the future will receive. Gains from past expenditures on defence and environmental protection clearly have an impact on the standards of living for the next generations. On the other hand, the benefits may be offset by a reduction of the capital stock and the depletion of natural resources. What generational accounting offers to this debate is an indication as to whether or not the distribution being practised by today's society is affordable. The accounts do not measure the full net benefit or burden created by public policy as a whole. They do, however, tell us which generations will have to pay for government spending in order that it may be ultimately sustainable. Generational accounting has chosen for its reference point that those born tomorrow should not have to pay proportionally more than those born today. Whether this is a fair policy of intergenerational redistribution must be determined by the citizens who are, or will be, affected by its course.

Generational Accounts: A Numerical Example

It may be helpful to follow a simple numerical example that shows how generational accounts are calculated. Although a very useful aid in understanding generational accounting methodology, the example is optional and is not needed in order to interpret the results for Canada. You may proceed directly to the findings in section III if you do not wish to peruse the arithmetic that follows.

Imagine a country, call it Fairview, in which there are only two people living at one time — one young and one old. A person in Fairview lives for only two periods, and one person is born each year, so that there are never more nor fewer than two people in the country. When calculating generational accounts, we need to start at a base year. For Fairview, the base year is period 1. The two people living right now in period 1 are Pat, who is young, and Kelly, who is old (there is no distinction between males and females). Kelly, having lived during the period before will not be alive after period 1. Pat, however, will be around until the end of period 2.

Like every law-abiding citizen in Fairview, Pat and Kelly pay taxes and receive benefits from the government. There is only one type of tax (say, income tax) which must be paid solely by those from the young generation. Since Pat is currently the only young person in the economy, Pat must pay all the taxes in period 1. There are only two types of transfers in Fairview, both of which benefit old generations more than the young. Old generations receive 60 percent of transfer one (welfare), while 40 percent of it goes to the young. Ninety percent of transfer two (health care) benefits old generations while only 10 percent is given to young generations. Finally, the government also spends on general goods and services such as defence and road construction which benefit all generations equally.[1]

Table 1

Period 1 Public Receipts and Expenditures in Fairview

(in dollars)

Receipts		Expenditures	
Income Taxes	$200	Welfare	$ 50
Deficit	150	Health Care	100
	350	Government Expenditure	200
Government Net Debt (beginning of period 1)	$500		350

Table 2

Relative Distribution of Taxes and Transfers in Fairview

Tax or Transfer Type	% to young generation	% to old
Income Taxes	100	0
Welfare	40	60
Health Care	10	90

The national accounts of Fairview show that in period 1 the government raised $200 from income taxes, spent $50 on welfare, and $100 on health care. They also spent $200 on government purchases, leaving a deficit of $150. Fairview had a net debt of $500 at the beginning of period 1. Tables 1 and 2 summarize this information.

Our first task is to put together the generational accounts for living generations — specifically, for Pat and for Kelly. To do this, we must add up each tax payment and transfer receipt that these two will make or receive during the rest of their lives. Kelly will only live until the end of period 1, so we need not calculate Kelly's net tax payments beyond this. Pat, on the other hand, will live for two periods. So not only do we have to calculate how much Pat will pay and receive in period 1, we must also find out how much Pat will pay and receive in period 2.

We calculate the average tax payment for a member of a generation by determining the total paid by that generation in taxes and then dividing by the number of people in this category. Fairview raised $200 in taxes, 100 percent of which was raised by young generations. Since Pat was the only one living in period 1, Pat was taxed $200, the average tax payment for someone who is young ($200 x 1/1). Similarly, Pat received 40 percent of the $50 spent on welfare (.40 x $50/1 = $20), and received 10 percent of the $100 spent on health care (.10 x $100/1 = $10). The remaining benefits ($30 in welfare and $90 in health care) were given to older generations (i.e., Kelly).

We now have the information to calculate the generational account for the elderly (Kelly's generational account). During the remaining one period of Kelly's life, Kelly will receive $30 in welfare, $90 in health care and pay no taxes. Thus, Kelly's net tax payment (Kelly's generational account) is minus $120, the negative sum of transfers received ($0 - $30 - $90). The amount is negative because Kelly will receive more in remaining lifetime benefits from the government than any taxes that must be paid (in this case none).

To estimate the generational account for Pat, we must find Pat's tax payments and transfer receipts in period 2. Recall however that Pat will no longer be young, but old in this period. However, the transfers received by old generations in period 2 will not be the same as the transfers received in period 1. Why? The economy of Fairview has grown during this time — specifically, we assume the real rate of productivity per person has risen by one percent. We assume also that the level of taxes and transfers per person in Fairview have also increased by this amount.[2] If the population of Fairview was ageing, we can see that the government would require a greater amount of funds in order to accommodate the greater level of transfer payments to older people.

Adjusting for the growth factor of one percent, Pat will receive $30.30 in period 2 from welfare ($30 x 1.01), and $90.90 from health care ($90 x 1.01). Pat, being old now, will pay no taxes. Before we can add the transfer receipts together for period 1 and 2, we must convert the transfers received in period 2 into present value. We need to figure out how much Pat would need to be given now, for him to have $30.30 in welfare and $90.90 in health care in period 2. Thus, we must factor these transfer benefits received in period 2 by a discount rate, which we assume to be five percent. Doing so, the present value of welfare received by Pat in period 2 is $28.90 ($30.30 / 1.05) and the present value of period 2 health care is $86.80 ($90.90 / 1.05).

We now have all the information to calculate the generational account for Pat. Pat's present value of tax payments is just $200, since no taxes are paid in period 2. The present value of welfare benefits received is the sum of the $20 Pat gets in the first period, and the $28.90 Pat receives in present value during the second ($20 + $28.90 = $48.90). Similarly, the present value of health care transfers for Pat is $96.60 ($10 + $86.60). Thus, the net tax payment for young generations (for Pat) is $54.50 ($200 - $ 48.90 - $96.60). Table 3 displays the generational accounts for living generations in Fairview.

What remains now is to use the government's intertemporal budget constraint to find the average net tax payments required from future generations to keep the government fiscal policy sustainable if (1) current fiscal policy does not change for living generations and (2) the level of future government purchases stay the same relative to productivity growth. First, we calculate the present value of future government purchases. We assume again that purchases will grow each year by a per-capita factor of one percent, and that these amounts will be discounted to period 1 by a discount rate of five percent. Adding all these payments up for the indefinite future we get the following equation:

P.V. of govt contribution =

$$\$200 + \$200(1.01/1.05) + \$200(1.01/1.05)^2 + \$200(1.01/1.05)^3$$
year 1 *year 2* *year 3* *year 4*

$$+ \$200(1.01/1.05)^4 \ldots = \$200\ 1/1 - (1.01/1.05) = \$5{,}250$$
year 5 ∞

Table 3

Generational Accounts for Fairview

(for living generations only)
Present Value of Receipts
and Payments (dollars)
(g=0.01, r=0.05)

Generation	Net Payment	Income Tax	Welfare	Health Care
Young	54.50	200	48.90	96.60
Old	-120.00	0	30.00	90.00

Table 4

Generational Accounts for Fairview

Present Value of Receipts
and Payments (dollars)
(g=0.01, r=0.05)

Generation	Net Payment	Income Tax	Welfare	Health Care
Young	54.50	200	48.90	96.60
Old	-120.00	0	30.00	90.00

Future Generations: 221.97
% difference: 307.0

The above calculation takes advantage of a formula in mathematics known as the geometric series, which enables us to add these figures together since they are getting smaller and smaller as time goes by. The value of $5,250 is the present value of all future government purchases paid by the government of Fairview. Together with the level of government net debt, it is the amount that all living and future generations must cover in order for fiscal policy to be sustainable. Since we have estimated what living generations will already pay, given that current policy remains the same for them, we now estimate the difference that future generations must pay in net taxes.

The intertemporal budget constraint says that the present value of future net tax payments equals the present value of future government consumption plus government net debt, minus the present value of net tax payments by living generations.

P.V. of Future net tax payments =
$5,250 + $500 - ($54.50 - $120.00) = $5,826.70

This is the present value of the net tax payments that will have to be made by all future generations if current fiscal policy remains in place. The generational accounting model extends over an infinite time horizon, which means that $5,826.70 will be paid by an infinite number of persons born in the future. At first glance, it seems impossible to determine how $5,826.70 can be apportioned among an infinite number of persons born in the future. However, recall that $5,826.70 is the present or discounted value of future generations' net tax payments. Also recall that all future persons in Fairview make equal tax payments after adjusting for earnings growth of one percent per period. This allows persons born in the future to pay higher taxes out of their higher earnings.

