Catalogue no. 68-513-XIB

Government Finances and Generational Equity

Edited by
Miles Corak

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All prices exclude sales tax

Catalogue no. 68-513-XPB, is published as a standard **paper product** for $35.00 in Canada. Outside Canada the cost is US$35.00.

This product is also available on the Internet as Catalogue no. 68-513-XIE for CDN $13.00 per issue. Users can obtain single issues at http://www.statcan.ca/cgi-bin/downpub/feepub.cgi.

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Statistics Canada

Government Finances and Generational Equity

Edited by
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Published by authority of the Minister responsible for Statistics Canada

February 1998

Catalogue no. 68-513-XIB
Frequency: Occasional

ISBN 0-660-59383-1

Ottawa

Note of appreciation

Canada owes the success of its statistical system to a long-standing co-operation involving Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Canadian Cataloguing in Publication Data

Main entry under title:

Government Finances and Generational Equity

Text in English and French with French text on inverted pages.
ISBN 0-660-59383-1
CS68-513-XPB

1. Generational Accounting — Canada.
2. Age Distribution (Demography) — Economic Aspects — Canada.
3. Finance, Public — Canada — Accounting.
I. Statistics Canada.
II. Title. III. Title: Les finances publiques et l'équité intergénérationnelle.

HJ793 G68 1998 336.71 C98-988002-8E

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences – Permanence of Paper for Printed Library Materials, ANSI Z39.48 – 1984.
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Preface and Acknowledgements

"Generational Equity" is a topic that has gradually risen higher and higher on the agenda of governments at all levels. In fact, it is a matter not just for government policy, but a topic that touches many Canadians directly: young and old, parents and grandparents. Canadian policy makers increasingly have to deal with issues associated with the relative status of individuals between successive generations. The reform of public pension programs presents the most obvious example, but there are many other developments that raise the same type of issue. Indeed, the heightened concern over government fiscal policies is due in large part to the readiness of many to view government deficits and debt as a burden on future generations. Generational equity, however, is also a concern of individual Canadians and their families. The allocation of resources between the young and the old within the family is becoming an increasingly important issue for many, especially in light not only of an aging population but also the belief that those just entering the labour force will likely not attain the standard of living to which their parents have become accustomed.

The contributors to this book examine the operation of government taxes and expenditures from a generational perspective. In part the motivation for bringing these essays together is to offer comprehensive and up-to-date information on the age incidence of government finances. This motivation, however, also has to do with the development of a new accounting framework, Generational Accounting, that has gained some currency in many industrialized countries, particularly in the United States. It is a truism to say that good analysis requires good data, and certainly Statistic Canada's central role is to offer high-quality data in support of analysis and decision making. But the opposite is equally true, if not as obvious: good data requires good analysis. That is to say, new analytical frameworks often highlight the need to organize existing data in different ways, as well as the need for the development of new types of data. This is certainly one of several reasons that Statistics Canada has sought to develop a strong analytical capacity, and to maintain strong ties with the research community. This book is meant to contribute to this process by examining Canadian data through the lens of Generational Accounting, and by analyzing some of the issues that arise.

A companion volume called *Labour Markets, Social Institutions, and the Future of Canada's Children* examines how labour markets, the family, and the state work to determine the well-being and prospects of children. Both books are based upon papers presented at a conference held at Statistics Canada in February 1997. Funding for the conference was obtained from the Analytical Studies Branch of Statistics Canada, and the Applied Research Branch of Human Resources Development Canada. I would like to thank Stewart Wells of Statistics Canada and Allen Zeesman of Human Resources Development Canada for acting as co-sponsors. The conference represented an important first step in the process of reviewing and revising the papers for publication, and I would also like to thank the group of people who acted either as chairpersons, commentators, or referees: Bob Baldwin, Roderic Beaujot, Geoff Dougherty, Chris Ferrall, Jane Gentleman, David Gray, Ronald Hirshhorn, Guy Lacroix, Jim Lahey, Paul Lanoie, Dean Lillard, Huw Lloyd-Ellis, Mike McCraken, Susan McDaniel, Alice Nakamura, Lars Osberg, James Pesando, Suzanne Peters, Robin Rowley, William Scarth, Andrew Sharpe, Jean-Pierre Voyer, Ted Wannell, Brian Ward, Ging Wong, Allen Zeesman, and David Zimmerman. In addition I would like to acknowledge suggestions made by the members of Statistics Canada's National Accounts Advisory Committee on how this book should be structured, as well as the

comments of John Helliwell, Laurence Kotlikoff, and Michael Wolfson on a first draft of Chapter 1. At the same time it should also be noted that the views expressed in this publication are those of the authors, and should not be interpreted as representing the official positions of either Statistics Canada or Human Resources Development Canada.

The organization of the conference and the publication of this book owes much to Valerie Thibault. I would like to thank her and Francine Simoneau, who was responsible for the layout and design of the publication, as well as Suzanne David, who did the French editing. Other members of the team contributing to this publication include staff from the Dissemination Division, and Agnes Thompson of Communications Division who helped organize the conference.

Miles Corak

Statistics Canada

Contributors

Miles Corak
Analytical Studies Branch
Statistics Canada
Ottawa, Ontario K1A 0T6
(613) 951-9047
coramil@statcan.ca

Steve Gribble
Analytical Studies Branch
Statistics Canada
Ottawa, Ontario K1A 0T6
(613) 951-3766
gribble@statcan.ca

Morley Gunderson
Centre for Industrial Relations
University of Toronto, 121 St. George Street
Toronto, Ontario M5S 2E8
(416) 978-5398
morley@chass.utoronto.ca

John Helliwell
Department of Economics
University of British Columbia
Vancouver, B.C. V6T 1Z1
(604) 822-4953
helliwel@unixg.ubc.ca

Chantal Hicks
Analytical Studies Branch
Statistics Canada
Ottawa, Ontario K1A 0T6
(613) 951-5311
hickcha@statcan.ca

Douglas Hyatt
Institute for Work and Health
250 Bloor Street East
Toronto, Ontario M4W 1E6
(416) 927-2027
dhyatt@iwh.on.ca

Steven James
Department of Finance, Canada
140 O'Connor Street, 18th Floor
Ottawa, Ontario K1A 0G5
(613) 992-6712
James.Steven@fin.gc.ca

Laurence Kotlikoff
Department of Economics
Boston University, 270 Bay State Road
Boston, Massachusetts 02215
(617) 353-4002
kotlikof@acs.bu.edu

Xiaofen Lin
Analytical Studies Branch
Statistics Canada
Ottawa, Ontario K1A 0T6
(613) 951-5312
linxiao@statcan.ca

Chris Matier
Department of Finance, Canada
140 O'Connor Street, 18th Floor
Ottawa, Ontario K1A 0G5
(613) 992-4996
Matier.Chris@fin.gc.ca

Marcel Mérette
Department of Finance, Canada
140 O'Connor Street, 18th Floor
Ottawa, Ontario K1A 0G5
(613) 992- 5437
Merette.Marcel@fin.gc.ca

Brian Murphy
Analytical Studies Branch
Statistics Canada
Ottawa, Ontario K1A 0T6
(613) 951-3769
murphy@statcan.ca

PHILIP OREOPOULOS
619 Kearney Street, Apt. 1
El Cerrito, California 94530
United States
(510) 526-8239
oero@econ.berkeley.edu

LARS OSBERG
Department of Economics
Dalhousie University
Halifax, Nova Scotia B3H 3J5
(902) 494-6988
osberg@is.dal.ca

GEOFF ROWE
Analytical Studies Branch
Statistics Canada
Ottawa, Ontario K1A 0T6
(613) 951-8215
rowegt@statcan.ca

FRANÇOIS VAILLANCOURT
Department of Economics
Université de Montréal
Montreal, Quebec H3C 3J7
(514) 343-7314
vaillanf@ere.umontreal.ca

MICHAEL WOLFSON
Institutions and Social Statistics Branch
Statistics Canada
Ottawa, Ontario K1A 0T6
(613) 951-8216
wolfson@statcan.ca

Chapter 1

Introduction

MILES CORAK

One of the major forces contributing to changes in Canadian public policy over at least the last ten years has been the size of government deficits. The need to reduce the "deficit" has led to substantial changes in the type and nature of services provided by governments at all levels, and this need is often motivated by the burden the accumulated deficit is claimed to place on future generations. Reforms to the Canada/ Quebec Pension Plan (C/QPP), and to many other programs ranging from health care, to education, to questions of child poverty all share this motivation.

In fact, the readiness of many to view government deficits as a burden on future generations implies that the state of government finances will remain a major issue in shaping public discourse even as actual deficits (at least at the federal level) are turning into projected surpluses. As the government accounts begin to register surpluses many will feel that fiscal policy no longer encumbers the unborn with the unpaid liabilities of those alive today. Rather, the argument continues, surpluses imply a "fiscal dividend" that can be used for present day needs.

But is the annual balance of the government finances—as reported in official statistics—the best measure of generational inequities? Many commentators have in fact suggested that the deficit is useless as a guide for public policy. In his recent book Laurence Kotlikoff claims that

> the government's budget deficit—the cornerstone of conventional economic policy and management—is a number devoid of economic content and that its use has repeatedly led us astray. By employing this faulty indicator we have repeatedly misjudged the true stance of economic policy and have chosen policies that compound, rather than solve, our critical economic problems. (Kotlikoff 1992, p.ix)

Although these words were written with reference to the U.S. experience, the author feels that the general point applies to most, if not all, advanced industrial economies. An annual measure based loosely on the government's cash flow requirements is an incomplete statistic, one susceptible to accounting sleight of hand and that ultimately does not measure what we wish it to: namely the burden that is being passed on to unborn generations by the conduct of existing policy.

Kotlikoff and his co-researchers have proposed an alternative accounting framework, Generational Accounting, and claim that it is a better measure of the extent to which current generations shift a fiscal burden on to future generations. Generational Accounting is intended to offer a yardstick for the conduct of fiscal policy in the long-term, across the generations.

Statistics Canada regularly produces data dealing with government finances, the deficit, and national accounting. Indeed, in a sense these data have been one of the historical mainstays of all statistical organizations. Is this information relevant for Canadians in an era of increasing concern over generational equity? How do Canadian government finances appear when viewed through the lens of Generational Accounting? What are the limitations of this approach, and to what degree should statistical agencies be involved in Generational Accounting exercises? More generally, what are the challenges in producing a series of statistics that measure the intergenerational transfers inherent in the operation of governments and society?

1. Overview

The chapters in this book are intended to respond to these questions. The authors apply Generational Accounting methods using

Canadian data; they present detailed information on the age distribution of government taxes and transfers and how this distribution has changed through time; they assess the assumptions upon which Generational Accounting is based and offer complementary information and methods that go beyond these assumptions; and finally they offer an assessment of the degree of generational inequity in Canada and a catalogue of the information gaps.

The major analytical papers are presented as Chapters 2 through 8. Chapter 9, which is based on contributions by Laurence Kotlikoff and by Lars Osberg, offers competing perspectives on the policy implications of this analysis, while Chapter 10 by John Helliwell is a summing up of the major lessons learned, and offers directions for future work.

In Chapter 2 Philip Oreopoulos and François Vaillancourt present an exposition of what Generational Accounting is about, how it is done, and an application that incorporates the most recent budgetary and policy decisions in Canada.

The authors make clear that at the heart of Generational Accounting is the notion of a government budget constraint, the idea that governments must pay for spending and debt servicing with resources from current and future generations. Generational Accounting involves allocating present government taxes and expenditures to each existing age cohort, and by using population and productivity growth projections assesses the extent to which this is "sustainable," meaning the extent to which current generations will pay in taxes (over the course of their lifetime) for the goods and services they consume. To the extent that they do not, the government's budget constraint dictates that the net taxes (taxes less transfers) of future generations will have to rise, in other words that current fiscal policy is not sustainable.

In the first instance this raises a host of measurement issues, and the following three chapters deal with various aspects of these. Chapter 3 by Morley Gunderson and Douglas Hyatt is both an application of Generational Accounting, and an illustration of some important matters of measurement. They use Generational Accounting methods to examine the intergenerational transfers implied by the unfunded liability of the Ontario Workers' Compensation system. The authors of Chapters 4 and 5 examine the allocation of government taxes and transfers by age, a necessary first step in Generational Accounting. In Chapter 4 Chantal Hicks presents a detailed analysis of the age distribution of taxes and transfers in 1995 by program and by level of government. Brian Murphy conducts a similar exercise in Chapter 5 but examines changes in the age incidence of government taxes and transfers between 1973 and 1995.

Generational Accounting also raises a number of broader issues related to several underlying assumptions. These are at least three in number (no incentive effects, no transitional dynamics, and no heterogeneity within generations), and are highlighted in each of Chapters 6, 7, and 8. Taken together these three chapters help us to understand the nature of the assumptions underlying Generational Accounting and the associated limitations.

Generational Accounting assumes that tax/transfer changes implemented as a result of an unsustainable fiscal policy do not have incentive effects. That is, individuals will not change their saving, consumption, or work behaviour in response to these changes. In Chapter 6 Steven James and Chris Matier address this possibility by examining the consequences of raising taxes in order to permanently lower the debt-to-GDP ratio by five percentage points. They use a computational general equilibrium model that permits individuals to interact with markets in response to this policy, and chart the consequences for GDP, consumption, the capital stock, hours worked and societal welfare in general.

Marcel Mérette examines a related issue in Chapter 7. The question he addresses is: if a government acts to reduce a generational inequity in the conduct of its fiscal policy by raising taxes, what are the short and medium term consequences? What are the implications for economic growth and welfare as the economy makes its transition to a new equilibrium with a lower debt load? Does it matter how quickly the government implements its policy? Mérette also uses a computational general equilibrium model, and examines an experiment similar to James and Matier (a five percentage point reduction in the debt-to-GDP ratio).

Finally in Chapter 8 Wolfson, Rowe, Lin, and Gribble address the fact that policy makers need to consider not only inequities between generations but also inequities within generations. For the sake of simplicity Generational Accounting assumes that all individuals within a particular generation are the same, or at least that it is appropriate to base

the analysis on a representative or average individual. The authors of Chapter 8 present a more general accounting framework that is not based on such an assumption.

2. Major Findings

Current Fiscal Policy is in Balance Across the Generations

Oreopoulos and Vaillancourt find that the current state of fiscal policy in Canada is roughly in balance across the generations. This is a major change over the situation that prevailed in 1995. If the fiscal policy prevailing in 1995 had been left to run its course, and if per capita taxes and transfers simply grew at the same rate projected for productivity growth (1%) then the net lifetime tax rate of future generations would have had to rise by over 85% to pay for the liabilities being accrued by existing generations. Existing generations would pay about 38% of their lifetime earnings in taxes, while future generations would have to pay 71% in order to ensure that the government's budget constraint was respected.

Recent reforms imply important changes. The 1997 federal budget, in combination with slower growth for certain transfer payments, means that the difference between the lifetime tax rates between current and future generations is significantly reduced: current generations having to pay 41% of their lifetime earnings in taxes, and future generations 50.6%. The proposed transition to higher C/QPP contributions eliminates this remaining differential completely. Both current and future generations are expected to pay 44% of their lifetime earnings in taxes.

This does not come without consequences for existing generations as illustrated in Table 2.2 of Chapter 2. Oreopoulos and Vaillancourt claim that the lifetime net taxes of those born after 1955 increase by more than $15,000, and that the increase is more than $20,000 for those cohorts born in 1965, 1975, and 1985. The C/QPP contribution changes are the major factor behind this. Juxtaposed to these increases, however, is a $78,400 decrease in the lifetime net taxes of the unborn. In sum, these changes imply that newborns will pay $127.5 thousand in taxes over their lifetimes, while future generations will pay $129.2 thousand.

Tax/Transfer Changes over the Last Two Decades have Benefited the Young and especially the Old

Very significant changes have in fact occurred not only since 1995, but in almost every year since the mid 1970s. Figure 5.2 in Chapter 5, illustrates that the net taxes of cohorts aged 30 to 60 are higher in 1994 than they were in 1973, in some cases by nearly $1,700. At the same time individuals over 65 years are receiving about $2,600 to $2,800 more in net transfers (transfers received less taxes paid) over this period. Murphy notes that these developments reflect legislative changes, but also macroeconomic fluctuations.

When the legislative reforms that took place between 1984 and 1994 are examined in isolation of demographic and macroeconomic changes he finds that about 60% of Canadians experienced a decrease in their net transfers, while 22% experienced an increase (the remaining 18% faced no significant change). Furthermore, individuals over 65 were the most likely to experience an improvement in their net transfers from government, with as many as 70% of those between 85 and 89 experiencing an increase. Those under 25 years also experienced above average gains. Murphy concludes: "[the] picture that emerges is one in which younger and older cohorts have fared relatively better than their middle aged counterparts as a result of tax/transfer changes over the past decade" (Chapter 5, p.67).

Allocating Government Taxes and Transfers to Age Groups Requires Knowledge of the Activities of all Governments, of How Labour Markets Work, and of How Resources are Allocated within the Family

The starting point for Generational Accounting exercises is an allocation of existing government taxes and transfers across each individual age group in the population. This is a challenge for a number of reasons.

First, it is difficult to obtain a comprehensive breakdown of government taxes and transfers by detailed age group. Chapters 4 and 5 help to fill this gap. In particular Hicks (Chapter 4) supplements existing databases with improved measures of heath and education expenditures by age. This permits, among other things an analysis by program, and by level of government. She notes that the federal government transfers

very little to the young, while on average providing $12,000 (net of taxes) to those over 64 years of age. In contrast, provincial and local governments transfer on average about $5,000 to those under 20, about $3,500 to those 65 to 75, and about $7,000 to those older than 75.

The analysis of the Ontario Workers' Compensation system in Chapter 3 by Gunderson and Hyatt also raises this theme. There are programs at all levels of governments (some of which may not at first glance appear to have an intergenerational dimension) that should be incorporated into Generational Accounting exercises. In fact, careful readers of Chapters 2 through 5 will note that in spite of representing an improvement over the existing literature the authors still do not offer a complete catalogue of government activities.

The allocation of taxes and transfers across age groups is also difficult because of the need to recognize the interaction between government programs and individual behaviour, an interaction that is mediated by the marketplace. One obvious dimension concerns the distinction between the legal and economic incidence of a tax, and is raised by almost all of the authors. Payroll, property, and corporate taxes are all shifted in varying degrees according to the bargaining power of the parties involved and the structure of the markets within which they operate.

Gunderson and Hyatt, however, raise a related but broader point: macroeconomic and structural labour market changes will influence the measurement of generational equity. The unfunded liability of Workers' Compensation programs implies that past employers have moved the costs of accidents forward in time. This raises an intergenerational consideration if these employers are not likely to be operating in the future. The authors argue that this is increasingly so because of heightened labour market changes due to global restructuring, and more generally shifts in employment from primary and secondary industries to the service sector. Murphy echoes this point by noting that some of his measures of generational equity are influenced by macroeconomic fluctuations: the business cycle (and the employment changes associated with it) have a major impact on the degree of intergenerational redistribution. In fact, he suggests that these factors have swamped the influence of legislative changes in the ten years between 1984 and 1995 (see Figure 5.6).

Finally, as Hicks stresses, the allocation across age groups requires some sort of assumption with respect to how taxes, transfers, and incomes are distributed within the family. Generational Accounting, like much economic analysis, makes the individual the basic unit of analysis, but in reality most people live their lives as members of some kind of family unit. In fact, some Statistics Canada data needed for this exercise are only available at the level of households. Hicks examines two extreme possibilities, and points out that they have a major impact on some of her results. If taxes and transfers are assumed to be shared equally between all members of the family then government policy is pretty well neutral between the generations. At the other extreme if all taxes and transfers are ascribed to the head of the household then there is overall a large intergenerational transfer from the young to the old. Osberg also raises this general point in Chapter 9 and examines its implications in greater detail.

The Consequences of Reducing Government Indebtedness Depend Upon How it is Done, and Upon How Fast it is Accomplished

Generational Accounting does not, in and of itself, offer a complete guide for the conduct of policy. We may all agree that a lower debt-to-GDP ratio will lead to lower debt interest payments in the future and, given the government's budget constraint, lower taxes (or equivalently higher transfers). But it should be equally evident that older generations will lose from net tax increases as they receive only part of the benefit of lower net taxes. At the same time younger and future generations should benefit as they will face lower net tax rates over a longer period of time or even over their entire lifetimes. Policy makers need to know how fast a debt reduction policy should be implemented, and what mix of tax increases or transfer reductions should be used. They also need to know the implications of lower taxes for economic growth, and how the gains are distributed both in the long-run and in the short-run.

The analyses in Chapters 6 and 7 examine these very issues. In Chapter 6 James and Matier focus on the general equilibrium effects of lowering the level of government debt and outline how the short-run and long-run consequences depend upon the speed with which the policy is undertaken, and with the combination of tax

changes used. A reduction in the debt-to-GDP ratio of five percentage points may lead to declines in GDP of about 0.5 percentage points for periods of about five to ten years. Generally the faster the implementation of this policy, the more adverse the short-run consequences. Some of these findings, however, are sensitive to the underlying assumptions made concerning the nature of the labour market, particularly the responsiveness of labour supply to changes in payroll taxes.

In Chapter 7 Mérette undertakes a similar analysis, but focuses more explicitly on economic growth. He makes a number of points, but the most innovative has to do with the need to recognize the importance of education in the growth process and how the tax structure effects human capital decisions. Changes in payroll taxes may be particularly important in this regard. If a debt reduction policy can be coupled with future reductions in wage taxes, individuals will be more inclined to invest in their human capital, and this can significantly magnify the long-run benefits of the policy. Mérette also points out that it is very difficult to evaluate the contribution of education to economic growth and well-being because of the limited way in which this is measured by the national accounts. The time individuals spend investing in their education (or more generally unpaid work) is not fully accounted for, yet it has a major impact on future well-being in an intergenerational context.

Both sets of authors recognize that the simulation models they use are highly stylized representations of the economy and lack many institutional details. Their analyses do not offer an explicit guide for the conduct of Canadian fiscal policy. Rather they should be thought of as a way of illustrating some of the underlying assumptions of Generational Accounting and why they are important. Even so the authors, like Oreopoulos and Vaillancourt, point out that policy cannot be made without some sort of value judgement with respect to the relative well-being of those alive today and the unborn. This is inherently a political issue, and beyond the domain of economic analysis.

Intragenerational Inequities may be more Important than Intergenerational Inequities

Generational Accounting attempts to document the extent of the redistribution between the generations as a necessary first step for policy making. However, in focusing attention on intergenerational distributional issues, the framework assumes that there are no important intragenerational issues.

This theme is taken up in Chapter 8. Wolfson, Rowe, Lin, and Gribble develop a simulation model that distinguishes individuals not only by their birth cohort, but also their gender, and earnings. They derive estimates of total lifetime net taxes paid by a representative sample of individuals, beginning with those born in the 1890s and ending with those born a century later in the 1990s.

They find that “Canada’s tax/transfer system provides massive redistribution from men to women,” and that generally those earning less than half the average annual full-time income are net gainers, while those earning more are net losers. Just as importantly they suggest that the variation in net lifetime taxes within each generation can be larger than between generations. These authors conclude by stating that “the very idea of framing the issue of the sustainability of government tax/transfer arrangements, including public pensions, in terms of generational equity may be seriously misleading” (Chapter 8, p. 119). In sum, policy addressing generational inequities should not be conducted in isolation of intragenerational inequities.

3. Policy Implications and Directions for Future Research

To what degree have the authors of these chapters answered the questions I pose in the opening paragraphs of this introduction? In Chapter 9 Laurence Kotlikoff and Lars Osberg offer an admirable summing up of many of the important findings in Chapters 2 through 8, but they take very different positions on the policy implications of the analyses, and the role of Statistics Canada in conducting Generational Accounting.

Kotlikoff stresses the underlying objective of Generational Accounting: to offer an accounting framework that measures the long-term stance of fiscal policy. On the basis of the results in Chapter 2 he argues that “while the Canadian Generational Accounts point to the restoration of generational balance … they also warn against imprudent changes in policy even if a government starts running a surplus” (Chapter 9, p.127). To Kotlikoff the real value of this exercise is to shift the emphasis of public debate away from measures of annual deficits or surpluses. He also

argues that Generational Accounting should be regularly performed by governments, and in particular that Statistics Canada should be directly involved, but that this involvement should stop short of forecasting. He illustrates this point with reference to the U.S. experience, but Generational Accounts have in fact been developed in over 20 countries, in many cases by government agencies. In addition Kotlikoff stresses that simulation exercises of the type used in Chapters 6 through 8 should play an important role in analyses of generational equity.

Osberg argues the opposite position on all these accounts: Generational Accounting should not be used as a tool for the conduct of policy; Statistics Canada should not be directly involved in the exercise; and simulation models, at least in their current form, are too crude to inform public policy in this area.

He stresses that the welfare of future generations will be determined, in the first instance, by the stock of productive assets that the currently alive bequeath to them. Generational Accounting has nothing to say about this. Osberg stresses a whole host of measurement issues associated with these assets (ranging from the valuation of public goods, environmental resources, and human capital) that Statistics Canada needs to address. He also stresses that an understanding of generational equity requires, in a fundamental way, an understanding of how resources are transmitted within families. And finally, relying on some of his own work as well as the analysis in Chapter 8, he points out that the variation of inequities between generations is minimal when compared to the variation within generations.

4. Conclusion

The last word belongs to John Helliwell. In Chapter 10 he offers a masterful summary that is based upon the research presented in this book, but that goes well beyond it to include not only the companion volume (Corak, 1998) but also his understanding of other relevant literatures and of the challenges facing policy makers. He considers how Generational Accounting could be extended if it were intended to provide a full measure of what current generations are likely to leave behind for their successors. In doing this Helliwell first examines the types of assets and liabilities left from one generation to the next, then the types of organization whose actions influence the distribution, and finally the interplay of distribution within and between generations.

In short, he poses three fundamental questions: What should Generational Accounts measure? Who distributes? Who matters? His answers offer a broader framework for public policy dealing with generational equity, synthesize the contributions of the research in this book, and contribute to setting an agenda for future work.

Bibliography

CORAK, Miles (editor) (1998). *Labour Markets, Social Institutions, and the Future of Canada's Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

KOTLIKOFF, Laurence J. (1992). *Generational Accounting: Knowing Who Pays, and When, for What We Spend*. New York: The Free Press.

Chapter 2

Applying Generational Accounting to Canada: Findings and Fallacies

PHILIP OREOPOULOS AND FRANÇOIS VAILLANCOURT

Generational Accounting (GA) is a method of long-term public policy evaluation that attempts to measure what representative members of each current and future generation can expect to pay over their remaining lifetimes in net taxes. In this chapter we highlight the issues that arise from using GA to assess Canada's fiscal policy in terms of sustainability and overall impact on different age groups.

Generational Accounting has become a widely used tool for indicating the generational stance of a government's fiscal policy. By assuming the present state of fiscal policy to hold, GA reveals whether future generations would have to pay a larger share of their lifetime income to the government than current generations, and if so what policies would be required to remove this imbalance. Good (1995) and Oreopoulos and Kotlikoff (1996) have calculated the Canadian Generational Accounts. Our analysis builds on this work by using improved projections of current fiscal policy and by reflecting in more detail on the implied equity considerations. We find that the state of Canadian fiscal policy is sustainable, such that no further changes would be required for it to maintain the same lifetime net tax burden indefinitely. The forward looking policies of increasing the Canada/Quebec Pension Plan (C/QPP) contribution rate, deindexing certain social programs and the three-year budget plan by the federal government do much to offset the large revenue requirements that will occur as the population ages.

We also address common concerns about the methodology and outline specifically how this approach can be used to assess inter-generational equity in Canada. The results must be interpreted carefully. Only with a clear understanding of how Generational Accounting works and an ethical judgement on what is a fair after-net-tax income distribution across age groups can one draw intergenerational welfare conclusions from it.

In Section 1, we give a brief description of GA. Section 2 describes the data sets and underlying assumptions, including tax and transfer projections, that are used for calculating the accounts presented here for Canada. Section 3 presents the Canadian accounts. Section 4 outlines the difficulties in using GA to assess intergenerational equity and Section 5 summarizes and concludes the chapter.

1. What is Generational Accounting?[1]

GA was designed as an alternative to annual deficit accounting in measuring directly the lifetime net tax burden on different age groups. Annual accounts cannot provide any information on anticipated financial strain or windfall in the future since they do not take into account expected changes to fiscal policy and to a country's demographic and population structure (Kotlikoff, 1993). GA, however, does accommodate these changes and thus offers a more informative tool for assessing the overall lifetime impact on different age groups of a government's action.[2]

The key tool of GA is the government's intertemporal budget constraint. The constraint states simply that the government must ultimately pay for its spending and service its initial indebtedness with resources obtained from current and future generations.[3] More specifically, it says that, at any given date, the sum of all subsequent net tax payments (net of transfers) of current and future age groups, measured in present value, must be large enough to cover the present value of all future government purchases, as well as pay off the government's initial net indebtedness. The

government's intertemporal budget constraint is an accounting identity. Failure to satisfy the constraint would result in the government defaulting on its liabilities (which would result in a loss to creditors). The constraint does not imply that government net debt must be fully paid off; it implies that primary surpluses occur over some period of time. As long as the debt grows less quickly than the levels of the present value discount rate, it is possible to exhibit long-run budget deficits. Thus, deficits need only be smaller than the amount required to service the level of outstanding debt for a government's fiscal policy to be deemed sustainable.

We can express the government's intertemporal budget constraint by the following equation:

present value of remaining net tax payments of existing generations	+	present value of net tax payments of future generations
	=	
present value of all future government purchases	+	government net debt

A generational account is simply the **remaining** net tax payment expected to be made by a particular age group before its death, measured in its present value. Summing all the accounts for each person alive now and those to be born in the future will give us the left-hand side of the above equation: the total (discounted) net tax revenue that the government will receive. This amount will be used to pay for the government's intertemporal bills, the right-hand side of the equation. That is, the government must use remaining net taxes received from current and future age groups to pay for: [1] the sum of all future government purchases (discounted to their present value); and [2] the level of government net debt. The total net tax burden can be divided among different age groups in any number of ways. Notice, however, that any change in one generation's account must be equally offset by a change in another, if the present value of government purchases is fixed. This outcome is commonly referred to as the zero sum nature of intergenerational fiscal policy.

The intertemporal budget constraint also shows that the expected net tax payment required by future age groups cannot be measured without knowing the future path of government purchases and the remaining net tax payments of living age groups. Thus, we are required to make a number of assumptions respecting these variables in order to assess the generational position of fiscal policy. Our initial base-case results assume that the current state of fiscal policy will prevail for those generations living now, and that the projected future path of government purchases will also remain unchanged. The net tax burden on future generations is then calculated as a residual from the intertemporal budget constraint. In allocating this residual, GA methodology further assumes that lifetime net tax payments of successive generations rise at the economy's rate of productivity growth. Hence, the generational accounts of all future generations are equal as a share of output and thus increase in real dollar terms.

Once we have all the data sets and projections required for measuring the generational accounts, we can then compare what the generation born this year will have to pay over its remaining lifetime (their **entire** lifetime) with what all generations born in the future will have to pay. The newborn's net tax burden is measured under existing fiscal policy, while the future cohort must bear the amount in net taxes required to satisfy the government's intertemporal budget constraint. If the generational account for future generations is higher than for newborns, we conclude that the government's current fiscal policy is not sustainable and must change at some point in time. We can further examine what types of policies would be required to remove this extra burden and restore governments' policy to a state where no further tax increases, transfer cuts or reductions to government purchases are necessary.

Before examining the data sets and assumptions used for calculating the generational accounts for Canada, it may be useful to highlight the three main issues of debate over the methodology behind GA: [1] the choice of an appropriate discount rate; [2] the absence of incentive effects; and [3] the assessment of the current state of fiscal policy. Discussions on other areas of contention are provided by the Congressional Budget Office (1995). These include the validity of assumptions with respect to demographics, productivity rates, and tax incidence.

To convert the net taxes into their present value a discount rate is needed, but there is room for argument about the most appropriate value to use. If the flows of government payments, receipts and expenditures were certain and riskless, it would be appropriate to use the government's borrowing rate, which can be taken simply as the cost of postponing consumption or net income. However, persons expecting to pay taxes or receive transfers cannot be entirely certain that these expected values will be fully recognized at actual time of distribution. In this case, the discount rate should reflect the additional cost to persons who face the chance of having higher net taxes than expected, rather than merely postponed. The uncertainty associated with this is probably less than would arise if these amounts were invested in the stock market. Thus, the discount rate used for GA is taken to be roughly halfway between the real historical returns on government bonds and private sector capital. Haveman (1994) has argued that each expenditure, transfer, and tax should be allocated its own discount rate since the risk characteristics of these flows are different. This would be a better approach if such detailed knowledge of individual government flows were available. Individuals may also not have full access to market capital, especially for those who are young and unemployed. In this case, cash-constrained consumers would be willing to pay a higher market rate of interest to consume more now and less later. The importance of cash constraints is controversial.[4]

There are thus arguments for using both a higher and a lower discount rate under particular circumstances. A cautionary result with all GA studies is that estimated net lifetime tax payments can be quite sensitive to this assumption. A greater discount rate will cause expenditures and receipts to be lower, once they are converted to their present value. Therefore, the higher the level of discount, the smaller the GAs, measured in real dollar terms. This effect will tend to increase the percentage difference between generational accounts for newborns and future generations. While the value of this percentage difference varies, the magnitude of policy changes to remove it is not as volatile. This is because permanent policy changes are also adjusted by the same discount factor. The choice of discount rate matters when interpreting the results from GA, and it is important to be aware of this. Simulations can be conducted to determine the consequences of varying the assumptions about this factor.

As many critics have pointed out, GA does not usually incorporate behavioural responses by individuals or businesses to changes in government policies (or rather, it usually incorporates the assumption of zero behavioural responses). For example, raising payroll taxes may induce workers to leave the labour force or resort to underground (untaxed) economic activity, thus preventing the government from receiving the full expected increases in revenue. A move to increase consumption taxes may cause an increase in personal savings, which could generate an increase in the capital stock and a higher productivity growth rate. When GA does not consider these types of feedback effects, which are known to exist in real life, it must be borne in mind that it can only provide approximations to the true generational welfare effects of changes in fiscal policy. The accuracy of this approximation depends on the extent to which actual fiscal changes are distributed across generations in accordance with GA procedures for allocating aggregate changes in taxes and transfers to specific generations. Fiscal policies that increase incentives to save or invest act slowly as more assets accumulate to produce more income. Therefore, ignoring such effects introduces larger errors for young and future generations than for older generations. The size of the errors will depend on the degree to which policy changes lead to fiscal distortions. Fehr and Kotlikoff (1995) suggest that changes in policies that lead to substantial changes to the capital stock over time (changes that induce greater domestic savings) will cause the GA results to be overestimated for very young and future generations. For example, in a simulation of switching from income tax to consumption tax they find that changes in generational accounts reflected only about one-third the change in overall utility for future generations.

One of the more difficult parts of the methodology of GA is estimating the path of future government receipts and transfers under current fiscal policy. Current fiscal policy is defined here to include the immediate state of a government's expenditures and receipts, and the likely changes to these values from demographic change and legislated policy. Some GA studies have also included policy changes or projections that, although not yet legislated, are very likely to happen in the near future. For example, the base-case results presented in this chapter incorporate the federal budget's three-year projections. Of course, predicting the evolution of net taxes and government purchases through time involves a

considerable amount of uncertainty. The difficulty in forecasting per capita growth paths, however, does not diminish the usefulness of GA. One cannot use the argument that, because the future is uncertain, we should only use past policies as predictions of the future. The fact is that if we really want to assess the implications of government policy on different generations, we have no choice but to postulate about the future. In this sense, the results from GA can be thought of as "what if" scenarios that can be conveniently altered if the projections need to be changed, an advantage of microsimulation approaches.

2. Data Description and Expenditure/Receipt Projections

To compute a set of generational accounts for Canada and to calculate the net tax burden on future generations initially implied by the government's intertemporal budget constraint, we require the following: [1] an estimate of the initial stock of government net debt; [2] a discount rate to convert taxes and transfers to the present value; [3] a set of population projections; and [4] projections of average taxes, transfers and government purchases by age and sex.

We measure the consolidated government net debt as the negative of Statistics Canada's *Government Net Financial Assets*. This amount was $506,488 billion at the beginning of 1995 (our base year). This does not include the unfunded liabilities of the C/QPP since the GA methodology requires that revenues cover payments in the long run.

When only one discount rate is used it is set at 5%, roughly halfway between the riskless government borrowing rate and the rate of return from private capital. The value is the same as those used in other studies that have attempted to calculate particular unfunded liabilities (Canadian Institute of Actuaries, 1995).

Age and gender specific population projections from 1995 to 2041 are from Statistics Canada's official medium baseline forecasts. Estimates were extended to 2100 using the same component assumptions prevalent at the end of 2041. Specifically, fertility rates are set at 1.70 in every year, while life expectancy is projected to rise from 74.8 and 81.3 in 1995 to 78.5 and 84 by 2016 for males and females respectively, remaining constant thereafter. Net migration between 2016 and 2100 is set at 196,030 per year, contributing to an overall increase in population during this period. A steady state is assumed thereafter.

Fiscal projections for taxes, transfers and government purchases begin with official aggregated values recorded in the base year, 1995. These amounts were collected from Statistics Canada's *National Income and Expenditure Accounts* and consolidated into more general categories. Nine broad types of taxes were identified: personal income; capital income; commodity; property; Unemployment Insurance (UI); Workers' Compensation; C/QPP and Public Pension Contributions; and other taxes. For transfers, we include: Old Age Security (OAS); Guaranteed Income Supplement (GIS) and Spousal Allowances (SpA); Income Assistance; Child Tax Benefits; GST Tax Credits; UI; Workers' Compensation; C/QPP and Public Pensions. For comparative purposes and consistency, we also include public health care expenditures as an implicit transfer and leave education expenditures as a part of general government purchases.[5] These aggregated values were then distributed by age and sex, according to profiles obtained from the Social Policy Simulation Database and Model (SPSD/M) produced by Statistics Canada (Bordt et al., 1990). Health expenditures were allocated to persons with age/sex profiles found in Health Canada (1996). In terms of tax incidence, most taxes are assumed to be borne by those paying the taxes: income taxes on income, consumption taxes on consumers, and property taxes on property owners. The two exceptions are payroll taxes (borne by employees only), and corporate income taxes, which are charged to employees through wages and salary income. Elementary, secondary and post-secondary education expenditures were distributed according to profiles discussed in Cameron and Wolfson (1994).[6]

Recall from the previous section that taxes and transfers are projected forward for living generations under current fiscal policy, and government purchases per capita are also set to increase in line with fiscal policy. The following assumptions are used: [1] Old Age Security, Guaranteed Income Supplement, Spousal Allowance and Income Assistance are indexed to the CPI over the 1996-2010 period and then assumed to grow at 0.5% (1/2 of the 1% growth rate); [2] the GST tax credit and child tax benefits are indexed to CPI on a permanent basis; [3] UI is reduced by 10% in 1995 with respect to past spending and then assumed to grow at the same rate as wages; [4] for Postsecondary Education

Table 2.1
Net Lifetime Tax Rates for Newborns and Future Age Groups Under Alternative Policy Scenarios (Base Year 1995)

Generation's Year of Birth	Present Value Net Lifetime Tax Rates (Percentage)				
	Column 1 Real Per Capita Taxes and Transfers Grow with Productivity	Column 2 Expected Slower Growth for Certain Transfers	Column 3 Column 2 + 3 year Federal Budget Projections	Column 4 (BASECASE) Column 3 + 6 Year Transition to Higher C/QPP Contributions	Column 5 Column 2 + Bracket Creeping Assumptions
1995 (newborns)	38.2	40.2	41.0	44.0	45.8
1996+ (future generations)	70.9	64.2	50.6	44.1	42.6
Percentage Difference	85.6	59.7	23.3	0.1	-7.0

Note: Productivity growth rate assumed to be 1.0%, discount rate used was 5.0%.
Source: Authors' calculations. See Appendix.

(PSE), the contribution of tuition fees is assumed to grow by 1% of the projected expenditure for each year in the 1996-2005 period, afterwards public spending on PSE grows as the growth rate of the economy; [5] C/QPP contributions and benefits are assumed to rise from 5.6% of earnings in 1997 to 9.9% by 2003, as stated by the federal and Quebec government.

These growth rates are arrived at by examining the evolution of either benefits or actual spending over the longest possible time period, given the program implementation date and the availability of data. See the Appendix for a more detailed discussion.

3. Results

We begin this section by presenting lifetime net tax rates for newborns and future generations. These are more easily interpretable than generational accounts because they express a cohort's total net tax burden (net of transfers including health care) as a share of their total lifetime labour earnings. They convey the same information as GA, since they are calculated by dividing the generational account for that cohort at year of birth by the present value of his/her total lifetime earnings, which remain the same between newborns and future cohorts after adjusting for growth. In Table 2.1 we present these net tax rates for newborns and future age groups: first without our alterations of future fiscal policies and then by adding these factors in order to end up with the base-case results in column 4. The base year is 1995, productivity growth is assumed to be 1% and the discount rate applied is 5%.

In column 1, it is assumed that taxes and transfers progressively grow in step with productivity and population served; in other words they remain unchanged in terms of real per capita share of output. The impact of inflation is thus neutralized. The exception is for the years between 1996 and 1999, where we have adjusted personal and corporate tax revenue growth as projected by the 1997 federal budget but have not taken into account other policy changes. These are essentially the same assumptions adopted by Oreopoulos and Kotlikoff (1996). Under this scenario, newborns may be expected to pay 38.2% of their labour earnings in net taxes. Future generations are initially presumed to bear the remaining burden that must be met for the government's intertemporal budget constraint to be satisfied. Each future generation shares this burden equally, except for a growth adjustment such that each year the net tax burden is

assumed to grow at the same pace as wage productivity. It is estimated from this that future age groups will have to pay 70.9% of their labour income in net taxes, or 85.6% more than what newborns are expected to pay (adjusted for growth). Thus, if we ignore expected changes to future policies, a very significant fiscal imbalance between living and future generations would seem to exist.

We now include in column 2 the slower indexation assumptions on certain government transfers discussed in the previous section. It should be understood that the real value of these transfers does not diminish: it is only increased at smaller rates than productivity growth or remains constant in per capita terms. By restricting the growth of these expenditures (for example, holding future real per capita child tax benefits and GST tax credits constant), the expected present value of transfer receipts for newborns is reduced and, consequently, a newborn's lifetime net tax rate rises (from 38.2% to 40.2%). Additionally, the estimated lifetime net tax rate for future generations falls to 64.2%, which is still 59.7% larger than the net tax payment for newborns under this state of fiscal policy. Hence, even with the slower indexation assumptions, there remains a significant fiscal imbalance between what newborns are paying in net taxes and what future generations are projected to pay.

When we take into account (column 3) the three-year projections of policy changes outlined by the 1997 federal budget, the imbalance is further reduced. The estimated lifetime net tax rate for future generations, so that the government's budget constraint will be satisfied, falls to 50.6%, or 23.3% more than that projected for newborns under this assumed current fiscal policy. The reduction to the fiscal imbalance is mainly due to the planned cuts in cash transfers to the provinces. It is assumed that the provinces correspondingly reduce their own government purchases, although higher taxes or lower transfers produce similar results. Results would differ if provinces used deficit financing; but this seems unlikely, given the fiscal flows of the ten provinces and particularly of Quebec and Ontario.

In column 4, we include the legislative changes to the C/QPP. Contributions to the C/QPP are raised from 5.6% of earnings in 1997 to 9.9% by 2003.[7] The payroll tax hikes raise the estimated lifetime net tax rate for newborns to 44.0%, while they reduce the future age groups' lifetime net tax rate to 44.1%. Thus, the forward looking policies from slower social transfer indexation, the 1997 federal budget projections and the changes to C/QPP contribution rates are enough to offset the additional costs from Canada's changing demographics. Given the underlying assumptions, Canadian fiscal policy is approximately at a state of fiscal balance, that is no further change in policy would be required to maintain the same level of lifetime net tax rates for newborns and all subsequent generations.

Another way of attaining such a result is by "bracket creeping." Under current legislation, income tax brackets are indexed only to the CPI minus 3% (or not indexed at all if CPI is below this). If this legislation is left unaltered, inflation will tend to push lower income earners into higher brackets, causing them to have to pay a higher portion of their salaries in taxes to the government. Assuming a 1% economic growth rate and a 3.5% inflation rate, Wolfson and Murphy (1996) find that the proportion of taxpayers who are in the top tax bracket rises from 6.7% in 1994 to 62.5% in 2036. This result, together with the other transfer indexation assumptions, leads them to conclude that the long-term fiscal position of the governments of Canada will be a sustainable one, even with the aging of the population. Extrapolating from Wolfson and Murphy's results, we simulated the effect from only partial indexation of income taxes by increasing real per capita income tax revenue by an extra 1.2% per year (from 1995 to 2030). The percentage difference between newborn and future net lifetime tax rates found in column 3 was reduced, from 59.7% to -7.0%. These results show that with only our indexing assumptions Canada's state of fiscal policy would be one that is sustainable if these tax indexing assumptions held. However, as Murphy and Wolfson have said, "(the projection from partial tax indexation) is likely an unrealistic scenario." Even if the 3.5% inflation projection is correct (which is also unlikely, given the Finance/Bank of Canada inflation target), policy makers will have to choose between increasing the incidence of low income among Canadians or raising the income tax brackets to keep in line with productivity, an assumption that we and most other GA studies adopt.

The large reduction in fiscal imbalance that results from including these anticipated policy changes does not come without cost. The lifetime net tax rates for future age groups, estimated under complete population, inflation and real

Table 2.2

Absolute Changes to Generational Accounts From Immediate and Permanent Policies which Remove Fiscal Imbalance (Base Year 1995)

Generation's Year of Birth	Generational Account	Absolute Change in Net Tax Payment		
	Column 1	Column 2	Column 3	Column 4 (BASECASE)
	Real Per Capita Taxes and Transfers Grow with Productivity	Expected Slower Growth for Certain Transfers	Column 2 + 3 year Federal Budget Projections	Column 3 + 6 Year Transition To Higher C/QPP Contributions
		(thousands of dollars)		
1995 (newborns)	111.0	5.6	2.4	8.6
1985	159.2	6.6	3.2	11.7
1975	224.0	7.4	4.3	13.8
1965	223.6	7.2	3.9	10.9
1955	165.5	7.4	3.1	7.2
1945	59.3	8.0	2.0	3.3
1935	-66.4	7.5	0.8	0.4
1925	-124.0	4.9	0.3	0.0
1915	-111.5	2.3	0.1	0.0
1905	-15.1	0.0	0.0	0.0
1996+ (future generations)	207.6	-19.57	-36.93	-21.9
percentage difference	111.8	-25.85	-34.25	-25.73

Note: Productivity growth rate assumed to be 1.0%, discount rate used was 5.0%.
Source: Authors calculations. See Appendix.

wage indexation (column 1, Table 2.1), falls dramatically when moving to the base-case result (column 4). This is because the government's expected future fiscal policy impacts living generations, even though they may not feel the effects from these changes right away. It is important to understand that future generations will also feel this impact, but the larger burden on existing age groups is more than enough to offset the larger burden that future age groups will face and, consequently, the generational accounts for future generations are reduced.

Table 2.2 shows this effect by presenting the absolute changes to the generational accounts for selected living and future age groups.[8] First, indexing transfers to slower rates than productivity growth reduces the expected present value transfers to living generations. The indexation provisions affect the elderly the most adding, for example, $7,500 and $4,900 to the generational accounts for those born in 1935 and 1925 respectively. Younger Canadians (1955+) also experience higher net tax burdens because of the relatively smaller transfers received. The age group born in 1975 faces the largest increase to their remaining net tax burden, from $224,000 to $231,400, an increase of $7,400. Second, since the 1997 federal budget affects fiscal policy mainly through cuts in cash transfers to the provinces, and since it has been assumed that the provinces respond accordingly by reducing their own government purchases, the net tax burden on living generations does not affect living age groups very much. Although, as a result of lowering the overall rate of government purchases, the generational account for future age groups is reduced by $36,930. Finally, the six-year transition towards higher C/QPP contribution rates will have an impact mostly on younger living Canadians. Cohorts living now, and who are born after 1965 are burdened the most.

Table 2.3
The Generational Accounts using Alternative Discount and Productivity Growth Rates

Panel A : Generational Accounts for Newborn and Future Generations

Productivity Growth Rate	Discount Rate 3 %			5 %			7 %		
	Newborns	Future Generations	Percent Difference	Newborns	Future Generations	Percent Difference	Newborns	Future Generations	Percent Difference
	(thousands of dollars)								
0 %	173.0	204.2	18.1	84.7	101.1	19.3	40.6	53.6	32.0
1 %	260.5	271.7	4.3	127.5	129.2	1.3	61.4	60.6	-1.2
2 %	386.1	372.6	-3.5	190.1	177.6	-6.6	91.7	78.4	-14.5

Panel B: Percentage Increase in Personal Income Taxes to Reach Fiscal Balance

Productivity Growth Rate	Discount Rate 3 %	5 %	7 %
0 %	8.9	4.5	3.4
1 %	2.9	0.46	-0.7
2 %	3.0	-3.2	-4.0

A sensitivity analysis of the base-case productivity and discount rate assumptions is reported in Table 2.3, Panel A. This table shows how the percentage difference between newborn and future generations' net tax payments vary under alternative assumptions for these rates. In general, the larger the gap between the assumed productivity growth and discount rate, the smaller the projected net tax payment. This effect will tend to increase the predicted fiscal imbalance. Using a range of three alternative growth rates (0, 1 and 2%) and three discount rates (3, 5 and 7%), the differential between newborn and future generations' net payments ranges from -14.5% to 32.0%. Thus, depending on our assumptions of future productivity growth and our use of a discount rate, our conclusions could vary in that Canadian fiscal policy changes are either sustainable or unsustainable! This result points out the need to apply caution when using GA.

Panel B shows that the magnitude of immediate and permanent income tax increases required to reach fiscal balance does not vary as much with the same changes to the productivity and discount rate assumptions. Our base-case scenario with productivity growth and a discount rate of 1.0 and 5.0% respectively finds only a 0.5% permanent increase of income taxes would be required to remove the remaining gap between newborn and future generation net tax payments. Alternatively, with no productivity change and a 3% discount rate, the percentage increase required would be 8.9%. (For example, someone paying 35.0% of their income in taxes would now have to pay 38.1%.) If productivity were growing at 2.0% and we used a discount rate of 7.0%, then we could **decrease** income taxes by 4.0% to reach fiscal balance. The conclusion that little change to policy is required to maintain a constant level of lifetime net tax rates for future generations remains.

4. Generational Accounting and Intergenerational Equity

We have found—after factoring in the expected impacts from the CPP reforms, the federal budget and slower indexation provisions—that Canada's current fiscal policy is approximately at a state of

sustainability. This implies that the tax burden born by each generation will be the same in terms of their share of private income paid in taxes, or in other words, that the tax burden is proportional to real income over time.

Is this equitable? It is tempting to conclude from the results of GA that the state of fiscal policy implied by fiscal balance, such that no future generations are paying proportionally more in net taxes than newborns, is one which is generationally 'fair'. The temptation comes, in part, from the fact that this is the **only** steady state examined by the GA approach. But the creators of GA never claimed that their methodology can be used to determine if an injustice is being done on future generations as a result of the government's policies. They write:

> Generational equity is an ethical concern, and our choice of any particular norm for purposes of illustration is not meant to impose this norm as our preferred ethical judgement. Rather, we simply choose a norm we think is of general interest: namely, that generations born in the future should not pay a higher share of their lifetime incomes to the government than today's newborns. (Auerbach, Gokhale and Kotlikoff, 1994, p. 84)

Thus, GA can only serve as an indicator as to what **will** happen, and it cannot tell us what should happen. As has been pointed out by Dalton (1920), Atkinson (1970), and Blackorby and Donaldson (1978), this is because any technique used to measure inequality is (knowingly or unknowingly) inextricably tied to some concept of social welfare. It is incorrect to interpret measures of inequality without being aware of the ethical implications underlying the measure. Thus, we cannot rely solely on GA findings to determine if a government's fiscal policy is generationally 'fair'.

The key issue is that GA attempts to measure only one aspect of intergenerational equity: the generational effects from fiscal policy. There are several other factors that should be considered when attempting this kind of welfare analysis, as Helliwell explains in Chapter 10. For example, if we use real income as an approximation to potential welfare, we note that with the fiscal balance rule, real income and real **after-tax** income is growing over time for cohorts. The lifetime buying power of someone born in the 1990s is higher than that of someone born in the 1930s simply because productivity and technological growth has led to access of goods that were previously unavailable. Even if it were true that, knowingly or unknowingly, the government was practicing a generationally inequitable policy in favour of older age groups, it is conceivably possible that the welfare gains to younger age groups from new technologies may offset any extra burden from having to pay higher net taxes. Secondly, if, as argued in a debate that took place at the turn of the century, marginal utility of income is decreasing—a postulate—then equal (proportional) sacrifice of utility requires increasing (progressive) taxation. Third, as Lipsey (1996) remarks, poverty has been greatly altered through technological change. From computers to halogen light bulbs, CD players to health care, continuously developing technology improves our standards of living over those who came before us. There are still difficulties, however, in concluding from this that we are all better off, on average, than previous generations. Welfare depends on both absolute and relative incomes. It also depends on other factors not related to income.

The point to take from this is that measuring welfare across generations is difficult, and that normative assumptions are required to reach any conclusion. If we want to examine solely the intergenerational impact from fiscal policy, GA can serve as a useful tool. Even here though, we would want to measure taxes paid against **all** benefits received. One possible measure is that lifetime present value taxes paid to the government should equal lifetime present value transfers and other benefits received. But no GA study has yet specified how government purchases are generally distributed among age groups: it only assumes that the distribution, whatever it may be, stays constant over time.

In not attempting to impute to generations the value of government purchases, we have not meant to suggest that this value is zero. However, apart from education, there is no clear method for allocating the benefits of government purchases such as defense expenditures across generations. In helping to clarify which generations will pay for government purchases, we hope also to stimulate more careful consideration of who the beneficiaries of these purchases are (Auerbach, Gokhale, and Kotlikoff, 1994, p. 88).

To assess intra and intergenerational equity, we must account for these expenditures. This has been done for Canada on an intra-generational basis by Vermaeten, Gillespie, and

Vermaeten (1994), but has not been done across generations. To do so would require several extrapolations, since as Buiter (1995) explains, there are two general classes of public consumption. The first are broadly publicly provided private goods, such as highways and education, whose beneficiaries can (in theory, at least) be identified. The second group consists of public goods which cannot be directly allocated to particular individuals, such as defense and research. Problems arise when attempting to allocate goods from this second group.

5. Conclusion

Using the GA approach, our findings show that consolidated Canadian fiscal policy is approximately at a state of sustainability such that no further changes are required for it to be maintained in perpetuity. This conclusion has been reached after having factored in anticipated tax revenue and government expenditure changes which have not yet occurred. In particular, we included in our calculations the indexation of certain social programs to the CPI, the projected reduction in federal government transfers from 1995 to 1998 and the predicted rise in C/QPP contribution rates under current legislation. Since these changes in policy are set to occur in the near future, net lifetime tax burdens are also set to rise higher than they are now for living age groups. Once sustainability is reached, however, all age groups born thereafter would pay the same proportion of their lifetime incomes in net taxes. This conclusion is different from the one reached by Oreopoulos and Kotlikoff (1996). This may surprise some readers but it shows that changes in tax/transfer policies by the government do matter (even if they seem small at first glance) when examined from the appropriate long-term perspective.

Finally, there are difficulties with measuring intergenerational equity. Generational accounting examines only one aspect of this measurement: the impact across age groups from fiscal policy. Even here we require information on the allocation of government purchases among age groups to properly compare lifetime taxes paid to lifetime benefits received. Generational accounting is a valuable and informative tool in showing the logical implications of alternative public choices, and can be useful in policy for this purpose. Extending beyond this, however, to address overall generational equity requires normative assumptions.

Appendix

In this appendix we offer a detailed discussion of the construction of our projected data by program. See also Oreopoulos and Kotlikoff (1996).

1. OAS/GIS/SpA

All three programs are federal programs funded from general revenues. OAS is a universal pension that was introduced in 1952, replacing a federal/provincial program instituted in 1926. GIS is an income-tested program introduced in 1966 at the same time as C/QPP to bolster the incomes of non-recipients of C/QPP. SpA, which is also income tested, was introduced in 1976 to help couples with one OAS recipient (65+, usually retired male) until the other spouse reaches 65. These programs will be replaced in 2001 by the Seniors Benefits Program that will be available on an income-tested basis. The universality of the OAS had already been eroded with the introduction in 1988 (three year phase-in) of a clawback implemented through the income tax system. As shown in Table 2A.1, OAS benefits grew at a rate between that of CPI and wages over the 1966-94 period, while between 1981 and 1994, they grew at about the CPI rate. Our assumptions appear appropriate, given the relative importance of OAS payments compared to GIS (14.9 versus 4.4 billion in 1993); the imposition of a clawback affecting 133,720 OAS recipients in 1993; and the reduction in GIS/SpA clientele as C/QPP matures and the combination in 2001 of OAS, GIS and SpA in one program.

2. Income Assistance

There are ten provincial Income Assistance programs in Canada funded from 1966 to 1996 by the federal and provincial government on a 50/50 basis (except for Ontario, Alberta and British Columbia, as of 1991) under the Canada Assistance Plan. This funding mechanism was replaced in 1996 by a block grant, the Canada Health and Social Transfer, which also replaces an existing block grant (EPF) for post-secondary education and health. Time series data on these programs are hard to find. We thus use the Ontario single able-bodied individual rate as a proxy. As shown in Table 2A.1, this increased faster than both CPI and wages over the period. However, it was recently reduced by 20%. More generally, welfare benefits have been cut back in other provinces in recent years. Given this and the change in funding mechanism described above, we assumed an evolution similar to OAS/GIS/SpA.

Table 2A.1

Benefits and Beneficiaries of Social Programs, (Growth Rates from 1966-1994)

	Social Programs					
	Benefits			Number of Beneficiaries		
	1966 (dollars)	1966-1994	1981-1994	During Peak Year 1981-1993	1981	1993
OAS (A)	900	516.3	182.9	n.a.	2,326,121	3,289,144
GIS[1] (M)	360	1,534.1	216.5	1,338,595[2]	1,231,871	1,312,817
Spa[3] (A)	265[4]	n.a.	182.9	139,804[5]	84,064	108,096
UI[6] (W)	36	1,236.1	235.4	1,388,280[7]	720,280	1,114,810
Income Assistance (A)	1,260[8]	631.4	297.1	n.a.	n.a.	n.a.
CPI		473.6	173.1			
Wages		588.6	159.6			

Sources:

CPI : Cansim Series P800000.
Wages: : *Historical Statistics of Canada*, Tables E49-59.
Cansim Series D700/69 and L57711.
Note that there is a discontinuity in the series in 1983 due to a change in survey coverage.
OAS/GIS/SpA : *Annual Statistics on Canada Pension Plan and Old Age Security*, Table 1-A.
UI : *Unemployment Insurance*, Statistics Canada, Catalogue No. 73-202.
Income Assistance : Various sources.

Notes:

[1] This is the single GIS. The married GIS increases by 999.2 and 187.9 over the same two periods.
[2] For 1989.
[3] Spousal Allowance. Widows see an increase of 201.9 over the same period.
[4] For 1976.
[5] For 1987.
[6] The first line is for the maximum benefit, the second for the average benefit paid out.
[7] For 1992.
[8] Ontario single able-bodied recipient for 1968.

(A) Annual (W) Weekly (M) Monthly

n.a. not available.

3. Unemployment Insurance

UI benefits increased very quickly in the 1966-94 period, mainly as a result of the fact that they almost doubled from 1970 ($53/week) to 1971 ($100/week). Increases in the 1981-94 period still exceed CPI or wage growth. Thus, our assumption that they will grow at the economy wide growth rate is reasonable.

4. Postsecondary Education

During1961-62 fee income accounted for 23.5% of the revenues of Canadian universities. This percentage dropped to as low as 9.3% in 1980-81 and has been above 10% since 1982-83, rising to 16.4% in 1993-94. We assume that it will return to its historical high of 26% of 1962-63 (Statistics Canada, *Education in Canada*, Catalogue No. 81-229, various years).

5. Canada/Quebec Pension Plan

On February 14, 1997, the federal finance minister announced major changes to the CPP, the most important one being that the contribution rate will increase from 5.85% in 1997 to 9.9% in 2003. This is a faster rate of increase than previously planned. The Quebec finance minister stated that similar rates would apply for the QPP. The minimum, normal and maximum retirement ages (60/65/70) remain the same. Accumulated funds will be managed by an investment board rather than automatically lent to provinces. Finally, admissibility criteria for disability pensions were tightened.

6. Federal Budget Projections

We have included the three-year projections as outlined in the 1997 federal budget in projecting future government expenditures and receipts (Department of Finance, 1997 pp. 41-44). For program spending, we have included planned reductions of cash transfers to the province: $3.9 billion in 1996, $2.8 billion in 1997, and $0.7 billion in 1998. It is assumed that these reductions will, in turn, be met by lowering government consumption by the provinces, although the findings are not significantly altered under alternative assumptions. Lower elderly benefits and UI payments are also taken into account. The budget projects revenue growth above that which would result solely from our productivity growth assumptions. The federal portion of personal income tax rises by 3.7%, 1.7% and 2.9%, more than productivity growth for 1996, 1997 and 1998 respectively. Corporate income tax falls in 1996 by 0.4% and grows in 1997 by 1.0% and by 2.6% in 1998. Finally, employment insurance contributions rise by 4.5% in 1996, fall by 2.9% in 1997 and rise again by 1.0% in 1998.

End Notes

We thank Marc Vachon for research assistance, and the participants at the “Intergenerational Equity in Canada” conference as well as two anonymous referees for helpful comments.

[1] This section provides only a brief description of the methodology of GA. For a more detailed account, the reader may consult Auerbach, Gokhale and Kotlikoff (1991, 1994) or Oreopoulos and Kotlikoff (1996).

[2] Unless otherwise stated, the term ‘government’ refers to all levels of government in Canada consolidated together.

[3] By generation, we are referring to males or females by specific years of age. Fafard (1996) argues that a more precise and analytically useful term would be “age group” instead of “generation”, since it carries a meaningful overtone. We shall use these two terms interchangeably.

[4] For example, it has been suggested that the fraction of cash-constrained individuals in the United States may range from one-quarter to only 6% of the population (Congressional Budget Office, 1995).

[5] Oreopoulos (1996) discusses the sensitivity of classifying health care or education spending as either part of government purchases or an implicit transfer. In general, the main conclusions will be the same. Including only health care as an implicit transfer allows for comparability with the United States.

[6] See also Chapter 4 by Hicks for discussion of this issue and some updated data.

[7] We do not account explicitly for the deductability of the contributions from the personal income tax, assuming personal income tax projections are unchanged.

[8] We have used changes to generational accounts instead of lifetime net tax rates because the data required to calculate the lifetime net tax rates for all existing generations are, as of yet, unavailable.

Bibliography

ANGUS REID GROUP (1995). *The Angus Reid Report.* (November/December), 10 pages.

ATKINSON, A.B. (1970). “On the Measurement of Inequality.” *Journal of Economic Theory*. Vol. 2, 244-263.

AUERBACH, A.J., J. GOKHALE and L.J. KOTLIKOFF (1994). “Generational Accounting: A Meaningful Way to Evaluate Fiscal Policy.” *Journal of Economic Perspectives.* Vol. 8, 73-94.

_____ (1992). “Generational Accounting: A New Approach to Understanding the Effects of Fiscal Policy on Saving.” *Scandinavian Journal of Economics*. Vol. 94, 303-318.

_____ (1991). “Generational Accounting: A Meaningful Alternative to Deficit Accounting.” In D. Bradford (ed.), *Tax Policy and the Economy*. Vol. 5. Cambridge: National Bureau of Economic Research.

BLACKORBY, C. and D. DONALDSON (1978). "Measures of Relative Equality and Their Meaning in Terms of Social Welfare." *Journal of Economic Theory*. Vol 18. 59-80.

BLACKORBY, C., W. BOSSERT and D. DONALDSON (1995). "Income Inequality Measurement: The Normative Approach." University of British Columbia, Department of Economics, Working Paper No. 95-23.

BORDT, M., G.J. CAMERON, S.F. GRIBBLE, B.B. MURPHY, G.T. ROWE and M.C. WOLFSON (1990). "The Social Policy Simulation Database and Model : An Integrated Tool for Tax/Transfer Analysis." *Canadian Tax Journal*. Vol. 38, 48-65.

BUITER, W.H. (1995). "Generational Accounts, Aggregate Saving and Intergenerational Distribution." NBER Working Paper No. 5087, Cambridge, MA.

CAMERON, G.J. and M.C. WOLFSON (1994). "Missing Transfers: Adjusting Household Incomes for Noncash Benefits." Statistics Canada unpublished paper presented at the Twenty-Third General Conference of the International Association for Research in Income and Wealth, St. Andrews, New Brunswick.

CANADIAN INSTITUTE OF ACTUARIES (1995). "Troubled Tomorrows: The Report of the 'Canadian Institute of Actuaries' Task Force on Retirement Savings." Ottawa : Canadian Institute of Actuaries.

CONGRESSIONAL BUDGET OFFICE (1995). "Who Pays and When? An Assessment of Generational Accounting." Washington DC: Congress of the United States.

DALTON, H. (1920). "The Measurement of the Inequality of Incomes." *Economic Journal*. Vol. 30, 348-61.

EPSTEIN, R.A. (1992). "Justice Across the Generations." In P. Laslett and J.S. Fishkin (eds.), *Justice between Age Groups and Generations.* Yale University Press: New Haven, Connecticut.

FAFARD, P.C. (1996). "Age Matters: Equity Between Age Groups in Canada." *Inroads: A Journal of Opinion* Vol. 5, 53-68.

FEHR, H. and L.J. KOTLIKOFF (1995). "Generational Accounting in General Equilibrium." NBER Working Paper No. 5090, Cambridge, MA.

FELLEGI, I.P. (1988). "Can We Afford an Aging Society?" *Canadian Economic Observer.* Statistics Canada, Catalogue No. 11-010, October.

GOOD, C. (1995). "The Generational Accounts of Canada." *Fraser Forum.* Vancouver: The Fraser Institute.

HAVEMEN, R. (1994). "Should Generational Accounts Replace Public Budgets and Deficits?" *Journal of Economic Perspectives.* Vol. 8, 95-111.

HEALTH CANADA (1996). *National Health Expenditures in Canada, 1975-1994.* Ottawa: Minister of Supply and Services Canada.

HIRSHHORN, R. (1990). "Thinking Intergenerationally." Economic Council of Canada, Working Paper No. 9.

KOTLIKOFF, L.J. (1993). "From Deficit Delusion to the Fiscal Balance Rule: Looking for an Economically Meaningful Way to Assess Fiscal Policy." *Journal of Economics.* Vol. 7, 7-41.

LIPSEY, Richard G. (1996). "Economic Growth, Technological Change, and Canadian Economic Policy." C.D. Howe Institute, Benefactors Lecture.

OREOPOULOS, P. (1996)."A Generational Accounting Perspective on Canadian Public Policy." UBC Department of Economics, Working Paper No. 96-12.

OREOPOULOS, P. and L.J. KOTLIKOFF (1996). "Restoring Generational Balance in Canada." *Choices.* Vol. 2, No.1. Montreal: Institute for Research on Public Policy.

RAFFELHUSCHEN, B. and A.E. RISA (1995). "Generational Accounting and Intergenerational Welfare." Dresdner Beitrage zur Volkswirtschaftslehre, Working Paper No. 15/95.

VERMAETEN, A., W.I. GILLESPIE, and F. VERMAETEN (1994). "Tax Incidence in Canada." *Canadian Tax Journal.* Vol. 42, 348-415.

WOLFSON, M. and B. MURPHY (1996). "Aging and Canada's Public Sector: Retrospect and Prospect." In Keith G. Banting and Robin Boadway (eds.). *Reform of Retirement Income Policy: International and Canadian Perspectives.* Kingston, Ontario: Queen's University School of Policy Studies.

Chapter 3

Intergenerational Considerations of Workers' Compensation Unfunded Liabilities

MORLEY GUNDERSON AND DOUGLAS HYATT

Canada's workers' compensation systems are financed through a payroll tax with the cost initially falling on employers. The rates that employers pay are supposed to reflect the costs of current and future medical and vocational rehabilitation, and financial compensation associated with workplace injuries, as well as the costs of administering the system. Because some injuries and illnesses are permanent in nature—that is, the injured workers never fully recover their health— reserve funds are set aside to pay benefits to these workers over several years. These funds are invested, and the returns from these investments are used to finance future benefits. However, in some provinces, notably Ontario, assessment rates charged to employers (combined with returns from accident fund investments) have been insufficient to cover these future costs. Over several years, this shortfall between assessments and costs, has resulted in the accumulation of an unfunded liability of $10.9 billion, as of the end of 1995, for the Ontario Workers' Compensation Board (WCB). In other words, if the Ontario Workers' Compensation Board had been required to discharge all of its liabilities at the end of 1995, $10.9 billion of funds from other sources than Board assets would have to have been found.

Some argue that because the workers' compensation system is a perpetually on-going operation, the notion of an unfunded liability is meaningless since this "debt" is due only if the Board winds-down operations today. However, the existence of the unfunded liability is evidence that, in the past, employers did not fully fund the costs of compensable accidents due on their accounts, and instead have passed the costs to current employers. This may be a problem if the firms that incurred these costs will not exist in the future. Global economic restructuring gives reason to believe that this may be the case. Manufacturing industries have been in decline relative to service and high-tech industries, and it is plausible that the costs of past accidents are being transferred to these growth sectors. As employers in the declining sectors slowly vanish they transfer workers' compensation debts to current and future generations of employers.

The public finance literature has highlighted an important distinction between the **initial** and the **ultimate** incidence of a tax. It has been estimated that in Canada two-thirds and possibly an even higher proportion of payroll taxes get passed back to workers (Dahlby 1992). Thus, even though employers initially pay the costs of workers' compensation insurance, competitive pressures cause employers to pass these costs along to consumers in the form of higher prices, shareholders in the form of lower dividends, and/or workers in the form of lower wages. With increasing foreign competition in most product markets and the very free mobility of capital, there is little scope for increasing prices or lowering dividends in response to increases in workers' compensation premiums. Because labour is less mobile than capital, workers are the obvious target for passing on increased payroll costs. Thus, the proportions of payroll taxes that will be passed back to workers is more likely to grow than to decline. It may also be the case that workers' compensation unfunded liabilities will be passed on to workers in the form of lower benefits and stricter eligibility criteria.

In summary, workers' compensation unfunded liabilities engender intergenerational transfer considerations. While concerns about generational equity across workers and firms have been raised with respect to the workers' compensation system, there has been to our knowledge no formal attempt to systematically examine the size of, and distributional issues associated with, workers' compensation unfunded liabilities.

We propose to use Generational Accounting to obtain projections of the potential burden on future firms (firms that are "born" today) of moving to full funding of currently unfinanced workers' compensation liabilities in Ontario. We derive measures of the extent to which these new generations of companies will bear the compensation costs of previous generations of firms, and the implied payroll tax burden if the current structures of assessment rates and benefits are to continue. Since these costs are likely to be passed back to workers in the form of lower wages, our analysis will provide an indication of the additional intergenerational burden to be borne by future generations of workers.

Our Intergenerational Accounting exercise confirms that substantial intra- and intergenerational transfers are associated with the Ontario Workers' Compensation Board's current strategy for retiring it's unfunded liability. That is, within most industries, substantial proportions of accumulated unfunded liabilities will be borne by future firms, and that the faster growing industries (as measured by payroll growth) are being required to assume at least part of the unfunded liabilities amassed by relatively slower growth industries.

1. Workers' Compensation Unfunded Liabilities[1]

There is little agreement among the stakeholders in the workers' compensation system (labour, employers and the government) as to whether the unfunded liability is a problem, let alone how it should be addressed. The positions of the stakeholders reflect, to varying degrees, their fear that the cost of eliminating the unfunded liability will fall on their own constituency.

The perspective of labour is well summarized by the following quotes from a labour representative cited in a recently published popular press article: "They tell us the unfunded liability is out of control, but that's just smoke and mirrors.... Labour says the Ontario WCB is one of the top 10 profit-making corporations in Canada. In 1995, the WCB made a profit of $510 million, and has $8 billion in assets....They've never had to borrow a dime." (*Niagara Falls Review*, November 23, 1996, page B1). It is frequently argued that a reason for the unfunded liability is that benefit levels are too high and the scope of injuries and diseases compensated too wide. The concern of labour is that elimination of the unfunded liability will come at the cost of reduced benefits to workers, and the preclusion of some injuries and diseases from eligibility for compensation. This fear is not misplaced as recent workers' compensation reform packages in Canadian jurisdictions have included both benefit reductions and injury and disease exclusions.

The position of many employers is generally that the unfunded liability is harmful to their competitive position, and it reduces their ability to create jobs. Its existence has become a lightening rod for employer accusations that the workers' compensation system is out of control. They note that, on average, about 30 percent of their current assessments are being applied to the unfunded liability. As a result, employers express the view that benefit reductions must be one of the routes by which the unfunded liability is reduced. Employers are also concerned with how the burden of reducing the unfunded liability should be distributed among employers in different industries. Further, some employers believe that firms in the non-covered sectors, such as banking, should be brought under the umbrella of workers' compensation, to help share the burden.

The position of governments, who must balance the concerns of the other stakeholders, has traditionally been to let the unfunded liability grow by failing to allow tax assessment rates to increase sufficiently to cover the costs of the benefits mandated by the legislation. However, as the unfunded liability grew, so did the government's concern with the potential concomitant efficiency and generational implications. If employers are not paying the full costs of injuries, then the incentive to reduce their incidence and severity is diminished. In addition, the liabilities of employers who have not had to pay the full costs of accidents as they occur, and who subsequently go out of business, effectively shift these costs to future employers who, in turn, pass at least part of the cost on to future workers in the form of lower wages.[2]

The recent report of the Government of Ontario's Workers' Compensation Secretariat (1996) summarized evidence that the classic problems associated with the unfunded liability are coming to a head. On page 55 of the report, it is noted that between 1985 and 1995, ".... the WCB .... transferred some $1.65 billion from the investment portfolio to general operations to pay for benefit payments." It is compounded returns on these assets that the WCB relies upon in order to pay future benefits. Removing the base of assets upon which investment revenues must be

earned presages the descent into a vortex that will require strong action to reverse.