To find the average net tax payment that a Fairviewian born in the future will have to pay, we must divide this sum by the number of people who will exist in Fairview in the future. Once again, the discount rate and earnings growth assumptions allow us to convert an infinite number of future persons into a finite number of discounted "growth-adjusted" persons. The process is a little tricky to explain. First, since we assume that each person in the future will find it easier to pay these net taxes because the economy is growing due to increases in productivity, we must "grow" the number of future Fairviewians by a corresponding growth rate. This, in effect, makes each person in the future able to pay more because of their larger wages resulting from productivity growth. Also, since we are dealing with amounts in present value, we must convert the number of "growth-adjusted people" by a discount rate. Since there is only one person born each period in Fairview, the number of future citizens who will have to pay the present value of future net tax payments, adjusted for growth and converted into present value, is:

$1 + (1.01/1.05) + (1.01/1.05)^2 + (1.01/1.05)^3 + (1.01/1.05)^4 + ...$
$= 1/1 - (1.01/1.05) = 26.25$

Thus, the generational account for an average Fairviewian born in the future is $5,826.70/26.25, or $221.97. This is the growth-adjusted net tax payment someone will have to pay, on average, in the future when s/he comes into the Fairview economy. These generations will live for two periods and since Pat will also live for two more periods, Pat's generational account is directly comparable to the account for a member from a future generation.[3] Notice that the $221.97 net tax payments that future generations must cover are much higher ($167.47, or 307 percent higher) than the $54.50 paid in net taxes by Pat. Thus, we conclude that Fairview is practising a large, generationally unbalanced policy that benefits living generations much more than those who will be born in the future. Table 4 presents the generational accounts for Fairview.[4]

One final item we should examine before we leave this numerical example and look at the Canadian generational accounts is a policy experiment that shows just how much policy would have to change right now in order to equalize the net tax payments between young and future generations. Changes could occur in many different ways. A government practising an unbalanced fiscal policy could increase taxes, cut transfers, reduce government purchases or use a combination of all three. For our example, let us ask the question: how much would taxes in Fairview have to increase today in order that fiscal policy be sustainable from this point forward. In other words, what would we have to do so that the net tax payments projected under current policy for living generations will be the same as the net tax payments projected for future generations? To answer this question, we have to increase the $200 paid by Pat in taxes during period 1 until Pat's net tax payment is the same as an average future generation's net tax payment. If Pat pays a further $161, an increase of 80.5 percent, his new generational account (after going through the steps again) will be $215.50, while a future generation's account will also be $215.50. Thus, this change in tax structure would restore fiscal policy to sustainability. Delaying

this change until a later period would require larger increases to achieve sustainability.

Notes

1 In the case of Canada, we use nine types of taxes and nine types of transfers. The distribution of these items is calculated according to Statistics Canada's Social Policy Simulation Database and Model (see appendix for details). The Canadian taxes and transfers are broken up by individual age (0-90) and sex (male and female) instead of using a two-generation model as in the Fairview example (young and old).

2 We make the same assumption in our baseline Canadian generational accounts. In other cases, we examine the generational accounts under the alternative assumptions of slower growth in health care and government purchases on goods and services. For the purposes of this example, we shall assume that the pattern of growth in future expenditures and receipts are the ones projected by the government, assuming they sustain current policy.

3 Note, however, that Kelly's generational account is not comparable to the one for future generations. This is because Kelly's remaining lifespan is only 1 period, while a future generation's remaining lifespan is 2. Kelly's account does not include the taxes paid and transfers received when Kelly was young.

4 One can appreciate now how many calculations are necessary to obtain generational accounts for a real economy. Fortunately, with the aid of a computer, these computations take only seconds.

III. Findings

Baseline 1994 Generational Accounts

Tables 5a and 5b present the baseline generational accounts for selected male and female Canadian generations, with current (living) generations defined as those born before 1995. The present values for tax payments and transfer receipts presented here assume a per capita growth rate of one percent and a discount factor of five percent. For the baseline accounts we initially take 1994 fiscal policy as remaining in place for current generations, with the exception that the policy will adjust to future changes in economic growth and demographics. All amounts are in 1994 Canadian dollars.

We shall begin our examination of these tables by first looking at columns 3-7, which show the remaining tax payments that a generation will make to the government, measured in present value. Notice that these amounts are highest for generations that are just beginning to enter the workforce and will face many more years of taxation before they retire. The present values of tax payments for newborns and children are smaller because, although they will also face many years of future taxes, these payments will be made much later.

The last three columns show present values of remaining transfers that current generations will receive. Similar to our examination of tax payments, we must keep in mind that these transfers are also measured in present value. For example, the present value of elderly benefits received by an average 65-year old is $159,800, much higher than the present value benefit of $22,500 for newborns. This is simply because the newborns must wait many years

Table 5a

Composition of Male Generational Accounts

(g = .01, r = .05)

Present Value of Receipts and Payments

(thousands of dollars)

		Tax Payments					Transfer Receipts		
Generation's Age in 1994	Net Payment	Personal Income Taxes	Capital Income Taxes	Commodity and other taxes	Property Taxes	Payroll Taxes[1]	Health Transfers	Elderly Benefits[2]	Social Assistance[3]
0	131.2	99.7	16.7	55.3	17.1	37.7	39.9	22.5	33.1
5	160.4	116.9	19.6	64.8	20.1	44.3	40.2	26.4	38.8
10	192.2	137	23	75.9	23.6	51.8	42.8	31	45.4
15	231.5	162.1	27.4	89.7	28	61.3	46.6	36.9	53.5
20	270.3	187.3	32.2	100.3	32.6	69.7	49.7	42.8	59.2
25	290.1	200.1	36.1	102	36.4	70.9	51.5	47.8	56
30	283.9	196.6	40.9	96.1	37.4	65.1	51.6	51.8	48.8
35	261.6	189.1	45.9	90.4	37.3	57.8	54.2	59.8	44.8
40	229.7	179.8	47.2	84.8	36.4	50.5	58.2	70.4	40.4
45	176.1	159.5	47.3	77.3	34.2	40.9	62.5	83.6	37
50	102.6	128.2	43.9	68.8	31.6	30.7	67.3	100.6	32.8
55	34.9	102	40.6	60.1	29	20.3	71.6	119.9	25.6
60	-51.4	69.2	29.7	49.3	24.2	9.7	74.1	144.4	15.2
65	-121.4	39.6	15.9	38.2	18.9	2.6	73.8	159.8	3.1
70	-119.3	25.5	9.3	29.9	14.1	1.2	71.8	125.4	2.1
75	-107.7	18.3	6.1	22.9	10.7	0.7	68.7	95.8	1.8
80	-93.8	11.3	4.8	17.1	7.2	0.2	63.2	69.8	1.4
85	-82.3	7.5	3	14	4.7	0.2	56.8	53.7	1.2
90	-17.5	1.6	0.9	2.9	0.9	0	12.4	11.2	0.3
Future Generations	267.9								
Percentage difference	104.2								

1: includes contributions to UI, Workers' Compensation and C/QPP.

2: includes OAS, GIS, C/QPP and other elderly transfers.

3: includes welfare payments, UI, Workers' Compensation, GST tax credits and child tax benefits.

Source: Authors' calculations.

Table 5b

Composition of Female Generational Accounts

(g + .01, r = .05)

Present Value of Receipts and Payments

(thousands of dollars)

		Tax Payments					Transfer Receipts		
Generation's Age in 1994	Net Payment	Personal Income Taxes	Capital Income Taxes	Commodity and other taxes	Property Taxes	Payroll Taxes[1]	Health Transfers	Elderly Benefits[2]	Social Assistance[3]
0	56.7	41.4	6.2	57.5	18	22.8	36.5	20.8	32
5	73	48.5	7.3	67.3	21.2	26.6	36.2	24.3	37.4
10	89.9	56.9	8.6	78.9	24.8	31.3	38.2	28.6	43.8
15	110.9	67.6	10.3	93.8	29.6	37.1	41.3	34.3	51.9
20	129.9	77.1	12	104.6	34.4	41.7	43.3	39.8	56.9
25	135.4	78.7	13.5	105.3	37.8	40.5	43.6	43.9	52.8
30	128.9	73.8	15.1	99.7	39	35.8	41.3	48	45.3
35	116.5	67.9	16.3	94.2	39	31.3	40	55.2	37
40	98.3	61.5	17.1	88.9	38.2	26.4	40.5	64.8	28.4
45	68.4	53.8	17.2	82	36.3	20.4	42.7	77.1	21.6
50	28.5	44	19	74.6	34.2	14	47.1	92.7	17.5
55	-19.7	34.3	17.2	66.6	31.9	7.9	52.8	111.3	13.5
60	-69.7	24.6	16	55.9	27.1	3.3	58.2	129.9	8.5
65	-108.1	17.7	13.2	44.7	21.6	0.9	62.2	141.6	2.5
70	-113	13.5	10.4	36	16.6	0.3	64.6	123	2.2
75	-110.9	10	8.7	28.6	12.8	0.2	66.6	102.6	2
80	-103.1	7.2	5.4	21.8	8.7	0.1	64.1	80.8	1.7
85	-91.5	5.2	4.3	17.8	5.8	0.1	59.2	64.2	1.4
90	-13.2	0.8	3	2.9	0.9	0	10.4	10.2	0.2
Future Generations	115.8								

1: includes contributions to UI, Workers' Compensation and C/QPP.

2: includes OAS, GIS, C/QPP and other elderly transfers.

3: includes welfare payments, UI, Workers' Compensation, GST tax credits and child tax benefits.

Source: Authors' calculations.

before receiving elderly benefits, while 65 year-olds begin receiving their remaining elderly transfers right away.

The differences between these tax and transfer amounts, the net tax payments, are shown in column 2. These amounts show how much a member of a generation will have to pay, on average and net of transfers, over the rest of his or her lifetime. The net tax payments are positive for male generations younger than 60 and for female generations younger than 55. The present value of future taxes to be paid for the rest of these generations' lifetimes exceeds the present value of their remaining transfers. On the other hand, males older than 60 and females older than 55 can expect to receive more in transfers from the government than they will have to pay in taxes over their remaining lifetimes. The net tax payments for these generations are negative.