Table 3.1 shows workers' compensation-covered employment, the number of lost-time injuries (injuries that require the worker to miss at least one day of work beyond the date of injury), and the rate of lost-time injuries per 100 covered workers, for Ontario over the period 1990 to 1994. During these five years, both the number and rate of lost-time injuries (LTI's) have generally been decreasing, with some industries experiencing a modest increase in 1994. That year, the 3.05 million covered workers suffered a total of 108,876 LTI's, a rate of 3.58 per 100 workers. The LTI rate is highest in the transportation and storage industries, and lowest in government and other service industries. It should be noted that LTI rates are only one of the factors that drive the costs of workers' compensation. Duration of lost-time from work and the proportion of lost-time claims that subsequently qualify for permanent disability benefits also have important cost implications.

Some of the benefits paid by workers' compensation boards, notably permanent disability benefits, entail financial obligations which extend out for potentially many years. As is always the case in such circumstances, a number of options exist for financing the future payments. At one extreme—full-funding—employers pay present costs of temporary benefits and set aside capital, which along with returns from the investment of these funds, will be sufficient to discharge all future benefit payments. At the other extreme—a "pay-go" system—the expenses of the Board are paid in the year they are incurred, and no funds are set aside for benefit liabilities arising from accidents in that year.

The Ontario Workers' Compensation Act gives no guidance on the extent to which reserves should be set aside. It requires only that the accident fund ".... be sufficient to meet all the payments to be made out of the fund in respect of compensation as they become payable and so as not unduly or unfairly to burden the employers in any class in future years with payments that are to be made in those years in respect of accidents that have happened previously" (Section 101), and that "... it is not obligatory upon the Board to provide and maintain a reserve fund at all times equal to the capitalized value of the payments of compensation that will become due in future years unless the Board is of the opinion that it is necessary to do so in order to comply with Section 101." (Section 102(1)).

There are essentially two sources of unfunded liabilities: experience deficiencies and un(der)-funded enrichments. In the case of experience deficiencies, unfunded liabilities arise when the assumptions actuaries make prove to have been mis-projected with respect to various factors: worker demographic variables (age at time of injury, mortality, etc.); firm variables (assessment revenues, insolvencies, etc.); and injury and disease-related factors (accident frequency, severity of injury, duration of benefits, etc.). In the case of un(der)-funded enrichments, unfunded liabilities arise when either the generosity or the scope of injuries and diseases covered by the system is increased, without provision for additional assessments to fund the new liabilities. In the past, some enrichments to the workers' compensation system have been retroactive, the most obvious of which is the retroactive inflation indexing that was mandated in Ontario in 1985.

Workers' compensation insurance is financed through a payroll tax. Firms are classified into industry or "rate" groups. The workers' compensation board determines an "assessment rate," expressed as an amount per $100 of assessable payroll, which is based on the historical and expected future claims cost experience of employers in the group. Because there is a ceiling on the amount of income which is protected by workers' compensation, assessments are made only up to the ceiling. In addition to claims cost experience, assessment rates can also vary over time depending upon the financial condition of the workers' compensation system, political exigencies, and general economic conditions (that affect Board expenditures, revenues, and returns on investment of assets). Assessment rates can vary across firms within an industry group where experience rating plans are in effect. Experience rating adjusts the assessment rate to more closely reflect the claims cost experience of a particular firm relative to other firms in the industry. Firms that experience lower than average claims costs will pay a rate below the industry average, while firms that experience greater than average claims costs will pay an above average rate. Very large employers have an option to self-insure, in which case the Board pays benefits to the injured workers of these firms, and then bills the firm for the cost of compensation and a pro-rated administration charge.

The Ontario Workers' Compensation Board categorizes firms into 219 separate industry

Table 3.1

Employment, Lost-Time Injuries and Lost-Time Injury Rate: By Industry, Ontario 1990-1994

Industry	1990			1991			1992			1993			1994		
	Employment	LTIs	LTI Rate	Employment	LTIs	LTI Rate	Employment	LTIs	LTI Rate	Employment	LTIs	LTI Rate	Employment	LTIs	LTI Rate
Forest products	42,212	2,482	5.88	38,483	2,019	5.25	38,124	1,659	4.35	37,982	1,595	4.20	40,149	1,600	3.99
Mining and related	29,627	1,685	5.69	25,625	1,285	5.01	22,305	921	4.13	22,973	766	3.33	22,288	683	3.06
Other primary	39,116	2,688	6.87	37,103	2,485	6.70	35,920	2,017	5.62	36,573	1,996	5.46	36,603	1,901	5.19
Manufacturing	996,489	68,872	6.91	902,843	52,221	5.78	904,054	44,026	4.87	866,646	38,723	4.47	910,710	40,068	4.40
Transportation and storage	108,409	9,887	9.12	102,971	9,062	8.80	103,393	8,283	8.01	102,264	7,619	7.45	107,380	7,870	7.33
Retail and wholesale trades	691,624	27,474	3.97	659,422	23,979	3.64	662,381	21,833	3.30	649,947	19,529	3.00	663,228	20,429	3.08
Construction	189,264	14,907	7.88	151,252	10,476	6.93	129,790	7,916	6.10	121,395	6,346	5.23	125,666	6,234	4.96
Government and related	687,042	19,370	2.82	710,231	19,018	2.68	709,442	18,123	2.55	607,877	15,437	2.54	605,870	15,351	2.53
Other services	545,717	16,714	3.06	524,305	15,461	2.95	516,105	14,075	2.73	515,304	13,793	2.68	533,178	14,740	2.76
Total	**3,329,500**	**164,079**	**4.93**	**3,152,235**	**136,006**	**4.31**	**3,121,514**	**118,853**	**3.81**	**2,960,962**	**105,804**	**3.57**	**3,045,072**	**108,876**	**3.58**

Notes: LTI – Lost Time Injury.
LTI Rate is measured per 100 workers.

Source: Ontario Workers' Compensation Board, *Assessment Rate Manual*, December 1995.

groups for the purposes of rate setting. In 1996, the average workers' compensation tax assessment rate was $3.01 per $100 of assessable payroll. The range was from $0.22 in the legal and financial services industry to $18.02 in the cargo handling industry.

Revenues from assessments are paid into an "accident fund" which the Board uses to pay for the costs of accepted claims, administration and overhead, and other expenditures for related agencies which the Board is obligated by legislation to fund. Revenues not expended by the Board are invested and the returns on these investments used to fund the on-going costs of permanent disability claims. Thus, the Board also generates revenues from returns on investments.

Table 3.2 provides data on the revenues and expenses, by source, over the years 1981 to 1995. The figures in the table are in millions of current dollars. In 1995, the Board collected $2,653 million in tax assessments, and accrued an additional $593 million in returns on investment of the accident fund, together amounting to total revenues of $3,246 million. Expenses in 1995 were $2,736 million, $2,385 million of which was paid out in benefits. Net new benefit liabilities, which arise from, for example, legislative changes to benefit structures or actuarial experience, were negative $150 million in 1995. Board administration and other costs were $501 million.

Revenues exceeded Board expenses by $510 million in 1995 and by $130 million in 1994, but in each of the previous thirteen years, the opposite was true. Between 1981 and 1993, the capitalized value of the Board's outstanding liabilities less assets—the unfunded liability—increased from $816 million to $11,532 million. The surpluses generated in the most recent two years reduced the size of the unfunded liability to $10,892 million by 1995. Also notable is a doubling of the unfunded liability between 1984 and 1985 as a result of retroactive inflation indexing.

Table 3.3 gives a similar set of financial statistics for the nine industry aggregates for 1995. The last row of the table also shows the funding ratio (assets held by the Board divided by expected future benefit liabilities). Only three of the industries have funding ratios in excess of 50 percent (other primary industries, transportation and storage, and government and related services). Only 16.2 percent of future liabilities are currently funded in the construction industry.[3]

Table 3.4 shows the components of the assessment rate for each of nine broad industry groups (excluding self-insured employers) in 1996. In addition to the expected costs of new claims, the assessment rate reflects each industry's share of WCB administration and overhead and the costs of various legislated obligations of the Board. In addition, the Ontario WCB assesses a surcharge to eliminate the unfunded liability. The unfunded liability charge shows what existing and new firms must contribute to eliminate the unfunded liabilities of firms already (or previously) in the industry.

The tax assessment rate of $3.01 per $100 of assessable payroll consists of $1.68 for the costs of new claims, 32.4 cents for WCB administration, 11.5 cents for legislative obligations and other overhead and an 88.7 cents charge for amortizing the unfunded liability, which reflects the costs of past injuries for which there are still outstanding benefit payment obligations, but for which there are no assets to fund them. Firm's in the construction and mining industries face the highest assessment rates, at $8.44 and $6.92 respectively, while government ($1.32) and other service industries ($1.92) pay the lowest rates.

If the policy decision by workers' compensation boards is to reduce or eliminate unfunded liabilities, it would appear that there are three possible ways to proceed: increase assessment rates; reduce benefits; or some combination of these two actions. However, reflecting the different components of the expenses and revenues of the workers' compensation system, there is a wide range of policy responses to unfunded liabilities that are within the financial authority of workers' compensation boards. Pay-outs or expenses, for example, can involve many components: workers' compensation benefits to workers who are permanently, temporarily or fatally injured; medical and vocational rehabilitation expenses; and administrative expenses associated with operating the system, including the adjudication of claims. Revenues can also have different components: payroll taxes on employers and employees; general tax revenues; and earnings from fund investments or perhaps even liquidating assets. Revenues can be raised by increasing the tax **rates** or by increasing the tax **base** (that is groups who pay the tax). Increasing the tax base could be accomplished, for example, by extending coverage to those currently not covered by workers' compensation.[4]

Table 3.2

Ontario Workers' Compensation Board Aggregate Financial Statistics, 1981-1995

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
								($ millions)							
Revenues															
Assessments	673	781	882	1,160	1,424	1,737	2,092	2,377	2,678	2,596	2,505	2,528	2,283	2,351	2,653
Investment	166	170	167	176	186	217	272	316	409	440	450	453	521	499	593
Total Revenues	**839**	**951**	**1,049**	**1,336**	**1,610**	**1,954**	**2,364**	**2,693**	**3,087**	**3,036**	**2,955**	**2,981**	**2,804**	**2,850**	**3,246**
Expenses															
Benefits paid	621	726	860	979	1,099	1,246	1,463	1,624	1,782	2,059	2,342	2,444	2,435	2,331	2,385
Net increase in benefits liability	520	700	640	880	2,990	1,304	1,096	1,443	2,117	1,220	1,440	760	400	(75)	(150)
Administration	117	137	146	162	192	230	289	285	307	376	430	444	443	435	452
Other	–	–	–	–	–	–	–	–	–	–	2	14	30	29	49
Total Expenses	**1,257**	**1,563**	**1,646**	**2,021**	**4,281**	**2,780**	**2,848**	**3,352**	**4,206**	**3,655**	**4,214**	**3,662**	**3,308**	**2,720**	**2,736**
Surplus (Deficiency)	**(418)**	**(612)**	**(597)**	**(685)**	**(2,671)**	**(826)**	**(484)**	**(659)**	**(1,119)**	**(619)**	**(1,259)**	**(681)**	**(504)**	**130**	**510**
Unfunded Liability	**816**	**1,428**	**2,025**	**2,710**	**5,381**	**6,207**	**6,691**	**7,350**	**8,469**	**9,088**	**10,347**	**11,028**	**11,532**	**11,402**	**10,892**

Source: Ontario Workers' Compensation Board, *Annual Report*, 1995.

Table 3.3

Ontario Workers' Compensation Board Financial Statistics: By Industry, 1995

Financial Statistics	Forest Products	Mining and Related	Other Primary	Manufac-turing	Transportation and Storage	Retail and Wholesale Trades	Construction	Government and Related	Other Services
					($ millions)				
Revenues									
Assessments	61.3	52.6	39.5	992.7	178.3	329.9	322.9	204.7	205.4
Investments	21.4	44.3	12.1	235.4	49.9	63.4	48.9	63.1	38.7
Total	**82.7**	**96.9**	**51.6**	**1,228.1**	**228.2**	**393.3**	**371.8**	**267.8**	**244.1**
Expenses									
Benefits	63.2	89.0	42.7	818.3	135.5	241.6	353.3	167.4	127.0
Administration and Other	12.8	15.7	6.1	162.3	19.8	60.2	56.1	48.3	34.9
Total	**76.0**	**104.7**	**48.8**	**980.6**	**155.3**	**301.8**	**409.4**	**215.7**	**161.9**
Surplus/(Deficiency)	**6.7**	**(7.8)**	**2.8**	**247.5**	**72.9**	**91.5**	**(37.6)**	**52.1**	**82.2**
Unfunded Liability	**523.5**	**574.1**	**142.8**	**3,908.7**	**575.6**	**1,041.2**	**3,057.6**	**544.2**	**524.0**
Funding ratio*	**34.1**	**48.4**	**50.8**	**42.7**	**51.4**	**42.3**	**16.2**	**58.0**	**47.4**

* The funding ratio equals assets divided by accrued liabilities.

Source: Ontario Workers' Compensation Board, *Statistical Supplement to the 1995 Annual Report*.

Table 3.4

Assessment Rate Components: By Industry Class, 1996

	Total	Forest Products	Mining and Related	Other Primary	Manufac-turing	Transpor-tation and Storage	Retail and Wholesale Trades	Construction	Government and Related	Other Services
New claims costs	1.684	2.566	3.860	2.907	1.886	3.713	1.219	4.789	0.745	1.073
Overhead expenses:										
WCB administration	0.324	0.409	0.534	0.442	0.344	0.520	0.279	0.623	0.234	0.265
Legislative obligations	0.115	0.150	0.329	0.052	0.126	0.080	0.102	0.229	0.085	0.094
Other overhead[1]	0.001	0.083	0.149	0.282	0.038	0.263	(0.052)	0.303	(0.120)	(0.070)
Unfunded liability charge	0.887	1.348	2.046	1.547	1.006	1.921	0.650	2.497	0.376	0.563
Target assessment rate[2]	**3.01**	**4.56**	**6.92**	**5.23**	**3.40**	**6.49**	**2.20**	**8.44**	**1.32**	**1.92**
Transition adjustment[3]	0.00	0.66	0.27	(0.82)	0.35	(0.28)	(0.10)	(1.39)	0.00	(0.18)
Actual rate	**3.01**	**5.22**	**7.19**	**4.41**	**3.75**	**6.21**	**2.10**	**7.05**	**1.32**	**1.74**

Notes:

[1] Other overhead costs include relief (net of transfer charges) from administrative fees, in addition to any applicable charges for safety associations or special training program costs.
[2] The "Target assessment rate" is the total cost per $100 of assessable payroll required to fund new claims, administration and overhead, and the accumulated unfunded liability.
[3] Because past actual experience differed from expected experience, an industry's target rate and actual assessment rate can be different. Rather than adjust rates dramatically from one assessment period to the next, the WCB usually provides for transitional adjustments (that may also reflect government policy, such as assessment rate freezes). The "Transitional adjustment" reflects the difference between what the WCB actually charges employers and the target assessment rate.

Source: Ontario Workers' Compensation Board, *1996 Assessments Rates Manual.*

Both the pay-out and revenue aspects also have an inter-temporal component in that different "generations" can be involved: the **current recipients** of payments whose employers paid into the system in the past; the **current workers** whose employers are paying into the system and who may draw from it if injured or disabled; **current uncovered workers** who are not presently covered by workers' compensation but who may be brought into the system in the future; and **future generations**, not yet working or not yet born, whose employers can be expected to pay into the system and who may draw from it. Similar intergenerational considerations apply to firms: failed firms may have accrued liabilities that they will not pay; current firms may be accruing liabilities or paying off the liabilities of previous firms; new firms may acquire such unfunded liabilities.

Each of these generations also has different degrees of "claims" on the system. Current recipients of pay-outs have a quasi-legal claim in that those who are permanently injured or disabled have a promised amount based on their award, although some workers may be in a stage where that promised amount is still being determined. As well, there may be some discretion in the extent of medical and vocational rehabilitation expenses that will be incurred, or on whether adjustments will be retroactive, or on how the compensation is indexed to compensate for inflation. For those who are temporarily injured there may be more immediate adjustments that could be made to the pay-outs. Current workers whose employers are paying into the system and largely supporting the current recipients, have an expectation of benefits that may be based on those being received by current recipients, but this expectation is complicated by the changing nature of occupational injuries and diseases, and by the fact that the pay-outs will largely come from taxes on future generations.[5]

It has been the stated goal of the Ontario Workers' Compensation Board to eliminate the unfunded liability within 25 years. In order to accomplish this goal, the Board instituted a strategy which includes adjusting the assessment rates of the industry classifications to more closely reflect their claims cost experience. In addition, as shown in Table 3.4, the Board added a surcharge to the assessment rates of all industries to help pay down the unfunded liability. All firms must pay the surcharge, including new firms who had nothing to do with any accumulated unfunded liability. Through this mechanism there is clearly a direct transfer from new firms to existing (and deceased) firms.

2. Methodology for Estimating the Distribution of the Burden of Eliminating the Unfunded Liability

In this section we examine the intergenerational consequences of the Ontario Workers' Compensation Board's strategy to eliminate the unfunded liability. Because some industries that have accumulated unfunded liabilities are in decline relative to other industries, it is likely that the burden of the unfunded liability will be distributed to the more rapidly growing industries. Indeed, the redistribution of the burden of eliminating the unfunded liability is an explicit policy choice of the Board. The Board calculates the payment that would be needed to eliminate the unfunded liability accumulated by a particular industry, and then decides on the extent to which the industry will be granted relief, or required to assume liabilities of other industries. In addition, within an industry group, new firms will be required to pay part of the unfunded liability attributable to existing firms and firms that ultimately ceased operations. In other words, the burden of eliminating the unfunded liability can be redistributed across industries (that is some industries may have to contribute to paying down the unfunded liabilities of other industries), and new firms may have to contribute to eliminating the unfunded liabilities of existing and "deceased" firms.

We begin by outlining the approach we take for analyzing how the Ontario Workers' Compensation Board's present funding strategy will distribute the burden of eliminating the unfunded liability. The approach is one similar to the intergenerational accounting framework described in Oreopoulos and Kotlikoff (1996) and Oreopoulos and Vaillancourt (Chapter 2), with some modifications to suit the special circumstances of this application.

We assume that there are two types of firms: those that exist today (which we will term "existing firms"); and those that will come to exist in the future (hereafter "new firms"). Existing firms "die", or more appropriately for our purposes, their payrolls diminish over time. As existing firm payrolls decline, new firms are born, and follow a life cycle of their own.

With i denoting the firm, k the year the firm was "born", t the current year, D the number of years over which the unfunded liability is

eliminated and, r the discount rate, the generational account of an **existing** firm is given by:

$$F^{i}_{t,k} = \sum_{s=\max(t,k)}^{k+D} T_{s,k}\ P_{s,k}\ (1+r)^{t-s}$$

where $F^{i}_{t,k}$ is the generational account of an existing firm/industry, $T_{s,k}$ is net tax assessment made in years, and $P_{s,k}$ is the proportion of payroll still existing in years.

The tax assessment burden on **new** firms is given by:

$$\sum_{s=1}^{\infty} F_{t,t+s} = \sum_{s=1}^{\infty} B_s\,(1+r)^{t-s} - \sum_{s=0}^{D} F_{t,t-s} - A_t$$

where B_s is benefit payments paid on account of new firms, and A_t is net workers' compensation assets of existing firms.

In other words, the tax assessment liability for new firms is equal to the benefits payable on the account of new firms to their injured workers, less the net future tax assessments of existing firms, less net assets attributable to existing firms.

We do not have firm-level data, but rather we have information for the 219 assessment rate groups. For reasons of tractability, we aggregate these industry groups into the nine broad industry categories used in Tables 3.3 and 3.4.

Because of our lack of firm-level data we are unable to follow firms from birth to death. Nor are we able to circumvent this problem by having the equivalent of mortality tables for firms in different industries. To address these shortcomings, we assume that the benefit liabilities of firms which exist today have been accrued by the existing firms (even though firms that have contributed to the unfunded liability may actually be out of business). Thus, for each industry group, net tax assessments of existing firms equal the present value of net future tax assessments plus the present value of accrued benefit liabilities, less assets held by the Board toward payment of accrued benefit liabilities. Clearly this is not an ideal situation, but it is a reasonable framework with which to illustrate the redistributional issues of moving to full funding.

We do not offer our own assessment of the reasonableness of the Ontario Workers' Compensation Board's assumptions with respect to the myriad of factors which are crucial to the actuarial valuations of assets and liabilities by industry. These assumptions are subject to annual scrutiny by the Board's auditors. Instead, we take the asset and liability values, and all of their underlying assumptions as given.

We do, however, need to make a number of other assumptions for this exercise. Among these is a rule for allocating future payroll across new and existing firms. We assume that an industry's payroll grows at a constant rate over the simulation period, while the payroll of existing firms is assumed to diminish at a constant rate over time. The payroll of new firms grows each year to a level sufficient to maintain the overall industry payroll growth rate in light of the attrition of the payroll of existing firms. For example, if the payroll of existing firms in an industry is $1,000 this period, and is expected to diminish at a rate of 5 percent, and the overall payroll growth for the industry is 10 percent, then next period the new firms will account for $150 of payroll, currently existing firms will account for $950 of payroll, and overall payroll for the industry will be $1,100.

Our assumptions regarding industry payroll growth rates were derived by calculating the mean real payroll growth rates over the period 1980 to 1995 for each of the industries using Statistics Canada data for Ontario. For the government sector, this approach yielded an annual payroll growth rate of about 2.5 percent. In light of more recent trends in this industry, we arbitrarily adjusted our government payroll growth rate assumption to zero.

As we have described, we do not have mortality tables for firms which we need to allow us to estimate the liabilities that are abandoned by firms as they go out of business. As a result, we are left in the position of having to make an assumption based on essentially no information. Thus, we begin with the assumption that the payroll of existing firms in all industries diminishes at a rate of 4.6 percent per year, which implies that firms that exist today will have remaining about one-third of their payroll after twenty-five years. As we will demonstrate, within our analytical framework this assumption influences the rate at which the burden of the unfunded liability is off-loaded from existing firms to new firms within an industry. More rapid mortality rates are associated with more of the unfunded liability being shifted to new firms.

We calculate the generational accounts for existing firms, aggregated to the major industry level, using the assumptions in Appendix Table

3A.1. Assets and outstanding liabilities of existing firms are shown in Appendix Table 3A.2. We assume a discount rate of five percent. Administrative costs are excluded from the calculations on both the assessment side and the benefit payment side. Thus, the tax assessment rates used in the calculations reflect the costs of new claims plus the charge imposed by the Board to eliminate the unfunded liability within approximately twenty-five years. Our model is therefore simulated out twenty-five years. This is equivalent to assuming that once the twenty-five year period is completed, the unfunded liability will have been eliminated, and the unfunded liability surcharge will be removed and firms will pay workers' compensation assessment rates consistent with the present and future costs of claims (that is, net tax assessments will equal zero).

3. Simulation Results

Table 3.5 contains the results of the simulation for each of the nine industries. The first row shows net tax assessment of existing firms (the present value of future net benefits, plus the present value of outstanding liabilities, less assets). If the burden of eliminating the unfunded liability for an industry was placed entirely on existing firms within the industry, the numbers in this row would all be zero. If the burden of the unfunded liability was placed on existing firms, but was redistributed across industries, then the sum of the figures in the first row would be zero. Neither of these is the case. Existing firms in all industries except transportation and storage, government and related services, and other services will have paid less in tax assessments than the value of benefits received by their injured workers. The bottom panel of Table 3.5 shows the amount, per $100 of future (discounted) assessable payroll, that firms have contributed to eliminating the unfunded liability. Existing forest products employers would have had to pay an additional $2.167 per $100 of assessable payroll if they were to have shouldered the entire burden for eliminating the unfunded liability for that industry. The similar "savings" per $100 to existing employers are: mining and related industries, $3.703; other primary industries, $0.431; manufacturing, $0.359; retail and wholesale trades, $0.017; and construction, $4.423. Net "over-assessments" amount to $0.131 per $100 of payroll for employers in the transportation and storage industries, $0.070 for government and related services employers, and $0.107 for employers in other service industries.

The second row of Table 3.5 gives the net assessments paid by new firms. In all of the nine industries, new firms will pay more in tax assessments over the next twenty-five years than will be paid to their injured workers in workers' compensation benefits. The proportion of assessable payroll which new firms pay toward the unfunded liability, none of which is attributable to them, is obviously exactly equal to the unfunded liability amortization charge (see Table 3.4).

The balance on each industry's account is shown in the third row. If the unfunded liability for an industry was eliminated by the existing and new firms within the industry, then this number would be zero for all industries. The result that these figures are not zero demonstrates the inter-industry redistribution of the burden of eliminating the unfunded liability. The inter-industry redistribution of unfunded liabilities by Board policy entails relief of liabilities to the forest products industries, mining and related industries and especially construction, financed by "excess" charges to all other industries. At the end of twenty-five years, the Board will have achieved its goal of eliminating the unfunded liability and, given the assumptions of this simulation, will have accumulated a modest surplus (the sum of this row is greater than zero).

Two of the central assumptions underlying our simulation results are the mortality rate of existing firms' payroll, and payroll growth rates. In order to demonstrate the importance of these assumptions, as well as the dynamics of our simulation model, we perform two further sets of simulations. In the first, we double the mortality rates of firms, and in the second we double the payroll growth assumptions.

Table 3.6, when compared to Table 3.5, shows that doubling the mortality rate of existing firms (from 4.6 percent per year to 9.2 percent per year), while holding the other assumptions constant at their Table 3.5 values, has the effect of lowering the net assessments of existing firms while increasing net assessments of new firms. However, the balance on the industry account is unchanged. This is because, as described earlier, our simulation model is constructed to allow the payroll of new firms to increase at a rate sufficient to maintain the assumed overall industry payroll rate. As a result, the payroll of existing firms declines more rapidly while the payroll of new firms expands more rapidly to compensate, but total overall industry payrolls are unchanged. In summary, the effect of an increase in the payroll mortality rate of existing

Table 3.5

Simulated Generational Accounts of Existing Firms and New Firms by Industry

Simulation Outcomes	Forest Products	Mining and Related Industries	Other Primary Industries	Manufac-turing	Transportation and Storage	Retail and Wholesale Trades	Construction	Government and Related Services	Other Services
					($ millions)				
Net assessments + assets of existing firms	(322.7)	(369.8)	(31.1)	(1,028.3)	42.0	(25.8)	(1,954.3)	125.1	122.7
Net assessments of new firms	44.7	109.5	59.9	1,293.2	347.8	690.9	653.8	309.7	631.7
Balance on industry account	(278.0)	(260.3)	28.8	264.9	389.8	665.1	(1,300.5)	434.8	754.4
Balance on industry account per $100 of payroll									
Existing firms	(2.167)	(3.703)	(0.431)	(0.359)	0.131	(0.017)	(4.423)	0.070	0.107
New firms	1.348	2.046	1.547	1.006	1.921	0.650	2.497	0.376	0.563
All firms	(1.527)	(1.697)	0.259	0.064	0.776	0.253	(1.848)	0.167	0.332

Table 3.6

Mortality Rate of 0.092 Simulation Results

Simulation Outcomes	Forest Products	Mining and Related Industries	Other Primary Industries	Manufac-turing	Transportation and Storage	Retail and Wholesale Trades	Construction	Government and Related Services	Other Services
					($ millions)				
Net assessments + assets of existing firms	(372.8)	(420.8)	(60.8)	(1,747.8)	(112.3)	(279.4)	(2,229.9)	(42.1)	(38.9)
Net assessments of new firms	94.8	160.5	89.6	2,012.7	502.1	944.5	929.4	476.9	793.3
Balance on industry account	(278.0)	(260.3)	28.8	264.9	389.8	665.1	(1,300.5)	434.8	754.4
Balance on industry account per $100 of payroll:									
Existing firms	(3.337)	(5.617)	(1.148)	(0.814)	(0.465)	(0.238)	(6.727)	(0.032)	(0.045)
New firms	1.348	2.046	1.547	1.006	1.921	0.650	2.497	0.376	0.563
All firms	(1.527)	(1.697)	0.259	0.064	0.776	0.253	(1.848)	0.167	0.332

Table 3.7

Double Payroll Growth Rate Simulation Results

Simulation Outcomes	Forest Products	Mining and Related Industries	Other Primary Industries	Manufac-turing	Transportation and Storage	Retail and Wholesale Trades	Construction	Government and Related Services	Other Services
					($ millions)				
Net assessments + assets of existing firms	(322.7)	(369.8)	(31.1)	(1,028.3)	42.0	(25.8)	(1,954.3)	125.1	122.7
Net assessments of new firms	92.9	131.6	71.8	1,333.0	416.1	960.2	815.6	1,163.5	1,145.1
Balance on industry account	(229.8)	(238.2)	40.7	304.7	458.1	934.4	(1,138.7)	1,288.6	1,267.8
Balance on industry account per $100 of payroll:									
Existing firms	(2.167)	(3.703)	(0.431)	(0.359)	0.131	(0.017)	(4.423)	0.070	0.107
New firms	1.348	2.046	1.547	1.006	1.921	0.650	2.497	0.376	0.563
All firms	(1.055)	(1.451)	0.530	0.073	1.335	0.307	(1.482)	0.204	0.398

firms is to further shift the costs of the net liabilities of existing firms to future firms.

The simulation presented in Table 3.7 holds constant all of the Table 3.5 assumptions, except that the payroll growth rates are doubled for all of those industries which had been assumed to have positive growth. Forest products and manufacturing industries, which had been assumed to experience negative payroll growth, are now assumed to experience zero growth. The government payroll growth rate, which had been assumed to be zero, is raised to 2 percent.

Increasing payroll growth rates results in larger net assessments by new firms, but no change in net assessments by existing firms, since all payroll growth is assigned to new firms. The net liabilities of existing firms are offset more rapidly (through the unfunded liability surcharge on payroll), and the net balances on industry accounts increase (industries with positive balances become larger, while the negative balances previously found for some industries become "less negative").

4. Conclusion

Workers' compensation in Canada evolved as a program for bringing some basic degree of income protection to individuals who suffer work-related injuries and diseases. In 1995, just over three million workers were covered by workers' compensation in Ontario and 3.6 percent of them suffered an injury which caused them to miss at least one day of work.

In some Canadian jurisdictions, workers' compensation tax assessments have in the past been insufficient to cover the current and expected future costs of claims, resulting in accumulated unfunded liabilities. At the end of 1995, the unfunded liability of the Ontario workers' compensation system stood at $10.9 billion, an amount in excess of four times assessment revenues in that year.

There is disagreement among the stakeholders as to whether the unfunded liability is a problem and, if it is, how it should be addressed. Some governments have become increasingly concerned with the efficiency and equity considerations associated with unfunded liabilities, and jurisdictions including Ontario have implemented strategies to eliminate workers' compensation unfunded liabilities.

Our simulation analysis represents an attempt to examine the inter-firm and inter-industry transfers of eliminating the unfunded liability in Ontario. In summary, it appears that the unfunded liabilities of "declining" industries are at least partly transferred to those larger industries which are experiencing relatively rapid payroll growth, and which are paying relatively low (compared to other industries) assessment rates. Notable is the transportation and storage industry in which, not only will existing firms have more than eliminated their own unfunded liability within 25 years, the burden per $100 of payroll of contributing to paying down the unfunded liabilities of other industries is large relative to other net contributing industries. Also, because new firms are not charged workers' compensation assessment rates that reflect only the expected costs of new claims, but rather must also pay an unfunded liability surcharge, there is an explicit transfer of the burden of paying eliminating the unfunded liability from existing to new firms.

Finally, as suggested earlier in the paper, to the extent that the costs of workers' compensation are shifted back to workers, these inter-firm and inter-industry transfers of the burden of unfunded liabilities ultimately imply that future workers will assume part of the cost of compensating previously injured workers. To the extent that policy may mandate that the unfunded liability be addressed by reducing benefits or excluding particular injuries and diseases from compensation, determining where the burden will rest among future workers is made more complicated.

Table 3A.1
Summary of Simulation Assumptions

Industry	Assessment rate per $100 of payroll	Initial assessable payroll	Mortality rate of existing firms' payroll	Benefits paid per $100 of payroll	Annual payroll growth rate
Forest products	3.914	1,540,569,962	-0.046	2.566	-1.97
Mining and related industries	5.906	1,032,927,357	-0.046	3.860	0.51
Other primary industries	4.454	746,572,611	-0.046	2.907	0.51
Manufacturing	2.892	29,616,405,439	-0.046	1.886	-0.10
Transportation and Storage	5.634	3,325,513,881	-0.046	3.713	0.69
Retail and whole-sale trades	1.869	16,158,018,331	-0.046	1.219	1.42
Construction	7.286	4,570,437,931	-0.046	4.789	0.88
Government and related services	1.121	18,411,887,699	-0.046	0.745	0.00
Other services	1.636	11,880,713,209	-0.046	1.073	2.99

Table 3A.2
Assets, Accrued Liabilities and Unfunded Liabilities, by Industry, 1995
(millions of dollars)

Industry	Assets	Accrued Liabilities	Unfunded Liability
Forest products	270.9	794.4	523.5
Mining and related industries	538.5	1112.6	574.1
Other primary industries	147.4	290.2	142.8
Manufacturing	2,912.8	6,821.5	3,908.7
Transportation and storage	608.8	1,184.4	575.6
Retail and wholesale trades	763.3	1,804.5	1,041.2
Construction	591.1	3,648.7	3,057.6
Government and related services	751.5	1,295.7	544.2
Other services	472.2	996.2	524.0
Total	**7,056.5**	**17,948.2**	**10,891.7**

Source: Calculations by the authors based on WCB 1995 Annual Report.

End Notes

The authors are grateful for financial support from the Donner Foundation project on New Perspectives on Workers' Compensation Policy, and to Howard Coote for valuable research assistance.

[1] More complete overviews of workers' compensation in Canada can be found in Hyatt (1995) and Chaykowski and Thomason (1995).

[2] Vaillancourt and Marceau (1990), using data for Quebec, found that workers' compensation payroll taxes were not shifted back to workers in the form of lower wages to the same extent as Unemployment Insurance and Quebec Pension Plan taxes. This may be the case because workers' compensation replaces the costs to employers of liability for workers' injuries that, in the absence of a workers' compensation system, would have arisen through tort actions. As a result, workers' compensation is not a "new" cost of employment, and therefore should not necessarily engender further wage reductions.

[3] Section 102(2) of the Ontario *Workers' Compensation Act* provides that, "It is not necessary for the reserve fund to be uniform as to all classes but, ... it is discretionary with the Board to provide for a larger reserve fund in one or more of the classes than in another or others of them."

[4] Coverage rates vary considerably across Canada highlighting the potential importance of extending coverage as a policy response. Currently about 70 percent of the workforce in Ontario is covered by workers' compensation, while coverage is virtually universal in British Columbia.

[5] An extended discussion of the policy options available for addressing workers' compensation unfunded liabilities is provided in Gunderson and Hyatt (1997).

Bibliography

CHAYKOWSKI, Richard P. and Terry THOMASON (1995). "Canadian Workers' Compensation: Institutions and Economics." In Terry Thomason and Richard P. Chaykowski (eds.). *Research in Canadian Workers' Compensation*. Kingston, Ontario: Queen's University IRC Press.

DAHLBY, Bev (1992). "Taxation and Social Insurance." In Richard M. Bird and Jack M. Mintz (eds.). *Taxation to 2000 and Beyond*. Canadian Tax Paper No. 93, Toronto: Canadian Tax Foundation.

GUNDERSON, Morley and Douglas HYATT (1997). "Unfunded Liabilities Under Workers' Compensation." Unpublished manuscript, Centre for Industrial Relation, University of Toronto.

HYATT, Douglas E. (1995). "Workers' Compensation in Canada: An Overview". Volume 5 of *Unfolding Change. Workers' Compensation in Canada*. Liberty International Canada.

ONTARIO WORKERS' COMPENSATION SECRETARIAT (1996). *New Directions For Workers' Compensation Reform*. Toronto: Government of Ontario.

OREOPOULOS, Philip and Laurence J. KOTLIKOFF (1996). "Restoring Generational Balance in Canada." *Choices*. Vol. 2, No.1, 52.

VAILLANCOURT, François and N. MARCEAU (1990). "Do General and Firm-Specific Employer Payroll Taxes have the Same Incidence? Theory and Evidence." *Economics Letters*. Vol. 34, 175-181.

Chapter 4

The Age Distribution of the Tax/Transfer System in Canada

CHANTAL HICKS

A clear understanding of the size and extent of intergenerational transfers made by governments is central to any informed debate dealing with "Intergenerational Equity." Accordingly, the aim of this chapter is to provide a descriptive backdrop to these discussions by examining how current policy at all levels of government in Canada redistributes income among the different generations. Who pays the taxes and who receives the transfers? Is government mainly transferring money from the young to the old? To what degree? In what way? By responding to these questions I provide important background information for the development of Generational Accounts as well as for a general understanding of the implications of an aging population.

Generational Accounting, as developed and discussed by Auerbach, Gokhale and Kotlikoff (1995), is used to examine the "sustainability" of fiscal policy, that is the net tax burden placed on future generations by the existing configuration of taxes and transfers. Generational Accounts assume that fiscal policy remains constant until the end of current generations' lifetimes, but that policy could change for future generations. To derive Generational Accounts, it is necessary to calculate the average tax payments and transfer receipts among generations for a base year. This exercise has been undertaken in Canada by Good (1995), Oreopoulos and Kotlikoff (1996), and most recently by Oreopoulos and Vaillancourt in Chapter 2. The two latter studies use Statistics Canada's Social Policy Simulation Database and Model (SPSD/M) to derive taxes and transfers by age and gender. My paper, which is also based upon these data, informs the Generational Accounting literature by examining the base year taxes and receipts in detail. I fill in several gaps in the SPSD/M by supplementing it with other Statistics Canada data and, just as importantly, point out methodological difficulties inherent in the calculation of the incidence of taxes and transfers across individuals at a point in time.