It must be stressed that, because the net tax payments for living generations are measured for a member's *remaining* lifetime, these payments are not directly comparable. It is true that retired generations over the age of 65 can expect to receive more in transfers from the government than they will have to pay in taxes. But these generations also paid taxes when they were working. The generational accounts do not include these amounts. Since past taxes paid and past transfers received are not recorded in the accounts, existing generations' net tax payments are not directly comparable.[20] However, since a future person's average remaining lifetime (after s/he is born) is the same as a newborn's average remaining lifetime, we *can* compare their present value of net tax payments. It is this comparison which makes tables 5a and 5b so useful.

The Burden on Future Generations

When calculating generational accounts we initially assume that current tax and transfer policy rules stay the same for living generations, while future generations (all those born after 1994) will have to pay enough net taxes to balance the government's budget constraint. The tax burden on future generations is allocated evenly among them, except that we adjust for the fact that a generation's real wage will rise in the future as its productivity increases. If we did not account for this rise, the tax burden on successive future generations would lessen as their ability to pay for these taxes increased. Thus, we assume the required net payment by a member from a generation will grow each year relative to his or her change in real wages (which we take to be one percent per year). This makes each future generational account comparable.

In the case of Canada, males born after 1994 will be expected to pay an (adjusted) average of $267,900 in net taxes, $136,700 more in present value than the amount Canadian newborn males will have to pay. Females born in the future will have to pay $115,800, which is $59,100 more than that to be paid by newborn females.[21] The average net tax payment that future generations are responsible for paying, in order that government policy be sustainable, represents a 104.2 percent increase from the amount that an average newborn must pay. This difference signifies a substantial generational imbalance in Canada.

Lifetime Net Tax Rates and Alternative Future Policy Paths

Another, perhaps easier, way to discern the findings from generational accounts is to compare lifetime net tax rates between newborn and future generations. Lifetime net tax rates express a generation's total tax burden as a share of its total lifetime labour earnings. In other words, they show what portion of earnings an average person from a particular generation will have to pay to the government over his or her lifetime. Lifetime net tax rates are calculated simply by dividing a member's generational account when s/he is born by the present value of his or her total lifetime earnings.[22] Table 6 presents these rates for combined male-female newborns and future generations under alternative growth paths for public health care spending and government purchases. Under the baseline scenario, where the distribution of per capita taxes and transfers are held constant relative to productivity growth, lifetime net tax rates for newborns are 32 percent, while future generations face rates of 65 percent. This means that if fiscal policy is not altered to affect the generations who are living as of 1994, those Canadians born afterward will face net tax rates more than twice as great as the generations that came before them!

Even if we examine these rates using more conservative assumptions for future paths of government spending, the difference between net tax burdens on newborns and future generations is still large. If real health care expenditures per person remained fixed after the year 2000 and did not grow relative to increases in productivity, lifetime net tax rates for newborns would rise to 35 percent and future generations' rates would fall to 57 percent. In this case, future generations would still face 61 percent more net taxes than newborns do. Alternatively, if one-third of all government purchases, excluding health care, were to be fixed in per capita terms for all years after 2000, future generations would face net lifetime tax rates of 53 percent, 65 percent more than that faced by newborns. Finally, in the (unlikely) scenario where both slower growth in health care and government purchases occur, lifetime net tax rates would be 35 percent for newborn and 46 percent for future generations — still a significant imbalance.

Policy Options to reach Generational Balance

When calculating generational accounts and net lifetime tax rates, we assumed that the current structure of fiscal policy would remain in place for living generations. In order to achieve a sustainable path of government expenditure (that is, to satisfy the government's intertemporal budget constraint), only future generations were required to pay more in net taxes. This was why projected net tax payments for future generations were much larger than the payments for living generations. Of course, the changes in policy required to meet the government's budget constraint could happen at any time. If they occurred sooner than the generational accounts' initial assumptions, the burden on future generations would be smaller while the burden on living generations would be larger. The opposite is true, however, if policies to achieve sustainability are implemented later.

If the generational accounts show that net tax payments for newborns under current fiscal policy conditions are *equal to or greater* than the payments projected for future generations in order to satisfy the government's budget constraint, then current fiscal policy can be

Table 6

Lifetime Net Tax Rates for Newborns and Future Generations under Alternative Health Care and Government Consumption Paths

Generation's Year of Birth	Baseline	Slower Health Care Growth[a]	Slower Gov't Purchases Growth[b]	Slower Health Care and Government Purchases Growth
1994	32.4	35.4	32.4	35.4
1995+	64.9	57.0	53.4	45.6
% difference	100.3	61.0	64.8	28.8

a. Health expenditures constant in real per-capita terms after the year 2000.

b. Government purchases growth is one-third less than productivity growth after the year 2000.

Source: Authors' calculations.

maintained into the future. No further corrections to policy would be required for the government to meet its current and future bills. When the payments projected by future generations are the same as those paid by newborns, a government's intergenerational policy is said to be balanced.

Tables 7, 8 and 9 present various policy experiments that would lead to generational balance in Canada for the years beginning in 1995, 2000 and 2005 respectively. We analyze these experiments under the alternative cases for future health care expenditures and government purchases discussed previously. In each case, the permanent percentage increase or decrease required for particular taxes, transfers and government purchases is calculated so that lifetime net tax rates between newborns and future generations are equalized. All generations living at the time the fiscal policy is altered and all generations thereafter will be affected by the change. While those born after the policy's implementation will be affected in the same manner, the impact on particular living generations will depend on which taxes or transfers are actually altered. For example, increasing taxes will impose larger burdens on young and working-aged generations but decreasing elderly benefits will hurt older generations more, since they will feel the effects from this change immediately.

Under the baseline case of projected government policy, table 7 indicates that personal income tax revenues would have to permanently increase in 1995 by 28.6 percent in order to reach generational balance. This implies that a Canadian currently paying 30 percent of his or her income in taxes would have to pay at least another nine percent more of his or her income to the government. Slower growth assumptions regarding health care and government consumption still lead to significant (although less dramatic) permanent income tax hikes if generational balance is to be reached. Even if both real per-capita health care expenditures remained constant and government consumption grew one-third less than productivity after 2000, equalizing net tax payments would still require raising income taxes by 9.7 percent.

Personal income taxes are not the only components of government revenues that may be used to reach a sustainable fiscal policy. However, taxes that constitute a smaller source of revenue for government will naturally have to increase more to reach the same goal. Raising all commodity taxes in 1995 to reach generational equity would require increases of 45.1 percent under baseline projections and 15.1 percent under more optimistic forecasts. If we look at revenues as a whole, all government taxes would have to rise by 11.8 percent to achieve generational equity under the baseline case for future public policy.

There are few government transfers large enough to single-handedly remove generational imbalance in Canada. If taxes are to be avoided, it is likely that a portion of most, if not all, transfers will have to be reduced. Reducing all transfers (including health care expenditures) to achieve fiscal sustainability would require permanent decreases of 19.0 percent in 1995 under the baseline scenario, or 12.9 percent if the amount spent on government purchases grew more slowly after 2000. We could also cut all government purchases (not including health care) by 21.6 percent to equalize newborn and future generation lifetime net tax rates.

Of course, the government need not use only taxes, only transfers or only government purchases to achieve generational balance. By combining these categories, there are endless ways to make fiscal policy sustainable. One example would be to raise all taxes by 1.4 percent, reduce all transfers by 2.7 percent and lower government purchases by 17.7 percent under the baseline scenario. This would be

Table 7

Permanent Tax Increases, Transfer Cuts or Reductions to Government Purchases Required in Order that Fiscal Policy be Sustainable

1995

(percent)

Policy Change in 1995	Baseline	Slower Health Care Growth[a]	Slower Gov't Purchases Growth[b]	Slower Gov't Purchases and Health Care Growth
Tax Increases				
Personal Inc.Taxes	28.6	19.6	18.6	9.7
Commodity Taxes	45.1	30.7	29.0	15.1
All Taxes	11.8	8.0	7.6	4.0
Transfer Cuts				
All transfers	19.0	14.0	12.9	7.0
All Transfers excluding health care	29.9	20.8	19.4	10.3
Cut Gov't Purchases				
All government	21.6	14.8	15.2	7.9
Combination of Tax increases, transfer cuts and gov't purchase cuts	1.4 2.7 17.7	-	-	-

a. Health expenditures constant in real per-capita terms after the year 2000.

b. Government purchases growth is one-third less than productivity growth after the year 2000.

Source: Authors' calculations.

approximately equal to the seven dollars of expenditure cuts for every one dollar of tax increases ratio that the federal government chose to use in the 1995 budget.

The Consequences of Delaying Action

Regardless of the action taken by the government to reach a sustainable fiscal policy, it is important that it does not delay. Tables 8 and 9 show the consequences of postponing changes to policy until 2000 and 2005 respectively. In every case, the necessary tax hikes or expenditure cuts needed to equalize newborn and future generations' lifetime net tax rates are significantly higher if they occur five or 10 years from now. For example, to reach generational balance in the year 2000, personal income taxes would have to increase by 34.6 percent, instead of the 28.6 percent required had this change taken place in 1995. Moreover, if no action is taken until 2005, revenues from personal income taxes would have to rise by 41.8 percent.

Under the more fortuitous case of both smaller future health care expenditures and government purchases, similar levels of increase are required if changes to policy are delayed. The cuts to all transfers required to meet the government's budget constraint in 2000 would be 21 percent more than if they occurred in 1995. Delaying these cuts further until 2005 would mean that the required reductions would have to be 44 percent greater.