Attention has also been focused on the sustainability of government programs in the face of an aging population. Many of these studies use dependency ratios (the number of elderly and children over the working age population), and combine the demographic effects with economic effects and changes in program costs. For example, Fellegi (1988) concludes that changes in labour force participation and fiscal spending are more important than the demographic effects of the aging population when analysing the sustainability of government programs. Murphy and Wolfson (1992), and Henripin (1994) also study these issues and reach different conclusions. These exercises often emphasize that health care costs, due to their importance for the elderly, will be an important factor as the population ages. By examining the age profiles of the Canadian tax and transfer system in 1995 I provide more information for studies of this kind.

The main results show that though net transfers are positive for the young and the old, average transfers per capita are much larger for the old. The federal government transfers money, for the most part, to the old, whereas provincial and local governments transfer money to both young and old. Given an aging population this may indicate that the two levels of government will have to deal with different fiscal issues in the future. The analysis also highlights the methodological difficulties inherent in attempting to allocate taxes and transfers by age. In particular, the results are sensitive to the assumptions made concerning the intra-household allocation of taxes and transfers, and thereby suggest that more attention is needed in linking Generational Accounting to models of the family.

1. Methodology

There are many ways to age taxes and transfers and the method chosen depends both on the unit of analysis adopted as well as on the availability of appropriate data.

Age profiles are often derived using the individual as the unit of analysis, since it is individuals who pay taxes and receive transfers. For most taxes and transfers this is the obvious choice, but for others the issue is not as clear-cut. Indeed, some current Statistics Canada surveys only provide data at the household level. Property and commodity taxes are just two examples. Property is shared by all members of the household, while sales taxes are paid by anyone who buys goods or services. Who should be considered as paying them? It is common to assign them in proportion to the individual's share of household income, but recent studies have shown that men and women may spend different proportions of their income on shared household goods and on goods for children (Phipps and Burton, 1995). Since resources can be shared or commonly used in the household, the allocation of taxes and transfers cannot be done without a model of intra-household division of goods.

Another conceptual problem with this method is the tendency to base tax-transfer policy on the individual's family income. Family income plays a role in Income Assistance, the Goods and Services Tax Credit, Employment Insurance and the future Seniors Benefit. Thus a study of the age-incidence of transfers necessitates a recognition of the family as the unit of analysis.

The household head has been used as a proxy estimate for all individuals in the family in many economic analyses, but this has come under criticism. Using the household head as proxy assumes that the welfare of the household can be attributed to the welfare of the head. Research has suggested that this is not always the case and that individuals within the household may benefit differently depending on which member of the household received the income. See, for example, Browning (1992), Browning et al., (1994), Macdonald (1995), Phipps and Burton (1995), and Thomas (1990). Alternatively, taxes and transfers may be split evenly among all members of the family. But this would be an extreme view with an equal amount of taxes being paid by children as well as their parents.

Yet another alternative is to forego an analysis based on individuals, and examine the average amount of taxes paid or transfers received by families of certain types of individuals. That is, rather than calculating the average amount of tax paid by an age group of individuals, the average amount of tax paid by families that have individuals of this type is examined. This would be similar to poverty analyses that examine the proportion of children living in poor families. Equivalency scales might be used to account for family size.

The analysis that follows examines the age profiles of taxes and transfers using the individual as unit of analysis. This is not to suggest that a stance is being taken on this issue. Rather the intention is simply to follow the Generational Accounting literature, and then to suggest—by examining the robustness of the findings to alternative assumptions—that more work is needed. Results using an approach that assigns family income to the household head as well as results that assume income is shared evenly among all members of the family are provided, albeit in less detail.

The data are drawn from the Social Policy Simulation Database and Model (SPSD/M), version 5.2, created by Statistics Canada (Bordt et al., 1990). This database integrates information from the Survey of Consumer Finances (SCF), personal income tax returns, Unemployment Insurance (UI) claims, and the Family Expenditure Survey (FAMEX). The SPSD/M has more information on taxes paid by individuals than any single household survey because it supplements survey data with administrative data. It attempts to correct the under-reporting of UI, and the income and income taxes of high-income earners, by relying on administrative data. The model also has two other advantages: it splits government taxes and benefits by the appropriate level of government and it allocates the taxes and transfers to individuals.

The focus of the analysis is on fiscal policy as it existed in 1995. More recent policy changes, such as the shift from UI to EI, the change in federal transfers to the provinces, the new child tax benefit, and changes to the financing of C/QPP are not, therefore, recognized.[1]

Most of the allocation of taxes and transfers to individuals are made directly, but other taxes and transfers require more attention. Commodity taxes and the federal Child Tax Benefit are two such examples. Commodity taxes are derived

using expenditures found in FAMEX. Since this survey collects expenditure information at the household level, it is necessary to distribute these taxes to individuals. Taxes were allocated to individuals in proportion to their share of household income.[2] This may skew the results toward those groups with greater incomes, particularly older persons. The distribution of consumption within the household has been the subject of recent attention but it is still unclear how income and spending is actually allocated within family units (Findlay and Wright, 1996). My approach is therefore just a first approximation. Concerning the federal Child Tax Benefit, it could be argued that it should be assigned directly to the child, but since this benefit has always been given to an adult (specifically the mother) there is no guarantee that all the resulting income is spent directly on child-related expenses. For this reason the transfer is assigned to the mother.

The SPSD/M also splits benefits and expenditures by level of government. Thus in a program like Income Assistance, where the federal government transfers cash to the provinces, the expenditure is divided between the portion funded by the provincial government and the portion funded by the federal government according to Canada Assistance Plan.

The taxes covered by SPSD/M represent 52% of government revenue, while the transfers represent 23% of total government expenditures.[3] The remaining taxes and expenditures are excluded from the calculations. These include such items as commercial taxes, debt repayment, spending on roads, policing and defence. They are not age-related to the same extent as the other programs studied, and their relationship to age is also more open to debate. Even directly measurable items, such as policing, are not easily split into age-related components. By excluding these expenditures I am implicitly assuming that they benefit all individuals equally. In contrast Buiter (1995) argues that these other governmental expenditures should be given an age dimension and included in the accounts. Corporate taxes pose a different problem. Do the owners pay these taxes, or are the costs transferred to the consumers of the products? There are different arguments for and against allotting these taxes to individuals (Vermaeten et al., 1994; Ruggeri et al., 1994). Since the age profiles used are averages, distributing the missing taxes and transfers evenly on a per capita basis to the entire population will not change the nature of the results. Therefore, I do not assign them to individuals.

Three taxes and two benefits were added to SPSD/M as they are strongly age-related. The first is property taxes for owner occupied dwellings. These are derived in SPSD/M, but are used only to calculate provincial tax credits. Since property taxes are a relatively large tax, not to mention the only local tax that is calculated, it was important enough to include them outright in the calculations. Further, since only homeowners pay property taxes directly, only those taxes are included. In the case of rented homes, the landlord pays the property taxes. It may be argued that this cost is passed on to the individual through increased rent. Given data limitations however, no imputed property tax on rent was assigned. This means that the results will be somewhat older than would otherwise be found given the fact that the average home owner is older than the average renter. Since property taxes are only collected at the household level, they were distributed to individuals according to their share of household income, which also tends to give the tax an older demographic.

In addition, employer contributions to the C/QPP and to UI were added to the model. As such we are assuming that the full incidence of these taxes falls on the employees.

Information on education and health transfers are also included. Both are strongly age-related and represent a large portion of provincial expenditure. In fact they play a central role in understanding the influence of changes in the dependency ratio as the population ages. This data was derived using administrative data supplemented with some survey data and added to the model. The derivation is explained in the Appendix.

Other taxes should very well be included in future work. Property taxes paid by renters and Workers' Compensation contributions are two examples. Furthermore, refundable tax credits were considered as transfers but tax deductions were not. Some of these are also age dependent, such as the RRSP tax credit and education deductions. Finally, tax expenditures associated with, for example, RRSP contributions are also important in understanding the age incidence of fiscal policy.

2. Age Distributions of Major Tax and Transfer Programs

The results that follow are expressed as average dollar amounts received (or paid) by individuals according to their age, with no sharing of income

Figure 4.1
Average Taxes and Transfers by Age: All Programs, 1995

within economic families. Averages as opposed to totals were used since otherwise the data would always mirror to some extent the population distribution with great declines at older ages when the population sharply declines. The 'average age' is defined, following the method used by Lee (1994a), as the average age weighted by the amounts received (or contributed) by an individual.

Figure 4.1 illustrates that individuals receive more transfers than they pay in taxes until the age of 22. The situation then reverses itself until the age of 64, with individuals contributing more to the government than they receive in benefits. Assuming for a moment that the government funded transfers solely by tax revenues, then it would appear that the population from the age of 22 to the age of 63 is on average paying for benefits received by the young and the elderly. The average age for paying taxes is 44.5 years while the average age for receiving benefits is 44.7 years.

Figures 4.2 and 4.3 offer these results by level of government. The structure of federal policies in 1995 provides large cash transfers on average to the elderly, much smaller transfers to the 20 to 65 year old population, and very little to the young.[4] The average age for the payment of federal taxes is 43.7 while the average age for receiving transfers is 49.6. At the provincial/local levels of government, the distribution of taxes paid by age is similar to that of the federal government, though slightly older due to the older age of property taxes. The distribution of benefits is quite different. Provincial and local governments fund programs that target persons of many different ages. Some apply to people of all ages; others (such as Income Assistance) are not given to seniors because they might duplicate the mainly federally funded old age programs; while others are directed mainly to the young, education being the most prominent of these. Overall, the average age for receiving a transfer from the provincial government is 37.2, more than eight years younger than the average age for paying provincial taxes (45.8).

The age distributions of taxes by program are all quite similar (see Figure 4.4). Income taxes, consumption taxes and property taxes all have similar distributions, with income taxes being the largest and youngest (average age of 45.0), property taxes the smallest and oldest (average age of 48.9), and consumption taxes falling in between (average age of 45.5). This is not surprising since taxation levels are related to total individual income.

Figure 4.2
Average Federal Taxes and Transfers by Age:
All Programs, 1995

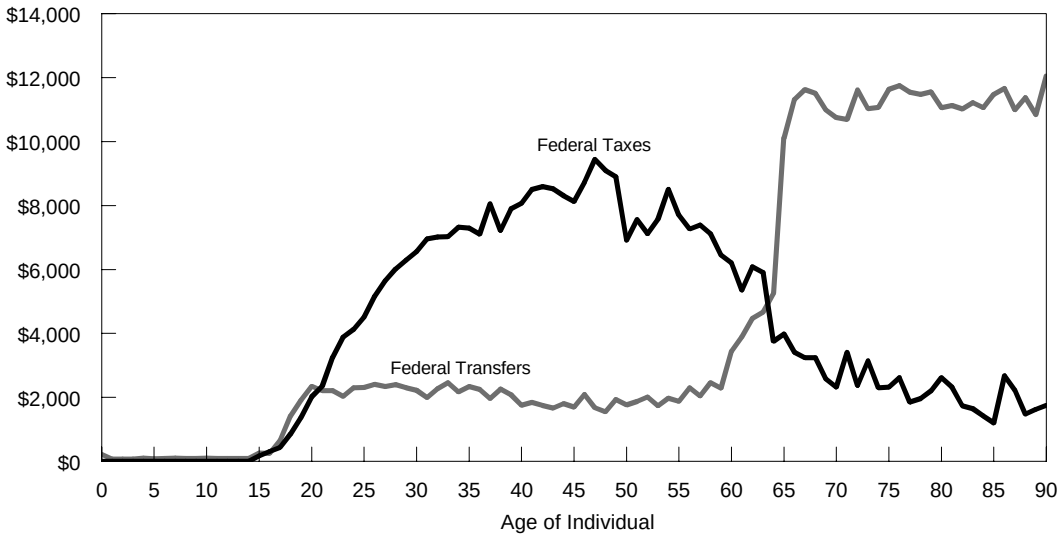


Figure 4.3
Average Provincial and Local Taxes and Transfers by Age:
All Programs, 1995

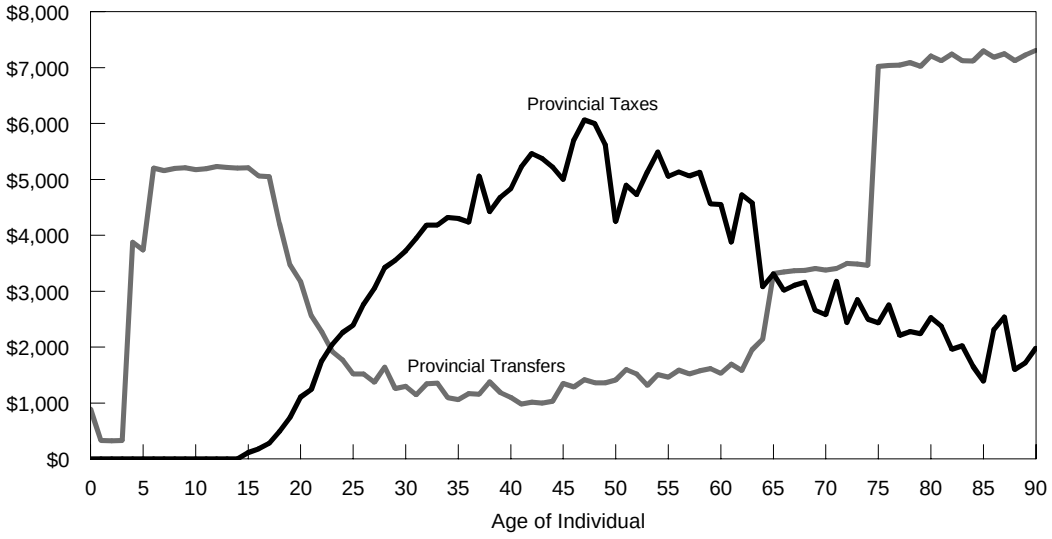
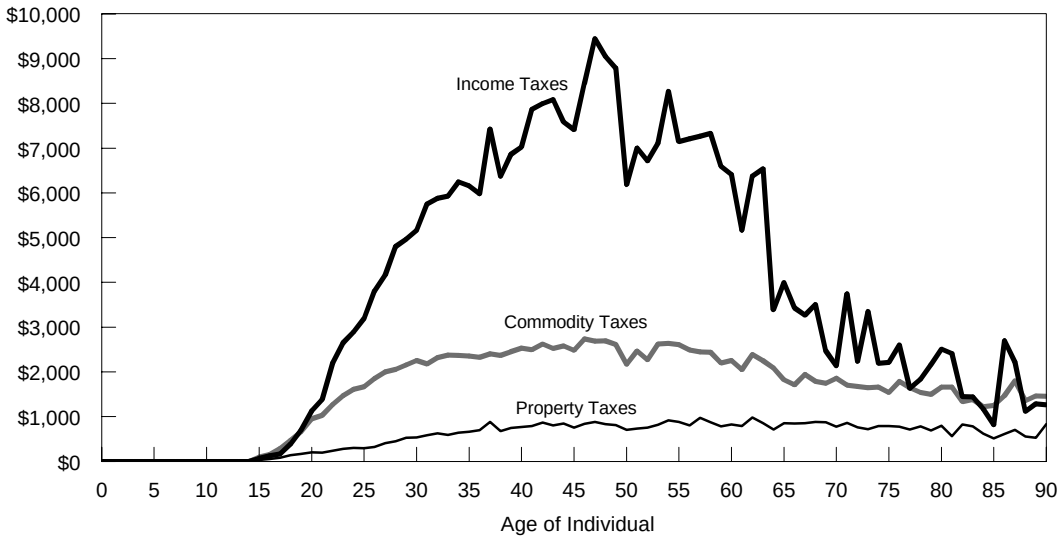


Figure 4.4
Average Taxes by Age: All Levels of Government, 1995



Income taxes are the only taxes that are directly available for individuals, survey data providing consumption data (and thus commodity taxes) at the household level. The SPSD/M assigns commodity taxes according to the person's share of household income. Thus commodity taxes are more strongly correlated to income in the model than they may be in reality since other members of the household without direct income will also be consuming and thus contributing commodity taxes. Property taxes are also divided within the household according to the person's share of the household income and will have the same problems as commodity taxes. Property taxes are a somewhat older tax which is partially due to a deficiency of the data, being collected only for owner-occupied dwellings.

Though all taxes follow similar distributions, the age distribution of the transfers differ widely. The age distribution for Income Assistance is noisier than that of most taxes and transfers (see Figure 4.5). There are a number of reasons for this. There are proportionally fewer people receiving this transfer, and the sampling variability is therefore larger. It is also a problematic transfer in terms of data quality as it tends to be under-reported in surveys and its derivation is difficult due to the different rules applied in different municipalities. The average age for receiving Income Assistance is 41.6, with average benefits increasing slightly until the age of 65 when benefits sharply drop off. This is the result of the fact that at that age the old age security programs begin and individuals are no longer eligible.

The Child Tax Benefit and provincial family benefits age distribution is much smoother. These credits are given to the parents, and their average age is 34.6. Education on the other hand was assigned to the children. The results are presented in Figure 4.6. Benefits are large and start declining at age 18, reaching levels under $1,000 at age 24. The average age for education benefits was 14.0 years. Benefits are quite similar for most primary/secondary aged children. This is due to the fact that all children between the ages of 6 and 15 were assumed to be in school full-time (see the Appendix for the details of the derivation).

In my calculations, health benefits are the only other benefit given to children (see Figure 4.6). Though children do receive benefits, health is nonetheless an older benefit overall with an average age of 58.0. The average benefits start to significantly increase at the age of 65. Figure 4.6 shows that the health distribution follows a step function. This is a result of the way the data

Figure 4.5
Average Income Assistance, Family Benefits, and Child Tax Benefits: All Levels of Government, 1995

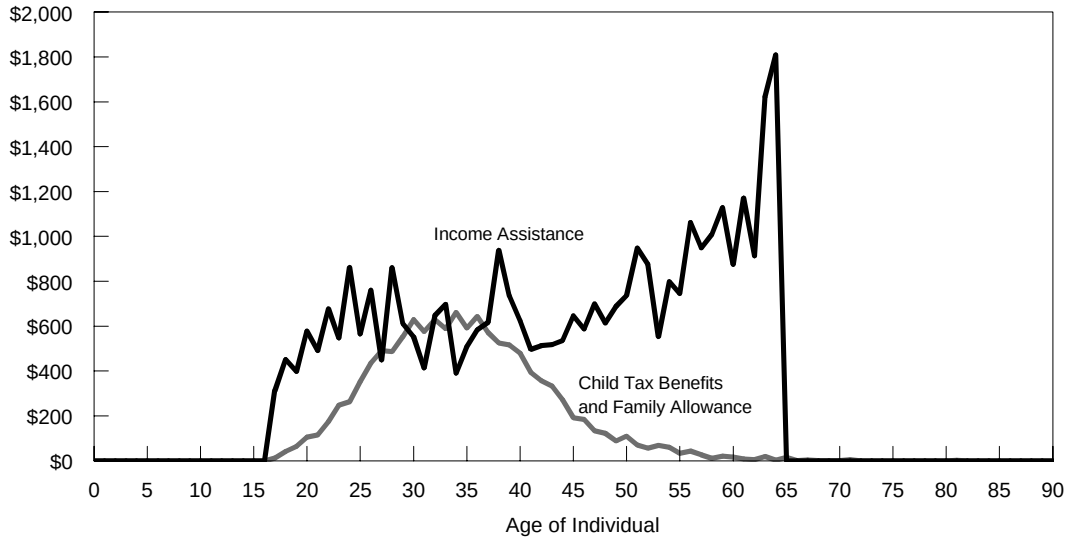


Figure 4.6
Average Health and Education Benefits: All Levels of Government, 1995

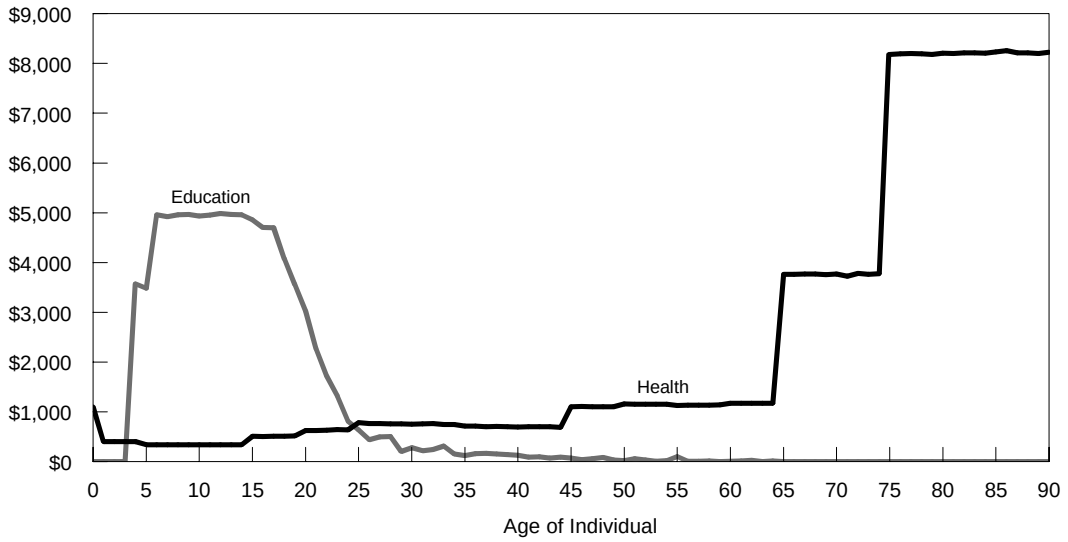
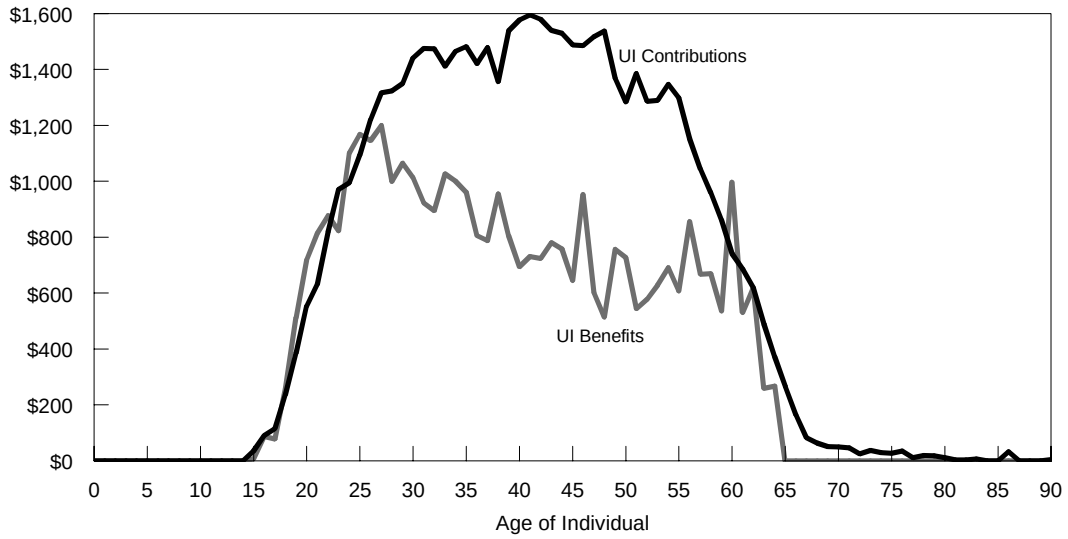


Figure 4.7
Average UI Benefits and Contributions, 1995



were derived. My use of a method similar to that used by insurance companies to assess risk means that contributions are constant for specific age groups (see the Appendix for more details). Average health care benefits increase with age. Hence, if the proportion of the population that is greater than 65 increases, there may be significant shifts in the cost of health care.

Unemployment Insurance contributions are very similar to the distribution of taxes though somewhat younger (see Figure 4.7). Since earnings constitute the greatest portion of income in the Canadian economy, this was expected. The distribution of benefits is very similar, though the average benefits received are smaller than the average contributions paid due to the fact that there was a surplus in the UI account in 1995. If instead of average over the entire population, the average was calculated using the number of people who either paid into the program or who received benefits, the average amount a UI beneficiary received would be larger than the average UI contribution. The average age for receiving benefits was 35.7 while the average age for contributing was 39.6.

The C/QPP has an average age for contribution of 33.9 (Figure 4.8).The average age for receiving benefits is obviously very different with a distribution which increases at the age of 60. The average benefit is also larger than the average contribution. The average benefit falls with age which may be due to the fact that women are more likely not to be covered by the C/QPP or to be receiving smaller benefits. Women are also more likely to live longer. The average age for receiving benefits is 64.2.

Old age security type programs, including OAS, GIS, spousal allowances and the provincial government's GIS top-up, are the oldest transfer with average age of 74.7. They are also one of the largest transfers and the largest cash transfer, average to $5,500 per capita for those aged 65, and rising to $8,000 for those over the age of 85. The average amount received increases with age mainly because women live longer than men and are more likely to be receiving either smaller or no C/QPP benefits which results in comparatively higher old age security benefits.

I offer arrow diagrams in Figures 4.9 and 4.10 as summary measures of all of these data. The extremities of these arrows indicate the average age of contribution and receipt, while the width represents the average transfer. In this way it is possible to compare many different series at a glance.[5] It is easy to see that though government transfers a lot of money, the overall age difference

Figure 4.8
Average C/QPP Benefits and Contributions, 1995

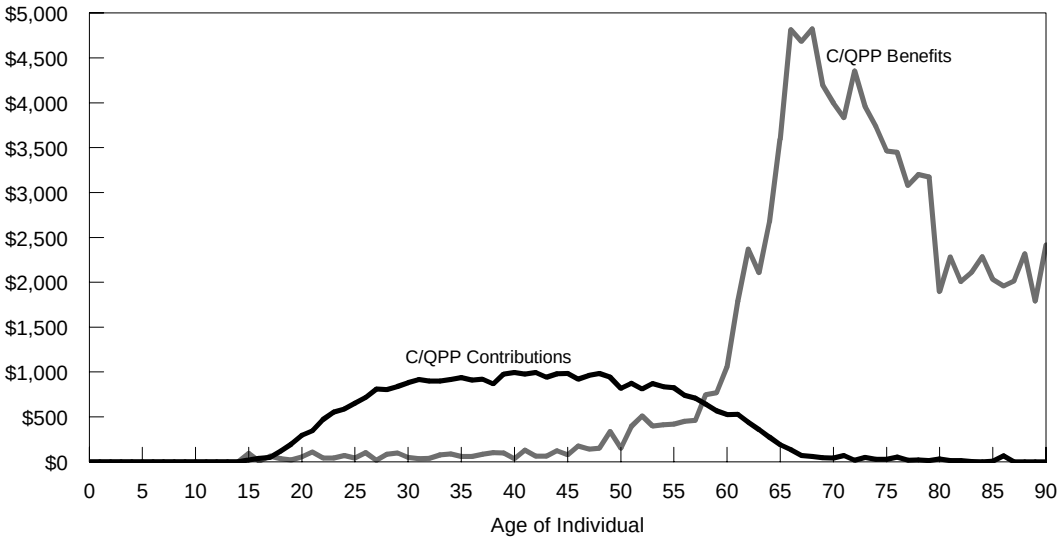


Figure 4.9
Direction and Magnitude of Intergenerational Transfers by Level of Government: All Programs, 1995

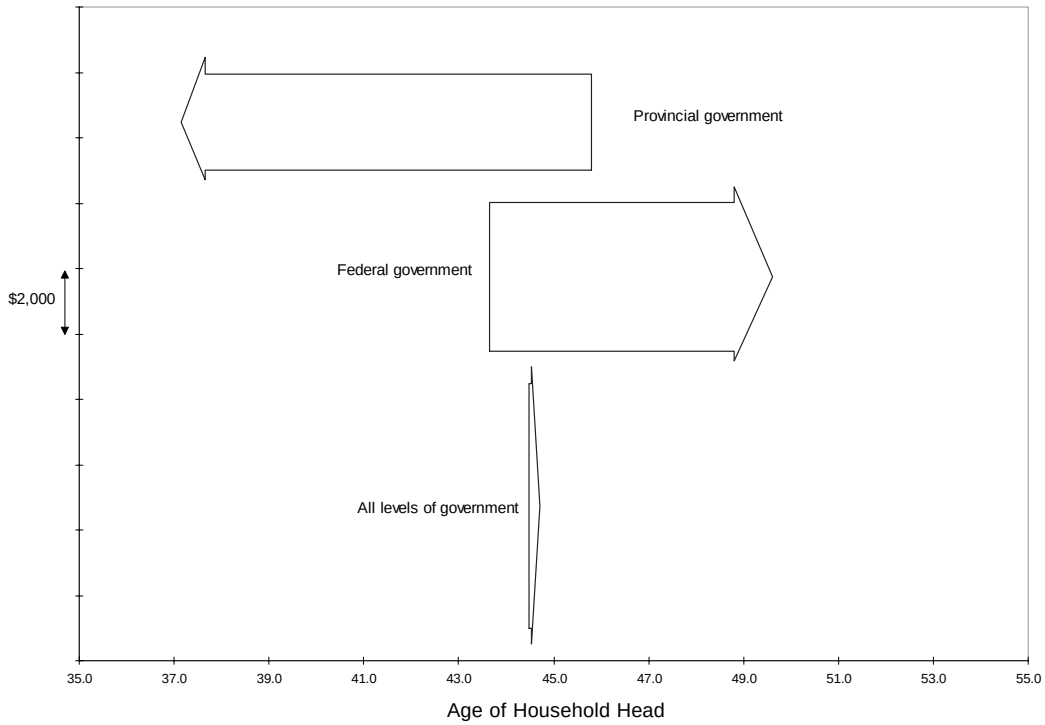
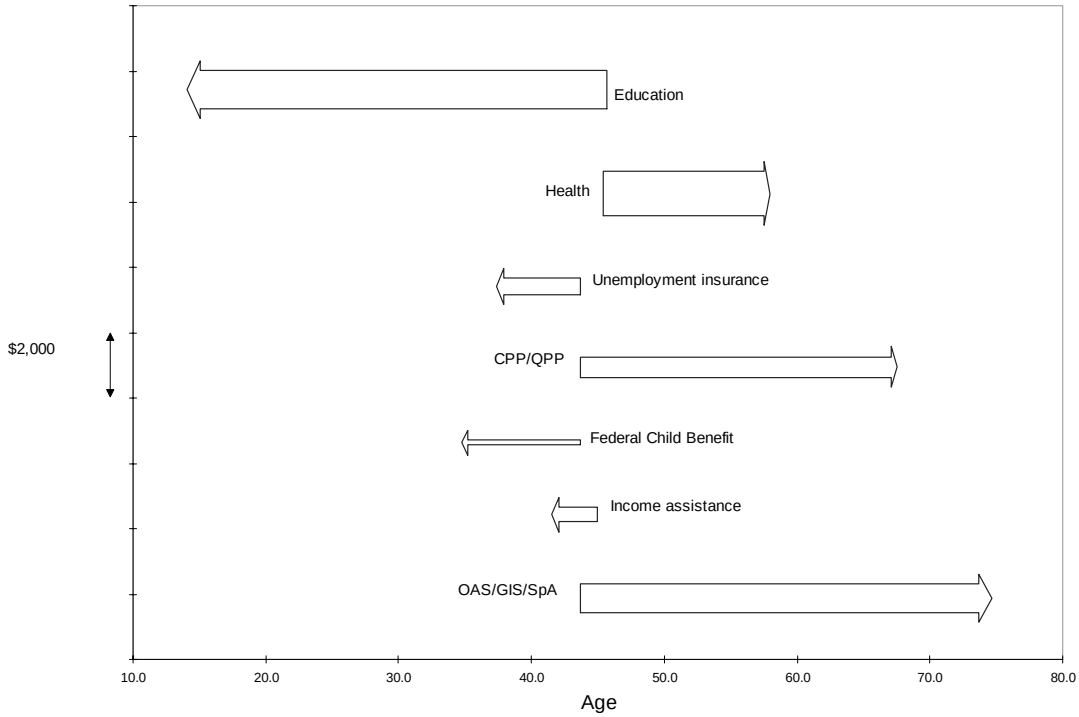


Figure 4.10
Direction and Magnitude of Intergenerational Transfers by Program: All Levels of Government, 1995



between paying and receiving is small. The average age for receiving federal transfers is older than that of contribution, while the opposite is true for provincial governments.

By program, UI, the Child Tax Benefit, Income Assistance, and education have average ages of receipt which is smaller than the average age for funding these programs. Health, C/QPP, and OAS, GIS, and the spousal allowance have greater ages of receipt. Education is the youngest program (14.0) while the seniors benefits (OAS, GIS, spousal allowance) are the oldest (74.7). Of the programs studied in this section, the Child Tax Benefit is the smallest in terms of average transfer while health is the largest.

3. The Household Head As the Unit of Analysis

Up to now the analysis has been based upon individuals assuming no sharing of income within the family. An alternative is to treat the household as the basic unit of analysis. Figures 4.11 and 4.12 offer arrow diagrams when the age of the household head is the basic unit of analysis. The ages are somewhat older than those obtained in the previous analysis. There are two main reasons for this. First, among adults, the head of the household is most likely to be the eldest person in the household. This is particularly true among households with adult children. Second, for the two transfers to children, the age rises since these transfers are now assigned to the parents.

By program the biggest change in the two sets of arrows is education. It becomes a much older benefit due to the transfer being assigned to parents instead of children, though it still transfers money from older households to younger households. The Child Tax Benefit becomes the youngest benefit. The change in education also changes the direction of the provincial transfer: younger households transfer money to older ones. Thus governments make a much larger transfer to older households. The difference between the average age of contributing to government programs and receiving benefits increases, as does the size of the average benefit. (The average age distributions are quite similar to those for individuals, with the exceptions of education and social assistance. These differences are methological.)

Figure 4.11
Direction and Magnitude of Intergenerational Transfers by Level of Government: All Programs, Calculated Using the Age of the Household Head, 1995

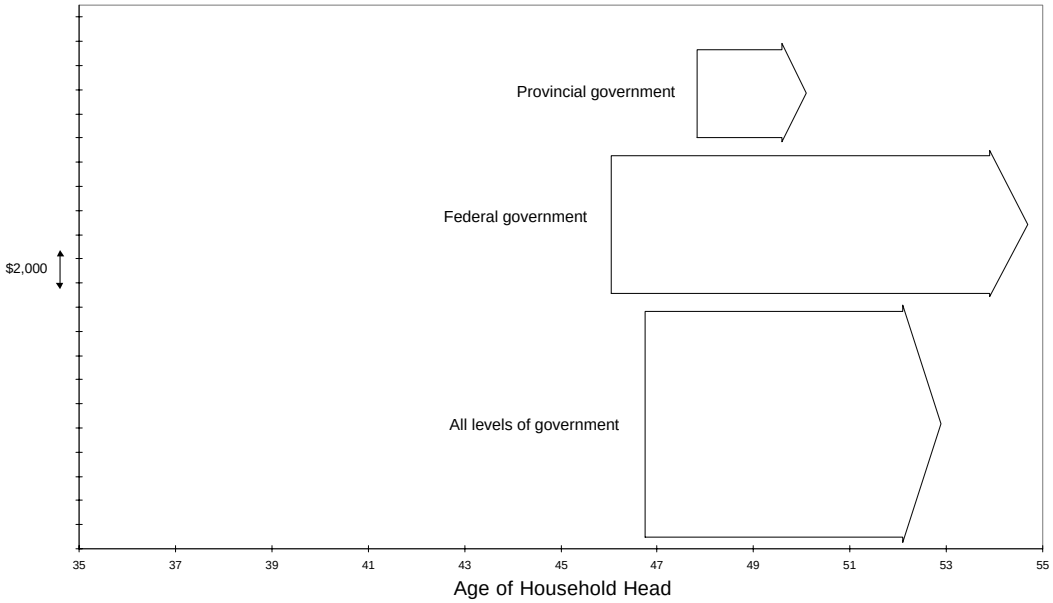


Figure 4.12
Direction and Magnitude of Intergenerational Transfers by Program: All Levels of Government, Calculated Using the Age of the Household Head, 1995

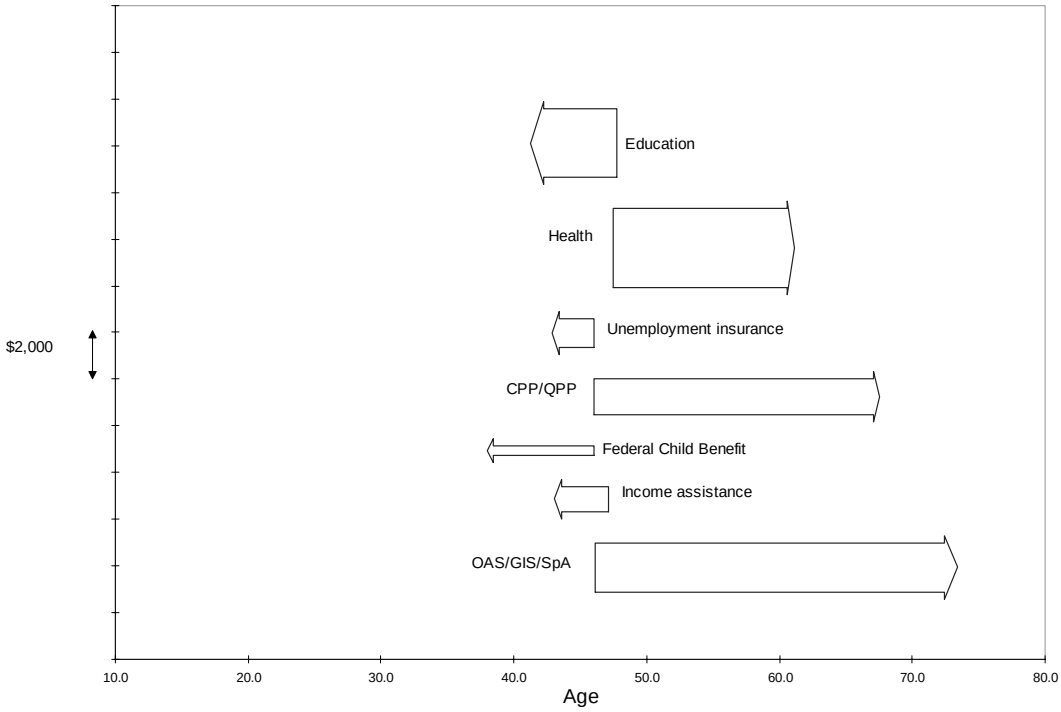


Figure 4.13
Average Education Benefits, by Age of Individuals and Age of Household Heads, 1995

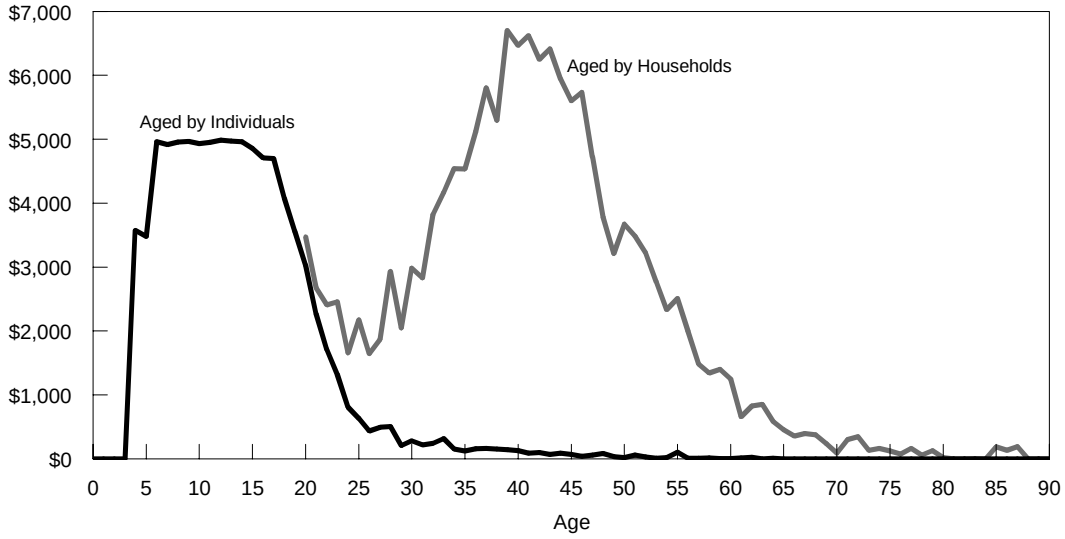


Figure 4.13 shows that education benefits, when distributed to household heads, have a double peak with most benefits going to the parents, but with a second peak for older students who do not live with their parents. Income Assistance had more complex differences, as seen in Figure 4.14. Benefits for individuals rise steadily until the age of 65, but when examined in a household context there is a maximum at the youngest ages, with lower benefits for middle-aged households and slightly increasing benefits for the those aged between 45 and 65. The main reason for this difference is that a much greater proportion of households headed by individuals under 25 receive Income Assistance. While 23% of households headed by people between the ages of 16 and 25 receive Income Assistance, only 12% of households with heads between the age of 26 and 44 are recipients. As for the other age distributions, they are quite similar to those for individuals.[6] The health distribution is somewhat smoother, especially when it comes to the elderly. The main reason for this is that a greater proportion of the elderly are no longer heads of their household. The same phenomenon can be seen for OAS-type benefits.

Another possible unit of analysis assumes equal sharing of income and taxes within the economic family. In this case there is only a large difference in age distribution when children are present. This is due to the fact that 79% of adults belong to economic families where the difference between their age and that of the oldest person in the family is less than five years. Thus, sharing income between adults in a family makes little difference to the age distributions, but when children are present the income gets split between adults and children. This means benefits such as education and the child tax benefit have a bimodal age distribution, representing the children and the parents.[7]

Finally Child Tax Benefits and Family Allowances are split evenly among the different children in the family, and Income Assistance is split evenly among all members of the economic family. Some of the transfers depend on the age of the child, and this method gives too much money to older children. The other transfers remain the same. Figure 4.15 shows that these results are different for these three programs. However, these programs are small compared to the elderly transfers, and the difference overall is slight so that the overall age for receiving transfers remains unchanged (see Figure 4.16).

Figure 4.14
Average Income Assistance Benefits, by Age of Individuals and Age of Household Heads, 1995

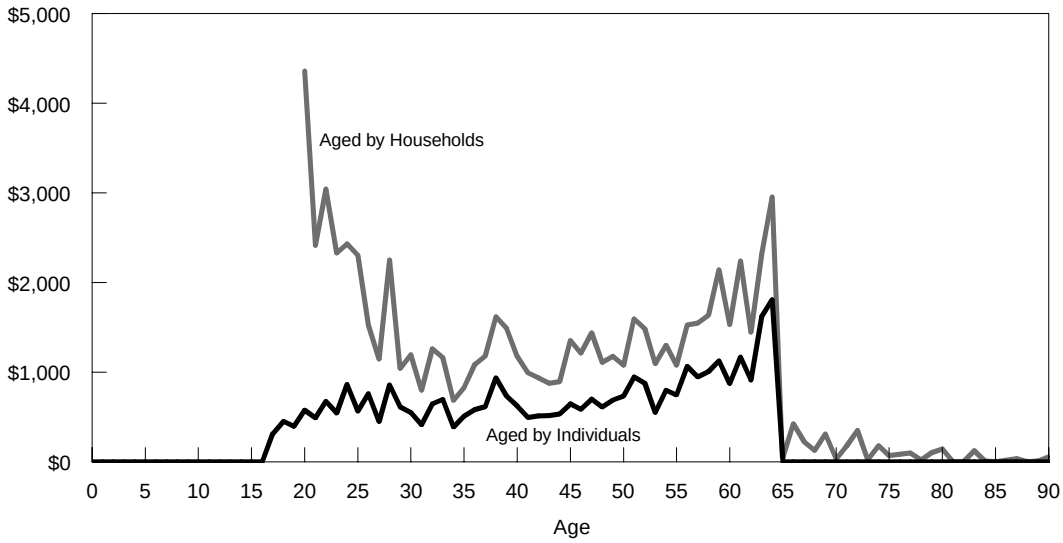


Figure 4.15
Average Child Tax Benefits, Family Allowances, and Income Assistance, with Transfers Given to Children, 1995

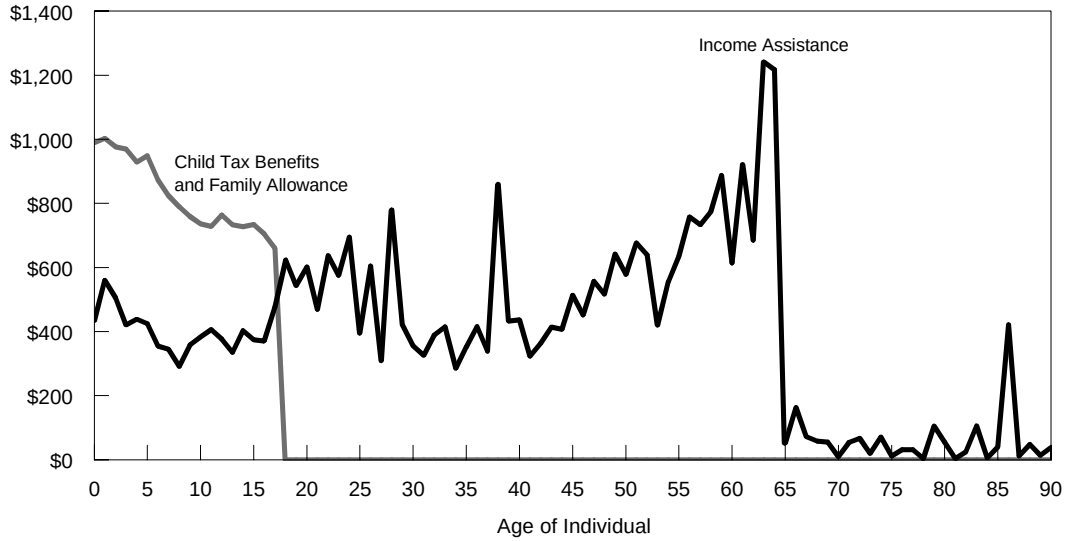
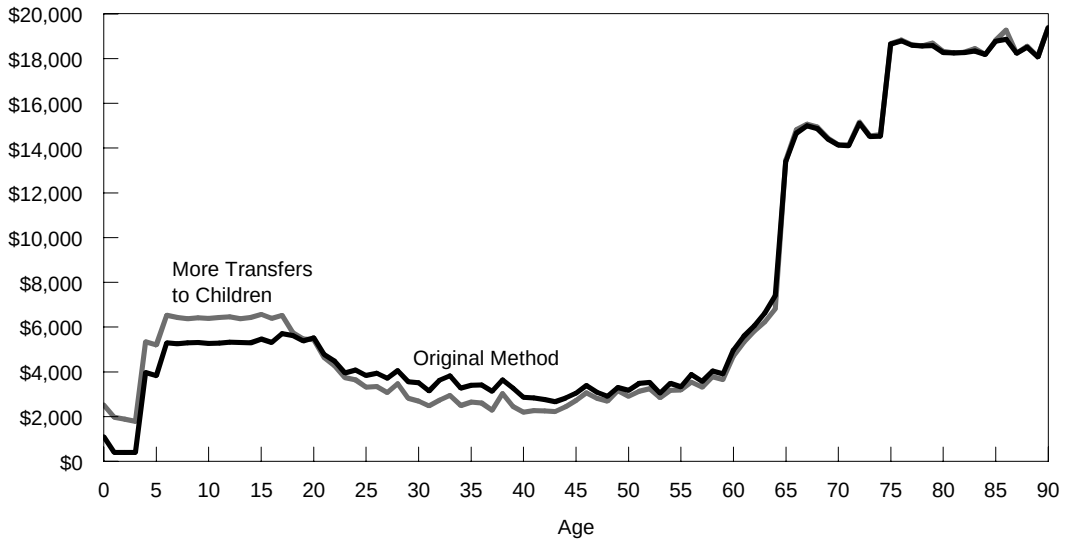


Figure 4.16
Average Transfers, All Programs and All Levels of Government: by Method Used to 'Age' the Transfer, 1995



4. Conclusion

This chapter provides the age profiles of some of the major taxes and transfers in 1995 by level of government and by type of program. These are useful as background to Generational Accounting and studies on the impacts of an aging population. The paper also highlights the different assumptions that are required to do such studies, and different alternatives are briefly examined.

The main result is that the average age for receiving transfers is greater than that for paying taxes. This is also true for the federal government, but the average age for receiving transfers from the provincial and local governments is younger than that for paying taxes, primarily due to education. Education, UI, Income Assistance, Child Tax Benefit and Family Allowances are the youngest transfers while health, C/QPP, and the seniors benefits (GIS, OAS, spousal allowances, and the GIS top-ups) are the oldest transfers.

Shifting the child and some family benefits to the children as opposed to the parents has little overall impact on total government transfers. This is due to the relative magnitude of these programs in comparison to the large health transfers and seniors benefits.

The difference between the federal government and the consolidated provincial and local governments may indicate that the impacts of the aging population will be felt by them in vastly different ways. However, I examined government policy as it existed in 1995. Policy changes rapidly in Canada and many of these changes are not age-neutral as Murphy demonstrates in Chapter 5. For example, the new Child Tax Benefit program which was proposed in the 1997 Federal Budget is not included. Furthermore, the split by level of government assumed the existence of CAP and EPF. But the new way that the federal government transfers money to the provinces means that many of these shared programs will also be affected.

Appendix

The health and education benefits were derived using a mixture of administrative and survey sources. Though the technique is similar to that used by Cameron and Wolfson (1994), the data sources used are different.

Health Benefits

Three categories of health care are used: hospital care, doctors, and government-paid drugs.

Health Canada (1994a,1994b) provides estimates of expenditures for these three categories by level of government and province. The federal portion used was the EPF cash transfers. Health Canada (1994b) includes both cash transfers and tax transfers. These were disaggregates using estimates from the Department of Finance (1992). These expenditures accounted for 73% of government health expenditures in 1993 (the latest year data is available).

The utilisation rates for hospitals were derived from Statistics Canada (1996b) on nights stayed in hospital by age-group and gender. This data does not include out-patient services but does include long-term care. This is a problem since the SPSD/M model includes institutionalized elderly, but not institutionalized non-elderly population. Long-term hospital care would include part of the institutionalized population. But this population also includes people in other types of residential care facilities. Thus the rate of hospital utilisation will be somewhat higher than it should be at younger ages since it will include institutionalized non-elderly, and somewhat low for the institutionalized elderly since some of them are receiving health benefits in publicly paid non-hospital institutions.

Doctor utilisation rates are derived from the National Population Health Survey, Statistics Canada (1995e). The target population of this survey does not include the institutionalized elderly, but is otherwise similar to the data coming from SPSD/M. A doctor utilisation rate by five year age-group is derived from the data. It is assumed that the utilisation rate for children 14 and under is the same as that of persons 15-19. As for the problem of the institutionalized elderly, while they are more likely to have frequent doctor visits some part of these expenses may be paid for through the hospital expenditure categories. It was decided to apply the doctor utilisation rate of the non-institutionalized elder equally to them.

The final category is drug use. Government pays for drugs for the elderly and in some provinces for those receiving Income Assistance. Due to the problems associated with Income Assistance data and the varying rules for receiving drug benefits, all drug benefits were allocated to the elderly. After completing this chapter, I was made aware of Health Canada (1996) which could be used to derive these figures for somewhat different age groups.

Education Benefits

Education benefits are also derived in two stages: the first for education expenditures and the second for education utilisation. The only levels of education considered are elementary/ secondary, community colleges, and universities.

For the elementary/secondary level, all children between the ages of 6 and 14 are assumed to be attending public school full-time. It is possible through FAMEX to see if there were any expenditures on tuition for private school in a household, but since there are many problems with assigning children to private versus public schools (Do all children attend? If not, which ones?) and since the government does provide some funding to private schools, all children are assigned public school benefits. For persons 15 and older, the SCF records an education status indicating whether or not the person was attending school full-time, part-time, or not at all, and the type of institution attended. This is used to derive educational attendance. An addition was required for pre-school students. The number of children enrolled in pre-elementary school by province was compared to the number of children aged 4 and 5 in that province to derive the proportion of 4 and 5 year olds attending school by province.

The data for expenditure is derived using Statistics Canada (1995a, 1995b, 1995c, 1996a). For the primary/secondary level, expenditures are measured at a provincial level. Only operating expenses of school boards were used. The most currently available data is used and then adjusted to correspond in size to the 1995 estimated values. For the community college and university levels, a similar method is used, though it is done only on a Canada-wide basis. Since children who are away temporarily at school are included in their parents household, it is not clear whether the provincial data would be accurate. Finally, the federal funding of post-secondary education through the cash transferred by the Established Programs Financing is derived as a proportion of total expenditures. Each post-secondary student has provincial and federal funding.

End Notes

Many thanks to Miles Corak for his excellent suggestions and comments. Thanks also go to Brian Murphy, James Pesando, and Steve

Gribble. Any errors that remain are mine. The contents of this paper do not necessarily reflect the views of Statistics Canada.

[1] The 5.2 release of SPSD/M is based on the 1988 population structure, but data can be projected to later years by modifying weights ascribed to the individual observations. In this way the model can apply the tax and transfer systems of future years to either the 1988 base year or to projected later years. This means that the age profiles of income and consumption for this study date back to 1988 though the 1995 tax and transfer system and population weights are used.

[2] The income of the head of the household is augmented with three income concepts which are not included in the SCF: savings; other money receipts; and the net sales of durables.

[3] At the federal level, taxes represent 72% of all federal revenue while transfers represent 41% of all federal expenditures. The rates are much lower at the provincial/local level of government. The comparison are with Statistics Canada (1995d).

[4] The young do receive health benefits (a program funded by both the provincial and federal governments) that are small compared to other federal government programs, and post-secondary education benefits.

[5] The average age for receiving transfers is calculated as the average age weighted for the transfers. But the average age for contributing to the transfers had to be calculated in a different manner. The SPSD/M model gives the federal/provincial breakdown of the different taxes and transfers. In this model there are more taxes than transfers since many of the government expenditures are not included as cash transfers to people (nor are the two non-cash transfers which we are examining). Since the excluded transfers do not easily break down into an age-related distribution the surplus was divided evenly among the entire population with each person receiving $1,645 from the federal government and $365 from the provincial government. The next step was to find the proportion of tax dollars each government transfer represents. For example, if Income Assistance represents 4% of all federal expenditures in the model and 9% of all provincial expenditures, then 4% of each persons federal taxes would be allocated to social assistance and 9% of each person's provincial taxes would be thus allocated. This way, each person's taxes are allocated to each transfer. There are problems with this method. For example, it pools the C/QPP with all other programs even though its finances are calculated separately in the federal system. These diagrams are based on the ones used by Lee (1994a).

[6] Graphs for these are available from the author upon request

[7] The different age distributions are also available from the author

Bibliography

AUERBACH, Alan J., Jagadeesh GOKHALE, and Laurence J. KOTLIKOFF (1994). "Generation Accounting: A Meaningful Way to Evaluate Fiscal Policy." *Journal of Economic Perspectives.* Vol. 8, 73-94.

_____ (1995). "Restoring Generational Balance in U.S. Fiscal Policy: What Will It Take?" In *Economic Review, The Federal Reserve Bank of Cleveland.* Cleveland.

BORDT, Michael, Grant J. CAMERON, Stephen F. GRIBBLE, Brian B. MURPHY, Geoff T. ROWE, and Michael C. WOLFSON (1990). "The Social Policy Simulation Database and Model: An Integrated Tool for Tax/Transfer Policy Analysis." *Canadian Tax Journal*. Vol. 38, 48-65.

BROWNING, Martin (1992). "Children and Household Economic Behaviour." *Journal of Economic Literature*. Vol. 30, 1434-75.

BROWNING, Martin, François BOURGUIGNON, Pierre-André CHIAPPORI, and Valérie LECHENE (1994). "Incomes and Outcomes: A Structural Model of Intrahousehold Allocation." *Journal of Political Economy.* Vol. 102, 1067-1098.

BUITER, Willem H. (1995). "Generational Accounts, Aggregate Saving and Intergenerational Distribution." NBER Working Paper No. 5087, April.

CAMERON, Grant and Michael WOLFSON (1994). "'Missing Transfers' Adjusting Household Incomes for Noncash Benefits." Paper prepared for the Twenty-third General Conference of the International Association for Research in Income and Wealth, St. Andrews, New Brunswick.

DAVIES, James B. (1991). "The Distributive Effects of Wealth Taxes." *Canadian Public Policy.* Vol. 27, 279-308.

DEPARTMENT OF FINANCE (1992). *Established Programs Financing*. Ottawa

ERMISCH, John (1989). "Intergenerational transfers in industrialised countries: Effects of age distribution and economic institutions." *Journal of Population Economics.* Vol. 1, No. 10, 269-84.

FELLEGI, Ivan P. (1988). "Can we afford an aging society?" *Canadian Economic Observer*. Vol. 1, No.10, 4.1-4.34.

FINDLAY, Jeanette and Robert E. WRIGHT (1996). "Gender, Poverty and the Intra-Household Distribution of Resources." *Review of Income and Wealth,* Series 42, 335-351.

GOOD, C. (1995). "The Generational Accounts of Canada." *Fraser Forum.* Vancouver: The Fraser Institute.

HEALTH CANADA (1994a). *National Health Expenditures in Canada 1973-1993.* Ottawa: Minister of Supply and Services Canada.

_____ (1994b). *Green Book Tables: Provincial Government Health Expenditures and Related Federal Contributions Canada, the Provinces and the Territories 1974-5 to 1992-3.* Ottawa: Minister of Supply and Services Canada.

_____ (1996). *National Health Expenditures in Canada, 1975-1994.* Ottawa: Minister of Supply and Services Canada.

HENRIPEN, Jacques (1994). "The Financial Consequences of Population Aging." *Canadian Public Policy*. Vol. 20, 78-94.

HUMAN RESOURCES DEVELOPMENT CANADA (1994). *Improving Social Security in Canada: Federal Support to Post-Secondary Education: A Supplementary Paper.*

LEE, Ronald D. (1980). "Age structure intergenerational transfers and economic growth: an overview." *Revue économique.* Vol. 31, 129-1156.

_____ (1994a). "Population Age Structure, Intergenerational Transfer, and Wealth: A New Approach, with Applications to the United States." *Journal of Human Resources.* Vol. 29, 1027-1063.

_____ (1994b). "Fertility, Mortality, and Intergenerational Transfers: Comparison across Steady States." In John Ermisch and Naohiro Ogawa (eds.). *The Family, the Market and the State in Aging Societies.* Oxford: Clarendon Press.

_____ and Shelley LAPKOFF (1988). "Intergenerational Flows of Time and Goods: Consequences of Slowing Population Growth." *Journal of Political Economy.* Vol. 96, 618-51.

MACDONALD, Martha (1995). "Feminist Economics: From Theory to Research." *Canadian Journal of Economics.* Vol. 28, 159-76.

MURPHY, Brian B., and Michael C. WOLFSON (1992). "When the Baby Boom Grows Old: Impacts on Canada's Public Sector." In *Changing Population Age Structures: Demographic and Economic Consequences and Implications.* Geneva: United Nations. pp.133-147.

OREOPOULOS, Philip, and Laurence J. KOTLIKOFF (1996). "Restoring Generation Balance in Canada." *Choices Public Finance.*

PHIPPS, Shelley A., and Peter S. BURTON (1995). "Sharing Within Families: Implications for the Measurement of Poverty Among Individuals in Canada." *Canadian Journal of Economics.* Vol. 28, 177-204.

RUGGERI, G.C., D. VAN WART, and R. HOWARD (1994). "The Redistributional Impact of Taxation in Canada." *Canadian Tax Journal.* Vol. 42, 417-452.

STATISTICS CANADA (1995a). *Education Quarterly Review, 1995*. Cat. 81-003. Vol.2, No.2

_____ (1995b). *Education Quarterly Review, 1995.* Cat. 81-003. Vol.2, No.3

_____ (1995c). *Education Quarterly Review, 1995*. Cat. 81-003. Vol.2, No.4

_____ (1995d). *National Income and Expenditure Accounts, Annual Estimates, 1983-1994.* Cat. 13-201. Ottawa.

_____ (1995e). *National Population Health Survey 1994-95. Public Use Microdata Files*. Ottawa.

_____ (1996a). *Education in Canada, 1995.* Cat. 81-229. Ottawa.

_____ (1996a). *Hospital Morbidity and Surgical Procedures, 1993-1994.* Cat. 82-216. Ottawa.

THOMAS, Duncan (1990). "Intra-Household Resource Allocation: An Inferential Approach."*Journal of Human Resources .* Vol. 25, 635-64.

VERMAETEN, Frank, W. Irwin GILLESPIE, and Arndt VERMAETEN (1994). "Tax Incidence in Canada", *Canadian Tax Journal*. Vol. 42, 348-416.

VERMAETEN, Arndt, W. Irwin GILLESPIE, and Frank VERMAETEN (1995). "Who Paid the Taxes in Canada, 1951-1988?" *Canadian Public Policy*. Vol. 21, 317-43.

WILLIS, Robert (1987). "Externalities and Population." In D. Gale Johnson and Ronald D. Lee (eds). *Population Growth and Economic Development: Issues and Evidence*. Madison: University of Wisconsin Press.

_____ (1988). "Life Cycles, Institutions, and Population Growth: A Theory of the Equilibrium Interest Rate in an Overlapping Generations Model." In Ronald D. Lee, W. Brian Arthur, and Gerry Rodgers (eds.) *Economics of Changing Age Distributions in Developed Countries.* Oxford: Clarendon Press.

Chapter 5

The Impacts of Changing Tax/Transfer Systems on the 'Lifetime' Distribution of Net Taxes: 1984 to 1995

BRIAN MURPHY

The use of the term intergenerational equity is increasingly prevalent in government, academia, and the media. It is a broad concept referring to the relative positions of persons in successive generations. There is no single measure of a society's intergenerational equity but rather a series of indicators for specific characteristics and their relative positions over time. Indeed, one of the most useful aspects of the concept is to put a longer time horizon on assessments of the likely costs and benefits of current policy proposals. This horizon and the broad nature of the concept present, however, significant measurement problems.

A major element of intergenerational equity is the net position of individuals with respect to the state. In any given year, within accounting limits, we can measure the net taxes paid to government (taxes less cash transfers) for single year age cohorts. By assuming a steady state and using averages to represent the experience of heterogeneous cohorts, we can arrive at an estimate of the 'lifetime' net tax burden. This is a measure similar in concept to the Generational Accounting measures produced by Auerbach, Gokhale and Kotlikoff (1994) for age zero cohorts. While it does not measure lifetime experiences of individuals it does provide a picture of some of the changes which give rise to those experiences.

My objective is to examine the impacts of changes in the Canadian tax/transfer system on the age distribution of net taxes paid to federal and provincial governments. To establish a baseline the observed changes from 1973 to 1995 will be presented. The main approach is then to hold constant the structure of the Canadian population in 1988 and impose the tax/transfer systems of 1984 through 1995 as if they had been in place in 1988. As such, net taxes measures the impacts of tax/transfer changes independent of population and economic changes. Similarly, the research will hold constant the 1988 tax/transfer system and examine the impacts of variation of employment levels and cohort effects on the 'lifetime' distribution of net taxes by age.

I begin with a brief discussion of the inherent difficulties in measuring intergenerational equality in relation to the tax/transfer system, and then outline the changes to the tax/transfer system that have occurred from 1973 through 1995. This is followed by a description of the data sources, modelling techniques and general approach taken in the analysis. Finally, the results are presented.

I find that the net tax burden on the middle aged has increased while the burden on both the young and the old has decreased. While the age distribution of average net transfers has clearly been affected by changes to the structure of the tax/transfer system, these effects are overwhelmed by the larger magnitude of business cycle effects. The primary policy factor driving the changes of the past decade is not intergenerational equity or even age, but rather the deficit reduction imperative combined with a goal of making the deficit reduction policies as fair as possible by trying to mitigate the impacts on the poor.

1. Intergenerational Equity and the Tax/Transfer System

Recent public debate over the sustainability of the public pension system, and particularly the Canada and Quebec Pension Plans (C/QPP), has been rife with references to intergenerational equity (Scott, 1996; Little, 1996; Greenspon, 1996). Its widespread use, however, has preceded the development of systematic ways in which to measure it. As a result, popular debate is largely limited to the equity of one specific component of the entire system of transfers and

taxes. A number of academic analyses directed at understanding intergenerational equity have also focused on specific programs or related sets of programs. (Oreopoulos, 1996; Banting and Boadway, 1997).

To illustrate some of the measurement issues involved, consider the case of young Canadians pondering the question of whether it is equitable that they would pay a 14% payroll tax in order to fund pension benefits to seniors in the year 2036. We might say it depended on what other taxes they would be paying and what other transfers they would be receiving in 2036. It may also depend on what they had paid in taxes up to this point in their lives and what they expected to pay in the future. In other words, what is their likely lifetime net balance of taxes paid and transfers received? What should we count and how long will we count it for?

If an individual's lifetime net contributions to government is to be measured we would require a lifetime's worth of longitudinal data, which is clearly unavailable and is likely to remain so for some time. We would also require inter-temporally consistent concepts over long periods of time. In the absence of such data (or simulation models to synthesize it) we are limited to observing the annual fluctuations in individual's taxes and transfers, and through them infering something of the shape of this lifetime distribution.[1] A number of macroeconomic models have used this basic approach (Fullerton and Rogers 1993; Davies, St-Hilaire and Whalley, 1984)

Temporal issues aside, what should be counted? For example, it would seem that we should not consider the payroll tax alone but also include income taxes. If this notion is extended to include all government services and taxes we would need to conduct an annual series of full fiscal incidence studies. In studies of this sort a value for **all** taxes and transfers are assigned to individuals (Vermaeten et al., 1994).[2] For example, who actually pays the corporate taxes: employees in reduced wages; shareholders in reduced profits; or consumers in higher prices? What is the actual value to individuals of publicly funded education, roads, health care and so forth? Is it only the input prices or is some multiplier also required? I point out later that what is counted has a significant impact on the lifetime balance of taxes and transfers.

Further measurement problems involve intra-household incidence assumptions. Because age is an individual characteristic the unit of analysis should be the individual. Individuals, not households, are the basic decision units in economic theory (Browning et al., 1994).[3] As such we must make assumptions regarding the allocation of benefits within the household. For example, who really pays the property taxes on a home: all members equally; the person who writes the cheque; or the contributors to household income? Who derives the benefits of a Child Tax Benefit cheque: the recipient (usually the mother); the wage earner who gave rise to the earned income supplement; or the children themselves?

All these considerations highlight the difficulty of measuring intergenerational equity. As it concerns the tax/transfer system, however, is it relevant to measure it at all? The primary goal of the tax/transfer system is not to ensure intergenerational equity. Grady (1990) identifies four fundamental objectives of the tax system: revenue generation, efficiency, simplicity and equity. There are two kinds of equity: vertical equity corresponds to notions of progressivity in the tax system (those with a greater ability to pay should pay more); and horizontal equity involves treating people with the same ability to pay in similar ways under similar circumstances. Intergenerational equity is a valid concern as one of a number of horizontal equity issues but has not been of paramount concern in the period covered in this paper. Over the past decade the focus has been on increasing revenues and ensuring vertical equity.

The tax/transfer system is constantly changing from year to year. The system is composed of various programs which tend to provide greater benefits to certain age groups (Hicks, chapter 4). It is the changing relative size of these programs which give rise to the overall impacts on cohorts. The cumulative impacts of these changes will in large part determine the intergenerational equity of cohorts. While we cannot add up the experience of individuals we can examine the changes to the tax/transfer system that give rise to them. This is the approach I adopt.

2. Tax Transfer Changes 1973-1995

A great many changes to the tax and transfer system occurred between 1973 and 1995. These changes have included both modest tinkering and major reforms. I can only hope to outline the more important of these changes in order to

highlight the amount of change and its general direction. Moreover the emphasis will be placed on changes in the 1984-1995 period.

The personal income tax system underwent a major reform in 1988 with the conversion of exemptions to tax credits and the move from 10 tax brackets to three. It has seen the partial de-indexation of exemptions and brackets in 1985 with the resulting tax increases in each and every subsequent year. The capital gains tax has undergone a phased-in increase in its inclusion rate from 50% to 75% as well as the implementation and subsequent removal of a $100,000 lifetime capital gains deduction. Between 1986 and 1988 the dividend gross-up rate has dropped from 1.5 to 1.25. The deductions for dependant children were reduced, then dropped, and the child care expense deduction was expanded. The age deduction available to those over age 65 was changed from a flat rate to a means tested rate in 1994.

There have been many changes to federal surtaxes. The federal basic surtax rate has had seven different rates in an 11 year period. The tax base for the surtax has changed twice, and the progressiviity of the tax has been adjusted five times in a nine year period both in terms of levels and rates. These fluctuations are driven by budgetary requirements and the need to offset other measures that would otherwise reduce the taxes on high income Canadians, such as the lowering of the top federal tax rate. The general trend has been toward increasing effective rates of surtaxes on both middle and high income filers.

Payroll tax rates have also changed, though not as frequently as surtaxes. CPP and QPP contribution rates have been steadily climbing from 1.8% in 1986 to 2.5% in 1992 and subsequent years.[4] Unemployment Insurance contribution rates have fluctuated from between two to three percent throughout the period.

Provinces have also made many tax changes. All provinces, with the exception of Manitoba and Saskatchewan, have increased the basic provincial tax rate by anywhere from two to nine percent of basic federal tax. (In the case of Manitoba and Saskatchewan, both provinces have implemented a net income tax which has also increased over time.) Many provinces —notably Quebec, Ontario, Manitoba and B.C.— have implemented or enriched systems of both refundable and non-refundable tax credits for families and low income filers. Provincial surtaxes have fluctuated considerably with the long term trend being one of increased effective rates.[5]

In addition, there have been important reforms to major federal transfer programs. Benefits available to families with children have undergone a conversion from a universal non-taxable demogrant (the Family Allowance program prior to 1973) to a targeted refundable tax credit with a labour market participation incentive component. This was achieved by making Family Allowance taxable in 1973, reducing Allowances in 1978 and offsetting that reduction with a new means tested Child Tax Credit. The benefits were partially de-indexed in 1986 and in 1989 were recovered from high income Canadians through the implementation of a clawback. This was combined with a corresponding enrichment of the Child Tax Credit. Both programs were replaced by the Child Tax Benefit in 1993.

Programs for the elderly have also seen significant changes. The OAS/GIS/SpA system of benefits saw a series of enrichments during the 1970s and 1980s including payments to immigrants, the gradual introduction of Spouses Allowance to persons aged 60 to 64, and lump-sum increases to the means-tested GIS and SpA benefit rates in 1978 and 1984. In 1989 the universal nature of the OAS program was ended with the introduction of a system of repayments for high income Canadians. The Federal Budget of 1996 proposes a new targeted seniors benefit to replace the OAS/GIS and SpA which effectively makes OAS payments fully means tested. In addition six provinces provide GIS supplement programs and three of those have substantially revised these programs. The provincial trend is also toward enriched benefits.

The Canada Pension Plan and Quebec Pension Plan have had relatively few changes. Through the 1970s and 1980s the yearly maximum pensionable earnings were increased and indexed to the average industrial wage. The yearly basic exemption was lowered in 1976 resulting in an increased tax burden. Benefits have been CPI indexed and flexible retirement provisions were introduced. More importantly the CPP system has been maturing and more individuals are entitled to receive benefits every year as the proportion of retirees who have paid into the system increases.

Unemployment Insurance (UI) has also undergone significant reforms. The implementation of variable entrance requirements based on regional unemployment rates in 1977 as well as fishing benefits in 1983 tended to transfer more benefits to low income regions.

A corresponding tightening of entrance requirements and benefit rates in 1990 and a move to a single phase benefit structure had the effect of reducing average payments. The general trend is toward relative increases of benefits received by young and middle-age workers.

It is difficult to assess the overall impacts of all these changes but three general themes emerge. First, the changes are frequent and widespread. Virtually all of the tax and transfer programs are constantly evolving in relation to changing economic and political conditions. Second, over the 1984 to 1995 period the trend has been towards an increasing tax burden. Third, transfer programs are becoming increasingly more targeted to low-income individuals and families with a higher proportion of benefits being means tested.

3. Methodology

Two microdata sources underlie this analysis: the Survey of Consumer Finances (SCF) and the database associated with the Social Policy Simulation Database and Model (SPSD/M) for 1988. The Survey of Consumer Finances is an annual survey of about 40,000 households and, among other things, records the incomes received and taxes paid. The microdata associated with the SPSD/M is an enhanced version of the SCF. A detailed description of the database enhancements may be found in Wolfson et al. (1989).

The general approach is to use the SCF to examine the overall changes in the age distribution of transfers received from government less taxes paid to government. The SPSD/M is then used to isolate the impacts of changes in the structure of the tax/transfer system on the age distribution of net government transfers. A comparison of these two data sources is offered in the Appendix.

Both these data sources provide estimates for cash transfers received from government and taxes paid to government. Neither the SCF nor the SPSD/M account for all taxes or for in-kind transfers. Absent are corporate income taxes, municipal level taxes and in-kind public benefits such as health, education, housing and transportation subsidies. While the SPSD/M does estimate commodity taxes, to facilitate comparison with the SCF these numbers are largely dropped from the analysis. However, the taxes on the SPSD/M which are considered in this analysis still account for 81% of the National Accounts estimate of direct taxes collected from persons, and 72% of transfer payments to persons. As such the major means of the redistribution of cash through transfers and taxes are accounted for. Nonetheless, it is important to remember that the major tax and transfer programs covered in this analysis represent a minority of government taxes and transfers. The personal income taxes and payroll taxes in the SPSD/M for 1988 represent only 44% of the National Accounts estimate of total government revenues in 1988. The corresponding figure for transfers is only 28% of total expenditures. Thus while the SPSD/M captures the majority of taxes and transfers paid or received directly by individuals, it represents a minority of all government revenues and expenditures which may logically be a part of intergenerational equality.