We can see from these tables the advantage of correcting an unsustainable fiscal policy earlier, rather than later. Already the immediate and permanent changes required to equalize lifetime net tax rates of newborn and future generations are significant — but they will be far greater if the changes are deferred. The federal government has stated that their recent budget proposals do address the nation's financial concerns. We shall consider shortly just how far these proposals go in reducing the burden on future generations and in coming closer to an overall fiscal policy that is sustainable.

How sensitive are the results to the discount and growth rate assumptions?

Within the scope of generational accounting it is necessary to assume an interest and productivity growth rate when projecting tax and transfer outlays into the future. It is natural to ask if the results from this methodology are sensitive to these assumptions. Tables 10 and 11 show, respectively, the lifetime net tax rates of combined male-female newborn and future generations, and the percentage increase in income taxes required to achieve sustainability under alternative interest and growth rate assumptions. Table 10 indicates that the lifetime net tax rates do indeed fluctuate according to changes in the assumptions. The gap between newborn and future generation lifetime net tax rates is larger when the interest rate used is higher, and when the growth rate used is lower. Even under the most favourable assumption, when the interest rate is three percent and the productivity growth rate is 1.5 percent, the lifetime net tax rate for future generations is still 64.8 percent greater than for newborns.

Moreover, when we look at Table 11, we see that the policy experiments that could remove this gap are not very sensitive to the same assumptions. Under the different interest and growth rate values used, the required tax increases to remove the generational imbalance range between 29 and 33 percent. The variation is also small when we look at any of the policy options that were presented in the previous section. Thus, our general results remain quite stable even if lifetime net tax rates fluctuate due to interest and growth rate variations. We need

Table 8

Permanent Tax Increases, Transfer Cuts or Reductions to Government Purchases Required in Order that Fiscal Policy be Sustainable 2000

(percent)

Policy Change in 2000	Baseline	Slower Health Care Growth[a]	Slower Gov't Purchases Growth[b]	Slower Gov't Purchases and Health Care Growth
Tax Increases				
Personal Inc.Taxes	34.6	24.4	22.4	12.3
Commodity Taxes	54.4	37.9	35.1	18.7
All Taxes	14.2	9.4	9.3	4.8
Transfer Cuts				
All transfers	23.1	16.9	15.6	8.5
All Transfers excluding health care	36.2	25.1	23.4	12.4
Cut Gov't Purchases				
All government	26.1	18.4	18.1	9.1

a. Health expenditures constant in real per-capita terms after the year 2000.

b. Government Purchases growth is one-third less than productivity growth after the year 2000.

Source: Authors' calculations.

Table 9

Permanent Tax Increases, Transfer Cuts or Reductions to Government Purchases Required in Order that Fiscal Policy be Sustainable

2005

(percent)

Policy Change in 2005	Baseline	Slower Health Care Growth[a]	Slower Gov't Purchases Growth[b]	Slower Gov't Purchases and Health Care Growth
Tax Increases				
Personal Inc.Taxes	41.8	28.2	26.3	14.0
Commodity Taxes	65.9	44.8	42.9	22.9
All Taxes	16.2	11.7	10.9	5.6
Transfer Cuts				
All transfers	27.7	20.0	17.8	10.2
All Transfers excluding health care	43.7	31.3	28.3	14.4
Cut Gov't Purchases				
All government	31.1	21.5	22.0	11.6

a. Health expenditures constant in real per-capita terms after the year 2000.

b. Government Purchases growth is one-third less than productivity growth after the year 2000.

Source: Authors' calculations.

Table 10

Percentage Difference Between Newborn and Future Generations' Net Tax Payments under Various Growth and Discount Rate Assumptions

(Baseline projections for future receipts and expenditures)

r =	g = 0.005	0.010	0.015
0.03	64.8	57.8	53.8
0.05	119.6	100.3	84.7
0.07	263.9	211.1	147.3

Source: Authors' calculations.

Table 11

Percentage Increase in Permanent Income Taxes Required to Achieve Fiscal Sustainability under Various Growth and Discount Rate Assumptions

(Baseline projections for future receipts and expenditures)

g =	0.005	0.010	0.015
r =			
0.03	30.8	31.6	32.9
0.05	29.2	28.6	29.0
0.07	30.0	29.1	28.6

Source: Authors' calculations.

only be concerned with the possible feedback effects that may occur as a result of these policies (see previous section).

The 1995 Federal Budget

In February of 1995, the federal government announced several proposed changes to its fiscal policy during the next three years. The changes were announced as being a major effort toward bringing the country's finances in order. In this section, we will look at these proposals from a generational accounting perspective and examine the effects they will have on lifetime net tax rates for future and newborn generations, and the degree to which further changes may be required to reach a sustainable level of fiscal policy.[23]

Using the federal government's three year projections, we take into account the following changes proposed by the 1995 federal budget: (1) the reductions to UI benefits and the changes to UI contributions, (2) the predicted rises in personal income taxes, excise taxes and corporate taxes and (3) the reductions to government purchases over the next two years. All these projections have been adjusted into real terms using a 1.8 percent inflation rate. Projected reductions to provincial transfers are accommodated by assuming such declines will be met by equivalent cuts to provincial spending on goods and services.[24] Thus, government spending is reduced further in 1996 by $2.5 billion and in 1997 by $4.5 billion. The above changes are taken to be permanent, but we apply the same growth rate assumptions used previously when projecting these amounts in the future.[25]

Table 12 shows the net lifetime tax rates for newborns and future generations before and after the 1995 budget proposals. In the baseline scenario, lifetime net tax rates for newborns increase from 32.4 to 33.9 percent. Future generations' rates, however, fall from 64.9 to 59.0 percent.[26] Hence, after implementing budget changes, the percentage gap between lifetime net tax rates for newborns and future generations is reduced by approximately one-quarter. A large generational imbalance still remains. If health care expenditures per capita were constant after 2000, the generational imbalance after the 1995 budget amendments is smaller, but still significant. Under these conditions, future generations would face 53.1 percent higher net lifetime tax rates than newborns (36.7 percent for newborns *versus* 56.2 percent for future generations).

The above results indicate that a large generational imbalance exists, even after the proposed three-year changes to the federal budget. Further tax hikes, transfer cuts or lower government spending are still required in order that fiscal policy may be sustainable. Table 13 shows the subsequent changes to policy that could occur, after budgetary changes, to eliminate the remaining gap between newborn and future generation net tax payments. Under baseline projections, assuming roughly the same seven-to-one dollar ratio of expenditure cuts to tax hikes that was used in the federal budget, all government purchases would still have to fall by 10.4 percent, all transfers would have to be cut by 2.1 percent and all tax revenues would have to rise in 1995 by 1.2 percent to restore generational balance. If relying merely on raising taxes, all government revenues would be required to increase by 9.3 percent in 1995, 11.1 percent if the change happened in 2000 and 13.2 percent if action was not taken until 2005. Alternatively, the government could choose to lower government spending (excluding health care) by 16.2 percent in 1995, 19.5 percent in 2000 and 23.6 percent in 2005 to reach sustainability. Under more conservative assumptions, if

Table 12

Impact of the 1995 Federal Budget on Lifetime Net Tax Rates of Newborn and Future Generations

Generation's Year of Birth	Baseline	Slower Health Care Growth[a]	Slower Gov't Purchases Growth[b]	Slower Health Care and Government Purchases Growth
Basecase				
1994	32.4	35.4	32.4	35.4
1995+	64.9	57.0	53.4	45.6
% difference	100.3	61.0	64.8	28.8
After Budget Changes				
1994	33.9	36.7	34.1	37.1
1995+	59.0	56.2	53.9	44.8
% difference	74.0	53.1	58.1	20.8

a. Health expenditures constant in real per-capita terms after the year 2000.

b. Government Purchases growth is one-third less than productivity growth after the year 2000.

Source: Authors' calculations.

Table 13

Impact of the 1995 Federal Budget on Policy Options to Achieve Fiscal Sustainability After 1995, 2000 and 2005

(permanent percentage increase/decrease required to reach a sustainable path)

Generation's Year of Birth	Baseline	Slower Health Care Growth[a]	Slower Gov't Purchases Growth[b]	Slower Health Care and Government Purchases Growth
Basecase				
Policy Change in 1995				
All Taxes	11.8	8.0	7.6	4.0
All Transfers	19.0	14.0	12.9	7.0
Gov't Purchases	21.6	14.8	15.2	7.9
Combination[c]	1.4, 2.7, 17.7			
After Budget Changes				
Policy Change in 1995				
All Taxes	9.3	5.4	5.2	1.5
All Transfers	14.8	9.8	8.5	2.7
Gov't Purchases	16.2	10.5	9.6	3.1
Combination[c]	1.2, 2.1, 10.4			
Policy Change in 2000				
All Taxes	11.1	6.6	6.2	1.8
All Transfers	17.9	11.6	10.2	3.1
Gov't Purchases	19.5	12.7	11.1	3.7
Policy Change in 2005				
All Taxes	13.2	7.7	7.7	2.1
All Transfers	21.1	14.3	12.6	4.0
Gov't Purchases	23.6	18.5	14.3	4.6

a. Health expenditures constant in real per-capita terms after the year 2000.

b. Government Purchases growth is one-third less than productivity growth after the year 2000.

c. Percentage increase/decrease for all taxes, all transfers, and all government purchases combined.

Source: Authors' calculations.

future health care expenditures were smaller, government spending would still have to fall by 10.5 percent in 1995 or 18.5 percent in 2005.

Thus, while the changes to fiscal policy proposed by the federal government are definitely on the right track, there is still much to be done. It is encouraging then, that the same government has also promised that this trend of action will continue. Addressing the imbalance between living and future generations' net lifetime tax rates sooner rather than later will go a long way in reducing the extra burden being placed on future Canadians. If the issue is ignored, tax burdens for these generations could quickly get out of control.

Comparison with the US

Before concluding this paper, it may be of interest to compare the generational accounts for Canada and the United States. Caution must be taken, though, when reading the different net tax payments, since definitions of taxes, transfers and government purchases for the two countries differ. Nevertheless, the definitions are similar enough that we may make comparisons between them. Table 14 presents the baseline net tax payments for both male and female Canadian generations, and the net tax payments for male and female US generations under different assumptions for projected health care expenditures.[27] The amounts listed for Canada are presented in 1994 US dollars, while payments for the United States are in 1993 US dollars.[28] Both sets of generational accounts assume an interest rate of five percent and a growth rate of 1.25 percent.

We can see by comparing net tax payments between baseline Canadian and US generational accounts that the values for all generations are very similar. Under the adjusted growth rate assumption, newborn Canadian males are projected to pay, on average, US$105,900 in net present value of lifetime taxes. US males just born can expect to pay US$119,100 in net taxes. Similarly, female Canadian newborns on average will pay US$46,000 in net taxes, while US newborn females will be expected to pay US$62,300. Both countries are currently practising large, unsustainable fiscal policies. To satisfy the government's budget constraint as of 1995, we have seen that the Canadian government could raise all tax revenues by 11.8 percent. A similar requirement was found for the United States. To reach sustainability in 1994, the government could raise all tax revenues by 11.7 percent.[29]

Despite the apparent similarities, there is one important distinction to be made between these two sets of generational accounts. The baseline generational accounts for Canada assume that per capita health care expenditures will grow in equal proportion to changes in productivity growth. The United States generational accounts, however, use health care projections from the Office of Management and Budget and the Health Care Financing Administration, which predict health care spending will grow much more quickly than rises in productivity.[30] The rapid growth in these expenditures is the chief reason why such a large generational imbalance was found for the United States. If the US government were able to contain future health expenditures, the difference between projected net tax payments for newborns and those for future generations would be reduced greatly. The last two columns of Table 14 show the effects of stabilizing United States health expenditures so that future spending matches the rate of population and productivity growth — the same assumptions that we used for the Canadian baseline generational accounts. Under this scenario, the percentage difference between newborn and future generation net tax payments is reduced

Table 14

1994 Net Tax Payments in the United States and Canada

r = 0.05, g = 0.0125

(present values in thousands of US dollars)

Age	Canada		United States (basecase)		United States (Health-Care Stabilized after 1994)	
	Males	Females	Males	Females	Males	Females
0	105.9	45.6	119.1	62.3	129.3	72.2
5	127.4	57.6	141.7	73.0	153.3	84.5
10	150.6	69.8	167.3	84.7	180.3	97.8
15	179.0	84.9	198.3	98.0	213.0	113.1
20	206.4	98.2	224.3	109.1	240.0	125.8
25	219.2	101.3	233.0	109.3	249.6	127.8
30	212.7	95.5	224.1	100.1	241.6	120.5
35	194.5	85.5	207.2	86.0	226.5	109.0
40	169.4	71.2	177.6	62.0	199.3	88.7
45	128.6	48.4	131.6	27.9	156.0	58.3
50	73.5	18.4	73.9	-13.5	100.9	21.0
55	23.0	-17.4	8.1	-58.6	37.1	-21.0
60	-40.4	-54.1	-56.7	-104.9	-28.5	-67.2
65	-91.2	-81.8	-105.4	138.6	-81.5	-105.2
70	-89.1	-84.9	-107.2	-136.9	-88.8	-110.1
75	-80.1	-82.8	-98.8	-126.5	-85.9	-107.1
80	-69.5	-76.5	-83.1	-105.6	-75.1	-93.6
85	-60.7	-67.5	-73.2	-81.5	-67.5	-76.4
90	-12.8	-9.6	-11.6	-11.3	-11.6	-11.3
Future Generations	206.9	89.1	219.0	114.6	150.4	84.0
% Difference	95.3		89.3		16.3	

Sources: Jagadeesh Gokhale, Bernd Raffelhuschen and Jan Walliser, *The Burden of German Unification: A Generational Accounting Approach* (Cleveland: The Federal Reserve Bank of Cleveland, 1995) and Authors' calculations.

dramatically, from 83.9 to 16.3. Thus, if health care costs in the United States could be contained, there would still be an imbalance between living and future generations, but the policies to rectify this difference would be much milder than the ones required for Canada.

The rapid increases in public health care expenditures predicted for the United States are unlikely to happen in Canada. The market-driven health care system in the United States gives providers many incentives to increase the scope of services and to bill for higher levels of service, while the third-party insurance payment structure shields patients from the true cost of their care. This arrangement makes it very difficult to control the growth of health expenditures. In contrast to the United States, the single payer model adapted by Canada allows for much more regulatory control.[31] The ability to restrict funding and intervene in the health care system has provided the Canadian government with the means to limit the growth of these public expenditures. Were the Canadian public health program similar to that of the US, the generational imbalance found for Canada would be much greater.

IV. Conclusion

This paper presents a new approach to analyzing fiscal policy and intergenerational redistribution effects in Canada. Generational accounting is an alternative to using budget deficit measures in tracking long-term fiscal discrepancies between current and future generations. By using the government's long run budget constraint, we can compare the differences in net tax payments that future generations will have to pay, with those payments that current generations are already paying. Thus, we can assess the feasibility of carrying on with current public policy, and how trying to maintain the *status quo* will affect people in the future.

Using this approach, it was found that current fiscal policy in Canada is indeed unsustainable. No matter which alternative case for forecasted public expenditures we use, the level of generational imbalance is significant. In our baseline scenario, if the existing fiscal structure remains in place for living generations, those born in the future could face net lifetime tax rates more than twice the current amount for newborns, in order that the government be able to pay its bills. Such increases would be difficult to implement in light of economic and political considerations. To relieve some of this burden on future generations, changes must occur sooner rather than later.

The proposals made by the federal government in its 1995 budget would ease the extra financial burden on future generations if they were enacted, but they would not remove it. Further tax hikes, transfer cuts and/or reductions to government purchases are required. Using the same seven-to-one dollar ratio of expenditure cuts to tax hikes from the budget's proposals, all government purchases would still have to fall by 10.4 percent, all transfers would need to be cut by 2.1 percent and all taxes raised by 1.2 percent. These types of actions would have to be immediate and permanent after 1995. Delaying implementation of this change will lead to much larger, more unpleasant policy adjustments in the future.

Admittedly, the policies prescribed in this paper are likely to cause political and public strain. There is no question that some generations, at a given time, will have to pay more or receive less in order that fiscal policy be sustainable. It is clear, however, that delaying action is not the thing to do. If living Canadians can understand this fact, perhaps they can accept the change that must inevitably occur.

Appendix A

The Technical Details

The following appendix documents in detail how the generational accounts for Canada were calculated. We will begin by describing the algebra behind the calculations, followed by an explanation of the data used and the assumptions made. The methodology presented here is brief, yet concise. It is recommended that readers who wish to examine the finer points of the generational accounts read Auerbach, Gokhale and Kotlikoff.[32] The numerical example included in this paper may also be helpful in understanding the framework of this method.

The Method of Generational Accounting

The total remaining net present value payment to the government for a specific generation can be symbolized as $N_{t,k}$, where k is the year in which the generation was born and t is the year discounted to our base year. By net payments we mean all taxes paid net of all transfers received, for all levels of government. An $N_{t,k}$ value exists for each living generation (where $k \leq t$), as well as for each future generation ($k > t$). We also distinguish here between male and female cohorts, but in order to simplify notation, we omit sex subscripts. A set of generational accounts is simply a set of values of $N_{t,k}$ divided by $P_{t,k}$ (the generation's current population in year t in the case of existing generations and the initial population in the case of future generations). That is, a generational account represents the average present value of remain-

ing net payments made to the government from a member of a specific generation born in *k*.

The term $N_{t,k}$ can be further expressed by:

$$Nt,k = \sum_{s=max(t,k)}^{k+D} Ts,kPs,k(1+r)^{t-s} \quad (1)$$

In expression (1), $T_{s,k}$ is the projected net payment that members from a generation born in year *k* will make, on average, to the government during year *s*. It consists of the average sum of taxes paid (such as income, commodity and payroll taxes), less the average sum of transfers received (such as old age security, unemployment insurance and welfare) during a particular year where at least some members in that generation will be alive. $P_{s,k}$ refers to the number of members born in year *k* who will still be alive in year *s*. For each currently living generation (those born prior to and in year *t*), we sum the net payments from year *t* to year *D*, the last year in which some members will still be alive. For future generations ($k > t$), the net payments are added up starting in year *k*. Irrespective of when a generation was born, discounting is always back to year *t*.