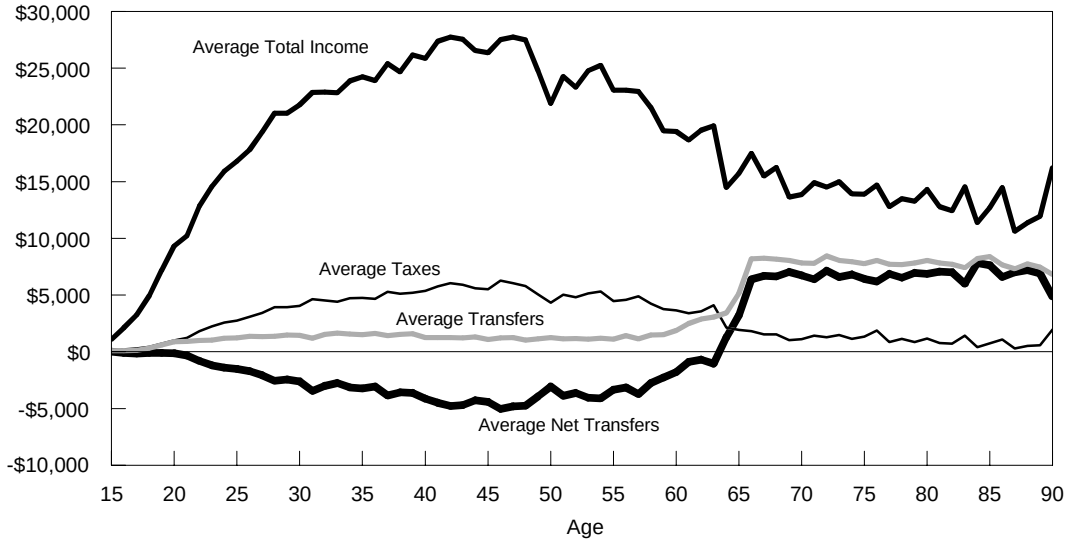
I adopt the individual as the unit of analysis. That is, all cash transfers are assumed to provide utility only to the recipient of those transfers. Similarly taxes are borne by the payer of those taxes. For example, a Family Allowance payment has no utility assigned to the children but rather 100% is assigned to the recipient of the cheque (in most cases the mother). Similarly, in a single income family, no costs of income taxes are attributed to the non-earning spouse.

The analysis makes use of the SPSD/M to disentangle the effect of the tax/transfer structure from demographic and macroeconomic changes. The SPSD/M contains a static microsimulation model which is capable of simulating all tax/transfer systems from 1984 through 1995 (Bordt et al. 1990). The two simulation scenarios developed to disentangle the causes underlying the fluctuations in the overall distribution of net government transfers are described later in this paper.

One important caveat is that forward looking legislated changes will not be reflected in the analysis. For example, recent changes to legislation affecting C/QPP and health care funding may have a more profound change to the age distribution of transfers than the changes over the past 12 years examined here. These changes will not show up in the distributions for many years to come.

A second important caveat to the simulation portion of the analysis is that changes in two major transfer programs, Income Assistance and the C/QPP, are not modelled. The data are

Figure 5.1
Average Total Income, Transfers, Taxes and Net Transfers by Age: SCF, 1988



collected based on benefits paid in 1988 and the levels remain constant throughout the simulation scenarios.

4. Results

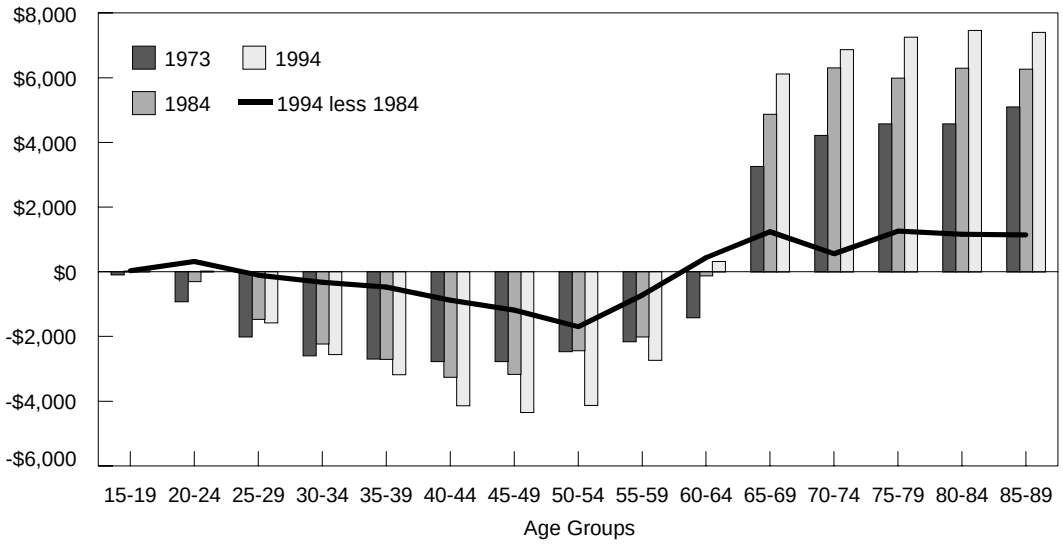
The first step in our analysis is to examine average net transfers by age using the SCF. Average total income, taxes and transfers over the life cycle are shown in Figure 5.1 for 1988. Average total income increases with age after individuals begin to enter the labour force at age 15. Participation, experience and consequently average incomes increase to the mid-40s and then average income declines as labour participation rates decrease. At age 65 average total income starts to flatten out as it is composed less of employment income and more of fixed transfers and declining investment income. The bulk of taxes are paid by middle-aged Canadians, those earning the bulk of income. Transfers are relatively low and constant proportion of average total income until age 65 when they rise sharply to represent over half of all total average income.

The line labelled “Average Net Transfers” is calculated as the average transfers less the average taxes within a given single year of age cohort. It shows that from age 15 to age 20 individuals are on average neither contributors nor beneficiaries. From age 20 through age 60, individuals are on average net contributors to the cash tax/transfer system. Individuals age 60-65 on average do not contribute or benefit from the system, but this average is made up of an offsetting mix of active labour force participants and early retirees. All cohorts after age 65 are net beneficiaries.

Average net transfers have changed considerably over the past 30 years as indicated in Figure 5.2. The vertical axis is constant 1988 dollars and the horizontal axis is five year age groups. The three sets of bars for each age group give the average net transfers for each of three years. So, for example, in 1973 the 25-29 year old cohort had an average net transfer of -$2,000 and by 1994 this had increased by $400 to about -$1,600. The solid black line gives the difference between the 1994 and the 1984 average net transfers within cohort. Up until age 30 individuals have the same or slightly more net transfers in 1994 than did individuals of that age in 1984. The cohorts age 30 to 60 are receiving lower net transfers, in some cases nearly $1,700 less. Individuals over age 65 are faring better by about $1,100 in 1994 compared to 1984.

In preparation for the subsequent comparison with the SPSD/M Figure 5.3 illustrates the changing shape of the average net transfer function in a slightly different way. The horizontal and vertical axes are identical to Figure 5.1. The heavy dotted line labelled 1988 is calculated by cumulating the net transfers for each successive single year of age cohort for the ‘net transfers’ curve in Figure 5.1. It is a simple transformation of the age distribution into a cumulative function. Thus, in a hypothetical

Figure 5.2
Average Net Transfers by Age, 1973, 1984 and 1994, and Change in Average Transfers 1984 to 1994 (SCF, 1988 Dollars)



situtation having the economic and demographic structure of a given calendar year, this curve would represent the 'lifetime' distribution of net cash transfers.[6] It is worth stressing that this is not an actual observation: we cannot conclude that individuals at age 60 in 1990 have contributed on average $140,000 more in taxes than they received in transfers. It does however smooth out the variability of the previous figure and provides a description of the function in intergenerational terms. Most importantly the function is intended to allow a comparison across different years, data sources and definitions of net transfers.

While this figure is based on the same data as Figure 5.2, it indicates that the trend towards decreasing net transfers is not a smooth one. Thus while the maximum hypothetical net transfer for a 100 year old is lowest for 1973 and highest in 1993, the intervening years are not sorted in ascending order. Note that the 1993 line has higher net transfers to the younger cohorts which causes a decrease in the depth of the trough relative to 1990. The fact that the curve for 1993 is closer to the horizontal axis is partially explained by the shift to the federal child tax benefit from the Family Allowance and Child Tax Credit programs.

Many macroeconomic, microeconomic, demographic and family status trends are cumulatively producing these shifts. For example, an increase in unemployment will shift the line up as there is less employment income to tax and higher transfers will be paid out. Likewise a greater proportion of elderly with low market income will increase the transfers to seniors. In fact, the general upward trend of the curve from 1990 to 1993 reflects such a business cycle shift.

Accordingly, the next stage of the analysis involves disentangling the impact of the tax/transfer system. The SPSD/M will be used for this purpose and I start with a comparison of the SCF and SPSD/M cumulative net transfer curves. These are depicted in Figure 5.4. The axes are the same as Figure 5.3 and the line labelled SCF corresponds exactly to the dashed line for 1988. The corresponding line for the SPSD/M, labelled Base SPSD/M, has a similar shape. The fact that it is below the SCF line reflects the increased taxable income, and consequently increased taxes calculated on the SPSD/M that more than offset the corrections for transfer income. In general, the SCF and the SPSD/M are comparable.

Two other curves are presented in Figure 5.4 to indicate the importance of which tax and transfer programs are included. The lower line includes commodity taxes, while the upper line also adds health and education transfers. The age distribution has a similar shape throughout

Figure 5.3
Cumulative Average Net Transfers by Age, SCF, Selected Years

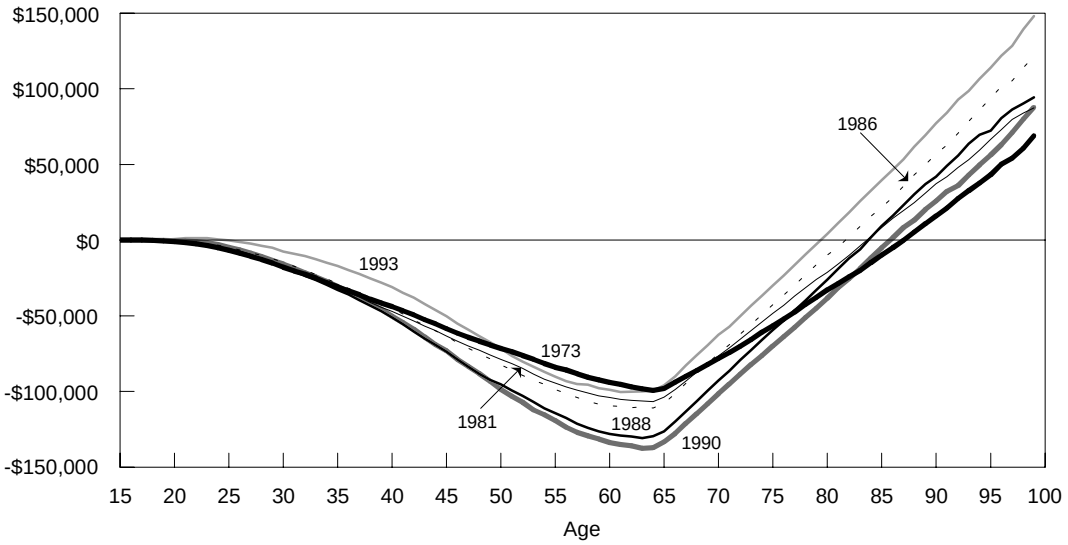
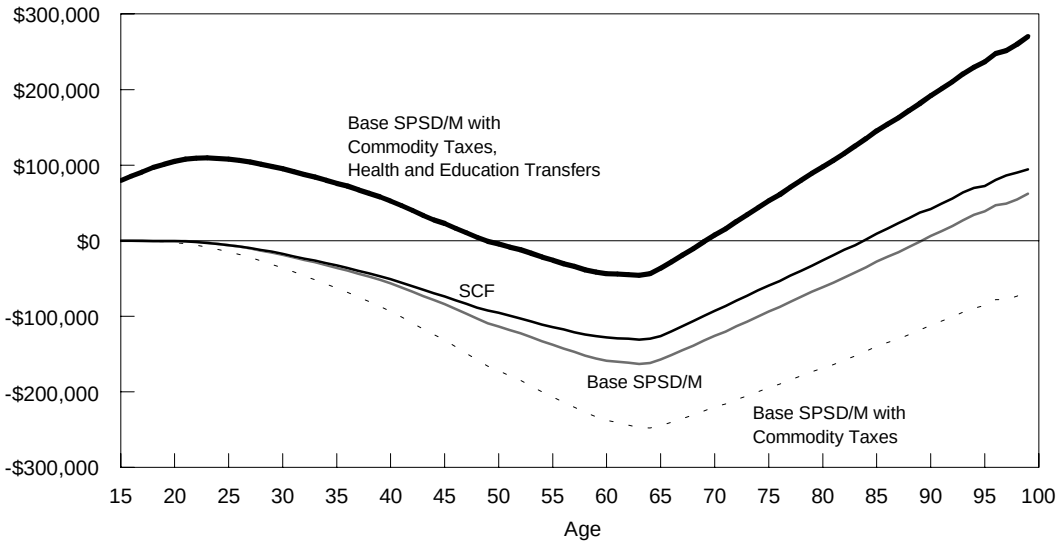


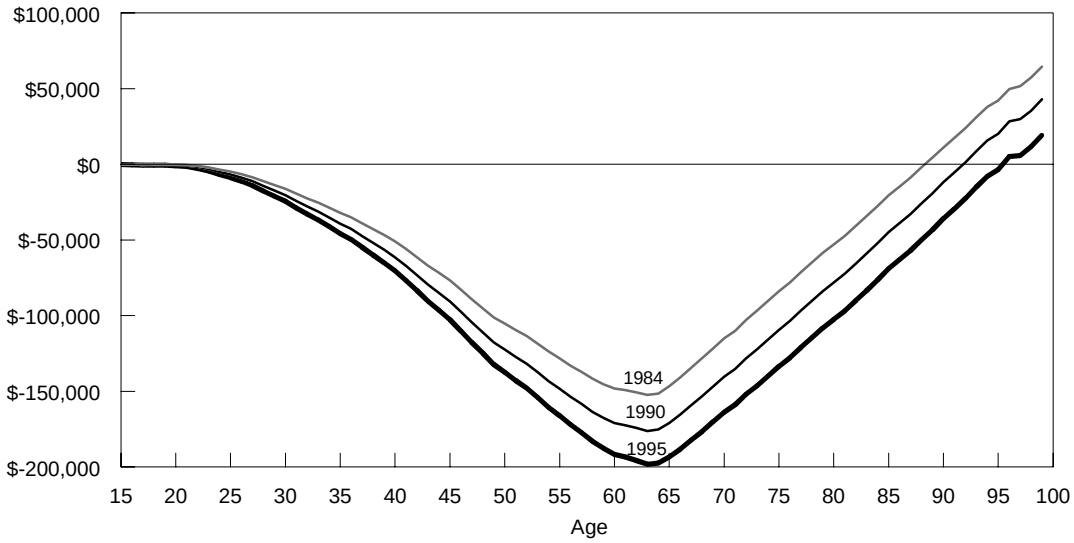
Figure 5.4
Cumulative Net Government Transfers by Age: A Comparison of SCF and SPSD/M for Various Tax/Transfer Definitions, 1988



but the levels are highly dependent on the definition of taxes and transfers. In our hypothetical static world, a person dying at age 60 could have a deficit as large as $250,000 or as little as $50,000 depending on the programs measured; a difference of $200,000. This difference could be as large as $300,000 for a hypothetical 100 year old.

Figure 5.5 presents the impact of changes in the tax and transfer system alone on the age distribution of net transfers. The “what if” scenarios seek to isolate the impact of changes to tax and benefit programs, rates and levels by asking what if the population in 1988 had paid taxes and received benefits based on the rules of the tax/transfer system as they existed, for

Figure 5.5
Cumulative Average Net Transfers, 1988 Population
Various Tax/Transfer Systems, SPSD/M



example, in 1984. The simulation exercise involves first selecting a single household in 1988. The taxes paid to government and transfer received from government are then calculated using the 1988 system as legislated. The taxes are calculated a second time, but using the system as legislated for 1984 with benefit levels and tax brackets appropriately adjusted for inflation.[7] This exercise is then repeated for all years from 1984 through 1995.

It can be seen that the tax/transfer system has reduced cumulative net government transfers at all ages between 1984 and 1990 and again between 1990 and 1995. This is consistent with findings in the tax literature that show a substantially increased tax burden in this period (Grady, 1990).

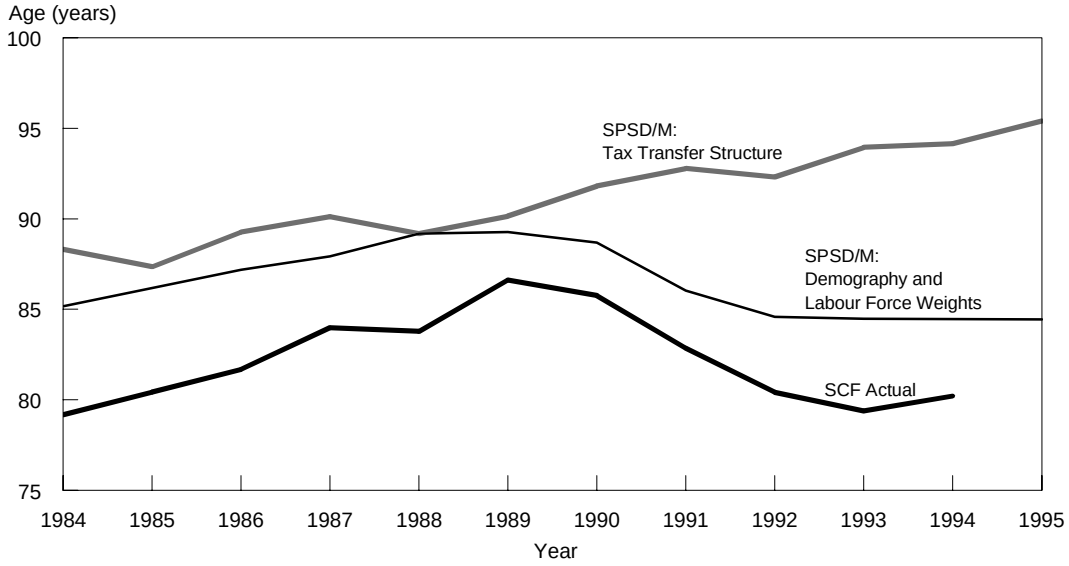
In order to compare the effects on the age distribution of net government transfers of the tax/transfer system to the overall shifts observed in the SCF data I use the age at which the cumulative function crosses the x axis. In the hypothetical situation being examined this is the age at which cohorts become, on average, net beneficiaries of the system. Because the curve always crosses the x axis above age 80, this crossover point includes the impacts of taxes and transfers received by over 97% of the population. In Figure 5.5 this occurs at age 88 in 1984, age 92 in 1990, and just over age 95 in 1995. The complete series from 1984 to 1995 is shown in Figure 5.6.

The horizontal axis is the calendar year while the vertical axis is the age at which the crossover occurs. The heavy black line labelled 'SPSD/M: Tax Transfer Structure' represents the impact of changes to the cash tax/transfer system alone. It shows an increasing net burden as the crossover point moves up seven years from a low of just over age 87 in 1985 to a high of about 95 in 1995.

The curve immediately below it, labelled "SPSD/M: Demography and labour Force weights" presents the results of a second what-if scenario. It is intended to give an indication of the effects of business cycle effects on the age distribution of the tax transfer system. The question being addressed is "what if the population were fixed in 1988 in all ways including the occupational and industrial employment structure, and the tax/transfer system structure was also fixed but the amount people worked was adjusted to match actual total annual weeks worked for different years?"[8]

In this time series, the crossover point declines in both directions from a high of just over age 89 in 1989.[9] This is because 1989 represents the top of the business cycle and the unemployment increases in either direction towards the recessions of the early 80s and 90s respectively. The range of the crossover point in this scenario is just under five years. The SCF has slightly larger range of seven years but the general shape is more similar to the 'Employment Levels' scenario. Thus while the age distribution

Figure 5.6
Net Transfer Crossover Points, SCF actual, Tax/Transfer System alone, and Cohort/Employment Effects, 1984 to 1995



has clearly been affected by the tax/transfer structure system, its effects—as seen in its general shape—are overwhelmed by the larger magnitude of business cycle effects. This draws into question the usefulness of this "intergenerational equity" measure as a public policy tool. The indicator is more subject to broader macroeconomic forces, and is highly sensitive to the definition of taxes and transfers.

These simulations allow a comparison of the relative impacts of the tax and transfer system but do not clearly show which age groups have benefited from the changes and which have not. The adage "beware the mean" is particularly appropriate here. The averages are composed of a heterogeneous and skewed mix of gainers and losers and cohorts of different sizes. In order to get a sense of this dimension the simulation for 1984 was compared to the simulation for 1995 under the 'tax/transfer structure' scenario. The results are presented in Figure 5.7. The horizontal axis presents five-year age groups in ascending order. The vertical axis gives the percentage of individuals within a given age group whose net transfers either increased by more that $120, decreased by more that $120, or did not change by more than $120 ($10/month). The area above the lines represents the percentage of individuals within the age group whose net transfers either did not change or changed by less than $120. So, for example, among individuals aged 20-24, 25% were net gainers, 65% were net losers, and 10% had no change.

As can be seen on the far right-hand bar labelled 'All', fewer than 18% of individuals over the age of 14 would have experienced no changes to their net transfers by moving from the 1984 to the 1995 tax/transfer system, and over 60% would have experienced a loss. Individuals aged 65 and over would have had the largest number of net gainers as a result of the structural changes, reaching as high as 70% of individuals ages 85 to 89. This result is strongly linked to the increases in GIS/SPA payments.[10] The 15 to 19 and 20 to 24 year old cohorts had a greater than average number of gainers and in the former group there were 50% more gainers than losers . The number of gainers in this group would have been higher, and the distribution more u-shaped, had the increases to Income Assistance in the late 1980s, especially in Ontario, been modelled.

The net transfer figure is composed of changes in both taxes and transfers. Figure 5.8 presents these. The left panel shows the distribution by age of persons whose taxes or transfers would have been reduced. The panel on the right presents results for those individuals who experienced an increase in either taxes or transfers. The vertical axis is the percentage of all individuals in the cohort. From Panel 1, fewer than 5% of individuals in any given cohort would have experienced a decrease in their taxes.

Figure 5.7
Distribution of Net Gainers and Losers by Age Group, 1984 vs. 1995
SPSD/M, Fixed Population

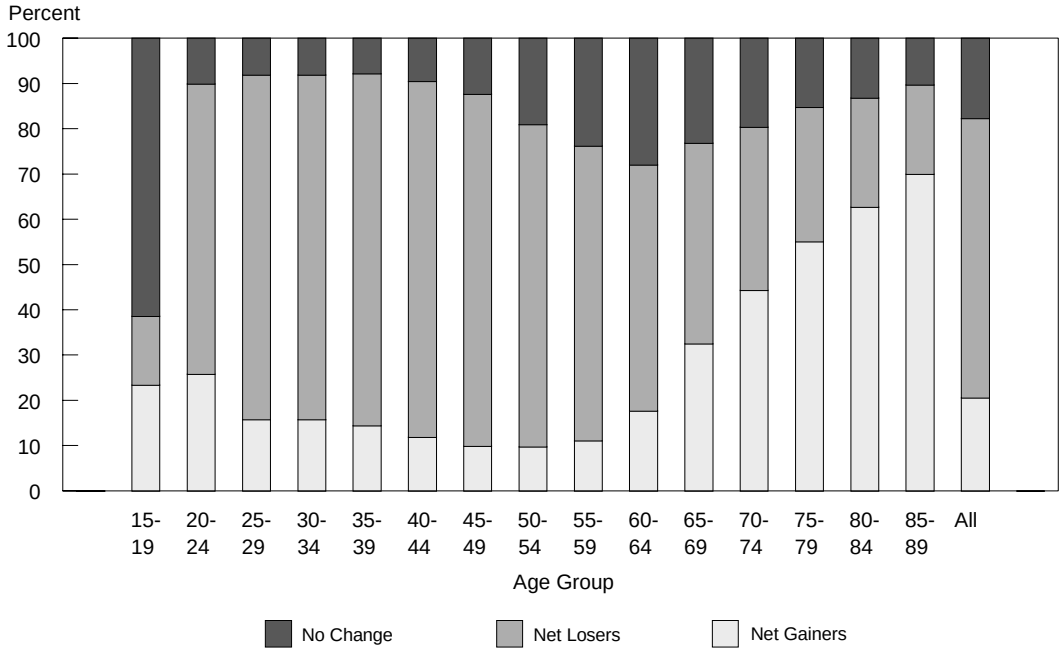


Figure 5.8
Distribution of Gainers and Losers for Taxes and Transfers by Age
SPSD/M Tax/Transfer Scenario, 1984 versus 1995

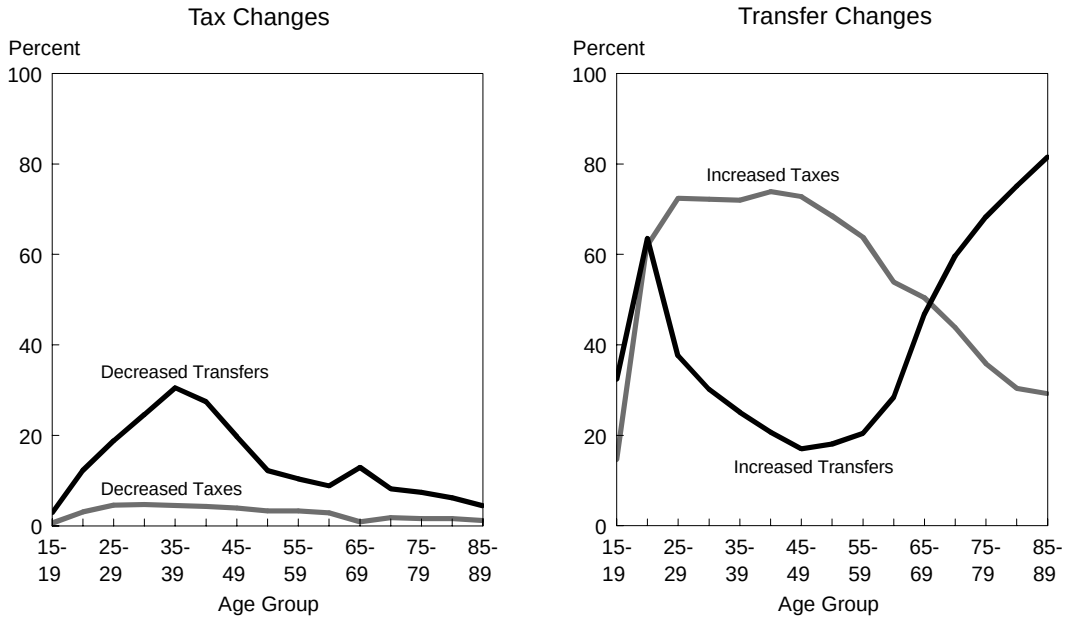
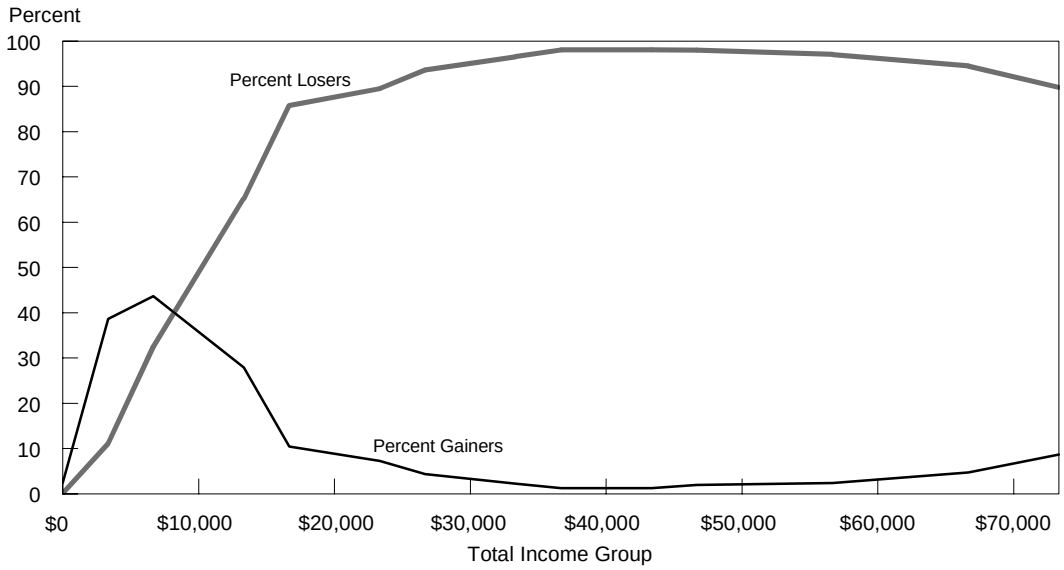


Figure 5.9
Distribution of Net Gainers and Losers by Income, 1984 vs. 1995, SPSD/M Tax/Transfers Scenario, Fixed Population



However more than 20% of the individuals in the cohorts between age 30 and 50 would have experienced a drop in transfers. This drop is largely due to reduced benefits in the UI program.

The larger changes are in the increased taxes and transfers. The increased transfers show a U shaped curve with large proportions of individuals with increased transfers in the youth and elderly cohorts. The younger cohorts would likely show even more gainers if the shifts in Income Assistance were included. Over 10% of individuals in all cohorts experienced increases in taxes. The proportion of tax increases declines for the older cohorts.

The picture that emerges is one in which younger and older cohorts have fared relatively better than their middle aged counterparts as a result of tax/transfer changes over the past decade. However, it is not age or inter-generational equity which is the primary policy factor driving the changes of the past decade. Rather it is the deficit reduction imperative combined with a goal of making the reductions as fair as possible by trying to mitigate the impacts on the poor.

The changes to the age distribution are largely driven by the changing progressivity of the tax/transfer system. Figure 5.9 shows the same data as Figure 5.7 but with income along the horizontal axis instead of age. The horizontal axis groups individuals into total income groups using $5,000 increments up to $50,000 and in $10,000 increments thereafter.

The percentage of individuals who would have experienced reduced net transfers exceeds those who would have gained in all income groups above $10,000. The individuals receiving more net transfers are heavily concentrated in the low-income ranges. The average age for the first two cohorts with income are 33 and 49 respectively and then level out to the mid-40's for the balance of the income distribution. This shape of the changes is consistent with other studies which show that changes in this period were progressive in the lower end of the income distribution, roughly proportionate in the middle, and slightly regressive at the high end of the distribution (Grady, 1990; Vermaeten et al. 1995).

5. Conclusions

The changes in tax and transfers in Canada between 1973 and 1995 have been significant, with the age distribution of net transfers—government cash transfers less income and payroll taxes—changing substantially between 1973 and 1994. The changes show a slight increase in the net transfers received by those aged 15 to 24, and a decrease in net transfers received in all other pre-retirement cohorts. The cohorts from age 40 to 59 experienced the largest

decrease in average net transfers between 1984 and 1994, reaching -$1,700 in the age 50 to 54 cohort. The average net transfers of all post-retirement cohorts has shown a substantial increase over the period, averaging about $1,100. These changes are caused by a number of factors both endogenous and exogenous to the tax/transfer system.

The age distribution of average net transfers has clearly been affected by the tax/transfer system structure and the overall burden has been steadily increasing. However, the effects of the tax/transfer system were offset by cyclical employment levels and cohort effects. The patterns of cumulative net transfers found when simulating only the employment and cohort effects more closely resemble actual patterns than those due to tax/transfer changes alone.

Not surprisingly, the vast majority of individuals have been effected by the changes in the 1984-1995 period; in terms of net transfers there were three times as many losers as gainers. The middle-aged cohorts had the highest proportion of net losers followed by the younger cohorts. The elderly cohorts all had proportionally the fewest losers with gainers outnumbering losers in the cohorts above age 70. However these effects were found to depend largely on increased taxes as they applied to income. Over 60% of individuals aged 20 to 24 and over 60% of individuals in all cohorts over age 70—both groups having a disproportionately high number of low income individuals—would have received increases in transfer payments as a result of changing rules in the tax/transfer system.

My findings imply that the use of inter-generational equity measures of the type examined here as a guide for public policy requires a great deal of caution. Any measure will be fraught with numerous measurement issues and is highly sensitive to the definition of taxes and transfers. Moreover, the specific indicators examined are more subject to broader macroeconomic forces than specific policy levers available to the government. They are useful in facilitating the examination of policy issues with a long time horizon and not in measuring attainment of a prescribed outcome.

Appendix

The SCF is known to under-report UI benefits, Income Assistance benefits, C/QPP pensions, and interest income. Moreover, the SCF survey frame does not include elderly persons living in institutions. The number of high income Canadians is also underestimated by the SCF. The methodology used to create the database associated with the SPSD/M includes adjustments to correct for all these factors. In light of the discussion of measurement issues it is worth noting that the SPSD/M enhancements will have an impact of the age distribution of Government taxes and transfers. Figure 5A.1 gives an indication of some of those impacts. The horizontal axis represents age groups and the vertical axis the SPSD/M averages as a proportion of SCF. For example, in the age 55 to 59 cohort, average total income on the SPSD/M is 25% higher than is reported on the SCF.

The number of persons is virtually identical through age 44. After age 44 the number of persons is slightly higher in the SPSD/M due to the imputation of high income taxfilers who are disproportionately represented in the older age cohorts. At age 65 the number of persons on the SPSD/M increases even more due to the imputation of the institutionalized elderly population as well as the fact that this population represents an increasingly large proportion in the more elderly cohorts. While the imputation of high income filers has a limited effect on the number of individuals it has a marked effect, (in combination with the interest income deduction), on the market incomes of the middle age and elderly cohorts. The higher levels of average income tax reflect this correction as well as an increase in taxable government transfers such as UI.

Figure 5A.2 shows that the corrections to UI and IA tend to increase the average size of transfers in all but the elderly cohorts, and by more than 50% in some of the younger cohorts. The fact that the increased government transfers among the elderly increase at the same rate as the population reflects the fact that a correction for QPP under-reporting was not performed in 1988; had it been, the elderly would have shown an even higher average transfer relative to the SCF. The combined effects of these corrections are presented in the paper. While they move us toward a better estimate, the underlying shape of the age distribution of net transfers is comparable.

Figure 5A.1
SPSD/M as a Proportion of SCF, Selected Variables, 1988

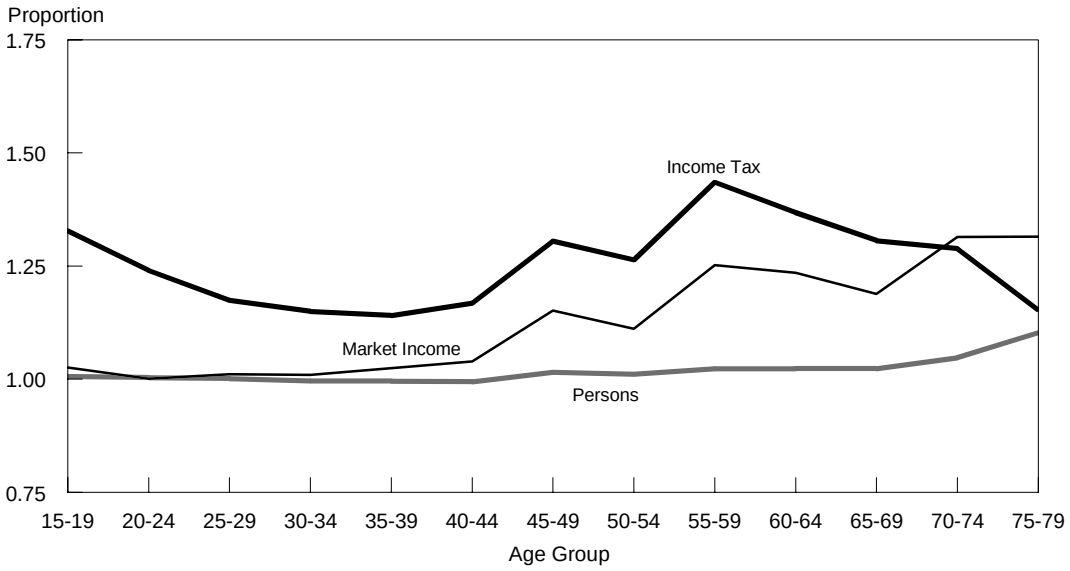
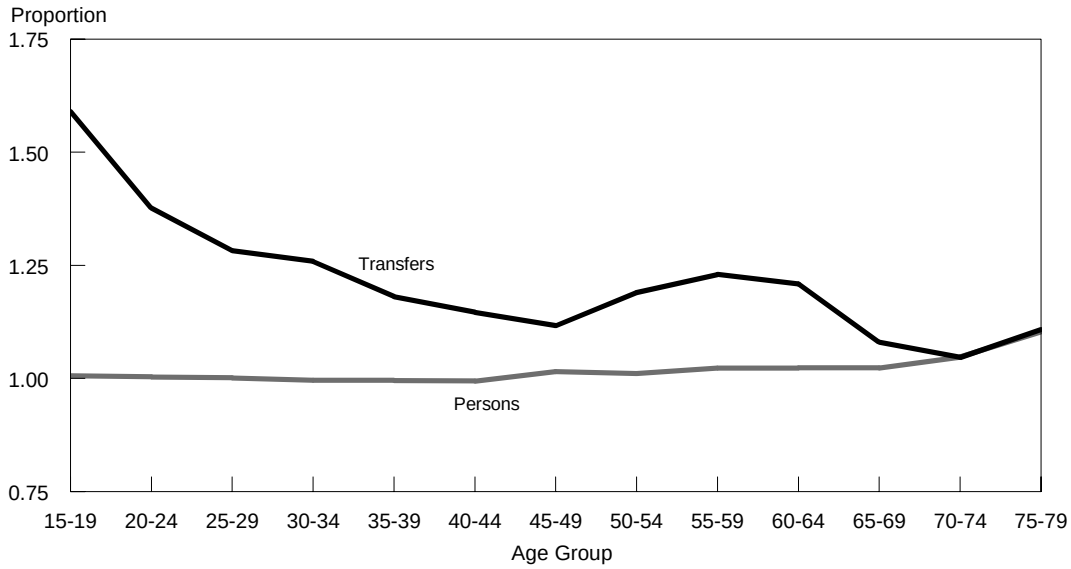


Figure 5A.2
SPSD/M as a Proportion of SCF, Selected Variables, 1988



End Notes

The author accepts full responsibility for any errors or omissions and for all views expressed herein. The analysis should not be taken as representing the views of Statistics Canada.

[1] Wolfson, Rowe, Lin and Gribble (Chapter 8) are the first to have conducted such a micro-simulation exercise directed towards intergenerational equity. The use of panel data in Canada to explore these distributional shifts is likewise just beginning. The Survey of Labour and Income Dynamics (SLID) and the longitudinally linked set of tax data (Longitudinal Administrative Database) can provide a better description of changing individual experiences but are as yet not fully exploited.

[2] Such studies do not examine the results by age.

[3] If we were limited to analysis of households, assumptions would have to be made as to the age of the household based on, for example, the age of the head. In Chapter 4, Hicks addresses the sensitivity of tax incidence to the assumptions made concerning the unit of analysis.

[4] The federal government has recently announced an accelerated increase to the CPP contribution rates and a reduction in benefits. These proposals are not factored into my analysis.

[5] Commodity Taxes for both federal and provincial governments have also undergone significant changes but are not discussed here as they will not be explicitly examined.

[6] This term would apply if fertility, mortality and net immigration were constant, labour force participation rates did not change, industrial and occupational mix were fixed, lifetime earnings profiles were fixed, and so forth. If such a world were frozen based on the reality in 1990, the average individual at age 65 would be in a net deficit position of $130,000.

[7] So, for example, in current dollars the child tax credit per child was $367 in 1984 and had increased to $559 in 1988. The increase was greater than inflation due to various enrichments. Inflation from 1984 to 1988 alone would have increased the credit to $431, the value that would be used to simulate the 1984 system as if it had been in place in 1988.

[8] In this case the tax/transfer system and individual incomes are held constant at the 1988 values. The weights are adjusted to reflect population and annual average employment and unemployment levels by age, sex and province.

[9] By construction the lines are at the same point in 1988.

[10] In 1988 dollars, the basic GIS guarantee for singles increased $587 from $4,002 in 1984 to $4,589 in 1994.

Bibliography

BANTING, KIETH and R. BOADWAY (1997). *Reform of Retirement Income Policy: International and Canadian Perspectives.* Kingston: Queen's University School of Policy Studies.

BORDT, M., G. CAMERON, S. GRIBBLE, B. MURPHY, G. ROWE, M. WOLFSON (1990). "The Social Policy Simulation Database and Model: An Integrated Tool For Tax/Transfer Policy Analysis." *Canadian Tax Journal.* Vol. 38, 48-65.

BROWNING, Martin, F. BOURGUIGNON, P. CHIAPPORI and V. LECHENE (1994). "Incomes and Outcomes: A structural model of Intrahousehold Allocation." *Journal of Political Economy*. Vol. 102, 1067-98.

DAVIES, Jim, F. ST-HILAIRE and J. WHALLEY (1984). "Some Calculations of Lifetime Tax Incidence." *American Economic Review.* Vol. 74, 633-49.

FULLERTON, Don, and D. ROGERS (1993). *Who Bears the Lifetime Tax Burden*. Washington: The Brookings Institute.

GRADY, Patrick (1990). "The Distributional Impact of the Federal Tax and Transfer Changes Introduced Since 1984." *The Canadian Tax Journal.* Vol. 38, 286-97.

GREENSPON, Edward (1996). "Generations clash over CPP." *The Globe and Mail*, June 5.

LITTLE, Bruce (1996). "The pension squeeze: From flush retirees drawing more than they paid to young adults paying more than they can spare, CPP is looking for cash – fast." *The Globe and Mail*, June 8.

OREOPOULOS, Phillip (1996). "Bad Tasting Medicine: Removing Intergenerational Inequity from the CPP." *Choices*. IRPP, Vol 2, No. 7 (November).

SCOTT, Sarah (1996). “Targeting seniors: Under the battle cry of ‘intergenerational equality’ governments are starting to claw back benefits for the elderly. It remains to be seen whether gray-power forces will be strong enough to stop the trend.” *Montreal Gazzette*, May 25.

VERMAETEN, Arndt, W.I. GILLESPIE and F. VERMAETEN (1995). “Who Paid the Taxes in Canada; 1951-1988.” *Canadian Public Policy*. Vol. 21, 317-43.

VERMAETEN, Frank, W.I. GILLESPIE and A. VERMAETEN (1994). “Tax Incidence in Canada.” *Canadian Tax Journal.* Vol. 42, 348-415.

WOLFSON M., B. MURPHY, S. GRIBBLE, M. BORDT, and G. ROWE (1989). “The Social Policy Simulation Database and Model: An Example of Survey and Administrative Data Integration.” *Survey of Current Business*. Vol. 69, 36-41.

Chapter 6

The Welfare Dynamics of Reducing Transfers from Future to Current Generations

STEVEN JAMES AND CHRIS MATIER

Generational Accounting (GA) attempts to measure the degree of intergenerational redistribution that exists within a given fiscal and demographic structure. This approach produces a more comprehensive measure of the extent of intergenerational redistribution stemming from government programs than traditional measures that are based solely on government debt and deficits. Auerbach and Kotlikoff (1987) argue that formal accounting definitions of debt and deficits are—in an economic sense—inherently arbitrary and potentially give rise to fiscal illusion. GA measures, on the other hand, incorporate a wide range of government programs that are potential sources of intergenerational redistributions. Kotlikoff (1992) suggests that the adoption of GA methods and measures would help to foster a longer-term and generationally-balanced policy focus by clearing up intergenerational issues regarding who pays for what the government spends.

While GA methods provide us with a measure of the degree of intergenerational redistribution under a given set of programs, these methods do not incorporate incentive effects or transitional dynamics into their framework. Thus, GA is potentially limited in its application to analysing issues related to changes in government-induced intergenerational redistribution. Dynamic computable general equilibrium (CGE) models can complement GA studies because they incorporate incentive effects and transitional dynamics. These models are well suited to analyse the impacts of government-induced changes in inter-generational equity.

In this chapter we do not attempt to measure the effects of the level of intergenerational redistribution that presently exists in Canada. Instead, we examine the short and long-run impacts of government-induced changes in intergenerational redistribution under various scenarios, and consider the economic and welfare impacts of increasing intergenerational equity by reducing transfers from future to current generations. The approach employed uses a dynamic CGE model that is loosely calibrated to the Canadian economy. The model, described in Section 1, is based on optimising behaviour and incorporates interactions between different agents and markets. While this model is a highly stylized representation of the Canadian economy, it provides a tractable framework for analysing issues related to government-induced changes in intergenerational redistribution.

The CGE model is simulated with alternative intergenerational transfer reduction scenarios. We find that the short and long-run economic and welfare impacts of reducing transfers from future to current generations depend on the speed at which these transfers are reduced and the tax mix used to bring about the transfer reduction. We also consider alternative parameter specifications of the model in order to evaluate the sensitivity of the welfare impacts. Simulation results indicate—with the exception of the alternative specifications of the labour supply elasticity—that the welfare impacts are generally robust.

Reducing transfers from future to current generations in the CGE simulations is achieved by a temporary tax increase that permanently lowers the government debt-to-GDP ratio by about five percentage points. In an economy that exhibits some degree of intergenerational disconnectedness, government debt acts as a transfer from future to current generations. It is important to keep in mind that the formal label of government “debt” itself is not significant. From an economic point of view, government-induced intergenerational redistribution schemes may be equivalent (Barro, 1974; Auerbach and Kotlikoff, 1987; and Tabellini, 1991). Therefore, this paper should be seen in a broader context that

examines transitional and long-run effects of a change in any government-induced intergenerational redistribution. Alternatively, transfers from future to current generations could be reduced by cutting spending (for example, decreases in public investment, pure public goods, and/or lump-sum expenditures). Determining the optimal transfer reduction financing mix would involve consideration of these alternatives, a topic beyond the scope of this paper.

Our methodology limits the scope of the findings. The CGE framework does not explicitly include all sources of intergenerational redistribution stemming from government policies nor does it incorporate their institutional details. These would be important omissions if we wished to measure the current level of intergenerational redistribution under the existing fiscal structure and its economic impact. Our results do not provide any estimates of the impacts of current government programs and/or intergenerational redistribution. The estimates we provide reflect impacts that follow from increasing intergenerational equity. By construction, CGE models are parsimonious representations of economies. To a certain extent, they abstract from institutional realities in order to focus on interactions between economic agents and markets in a dynamic framework.

1. The Model

The model economy presented here is a revised version of the one presented in James (1994) and James and Matier (1995). The revised model incorporates money demand and nominal wage rigidities into an uncertain lifetimes framework with an endogenous labour-leisure decision, open economy imperfect foreign-domestic asset-substitutability, and portfolio choice. The details are described in a technical appendix available from the authors.

Real effects of reducing transfers from future to current generations follow from the failure of Ricardian equivalence to hold when generations are disconnected and from the future decreases in distorting taxes that are made possible by reducing intergenerational transfers. The notion that the debt-lump sum tax mix might be irrelevant is called “Ricardian equivalence.” It is useful to think of government debt in this framework as an intergenerational transfer from future to current generations. If some degree of intergenerational disconnectedness exists, then future taxes associated with a current deficit have a smaller present value than the new debt and government bonds make a net contribution to household wealth. In a closed economy, this transfer from future generations initially raises current wealth and consumption. Current investment falls, leading to a long-run crowding-out of some private physical capital. Provided the economy is not dynamically inefficient, this lowers steady-state social welfare. In an open economy the consequences are a reduction in the consumption possibilities of future generations through a combination of increased net foreign indebtedness and a lower capital stock.

Household Behaviour

The objective of all households is to maximize expected lifetime utility (the sum of expected instantaneous utility flows discounted by a positive rate of time preference) subject to an intertemporal budget constraint or asset accumulation condition. We adopt an uncertain lifetimes framework following Blanchard (1985) and Weil (1989). Households face a constant instantaneous probability of extinction and the number of households in the economy grows at a constant (positive) rate. Foreign and domestic households are modelled symmetrically. Two types of domestic and foreign households exist and are distinguished by their leisure and portfolio choices.

The modelling of imperfect substitutability of foreign and domestic assets reflects the observation that households seem to exhibit strong home country asset preference (Goulder and Eichengreen, 1992; Kouri, 1976). The first type of household does not face a leisure choice and holds equity and corporate as well as government debt. They receive no labour income, hence their wealth equals their financial asset holdings. Optimal consumption is proportional to wealth where the factor of proportionality is the rate of time preference plus the household mortality rate. The optimal portfolio shares are a function of expected rates of return and the variances and covariances of the various assets (Merton, 1971). The imperfect substitutability of foreign and domestic assets means that cross-country risk-adjusted return differentials can be consistent with diversified portfolios.

The second type of household faces a leisure choice and holds only money and government debt. Money is introduced through a transactions cost technology similar to that in Black, Macklem and Poloz (1993). Transactions costs are a function of current levels of consumption and real money balances. This gives rise to a standard interest-elastic money demand function. These households receive all domestic labour income. Their wealth equals their financial asset holdings plus the discounted present value of future transfers net of wage, consumption, and lump-sum taxes, plus human wealth. Human wealth is defined as the discounted present value of future time endowments, which are discounted by the real after-personal tax return on domestic government bonds plus the household mortality rate.

Demography and Household Welfare Measures

A new household entering the economy at time t is said to belong to generation t. New households are created in part by existing households and immigration, however, they are not linked to any existing households through operative bequest motives. There is no intra-household growth. Each household faces a constant instantaneous probability of extinction. The birth rate of new households exceeds the mortality rate, therefore population growth (in terms of the number of households) is positive. At each instant in time, there exists many households belonging to different generations. Per capita measures reflect per household values.

Welfare is measured as the discounted stream of consumption per capita. **Social welfare** is a summary measure, calculated as the sum of current and future consumption per capita taken from the perspective of an initial vantage point (discounted at the pure rate of time preference). It represents the overall welfare impact of the transfer reduction from future to current generations. **Generational welfare** is calculated as the sum of current and future consumption per capita taken from the perspective of current generations (discounted by the pure rate of time preference plus the rate of creation of new households). This measure captures the net welfare impact of the transfer reduction from the point of view of current—including new—households in each year. The discount rate used in this measure is equivalent to the rate that households use to discount the stream of primary balance surpluses.

Firm Behaviour

Representative firms choose levels of investment in order to maximize the market value of equity (which is the discounted value of after-tax dividends net of new share issues) subject to technology, physical capital accumulation, and installation cost constraints. The discount rate is determined by equating the required after-personal tax equity return with the sum of the after-tax dividend-price ratio and the after-tax rate of capital gain per share. The firm's technology is described by a constant returns to scale Cobb-Douglas production function. Trend total factor productivity and the time endowment evolve exogenously and physical capital depreciates at a constant rate. Installation costs are assumed to be a quadratic function of the rate of investment. Dividends paid to shareholders are the unretained portion of after-corporate tax earnings. The existence of installation costs that increase more than proportionally with the rate of investment causes firms to smooth their investment paths. The investment decision generates the capital stock, and this combined with the labour input, determines output via the production technology. The firm chooses the level of labour input in order to equate the marginal product of labour with the real wage.

Government Behaviour

The government chooses paths for taxes, government debt and its expenditure mix (Lavoie, 1995). Its expenditure mix consists of its wage bill, purchases of goods and services, and public investment. Government expenditure is not constrained to equal government output. The government good is perfectly substitutable with the commercial good and is produced using labour and the public capital stock with a constant returns to scale production function. If government expenditure is greater than government output, the government absorbs resources which would have otherwise been utilized by the commercial sector. This results in a lower level of income for those households supplying labour. Since their wealth is comprised of their future (discounted) income, it too will be reduced. In the intergenerational transfer reduction simulations under consideration, government output almost always equals government expenditure. A small discrepancy arises due to changes in the government's wage bill.

The stochastic portion of government capital tax revenue is assumed to be offset by the

application of stochastic lump-sum capital taxes and transfers. (This precludes an insurance capability for capital taxation described by Gordon, 1985). Household enforcement of a transversality condition upon private and government issuers of assets means that the government may not permanently issue bonds at a rate faster than the real after tax return on government bonds. Steady-state stability of the government debt-to-GDP ratio ensures that this condition is satisfied. With a real after tax risk free rate of return greater than the growth rate of output, a positive steady-state debt-to-GDP ratio requires steady-state primary surpluses.

General Equilibrium

The intratemporal equilibrium conditions are that given expectations, aggregate supplies and demands are equal at each point in time. Contract wages are set in such a way that equilibrium in the labour market exists in the steady-state, while labour demand determines employment over the short-term horizon (Cardia, 1994; Ambler, Guay and Phaneuf, 1995). The goods, and foreign exchange markets clear, and firm financial structure is consistent with household portfolio choice. Expectations conform to the trend values realized in later periods.

Calibration

The steady-state version of the model is loosely calibrated to a 1991 Canadian benchmark. In the steady state, the trend income, expenditure and wealth variables grow at a rate of 3% per year. This follows from the production function, the time endowment and trend total factor productivity growth rates, and implies a constant capital-labour ratio when labour is measured in efficiency units. Labour's share in the production function is 0.6 and total factor productivity grows at approximately 1%. Labour force growth is 1.4%.

The calibration values of the elasticity of substitution between foreign and domestic assets, the momentary elasticity of labour supply and the household mortality rate are worthy of particular attention. This is because the elasticity of substitution determines the openness of the economy to international financing flows, the momentary elasticity of labour supply determines the impact of an income-compensated real wage change on labour supply and the household mortality rate determines the degree of deviation from Ricardian equivalence.

The base case elasticity of substitution between foreign and domestic assets is calibrated to be 1.4, which is close to the benchmark estimate of 1 used by Goulder and Eichengreen (1992) in their analysis of the general equilibrium effects of saving and investment-promoting tax policies.

The base case momentary wage elasticity of labour supply is assumed to be 1, based on a ratio of work to available time of 0.5. A smaller elasticity would naturally imply smaller wage tax effects, however this is already less than values typically calibrated in real business cycle models where the ratio of work to available time is assumed to be as low as 0.2 which implies a labour supply elasticity of 4 (Prescott, 1986; Greenwood and Hercowitz, 1991). Micro-econometric studies typically find smaller elasticities. Dahlby (1994), for example, assumes compensated labour supply elasticities of 0.2 to 0.4 in his examination of the marginal cost of public funds.

The base case household mortality rate is assumed to be 0.04, which implies a new household birth-rate of 0.054, given a population growth rate of 0.014. This is consistent with an average expected remaining life of 25 years for adults. In theory, however, there is no strict link between observed individual mortality rates and the notional household mortality rates. A zero household birth-rate could be consistent with positive individual birth and mortality rates. Our household mortality rate is, however, close to those of many studies that use the Blanchard-Buiter-Weil approach. For example, Macklem, Rose and Tetlow (1994) assume a household birth-rate of 0.0532. The pure rate of time preference and the intertemporal elasticity of substitution is calibrated as 0.06 and 0.5 respectively.

The calibration values for the parameters of the transactions cost technology are based on Black, Macklem, and Poloz (1993). They were obtained by estimating a money demand function that yields an interest elasticity of -0.31. Households that supply labour services face a probability of two-thirds that their nominal wage contracts will expire. This implies an average contract length of 3 years.

2. Results

Simulations of a 5 percentage point reduction in the debt to GDP ratio were conducted under alternative assumptions about the speed of

transfer reduction and the method of financing the transfer reduction. We examine various reduction speeds ranging from an immediate transfer reduction to an extreme case where the reduction takes 60 years to achieve. Three tax mixes are considered: lump-sum, wage and general taxation. Intergenerational transfer reduction through wage taxation means that households supplying labour services bear the full tax burden. Under general taxation, indirect consumption taxes, source and personal capital taxes, and corporate as well as wage taxes are used. Short and long-run economic impacts (presented in terms of per cent shock minus control) are examined along with social and generational welfare measures. Additional analysis is presented in the appendix.

Intergenerational Transfer Reduction using the Lump-Sum Tax Mix

In reality, governments do not have recourse to lump-sum taxes, however, simulations of the intergenerational transfer reduction through lump-sum taxes provide a useful benchmark that can be used to gauge the additional impacts from lower distortionary taxes. The short-run economic impact of temporarily raising lump-sum taxes (or cutting lump-sum expenditure) to bring about a reduction in transfers from future to current generations does not significantly depend on the speed at which the reduction is achieved (see the impact on GDP in Panel A of Figure 6.1). Even though households face large decreases in their disposable incomes, consumption is only slightly affected since it is primarily a function of lifetime wealth. Firms begin to increase investment early on since future output is expected to be higher. As well, the supply and demand for hours worked increases from the onset. Achieving the transfer reduction relatively quickly does not impose any transition costs.

The long-run impacts of the transfer reduction on GDP, GNP, consumption, the capital stock, and hours worked are depicted in Figure 6.2. These are defined as the difference between the steady-state values in the economy with the lower debt/GDP ratio and the steady state values in the control case. GNP, consumption, and the capital stock are all about 0.5% higher. GDP and hours worked are also higher but by not as much. The economic impacts that we observe are directly related to the degree of intergenerational disconnectedness, they arise from pure “savings-channel” effects. Households initially decrease consumption in response to lower levels of wealth. This implies that the rise in public saving will not be fully offset by the fall in private saving. As a result, domestic saving rises and since the economy is open this leads to a lower level of net foreign indebtedness in conjunction with a higher capital stock. Productivity and the demand for hours worked rise in response to the increase in the capital stock.

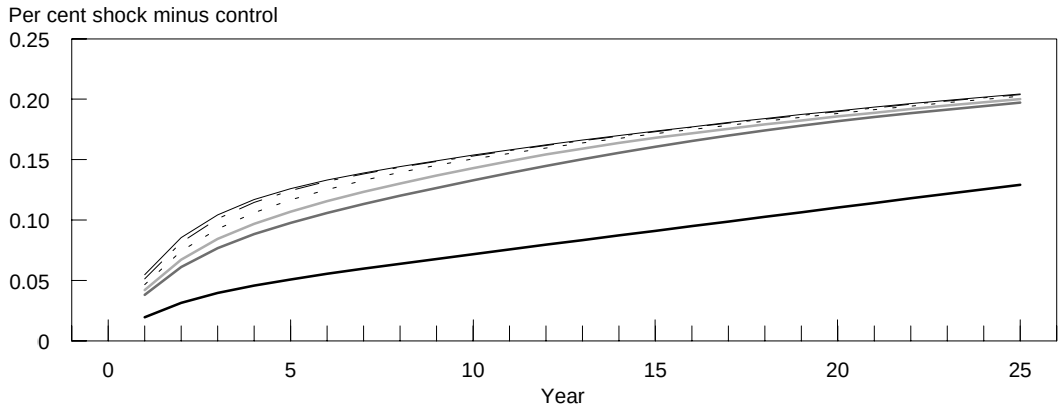
With regard to the various transfer reduction speeds, social welfare impacts are also quite robust. The impact on social welfare is positive in all cases. Figure 6.3 shows that the impact on social welfare increases by only 10 per cent when the transfer reduction speed is increased from 20 years to the immediate reduction scenario. Generational welfare impacts (calculated each year in Figure 6.4) are also positive in all cases. This means that current generations of households, along with new households entering the economy immediately following the transfer reduction, are not made worse-off as a result of the increased tax burden.

Intergenerational Transfer Reduction using the Wage Tax Mix

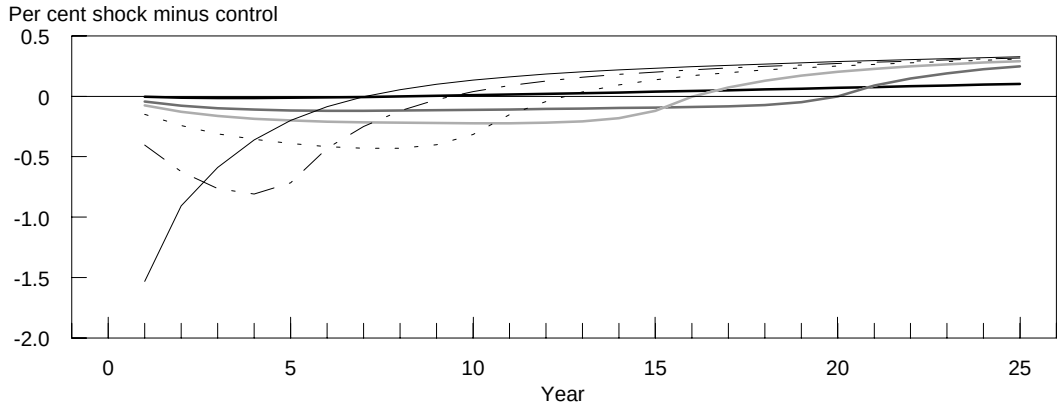
In sharp contrast to the transfer reduction scenarios through lump-sum taxes, the short-run economic impacts under the wage tax mix are significantly below their control levels. From Panel B of Figure 6.1 it is apparent that the short-run impact on GDP depends on the transfer reduction speed. The more rapid the reduction, the more adverse the short-run impact on GDP. Initiating a relatively fast rate of transfer reduction involves raising wage taxes to extremely high levels. This reduces a working household’s real after tax wage income, lowering aggregate labour supply and increasing the real wage that firms face. Firms reduce their demand for labour and investment since future output is expected to be lower. Consumption also falls in response to lower household wealth. This is due to the reduced value of future time endowments and the reduction in government debt. Along the transition path wage taxes are increasingly raised to compensate for decreases in the tax base. This accounts for the U-shaped transition path observed for GDP. Slower transition speeds imply smaller increases in wage taxes which are spread out over a longer time horizon. The negative labour supply response is tempered along with the increase in real wages that firms face.

Figure 6.1
The Impact on GDP of Reducing the Debt to GDP Ratio by 5%

A. Increase in Lump-Sum Taxes



B. Increase in Wage Taxes



C. Increase in General Taxes

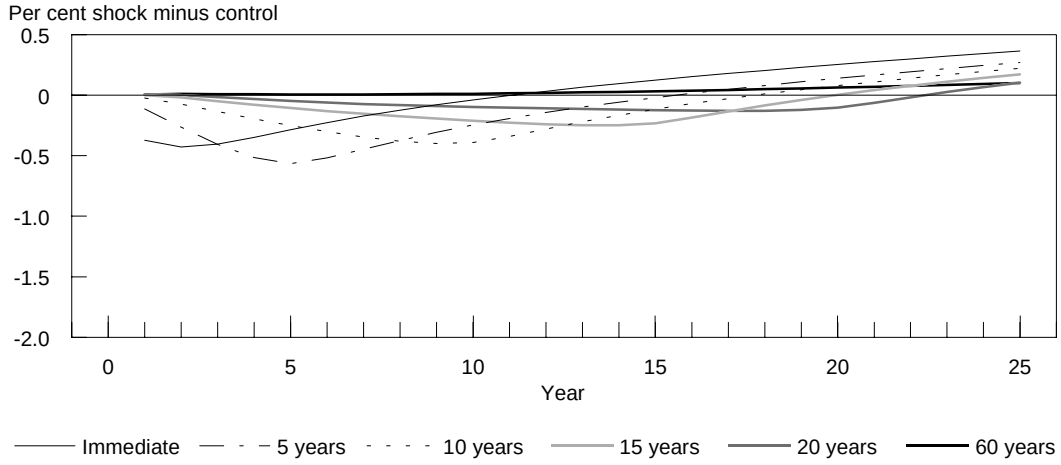


Figure 6.2
Long-Run Economic Impacts

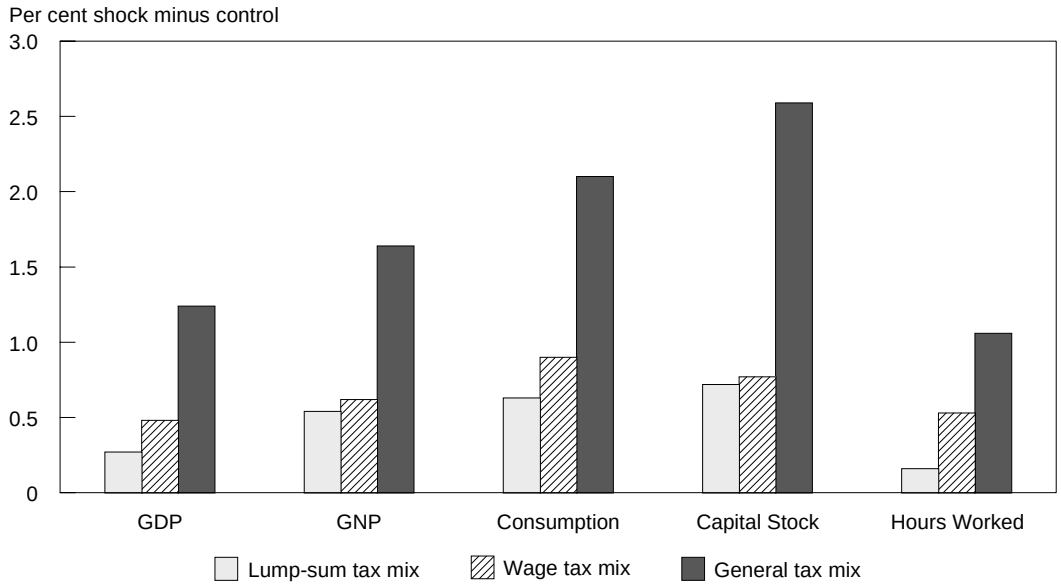


Figure 6.3
Social Welfare Impacts

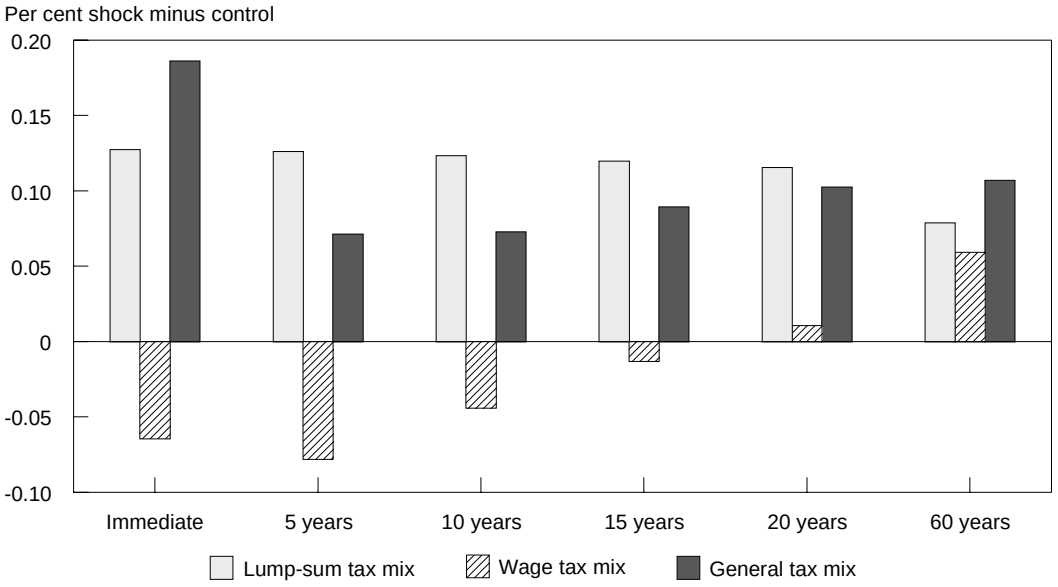
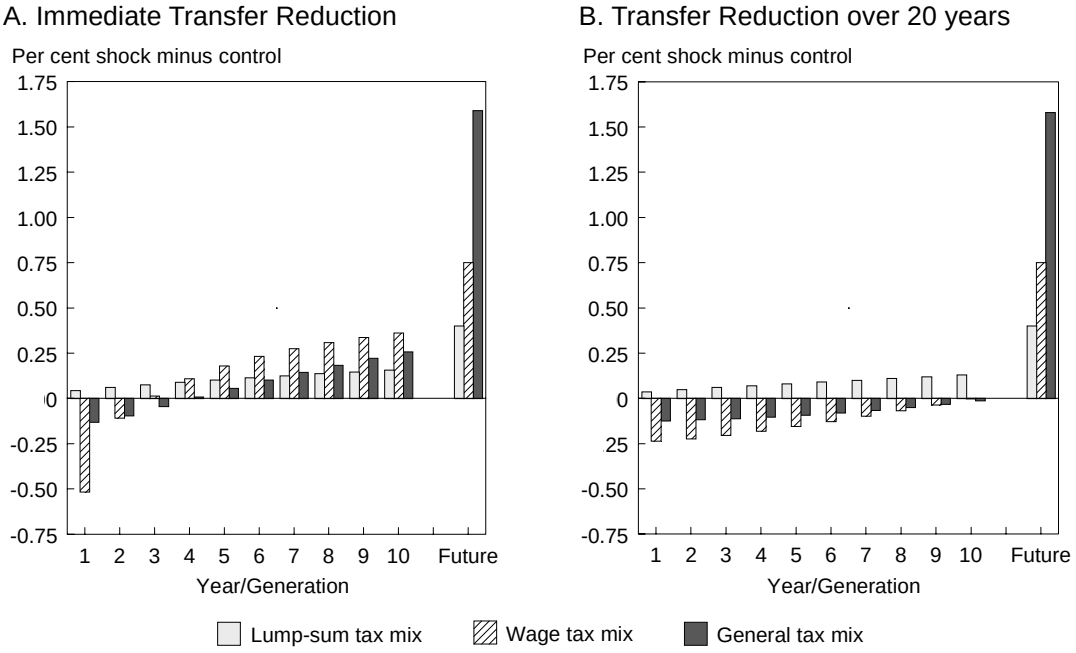


Figure 6.4
Generational Welfare Under Different Transition Horizons



Raising wage taxes in the short-run permanently reduces transfers from future to current generations by reducing the stock of government debt. With a permanently lower debt-to-GDP ratio (and given that the economy is dynamically efficient) this enables the government to run a smaller primary balance surplus. Therefore, after a period of time, the government can actually lower wage taxes below their initial levels. The economic gains achieved in this manner are referred to as the "tax-channel" effects. Long-run economic impacts (shown in Figure 6.2) follow from both the savings and tax-channels.

The long-run economic impacts of reducing intergenerational transfers using wage taxes are moderately higher compared to those under the lump-sum tax mix. In the immediate reduction scenario, wage taxes are increased by approximately 13 percentage points (over 39 percent) above their initial levels to bring about the reduction in transfers. However this increase is extremely short-lived and wage taxes fall permanently by about half a percentage point (approximately 2 percent) below their initial control levels. Since the decline in wage taxes is relatively small, we do not observe extremely large tax-channel effects. The lower wage taxes have their biggest impact on hours worked and GDP.

The use of wage taxes to reduce transfers from future generations significantly lowers per capita consumption in the short-run. This is even more apparent when the reduction is achieved at a relatively fast rate. Given the high weight placed on these levels in the early years of the transfer reduction policy, it is not surprising that the overall effect on social welfare is negative at the higher transfer reduction speeds (see Figure 6.3). Slower reduction speeds induce smaller increases in distortionary wage taxes, and decreases in household consumption levels are spread out more evenly over the transition period. The impact on social welfare is positive at reduction horizons greater than 15 years.

While the overall impact on social welfare is negative at high transfer reduction speeds, Figure 6.4 shows that the impact on generational welfare (welfare viewed from the perspective of current generations in the economy) is negative for only the first few periods. As the speed of transfer reduction slows, the negative impact on generational welfare is stretched out over the transition period. In the scenario where the transfer reduction is achieved in 20 years the impact on social welfare is positive, however, from the perspective of current generations following the onset of the transfer reduction policy, the impact on their welfare is negative.

Intergenerational Transfer Reduction using the General Tax Mix

Under the general tax mix, wage, consumption, capital and corporate taxes are proportionately raised in order to bring about the reduction in transfers from future to current generations. Compared to the short-run impacts observed under the wage tax mix, reducing inter-generational transfers immediately does not impose a higher initial cost in terms of lower output (Figure 6.1, Panel C). The initial impact on GDP under the general tax mix is only one-fourth the size of the decrease observed under the wage tax mix. This result is largely due to the fact that wage taxes are inherently more distortionary in our framework since firms do not face adjustment costs when they change their labour inputs. For example, when capital taxes are temporarily increased, there is less of an incentive (stemming from installation costs) for firms to augment their capital stock. On the other hand, sharp increases in wage taxes—despite the expectation that they will be short-lived—elicit strong labour supply responses.

As the speed of the transfer reduction is decreased, the path the economy takes follows the U-shaped pattern that was observed under the wage tax mix, although the negative impacts are somewhat smaller. The negative impact on GDP in the immediate reduction scenario is not as large in absolute terms as that observed in the 5 and 10 year scenarios. This results from an earlier expectation and realization of the tax reduction benefits. When the transition speed is decreased, the negative impacts are muted, however there is a trade-off because this involves delaying the benefits of lowering taxes.

When the general tax mix is used we observe significantly larger long-run impacts. In the long-run, consumption, capital, wage and corporate taxes are permitted to fall proportionately. Under the immediate reduction scenario, these taxes all have to rise by approximately 1 percentage point (this implies a range of tax increases from 3 to 12%, depending on the nature of the tax). In the long run, these taxes fall permanently by roughly half a percentage point. Compared to the lump-sum tax mix, we observe an approximate five-fold increase in the long-run impact on GDP and hours worked (Figure 6.2). The impact on GNP, consumption and the capital stock is approximately three and a half times larger than that observed under the lump-sum tax mix. The larger tax channel effects are the result of lower capital taxes that reduce the user cost of capital (along with lower corporate taxes) firms face and increase the returns to saving for households. The higher capital stock increases labour productivity and the demand for hours worked. Lower wage taxes increase the return to working and the supply of hours.

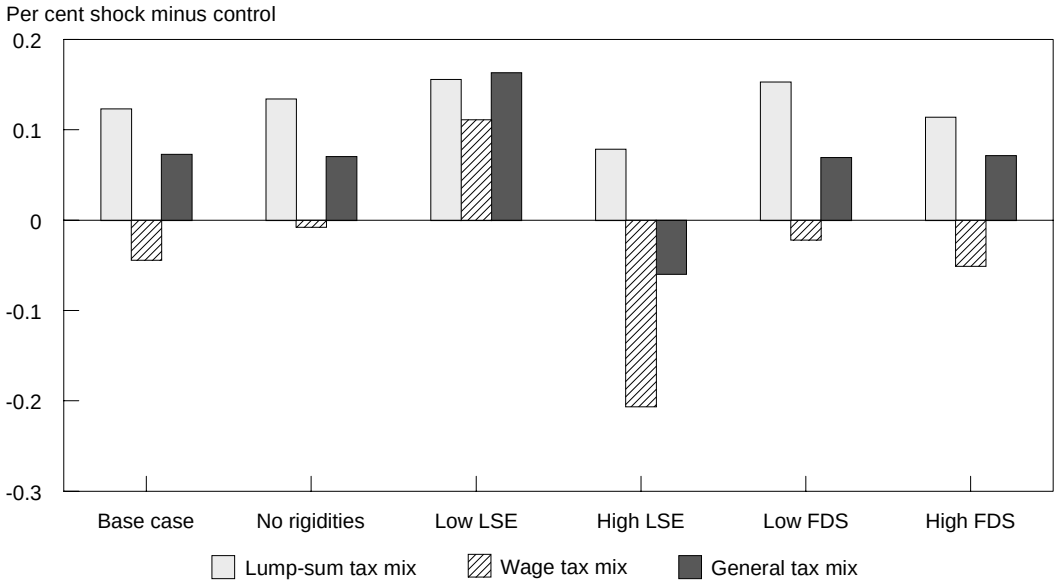
In contrast to the social welfare impacts observed under the wage tax mix, the impacts under the general tax mix are positive at all reduction speeds. In fact, Figure 6.3 shows that the impact on social welfare is the greatest when the reduction is achieved immediately. However, in the other cases where the transfer reduction is not achieved immediately, the positive impact on social welfare increases as the reduction speed is slowed. The larger tax channel effect raises household wealth considerably and this translates into higher consumption per capita.