The construction of generational accounts first involves calculating the $N_{t,k}$s for living generations. Each average tax payment and transfer receipt must be projected for every year that a generation is alive. We first calculate the average net payments for the base year. In the case of Canada, the aggregate values of these taxes and transfers are taken mainly from the 1994 National Accounts. We then distribute these amounts according to age-sex profiles estimated by Statistics Canada's Social Policy Simulation Database and Model (SPSD/M) and the Canadian Institute of Actuaries.[33] This will give us the aggregate payments and receipts made or received by each living generation in the base year. Dividing these values by the generations' population in 1994 ($P_{1994,k}$) will give members of these generations their average tax payments and transfer receipts for that year ($T_{1994,k}$).

We assume initially that the state of fiscal policy that prevailed in 1994 will also prevail in the future for living generations. Thus, average per-capita taxes and transfers projected for age- and sex-specific living generations will be the same as estimated 1994 values, except for a growth adjustment. In the case of Canada, our baseline assumes that per-capita payments and receipts will increase at the same rate as productivity growth (which we take to be one percent per year). Changes to a country's demographic structure will also alter the aggregated levels of these taxes and transfers. For example, if the number of 65-year olds is larger in 1997 than the number of 65-year olds in 1996, the sum of per-capita elderly benefits in 1997 will also be larger, even without the growth adjustment.

Subtracting the sum of transfer receipts from the sum of average tax payments for each generation between year *t* and year *D* will give the $T_{t,k}$s. We use an assumed discount rate, *r*, to convert these amounts to present value. Finally, adding these present values together for each generation will give us the $N_{t,k}$s, which can then be used to find the generational accounts for living generations.

Generational accounting makes use of the government's intertemporal budget constraint to find the average net tax payments that future generations will pay. The constraint can be expressed by:

$$\sum_{s=1}^{\infty} Nt,t+s + \sum_{s=0}^{D} Nt,t-s = \sum_{s=1}^{\infty} Gs(1+r)^{t-s} + Lt \quad (2)$$

In equation (2), the left hand side has been divided up between the present value of net remaining lifetime payments to the government for future generations (those born in $t+s$), and the present value of net remaining lifetime

payments for living generations (born in *t-s*). Taken together, the left hand side of this constraint represents total present and future taxes received, net of transfers by all levels of government. On the right hand side are the government's present and future bills. G_s stands for total government purchases in year *s*, and L_t stands for the stock of all government net debt in year *t*. Each G_s for all years now and in the future is summed up and discounted to get a net present value in year *t*.

What the intertemporal budget constraint says is that the present value of all current and future government spending must be paid for out of: (1) the present value of net tax payments to future generations or (2) the present value of net tax payments to currently living generations. If any one of these components is altered by a change in public policy, there must be a corresponding change in at least one of the other components. Such is the zero-sum nature of intergenerational fiscal policy. For example, if the right hand side of equation (1) is fixed, a decrease in remaining net present value of tax payments for living generations will have to be offset by an equal increase in the present value net payments by future generations. Alternatively, if government purchases are raised for living generations, but are not financed by an increase in tax payments from those living, then funding for this increase will have to come from generations in the future.

After constructing the generational accounts and finding the $N_{t,k}$s for living generations, we use equation (2) to find the $N_{t,k}$s and the accounts for future generations. Rearranging the intertemporal budget constraint we get:

$$\sum_{s=1}^{\infty} Nt,t+s = \sum_{s=1}^{\infty} Gs(1+r)^{t-s} + Lt - \sum_{s=0}^{D} Nt,t-s \qquad (3)$$

From equation (3), we can see that inferring the fiscal burden on future generations involves not only knowing the generational accounts of current generations, but also the net debt position in the beginning of year *t*, and the projected present value of all future government purchases. In the case of Canada, total government sector net debt is obtained from the National Balance Sheet Accounts. For the initial baseline calculations, future government purchases are projected using an assumed constant rate of productivity growth after 1994. The non-education portion of government consumption is assumed to increase with the growth rates of productivity and population. Education is assumed to increase with the growth rates of productivity and the portion of population under the age of 25. All projected government purchases are converted to present value and added together to get the first term on the right hand side of equation (3).

Subtracting the present value of future government purchases and the level of government net debt in *t* from the sum of the net tax burden of those currently alive, we obtain as a residual the net tax burden on future generations. While future generations will be expected to pay this burden if current policy is unaltered for those living, the actual distribution of this amount can be allocated between them in any number of ways. For illustrative comparisons however, the burden is distributed equally among future generations, with the exception that the net payments for each successive generation are adjusted for changes to a cohort's lifetime income, which we take to be the rate of growth of productivity.

It is stressed again that the assumption that only future generations will bear the brunt of tax changes to correct the unsustainable path of fiscal policy is simply a reference point. We can easily make different assumptions about the allocation of future taxes and transfers and how government spending will have an impact on different generations. In

doing so, we can analyze the measures necessary to remove generational imbalance, or the consequences of delaying action even further.

Data Sources and Assumptions

To construct generational accounts for both living and future generations, we require (1) projections for population by age and sex; (2) projections for average taxes and transfers for living generations for each year in which at least some of its members are still alive; (3) a discount rate to convert future payments and receipts into present value; (4) a value for the initial stock of government net debt and; (5) projections for future government purchases on goods and services.

(1) Population Projections

Age and sex-specific population projections were obtained from the Demography Division of Statistics Canada's Population Projection Section, using their official medium baseline projections up to 2041, and extending beyond that using the same assumptions that were prevalent at the end of that year. Table 15 describes the components underlying Statistics Canada's forecasts. Immigration plays a crucial role in the projections since fertility rates for every year observed are less than two. That is, without the forecasted level of immigration, Canada's population would be declining each year. Statistics Canada has also projected that population growth, while still positive due to immigration, will begin to lose momentum, declining steadily from about 1.3 percent in 1994, 1.0 percent in 2010, to less than 0.2 percent by 2050. Population growth levels off to 0.5 percent shortly after. This pattern in Canadian demographics results in a population increase from 29.2 million people in 1994, to a projected 51.4 million by 2200.

(2) Projected Taxes and Transfers

The aggregated values of taxes and transfers used to calculate the net payments were obtained mostly from the National Income and Expenditure Accounts.[34] The amount recorded for seigniorage revenue was obtained from the Bank of Canada's 1994 annual report.[35] We also include health expenditures as part of government transfers rather than as part of government purchases. These payments represent purchases of goods and services on behalf of specific age groups. We therefore treat these expenditures, in effect, as additional age- and sex-specific transfers. The aggregated value for 1994 health care was drawn from Public Sector Finance data.[36] Table 16 itemizes the government receipts and transfers used to calculate the net tax payments for living generations.

The generational accounts require these aggregated values to be broken up by age group and sex. Health care expenditures were distributed by age and sex according to data from the Canadian Institute of Actuaries.[37] Government receipts recorded in the "other taxes" category were allocated evenly to all males and females over the age of 16. All additional taxes and transfers used were distributed according to profiles estimated by the Social Policy Simulation Database and Model (SPSD/M). The SPSD/M contains comprehensive information of social and demographic characteristics, income sources and expenditure patterns on over 150,000 individuals in 60,000 families. The data was collected from a variety of different statisti-

Table 15

Component Assumptions Underlying the Medium Population Projections for Canada 1994 - 2200

Year	Life Expectancy		Fertility	Immigration
	Males	Females		
1994-2000	74.8	81.3	1.70	257,000
2001-2015	76.2	82.1	1.70	250,000
2016-2200	81.0	86.0	1.70	330,000

Source: Statistics Canada, *Population Projections Section, Demography Division*, April 1993.

Table 16

1994 Public Receipts and Expenditures in Canada

(millions of dollars)

Receipts		Expenditures	
Personal Income Taxes	104,277	Health care Expenditures	47,820
		Elderly Benefits	21,907
Capital Income Taxes	19,721	Social Assistance	14,812
Commodity Taxes	65,577	Child Tax Benefits	5,259
Property Taxes	28,596	U.I.	15,012
U.I. Contributions	19,940	Workers' Compensation	3,922
Workers' Compensation Contributions	4,290	C/QPP	19,804
C/QPP Contributions	12,931	Public Pensions	5,402
Public Pension Contributions	3,829	GST Tax Credits	2,833
Other taxes	15,527	Interest Payments	68,556
Net Investment Income	40,943	Government Purchases	148,249
Deficit	39,441		
	355,072		
less seigniorage revenue	1,496		
Total	353,576	Total	353,576

Sources: Statistics Canada, *National Income and Expenditure Accounts: Annual Estimates, 1985-1994,* 1995, catalogue no. 13-201; and *Public Finance Sector,* 1995, catalogue no. 68-212.

cal surveys — mainly: the Survey of Consumer Finance, Personal Income Tax Returns, UI Claimant History Data, Family Expenditure Survey and National Input/Output Tables. The actual model in SPSD/M processes each individual and family unit on the database and calculates taxes and transfers using legislated or proposed programs and algorithms. Table 17 shows a representation of the profiles that were used in calculating the generational accounts for Canada. Note, however, that the data actually used was broken up into 91 age categories (zero-90) instead of the five listed in Table 17.

All future receipts and expenditures were projected to increase with changes to population and changes to productivity (which, for our base case, we assume to be one percent). Alternative generational accounts are measured under slower growth assumptions for health care expenditures. Specifically, we also assess the findings if future per-capita health care became fixed after the year 2000.

(3) Interest Rate Assumptions

The appropriate interest rate to use when discounting future payments and receipts depends on whether or not these amounts will be realized for certain. Anticipating government transactions in the future is risky, which suggests discounting expected payments or receipts at a higher amount than the riskless government borrowing rate. On the other hand, these transactions are not as volatile as the return from capital assets. We assume for our baseline results an interest rate for discounting purposes of five percent, which is a compromise between the riskless and risky rates of return in Canada. It is the same rate as that assumed by the Office of the Superintendent of Financial Institutions in calculating Canada Pension Plan unfunded liabilities and by the Canadian Institute of Actuaries in determining unfunded liabilities for C/QPP, old age security and health care.[38] The assumption is also similar to the ones used by all the other countries in calculating generational accounts.

(4) Total Government Net Debt

The level of government net debt was obtained from Statistics Canada's National Balance Sheet Accounts. Consolidated net financial debt for federal, provincial, territorial and local governments, measured on a national accounts basis, was $440,929 million at the beginning of 1994.[39] With 1993-94 GDP at $712,855 million, the net debt-to-GDP ratio was 61.8 percent for that year.

(5) Government Purchases

Public spending on net investment and public goods and services, defined in this paper as government purchases, amounted to $148,365 million. This amount included a number of small, miscellaneous transfers that were not classified in the National Accounts as expenditures on goods and services but were allocated as part of such expenditures because it was not possible to distribute them to age-specific generations. Health care spending, on the other hand, was excluded from this amount, since we chose to treat it as an implicit transfer to age- and sex-specific generations. Table 18 quantifies these calculations.

Table 17

Average Percentage Distribution of Particular Taxes and Transfers by Individual Age and Sex

	Personal Income Tx.	Commodity Taxes	Property Taxes	UI Contrib.	Health Transfers	Elderly Benefits	C/QPP	UI
Males								
Age								
0-14	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0
15-24	2.2	2.3	0.4	4.8	1.8	0.0	0.0	10.4
25-64	58.8	33.3	31.5	57.8	14.0	0.2	11.1	54.3
65-74	6.3	6.4	8.5	1.1	10.0	16.4	27.7	0.0
75+	5.3	8.0	9.6	0.0	29.7	28.4	28.1	0.0
Females								
Age								
0-14	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0
15-24	1.4	2.3	0.4	3.8	1.9	0.0	0.0	4.5
25-64	21.1	33.3	31.5	32.5	9.5	1.4	6.8	30.8
65-74	2.4	6.4	8.5	0.0	5.4	17.8	13.0	0.0
75+	2.5	8.0	9.6	0.0	22.3	35.8	13.3	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Social Policy Simulation Database and Model (SPSD/M) and Canadian Institute of Actuaries (1995) [health data].

Table 18

Components of Government Purchases Used in Computing the Canadian Generational Accounts

Component of Government Purchases	
Total Government Current and Capital Expenditure on Goods and Services	167,406
less capital consumption allowance	-10,356
sub-total	157,050
Family and youth allowances	37
Grants from Canada Council	88
Scholarships and grants - research	780
Grants to Universities	191
Post-Secondary Education Grants	6,260
Grants to Native Peoples	3,027
Grants to National Organizations	316
Grants to Benevolent Associations	9,002
Provincial Miscellaneous	2,573
Grants to Charitable and other Organizations	73
Capital Assistance	1,386
Subsidies	10,949
Non-Residents	2,345
Federal Miscellaneous (less child tax benefits and GST credits)	1,992
sub-total	196,069
less health care expenditures	-47,820
Total	148,249

Sources: Statistics Canada, *National Income and Expenditure Accounts: Annual Estimates, 1985-1994,* 1995, catalogue no. 13-201; and *Public Finance Sector*, 1995, catalogue no. 68-212.

Appendix B

A Reconciliation

Christopher Good, commissioned by the Fraser Institute, has prepared his own set of generational accounts for Canada. His research and ours were conducted independently, but both reach the same conclusion — that Canadian fiscal policy is currently unsustainable. If the current structure of fiscal policy remains in place for living generations, both reports find that future generations would probably have to pay more than twice as much in net taxes in order to satisfy the government's budget constraint.

In preparing the accounts, however, there were a number of distinct differences between Good's approach and ours that caused the two sets of findings to vary. We chose in this paper to follow, as closely as possible, the methodology that was used when calculating the generational accounts for the United States. In doing so, our accounts distinguish between males and females; health care spending is counted as an implicit transfer; and the interest and growth rate assumptions are more similar to the ones used for the US (and other countries). These differences will alter the amounts for the net present value payments by generations, but they should not alter the main conclusions. Table 19 shows our baseline generational accounts for newborns and future generations under the different methodological approaches that Good uses when calculating his accounts. All values shown are in 1991 Canadian dollars.[40]

In the first column of Table 19 we show our baseline accounts, except that we have combined male and female generations. Interest and growth rates are still assumed to be five and one percent respectively. For this scenario, newborns (males and females) are projected to pay $94,500 over the rest of their life in present value net taxes, while future generations will have to pay $190,900. The 102.0 percent increase is almost identical to the 104.2 percent increase we found in our baseline results that distinguished in between the sexes.

The generational accounts in column 2 treat health expenditures as part of government purchases, similar to Good's approach. The net present value of tax payments in this case will be different because the gross present value of total taxes will no longer be subtracted by the present value of health care benefits. This is why both the net tax payments for newborns and the ones for future generations are larger in column 2.

In addition to treating health expenditures as part of government purchases, the generational accounts in column 3 assume the same interest and growth rates used by Good in his medium case (an interest rate of four percent and a productivity growth rate of 0.6 percent). The present value net tax payments here look similar to the ones used in Good's study. Male and female newborns are projected to pay $164,800 in present value net taxes to the government over their lifetime, compared to the $125,500 found by Good. Future generations, under the assumptions in column 3, will be expected to pay $307,400. Good finds this amount to be $316,600.

Finally, in column 4 we show what our generational accounts would look like if (1) we do not distinguish between the sexes, (2) health expenditures are counted as part of government purchases and not as implicit transfers, (3) we assume an interest and growth rate of four and 0.6 percent respectively and (4) we project the fiscal policy prevalent in 1991 instead of 1994. Good adopts all these approaches. Our results are very similar when we adapt his methodology. Note that there are not very signif-

Table 19

Net Present Value Payments for Newborns and Future Generations Under our Various Methodological Approaches and the Canadian Generational Accounts Determined by Good (1995), Medium Assumptions

(thousands of 1991 Canadian dollars)

	1994 Basecase r=.05, g=.01 Males and Females Combined	1994 Health as part of gov't con. r=.05, g=.01 Males and Females Combined	1994 Health as part of gov't con. r=.04, g=.006 Males and Females Combined	1991 Health as part of gov't con. r=.04, g=.006 Males and Females Combined	Good's Study r=.04, g=.06
Newborns	94.5	121.3	164.8	162	125.5
Future Generations	190.9	237.4	307.4	331.8	316.6
% Difference	102	95.7	86.5	104.8	191.1

Sources: Christopher Good, "The Generational Accounts of Canada," *Fraser Forum* (Vancouver: The Fraser Institute, August 1995); and Authors' calculations.

icant differences between projecting the fiscal policy conditions existing in 1991 and those existing in 1994. There are several other minor variations between the two papers which may explain the remaining discrepancy. Among them, we obtain age and sex profiles from the SPSD/M, while Good uses statistics from Revenue Canada. We include seigniorage revenue as part of government revenue while Good does not. We make an adjustment for the one time intergenerational transfer caused by the different tax treatments of old and new capital. Good does not. Furthermore, our study defines government subsidies as part of government purchases, while Good includes these payments as direct transfers. We also differ in our definition of net debt.

Most of these differences are a matter of preference. We prefer to distinguish between males and females because the generational accounts of the two sexes differ so significantly. We treat health care as an implicit transfer so that we may make useful comparisons with the United States' generational accounts. Our interest and growth rate assumptions are similar to those used by the Canadian government and the Canadian Institute of Actuaries, and by others who calculated generational accounts for different countries. A 0.6 percent productivity growth rate assumption is, in our opinion, too low. Finally, we chose to use the fiscal policy prevalent in 1994 because it was the most current available and it represented a year that was neither too high nor too low in the business cycle.

Nevertheless, despite these differences, Good's set of generational accounts and ours reach similar conclusions. Good focusses his paper on the consequences of postponing fiscal change. We agree with him that if current policies remain in place for living generations, future generations are likely to have to bear extremely high net tax burdens.

In addition, we have estimated the kinds of policy changes that would have to occur now to lessen this burden. The magnitude of change required immediately is significant, but possible. It is important that these changes occur before the government's finances get out of control.

Notes

1 Alan J. Auerbach, Jagadeesh Gokhale and Laurence J. Kotlikoff, "Generational Accounts: A Meaningful Alternative to Deficit Accounting," in David Bradford (ed.), *Tax Policy and the Economy* (Cambridge, USA: National Bureau of Economic Research, 1991), Vol. 5, pp. 55-110. For an intuitive discussion on generational accounts, see Laurence J. Kotlikoff, *Generational Accounting: Knowing Who Pays, and When, for What we Spend* (New York: Free Press, 1992); and Alan J. Auerbach and Laurence J. Kotlikoff, "U.S. Fiscal and Savings Crises and Their Impact for Baby Boomers," in Dallas L. Salisbury (ed.), *Retirement in the 21st Century: Ready or Not?* (Employee Benefit Research Institute, 1994).

2 Alan J. Auerbach, Jagadeesh Gokhale and Laurence J. Kotlikoff, "Restoring Generational Balance in U.S. Fiscal Policy: What Will It Take," in *Economic Review*, The Federal Reserve Bank of Cleveland (Cleveland: First Quarter, 1995); Leibfritz Willi, Deborah Roseveare, Douglas Fore and Eckhard Wurzel, *Aging Populations, Pension Systems and Government Deficits: How do they affect saving?*, Working Paper No. 156, Paris, OECD, 1995; and Alan J. Auerbach, Bruce Baker, Laurence J. Kotlikoff and Jan Walliser, "Generational Accounting in New Zealand — Is There Generational Balance?", unpublished, 1995.

3 Christopher Good has recently produced his own set of generational accounts for Canada in "The Generational Accounts of Canada," *Fraser Forum* (Vancouver: The Fraser Institute, August 1995). His work was conducted independently of ours. A reconciliation between his results and ours is provided in Appendix B at page 48 of this study.

4 We refer to government net debt in this paper on a national accounts basis, defined by Statistics Canada as the gross debt of the public sector less its financial assets. You may be more familiar with the debt on a public accounts basis, the debt-to-GDP ratio of which is rapidly approaching 100 percent. The public accounts measure of net debt includes government unfunded liabilities for public employee pensions and excludes revenues and expenditures for hospitals and C/QPP. The national accounts measure of net debt includes revenues and expenditures for hospitals and C/QPP, and treats public employee pension contributions as government revenue and public employee pension benefits as expenditures. Both measures have risen dramatically over the last decade. We chose to refer to the national accounts measure simply because it was more compatible and consistent with the generational accounting's own framework of debt, revenues and receipts.

5 Statistics Canada, *National Income and Expenditure Accounts: Annual Estimates, 1985-1994*, 1995, catalogue no. 13-201.

6 For a more detailed, yet non-technical discussion on the effects of budget deficits, see Laurence Ball and Gregory Mankiw, "What Do Budget Deficits Do?", NBER, Working Paper No. 5263.

7 Canadian Institute of Actuaries, *Troubled Tomorrows: The Report of the Canadian Institute of Actuaries' Task Force on Retirement Savings* (Ottawa: Canadian Institute of Actuaries, 1995).

8 Generational accounts include the taxes and transfers for all levels of government — federal, provincial and local. The baseline accounts do not show the separate effects from different levels of fiscal policy. However, a change in policy by any particu-

lar level of government that would alter the baseline results *can* be examined.

9 The scenario of burdening only future generations may not even be feasible. It may be that, under this scenario, debt-to-GDP levels would be so high that governments would not be able to raise enough tax revenues to finance the ongoing deficits. The required tax increase to future generations could lead to citizens refusing to pay, and the temptation to default on the debt or to monetize it could cause lenders not to want to hold any public sector bonds. If this is the case, our reference point for choosing when a policy change would occur to make government spending sustainable would be useful only in indicating the improbability of such a scenario. The necessary changes would have to occur much sooner if they were to be politically possible.

10 Statistics Canada, *Public Sector Finance*, 1995, catalogue no. 68-212.

11 Commodity taxes include the goods and services tax, all retail sales taxes, gasoline taxes, amusement taxes and all licence and permit fees. The "other taxes" category consists of federal, provincial and local miscellaneous taxes, seigniorage revenue and hospital insurance premiums.

12 Elderly Benefits consist of old age security payments (OAS, GIS and PSA), old age and blind pensions, WWI and II pensions and War Veterans' allowances.

13 For more information on the effects of including or excluding age-specific government purchases as implicit transfers, see Philip Oreopoulos, "A Generational Accounting Approach to Canadian Public Policy," thesis submitted to the University of Western Ontario, Huron College, Economics Department in May 1995.

14 For a comprehensive discussion on the structure and methodology of the SPSD/M, see Michael Bordt, Grant J. Cameron, Stephen F. Gribble, Brian B. Murphy, Geoff T. Rowe and Michael C. Wolfson, "The Social Policy Simulation Database and Model: An Integrated Tool for Tax/Transfer Analysis," *Canadian Tax journal*, Vol. 38, no. 1 (1990), pp. 48-65.

15 US Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal year 1995* (Washington, DC: Government Printing Office, 1994).

16 We hope to be able to use these types of projections in future research.

17 Office of the Superintendent of Financial Institutions Canada, *Canada Pension Plan: Fifteenth Statutory Actuarial Report as at 31 December 1993* (Ottawa, 1995); and *Troubled Tomorrows: The Report of the Canadian Institute of Actuaries' Task Force on Retirement Savings*.

18 Statistics Canada, *National Balance Sheet Accounts: Annual Estimates, 1995-1994*, 1995, catalogue no. 13-213.

19 For a discussion about generational accounting in general equilibrium, see Hans Fehr and Laurence J. Kotlikoff, "Generational Accounting in General Equilibrium," unpublished, 1995. The authors conclude that "[i]n general, changes in generational accounts appear to provide fairly good approximations to [changes in generations' actual behaviour]. The approximations are better for living generations. They are worse for policies that involve significant changes in the degree of tax progressivity and for economies with sizable capital adjustment costs."

20 It is possible to compare the net tax burden between living generations using lifetime net tax rates, which have been constructed for the United States. In this paper, only the lifetime net tax rates for newborns and future generations are presented, since calculating these amounts for older generations requires a considerable amount of historical data that was unavailable at the time of this study.

21 To date, we have not taken account of the effects of future increases to female labour force participation. However, including these changes will not alter the generational accounts significantly, since the projected increases after 1994 are small and occur over a gradual period of time.

22 The present value of lifetime earnings is calculated much in the same way as when calculating the present value of taxes and transfers. To obtain this value, we add up all discounted future earnings that an average member of a generation will make during his or her lifetime. The data required for this calculation was acquired from the SPSD/M and from Statistics Canada's *National Income and Expenditure Accounts*.

23 No attempt has been made here to incorporate similar impacts of the 1995 provincial budgets. Financial projections for the provinces exist for the upcoming year only and, with the exception of Alberta, no province is projected to make any major expenditure changes during this period. It is hoped that future research will attempt to include prospective changes to provincial budgets, especially for Ontario and Alberta.

24 It is impossible to know exactly how each province will react to these transfer reductions. The assumption that these reductions will be offset by equivalent declines in provincial spending is only one of many possible outcomes. The generational accounts will be affected in similar fashion if the provinces instead respond by cutting transfers or raising taxes. However, if the provinces finance the loss of revenue by borrowing, no improvements to the degree of generational imbalance will occur.

25 Department of Finance, *Budget Speech*, 1995. For specific details about the proposed federal budget changes beginning in 1995, in particular, see pp. 29-33.

26 Lifetime net taxes have increased for newborns because gross taxes have risen and gross transfers have fallen. Future generations are also affected by these changes, but their net taxes are reduced because the extra burden placed on living generations from this change in policy outweighs the burden that they will face from this change (see section III regarding the intertemporal budget constraint).

27 Values for the US accounts were obtained from Jagadeesh Gokhale, Bernd Raffelhuschen and Jan Walliser, *The Burden of German Unification: A Generational Accounting Approach* (Cleveland: The Federal Reserve Bank of Cleveland,1995).

28 The exchange rate used was 0.734.

29 Alan J. Auerbach, Jagadeesh Gokhale and Laurence J. Kotlikoff, "Generational Accounting: A Meaningful Way to Evaluate Fiscal Policy," *Journal of Economic Perspectives*, Vol. 8, no. 1 (1994), pp. 73-93.

30 Annual aggregate changes for Medicare and Medicaid are taken from projections provided by the United States Office of Management and Budget (OMB) and the United States Health Care Financing Administration (HCFA). See US Office of Management and Budget, *Analytical Perspectives*. Between the years of 1993 and 2005, Medicaid is projected to grow about

nine percentage points faster than population and productivity change. Between 2005 and 2030, these expenditures grow from one to three percent. For Medicare, per-capita growth above the rate for productivity is estimated to be three and five percentage points for each year between 2005 to 2030. After 2030, health care expenditures are assumed to increase in relation to changes in population and productivity.

31 Ralph Sutherland and Jane Fulton, *Spending Smarter and Spending Less: Policies and Partnerships for Health Care in Canada* (Ottawa: The Health Group, 1994), chaps. 5 and 10.

32 Auerbach, Gokhale and Kotlikoff, "Generational Accounts."

33 Canadian Institute of Actuaries, *Troubled Tomorrows*.

34 Statistics Canada, *Income and Expenditure Accounts*.

35 Bank of Canada, *Annual Report*, 1995. Seigniorage revenue was taken to be the net revenue paid to the Receiver General for Canada.

36 Statistics Canada, *Public Sector*.

37 Canadian Institute of Actuaries, *Study on Health Care Delivery*, Ottawa, forthcoming.

38 Office of the Superintendent of Financial Institutions Canada, *Canada Pension Plan*; and Canadian Institute of Actuaries, *Troubled Tomorrows*.

39 The exclusion of non-financial government assets, such as land, has little impact on the findings from generational accounting. If we were to add these items to the right hand side of the intertemporal budget constraint in equation (2), we would also have to include the imputed present value of rent from these amounts. As a first approximation, these values are equal and would cancel one another from the equation, leaving our calculation of net tax burdens on future generations unaltered. See Auerbach, Gokhale and Kotlikoff, "Generational Accounting," for details.

40 1994 amounts were converted to 1991 amounts using the GDP deflator ($1.00 in 1994 equalled $0.95823 in 1991).

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