Compared to the wage tax mix, the impact on generational welfare is modest and the profile resembles the same pattern observed over the transition period (Figure 6.4, Panel A). Decreasing the transfer reduction speed also helps to spread the initial negative impact across more households. In contrast to the wage tax mix, generational welfare improves at a slower rate although it is considerably higher in the long run (Figure 6.4, Panel B). This result follows from the relatively slow response of investment and the capital stock to reductions in corporate and capital taxes brought about by the transfer reduction. Under the wage tax mix, the labour supply response is faster with regard to the expected tax reduction. Consequently, output, consumption and generational welfare rise more rapidly above their control levels under the wage tax mix compared to the general tax mix.

3. Sensitivity to Alternative Assumptions

In this section we consider the 10 year transfer reduction scenario as the base case in terms of the reduction speed, and test the robustness of the base case social and generational welfare results under each taxation mix. The base case parameter values of interest are: the average length of nominal wage contracts (3 years); the momentary elasticity of labour supply (1.0); and the elasticity of substitution between foreign and domestic assets (1.43). We consider alternative average contract lengths of 1 year. The alternative values for the labour supply elasticity (LSE) are 0.2 and 2.0, and the alternative values

Figure 6.5
Social Welfare Impacts under Alternative Assumptions



for the elasticity of substitution between foreign and domestic assets (FDS) are 0.2 and 2.5.

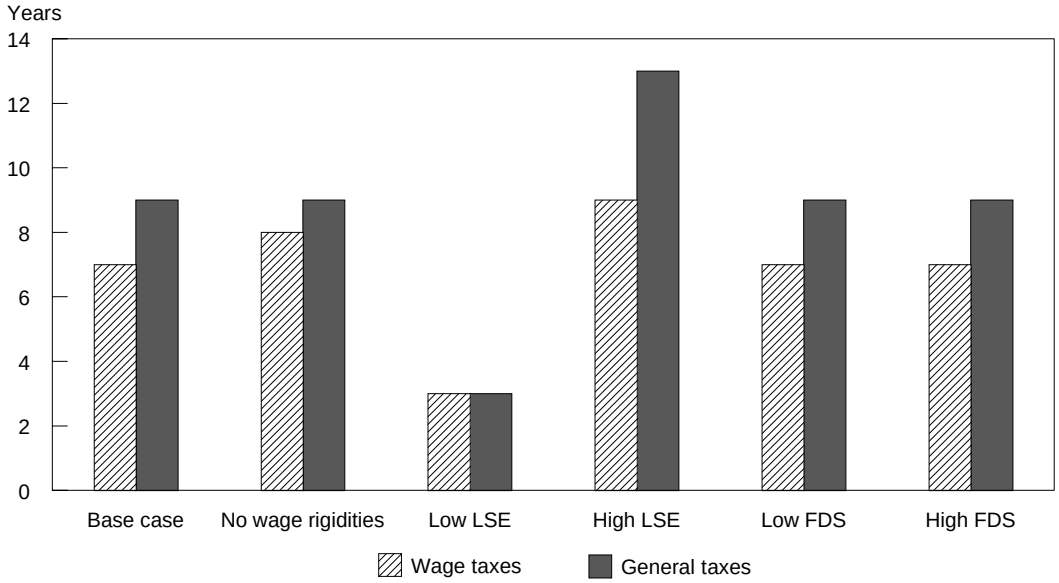
The values of the labour supply elasticity reflect an attempt to compromise between microeconometric studies that typically find "small" elasticities and real business cycle models that are calibrated with "large" elasticities. We consider a range of estimates that some are likely to disagree with. This is a crucial parameter and unfortunately there is a lack of consensus in the literature. Hum and Simpson (1991, p.xvi) survey estimates and conclude that "precise measurement of labour supply response is a very difficult problem—one that economists and econometricians have not yet mastered." Thus, it is important to keep in mind that a range of estimates outside our bands is likely to exist.

Figure 6.5 shows the social welfare impacts under the alternative parameterization assumptions for each of the three tax regimes. In the case of lump sum taxes the base case result appears to be fairly robust. The largest deviation from it is associated with alternative values for the elasticity of labour supply. With a lower LSE value, we observe a higher social welfare impact. This follows, in short, from a larger savings-channel effect that raises the capital stock and consumption above their base case levels. It is also the case that the social welfare impact is lower with the higher FDS value. Here smaller savings-channel effects are occurring—a higher proportion of domestic saving is channelled into reducing the level of net foreign indebtedness instead of augmenting the capital stock. Generational welfare impacts remain close to their base case levels.

The alternative parameter values have a significant effect on the social welfare impact under the wage tax mix. Decreased nominal wage rigidity leads to a moderate improvement over the base case result, but the social welfare impact remains negative. Surprisingly with a lower LSE value the impact on social welfare becomes positive. The muted labour supply response translates into less upward pressure on real wages. Firms do not reduce their demand for hours worked (compared to the base case scenario) and output and consumption do not fall to the same extent. This implies a much smoother transition path for the economy in general. Conversely, it follows that with the high LSE value there is more upward pressure on real wages. Under the alternative parameterization assumptions about FDS, the impact on social welfare is not significantly altered.

Under the alternative low LSE scenario, current generation welfare falls below its control level for only three years, compared to seven

Figure 6.6
Generational Welfare Years below Control Welfare Levels
10-year Transfer Reduction through Wage Taxes



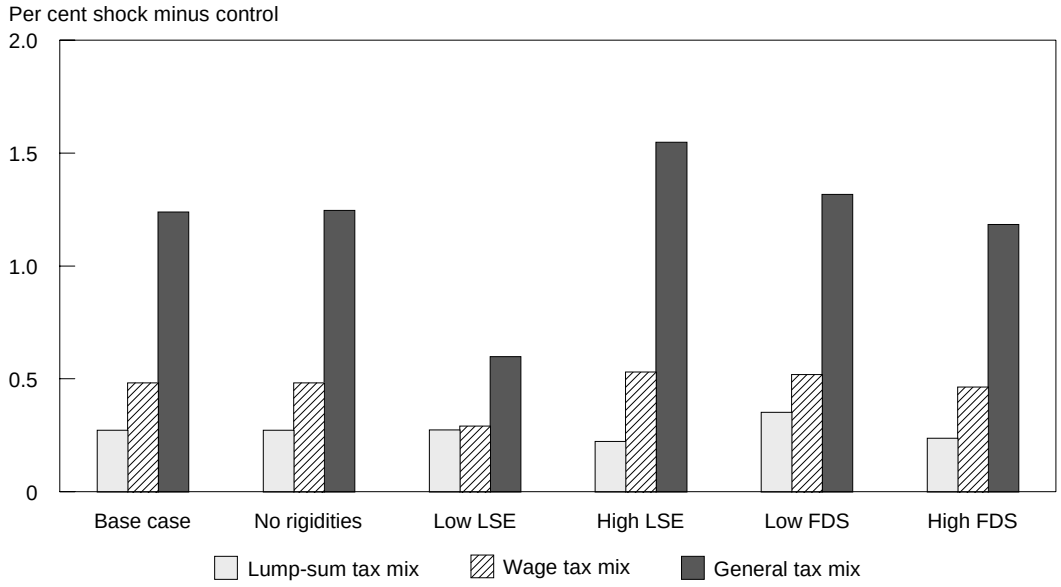
years in the base case (see Figure 6.6). In the base case scenario wage taxes have to be raised substantially because the tax base decreases significantly. With a lower LSE value, the tax base does not shrink as much when wage taxes are increased. Under the high LSE value, generational welfare falls substantially over the transition period. The impacts under the alternative contract length and FDS values are fairly robust.

In the case of the General tax mix the social welfare impacts are extremely robust, with the exception of the alternative LSE parameter value scenarios. The positive social welfare impact under the low LSE scenario is approximately double the size observed in the base case. The impact also exceeds that observed in the low LSE scenario under the wage taxation mix. In the high LSE scenario, the impact on social welfare is negative, though it does not reach the low level observed under the wage taxation mix.

Generational welfare impacts under the general tax mix are also sensitive to the alternative LSE parameter values (Figure 6.6). Under the low LSE scenario, generational welfare falls below its control level for only three years compared to nine years in the base case scenario. Generational welfare remains below its control level for ten years in the high LSE scenario, however, the impact on households over this period is more severe compared to the base case scenario. Welfare impacts under the other alternative parameter values are robust.

The welfare results presented above are sensitive to alternative values for the labour supply elasticity. In some cases, the social welfare impacts are reversed. By construction, the social welfare measure places relatively high weights on short-run movements in consumption per capita. Alternative LSE values accentuate these movements and this in turn leads to dramatic swings in the impact on social welfare. In contrast, the long-run impacts on GDP (presented in Figure 6.7) are robust to the alternative parameterization assumptions. Under the general tax mix, decreasing LSE by 80 per cent reduces the long-run impact by approximately one-half, and doubling the LSE value increases the impact by only 25 per cent.

Figure 6.7
Long-Run GDP Impacts under Alternative Assumptions



4. Conclusion

In the scenarios we examine reducing transfers from future to current generations involves temporary tax increases. The increase in revenue is used to reduce the stock of government debt. Transitional economic and welfare impacts depend on the speed at which the intergenerational transfer reduction is carried out, and the nature of the tax mix used to achieve the reduction. In general, faster reduction speeds impose higher costs, except under the lump-sum tax mix and when the reduction is achieved immediately under the general tax mix. The long-run economic and social welfare impacts of the transfer reduction are significantly higher under the general tax mix compared to the wage tax mix. Lower capital and corporate taxes lead to larger increases in the capital stock. The higher capital stock raises labour productivity and the demand for hours worked. Impacts observed under the lump-sum and wage tax mixes are closely tied to the benefits from higher domestic saving and reduced net foreign indebtedness.

Simulations incorporating alternative parameterization assumptions indicate that the economic and welfare impacts are robust to alternative values for the nominal wage contract length and the elasticity of substitution between foreign and domestic assets. However, in some simulations the social welfare impacts were sensitive to the alternative labour supply elasticity parameterization assumptions.

As an important caveat, it should be stressed again that other options exist (with regard to the financing of intergenerational transfer reductions) that could be superior in terms of the economic and/or social welfare impacts. Alternative options such as cuts in government spending followed by increases in investment and/or tax cuts are not examined in this analysis. This would need to be done in order to address the issue of optimal financing mix.

End Notes

This paper does not reflect the views of the Department of Finance. The authors thank Miles Corak and an anonymous referee for helpful comments.

Bibliography

AMBLER, S., GUAY, A. and L. PHANEUF (1996). "Nominal Wage Contracts and Business Cycles." Université du Québec à Montréal, unpublished.

ASCAH, L. and A. ASIMAKOPULOS (1990). "Public Pensions: A Social Response or a Misuse of Individual Saving." In A. Asimakopulos et al. (eds.). *Economic Theory, Welfare and the State*. Montreal: McGill-Queen's University Press.

AUERBACH, A.J., and L.J. KOTLIKOFF (1987). *Dynamic Fiscal Policy*. Cambrigde: Cambridge University Press.

BARRO, R.J. (1974). "Are Government Bonds Net Wealth? " *Journal of Political Economy*. Vol. 82, 1095-1117.

BAXTER, M. and R.G. KING (1983). "Fiscal Policy in General Equilibrium," *American Economic Review.* Vol. 83, 315-34.

BLACK, R., T. MACKLEM, and S.POLOZ (1993). "Non-Superneutralities and Some Benefits of Disinflation: A Quantitative General Equilibrium Analysis." In *Economic Behaviour and Policy Choice Under Price Stability*. Proceedings of a conference held at the Bank of Canada.

BLANCHARD, O.J. (1985). "Debt, Deficits and Finite Horizons," *Journal of Political Economy.* Vol. 93, 223-47.

BLANCHARD, O.J. and S. FISCHER (1989). *Lectures on Macroeconomics*. Cambridge: MIT Press.

BUITER, W.H. (1988). "Death, Birth, Productivity Growth and Debt Neutrality," *Economic Journal.* Vol. 98, 279-93.

CARDIA, E. (1994). "The Effects of Fiscal Policies in a General Equilibrium Model with Nominal Wage Contracts." Département de Sciences Économiques and CRDE, unpublished.

DAHLBY, Bev (1994). "The Distortionary Effect of Rising Taxes." In W.B.P. Robson and W.M. Scarth (eds.). *Deficit Reduction: What Pain, What Gain?* Toronto: C.D. Howe Institute.

GORDON, R. H. (1985). "Taxation of Corporate Capital Income: Tax Revenues Versus Tax Distortions." *Journal of Quarterly Economics*. Vol. 10, 1-27.

GOULDER, L.H. and L.H. SUMMERS (1989). "Tax Policy, Asset Prices and Growth: A General Equilibrium Analysis," *Journal of Public Economics*. Vol. 38, 265-96.

GOULDER, L.H. and B. EICHENGREEN (1992). "Trade Liberalization in General Equilibrium: Intertemporal and Inter-industry Effects." *Canadian Journal of Economics.* Vol. 25, 253-80.

GREENWOOD, J. and Z. HERCOWITZ (1991). "The Allocation of Capital and Time over the Business Cycle." *Journal of Political Economy*, Vol. 99, 1188-214.

HUM, D. and W. SIMPSON (1991). *Income Maintenance, Work Effort, and Canadian Mincome Experiment*. Ottawa: Economic Council of Canada.

JAMES, Steven (1994). "Debt Reduction With Distorting Taxes and Incomplete Ricardianism: A Computable Dynamic General Equilibrium Model." In W.B.P. Robson and W.M. Scarth (eds.). *Deficit Reduction: What Pain, What Gain?* Toronto: C.D. Howe Institute.

JAMES, S. and C. MATIER (1995). "The Long-Run Impacts of Government Debt Reduction." Department of Finance, Working Paper 95-08.

JOHNSON, David (1994). "Ricardian Equivalence: Assessing the Controversy for Canada." In W.B.P. Robson and W.M. Scarth (eds.). *Deficit Reduction: What Pain, What Gain?* Toronto: C.D. Howe Institute Policy Study.

KING, R.G., C.I. PLOSSER, and S.T. REBELO (1988). "Production, Growth and Business Cycles: I. The Basic Neoclassical Model," *Journal of Monetary Economics.* Vol. 21, 195-232.

KOTLIKOFF, L.J. (1992). *Generational Accounting: Knowing Who Pays, and When, for What We Spend.* New York: Free Press.

KOURI, P.J.K. (1976). "The Exchange Rate and the Balance of Payments in the Short Run and in the Long Run." *Scandinavian Journal of Economics.* Vol. 78, 280-304.

LAVOIE, C. (1995). "Le secteur non-commercial dans le modèle d'équilibre général calculable," Department of Finance, unpublished mimeo.

LUCAS, R.E. Jr. (1967). “Adjustment Costs and the Theory of Supply.” *Journal of Political Economy.* Vol. 75, 321-34.

MACKLEM, R.T. (1991). “Terms of Trade Disturbances and Fiscal Policy in a Small Open Economy.” Paper given at the meetings of the Canadian Macroeconomics Study Group.

MACKLEM, R.T., D. ROSE and R. TETLOW (1994). “Government Deficits and Debt in Canada: A Macro Simulation Analysis.” In W.B.P. Robson and W.M. Scarth (eds.). *Deficit Reduction: What Pain, What Gain?* Toronto: C.D. Howe Institute.

_____ (1995). “Government Debt and Deficits in Canada: A Macro Simulation Analysis.” Bank of Canada, Working Paper 95-4.

MEHRA, R. and E.C. PRESCOTT (1985). “The Equity Premium: A Puzzle.” *Journal of Monetary Economics.* Vol. 15, 145-61.

MERTON, R.C. (1971). “Optimum Consumption and Portfolio Rules in a Continuous Time Model.” *Journal of Economic Theory*. Vol. 3, 373-413.

OBSTFELD, M. (1982). “Aggregate Spending and the Terms of Trade: Is There a Laursen-Metzler Effect?” *Quarterly Journal of Economics*. Vol. 97, 251-70.

PRESCOTT, E.C. (1986). “Theory Ahead of Business Cycle Measurement.” *Federal Reserve Bank of Minneapolis Quarterly Review*. Vol. 10, 9-22.

SAITO, M. (1992). “On the Stationary Distribution of Risk Premia in an Economy with Stockholders and Non-Stockholders: A Simple Explanation for the Equity Premium Puzzle.” Paper presented at the Canadian Macro-economic Study Group Meetings.

SEATER, J.J. (1993). “Ricardian Equivalence.” *Journal of Economic Literature.* Vol. 31,142-90.

SUMMERS, L.H. (1981). “Taxation and Corporate Investment: A Q-Theory Approach.” *Brookings Papers on Economic Activity*. Vol. 1, 67-127.

TABELLINI, G. (1991). “The Politics of Intergenerational Redistribution,” *Journal of Political Economy*. Vol. 99, 335-57.

WEIL, P. (1987). “Love Thy Children: Reflections on the Barro Debt Neutrality Theorem.” *Journal of Monetary Economics*. Vol. 19, 377-91.

_____ (1989). “Overlapping Families of Infinitely-Lived Agents.” *Journal of Public Economics.* Vol. 38, 183-98.

YOTSUZUKA, T. (1987). “Ricardian Equivalence in the Presence of Capital Market Imperfections.” *Journal of Monetary Economics*. Vol. 20, 411-36.

Chapter 7

The Effects of Debt Reduction on Intergenerational Equity and Growth

MARCEL MÉRETTE

Many governments have adopted policies aimed at reducing public debt. Although the long-run fiscal dividends of such policies largely depend on the size of the debt-to-GDP cut, the short and medium run effects are more dependent on the type and speed of measures taken. In addition to the long-run effects, a debt-to-GDP reduction raises two other issues. The first is related to the transition path taken by the economy moving from a high to lower debt-to-GDP steady state. The second is related to the welfare effects across present and future generations.

This chapter investigates and quantifies how transitional economic growth and welfare across generations are affected by debt reduction policies. A computable overlapping generations model calibrated to the Canadian economy is used to conduct the analysis. The model's features include endogenous growth through the accumulation of physical and human capital, perfect international mobility of physical capital, and an endogenous labour-leisure-education time decision that is affected by distorting taxes. Distorting taxes are applied on wage and interest income and on consumption. Tax revenues and government deficits finance government expenditures, lump-sum transfers and interest payments on the public debt. Public goods do not enter as arguments in the utility nor the technology specifications.

In the model simulations, debt-to-GDP reductions are achieved through temporary increases in taxes (or reductions in lump-sum transfers). The focus is on the transfer of the government solvency burden from future to current generations. Debt reductions achieved by non-transfer spending cuts are not considered, thus this study does not address the welfare implications of cuts in the supply of public goods, in public investments, or cuts in distorting (as opposed to lump-sum) transfers.

The simulation experiments that are conducted consist of transferring the net tax burden of future generations to current generations through a 5 percentage point permanent reduction of the debt-to-GDP ratio. A lower debt-to-GDP ratio allows smaller debt interest payments. Tax (lump-sum transfers) increases (reductions) are thus followed by reductions (increases) in taxes (lump-sum transfers), while the dynamic path of non-transfer expenditures is maintained. The results are driven by private behavioural responses to the new dynamic pattern of taxes or transfers. The main results are: [1] a faster approach in achieving debt reduction implies larger growth deviations with respect to the initial rate, a higher rise in the long-run GNP and, in most cases, a lower number of generations suffering welfare deterioration; [2] shifting the generational consumption and wage tax burdens generates larger and generally more positive growth and welfare effects than shifting the transfers burden; [3] old generations suffer small welfare losses in comparison with the welfare improvement of younger and future generations; [4] the smallest number of generations suffering a welfare deterioration occurs when debt reduction is achieved using a consumption tax; and [5] the endogenous growth feature of the model, through the presence of human capital, magnifies the growth and welfare results.

The rest of the paper is organized as follows. Section 1 reviews the growth effects of fiscal policies in the endogenous growth literature and discusses the role played by alternative model specifications. Section 2 describes the simulation model in detail. Section 3 reports the values of key parameters used in the model and some stylized lifecycle and intergenerational profiles. Section 4 reports and discusses the results of policy simulations. Section 5 provides some concluding remarks.

1. Deficits, Taxes and Endogenous Growth Models

The model I use stresses the importance of capital accumulation in a two-sector endogenous growth model.[1] Private agents internalize the returns from capital accumulation activities. Although the accumulation process is compatible with perfect competitive markets and zero total factor productivity growth, it is incompatible with zero marginal products in the accumulating factors (Jones and Manuelli, 1990; Mulligan and Sala-i-Martin, 1993). Constant returns technologies in the accumulating factors generate a balanced growth path that is compatible with the stylized facts of economic growth described by Kaldor (1963).

There are a number of important contributions on the issue of fiscal deficit and intergenerational welfare in the literature. Building on the seminal work of Buiter (1981), Persson (1985) analyzes the intergenerational welfare effects of a temporary deficit-financed tax cut in a two-period overlapping generations model for a closed, a small open, and a world economy composed of two economies with market power in the international capital market. He finds that if the economy is dynamically efficient, a temporary deficit-financed tax cut to the current young generation raises their well-being at the expense of future generations, and the size of the intergenerational redistribution diminishes as the economy approximates a small open economy. Burgess (1996) examines the same issue but for an economy that has unexploited market power in exports. He finds that the effects from a temporary tax cut to the current young generation is greater than it is in a small open economy because there is a permanent deterioration in the temporal terms of trade. Although the contributions of these papers are important, the analysis is conducted under the assumption of exogenous growth. In the endogenous growth literature the issue of fiscal deficit and growth is covered indirectly through the examination of the relationship between taxes and growth.

Quantitative studies using two-sector endogenous growth models have reported widely differing results on the effects of taxes on growth.[2]

In a two-sector growth model, a tax change will generate intersectoral and intertemporal reallocations. The greater the intertemporal reallocation is relative to the intersectoral reallocation, the higher will be the growth effect of a new tax policy. When the specification of the human capital production function is symmetric to physical capital,[3] tax policies have qualitatively similar effects on both accumulating activities. However, when the production function specifications differ, there is more scope for intersectoral reallocation.

Human capital can further differ from physical capital by being non-substitutable with consumption and a non-market good. While human capital is not substitutable with consumption, it can be with leisure if both activities share the property of being intensive in time. An elastic labour supply function provides another avenue by which agents can respond to changes in human capital returns and thus strengthens the effects of taxes on growth (as in Jones, Manuelli and Rossi, 1993). The non-marketability of human capital implies that some inputs used for its production are not subject to direct factor income taxation. Asymmetric tax burdens across sectors favours intersectoral rather than intertemporal reallocation. To summarize, symmetric production functions and symmetric sectoral tax burdens, combined with elastic labour supply, lead to stronger tax policy growth effect.

All the aforementioned quantitative studies use the representative agent (Ramsey) framework. The model used here has an overlapping generations (OLG) framework. There is a common view in the literature which claims that although the Ramsey and OLG models have very different theoretical frameworks, they yield in practice rather similar results for tax problems.[4] This view and the fact that the Ramsey structure is analytically more tractable explain why only a few tax policy investigations have been conducted using an OLG endogenous growth model.[5] However, this view does not hold for endogenous growth models. Jones and Manuelli (1992) show that the observational equivalence between overlapping generations and infinitely lived agent models does not hold when growth is endogenously driven. Mérette (1997a) shows that life-cycle issues may significantly affect growth results. Moreover, since each maximizing agent has a different finite planning horizon in an OLG framework, their marginal propensities to spend and save differ. As a result, even if the long-run effects with an OLG structure were similar to those obtained with a Ramsey structure, the adjustment path of such economies to various shocks will differ from the adjustment path of

economies with agents who have infinite planning horizons.

2. The Model

The 55 generations included in the model are members of the active population, and are 17 to 71 years of age.[6] Since every generation has 55 periods to live, there are 55 generations living side by side at each point in time in the economy. The economy's population growth rate is exogenous. There are two sectors in the economy: final goods and post-secondary education. Growth is generated by the accumulation of physical capital produced in the final goods sector and imported from foreign sources, and of human capital produced in the post-secondary education sector.

Human versus Physical Capital

Human capital is differentiated from physical capital in many dimensions. First, human capital, unlike its counterpart, is non-substitutable with consumption. Second, it is a non-market good which implies that the benefit from investing in human capital is the stream of future net revenue from labour supply. Third, it is embodied in people with finite lifetimes. The combination of this dimension with the previous one has important life-cycle implications. For example, the intertemporal trade-off is not between current and next period consumption, but between current and rest-of-life consumption. With such a trade-off, human capital investment decisions depend upon previous decisions and the entire future payoff. Fourth, human capital is produced using a different technology than physical capital which strengthens intersectoral effects. Fifth, human capital stock accumulated by living generations is transmitted to future generations in order to allow aggregate human capital accumulation and ensure the existence of a balanced growth path. The transmission process is based on the fact that although each person has only a finite number of years that can be spent acquiring human capital, any nonrival good that this person produces (a mathematical theorem; a patent; a blueprint; new ideas; new way of working) or shares with others (teaching, supervision) lives on after the person dies. The transmission of those nonrival goods is captured in the model by the presence of a basic educational institution that transfers a fraction of the stock of human capital accumulated by living to succeeding generations. The basic educational institution disembodies a portion of human capital accumulated by living generations for the benefit of the new generation. Aggregate human capital can thus grow without bound. This is represented in my model by a function that transfers a constant fraction of the aggregate stock of human capital to the new generation. It should be noted this function implies that during the first years of life (0-16), the decision to develop and acquire human capital is not made by the owners of human capital, but by the owners' parents and teachers, by governments, and by society as a whole through its educational and social institutions. A deterioration or an improvement of the social institutions would alter the transmission process of human capital and growth. However, this issue is not dealt in this paper as it is beyond its scope. Physical capital is transferred from living to succeeding generations through the market. Sixth, human capital is immobile internationally while physical capital is perfectly mobile. This characteristic of human capital combined with the transmission institution imply that human capital is the only non-traded accumulating factor in the economy and thus makes human capital the real engine of growth. An increase in domestic physical wealth reduces foreign debt but does not stimulate growth.[7] Finally, a positive depreciation rate for human capital but zero depreciation rate for physical capital are assumed. This assumption reflects the fact that the physical capital depreciation is commonly tax deductible while human capital depreciation is not.

Technologies and Firm Behaviour

The final goods sector production depends on physical capital and effective labour. All firms are identical. As first proposed by Tinbergen (1942) and corroborated by Jorgenson et al. (1987), the aggregate production function is a useful simplification for modelling aggregate long-run growth. Technology is assumed to be Cobb-Douglas.[8] Effective labour is the sum over the individuals' fraction of human capital stocks allocated to the labour market. Physical assets can be accumulated as foregone consumption which is equivalent to assuming that physical capital goods are produced in a separate sector that has the same technology as the final-output sector.

Factor demands stem from profit maximization by the firms. Firms rent physical capital from domestic and foreign sources at the world rental rate and hire domestic labour at the

wage rate per unit of effective labour, up to the point at which their marginal products equal their marginal costs. With a given interest rate and a constant returns to scale production function, the economy's capital-effective labour ratio is determined independently of domestic conditions, as is the gross wage per effective unit of labour. The firm's wage bill is thus the product of the gross wage rate times the stock of human capital allocated to the labour market by all living individuals.

The post-secondary education (human capital formation) sector is described by a well-behaved technology, linear with respect to human capital and strictly concave with respect to education time. The technology is personified in the sense that production of new human capital by each generation depends on its own human capital stock accumulated and time allocated to education. The decision process is totally internalized at the post-secondary level. These two features contrast sharply with basic level acquisition of human capital by new generations, which is a constant fraction of the stock accumulated by previous generations. Total production of new human capital in the economy is simply the sum of all individuals' production. The plausible assertion that post-secondary education is relatively human capital intensive is translated into an extreme specification in which only human capital and education time are used to produce new human capital. Physical capital plays no role. A relaxation of these assumptions preserving the factor intensity orderings used here would not likely change the basic dynamics of the model.

If human capital accumulation was treated as a series of discrete indivisible investments that are not produced by a deterministic well-behaved production process, then the production technology for human capital would have to take explicit account of both integer constraints and uncertainty. There is no doubt that both indivisibility and uncertainty are important at the individual level and over short periods of time. The simplifying assumption made here is not crucial to a first-pass analysis of human capital accumulation at the generational and aggregate level.

Individual Behaviour

There is a representative individual for each generation. Each individual maximizes an intertemporal (constant elasticity of substitution) utility function with final goods consumption and leisure activity as arguments, subject to two accumulation conditions (one for physical wealth, the other for human capital) and an endowment time constraint. With constant effective wage rates, a generation's lifetime profile of wage income is determined by a fraction of its human capital stock allocated to the labour market. Interest income is determined by its stock of physical wealth. At any age, each individual allocates a specific proportion of its time endowment towards leisure, work, and human capital formation (education time). Every individual also allocates its disposable income towards consumption and savings. Leisure activity has a quality time feature, meaning that utility from leisure equals the product of time allocated to that activity and the accumulated stock of human capital.

The cost of investing in human capital is the current wage income. Investment returns in education are a stream of net revenue from future labour supply. If the interest rate net-of-tax is large, then the present discounted value of the stream of net revenue will be lower. Less human capital will be allocated to education, and the growth rate will be lower. This follows directly from the assumption that the benefits of education come largely in the future and that the costs are incurred immediately.

Because of the distinct properties of physical and human capital, the investment decision in both assets are subject to lifecycle incidences. Since the returns to human capital are the discounted sum of future wage revenues, it is rational to invest in the post-secondary education sector when young. Since the principal of the physical asset can be sold, it is rational to prefer this asset for old aged retirement preparation. The 55 generations can thus be divided into three important groups: the young, the middle-aged, and the old. The young invest mainly in human capital and work a little, the middle-aged invest mainly in physical capital and work a lot, and the old do not invest and work much, but consume a large amount of leisure.

An important qualification to the analysis is the absence of private intergenerational transfers. It is well known since Barro's (1974) study that such transfers may lead to public debt neutrality (Ricardian Equivalence). Bequest motives are absent from this model, hence Ricardian Equivalence does not hold. The transmission of human capital to future generations is a nonrival and nonexcludable good. Neither old nor new generations internalize the transmission process.

Table 7.1
Taste and Technology Parameters

Stationary growth rate	.02327
Population growth rate	.01226
Physical capital output share	.345282
Pre-tax interest rate	.072943
Interest income tax rate	.46
Sales tax rate	.10
Wage income tax rate	.29
Depreciation rate of human capital	.02
Human capital production class time coefficient	.6
Intertemporal elasticity of substitution	.25
Intratemporal elasticity of substitution (consumption vs. leisure)	.8
Pure rate of time preference	.0016

3. Key Parameters and Lifecycle Profiles

Given the constant returns to scale production functions with respect to accumulating inputs in both sectors, the basic-educational institution, and the time endowment, all income, consumption, and wealth variables grow at a constant rate on the benchmark balanced growth path. Moreover, each generation's life-cycle time allocations chosen with respect to leisure, work and education time are continuously repeated. The taste and technology parameters are reported in Table 7.1.

The balanced path growth rate is the Canadian average real GDP growth rate between 1981 and 1995. The population growth rate is the average rate over the same period of the population aged 15 to 64. With these GDP and population values, the per capita trend of income, consumption, wealth and debt is 1.01%. Real pre-tax interest and tax rates are taken from 1995. The world interest rate is higher than the growth rate, which rules out equilibria that are dynamically inefficient.

The depreciation rate of human capital is a weighted average of empirical findings. Mincer (1974) reports .012; Heckman (1976) .002; and Haley (1976) suggests .03 to .04. Ours is .02. Intertemporal and intratemporal elasticities of substitution are those used by Auerbach and Kotlikoff (1987). The rate of time preference is one of the calibrated parameters that ensures a general equilibrium. Its calibrated value of .0016 is comparable to that used in other numerical overlapping generations models (Auerbach and Kotlikoff used a value of .015 and Davies and Whalley used a value of .001).

Government Behaviour

The government may enter the economy in several ways but to keep the analysis simple government expenditures are restricted to lump-sum transfers, public good expenditures, and interest payments on the public debt. In each period, the government collects consumption, wage, and capital income taxes from each generation. It is assumed that the residence principle applies to the capital income tax. Any deficit in the government budget has to be covered by borrowing which increases its debt. The government's debt instruments are one period bonds that pay the current interest and principal in the next period. Government spending is simplified in two ways in the model. First, lump-sum transfers are assumed equally distributed to individuals. Second, public good expenditures do not affect private consumption nor production in the model.

Equilibrium Conditions and Initial Balanced Growth Path

Besides the equilibrium conditions for factors of production in the final goods sector, foreign debt must equal the sum of domestic physical capital and government debt minus private wealth. The model is calibrated with a positive foreign debt on the initial balanced growth path. As Buiter (1981) shows, a current account deficit is possible along a balanced growth path in a one-good overlapping generations model. It is only necessary to assume that the country has a higher pure rate of time preference than the rest of the world.

Figure 7.1
Time Allocation

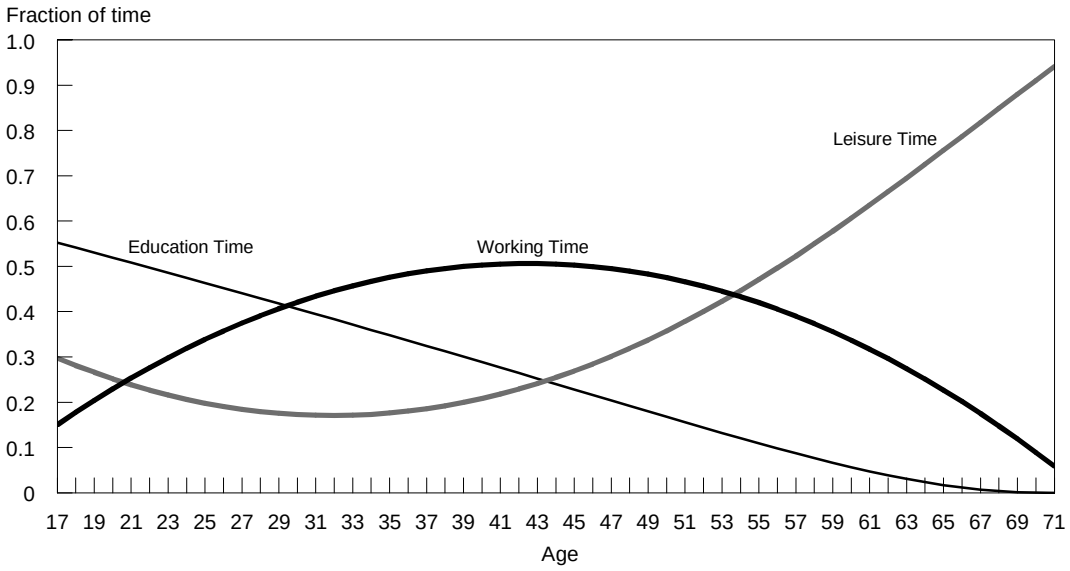


Figure 7.2
Human Capital Profiles

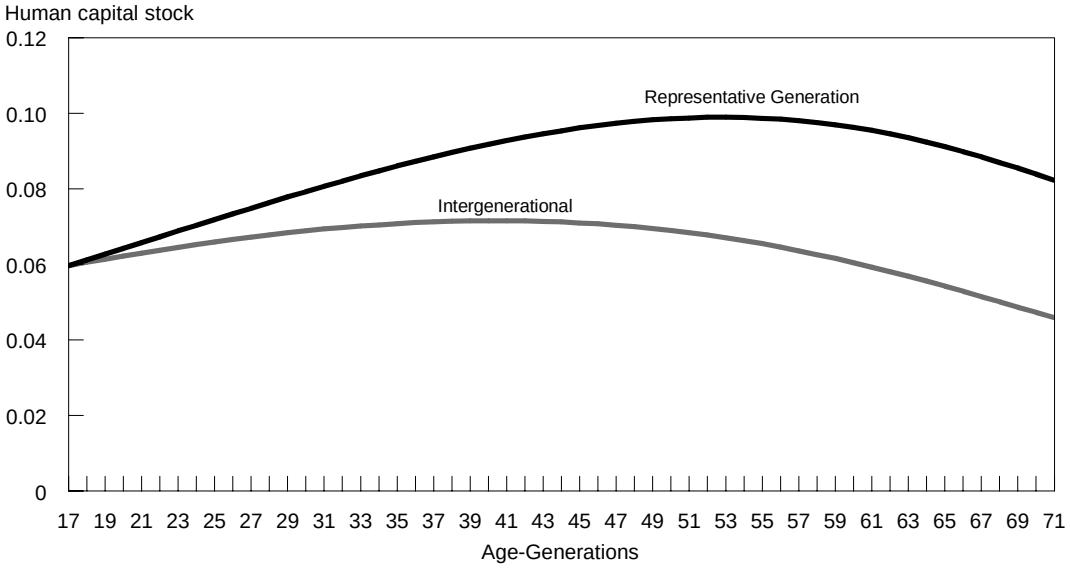


Figure 7.3
Wealth Profiles

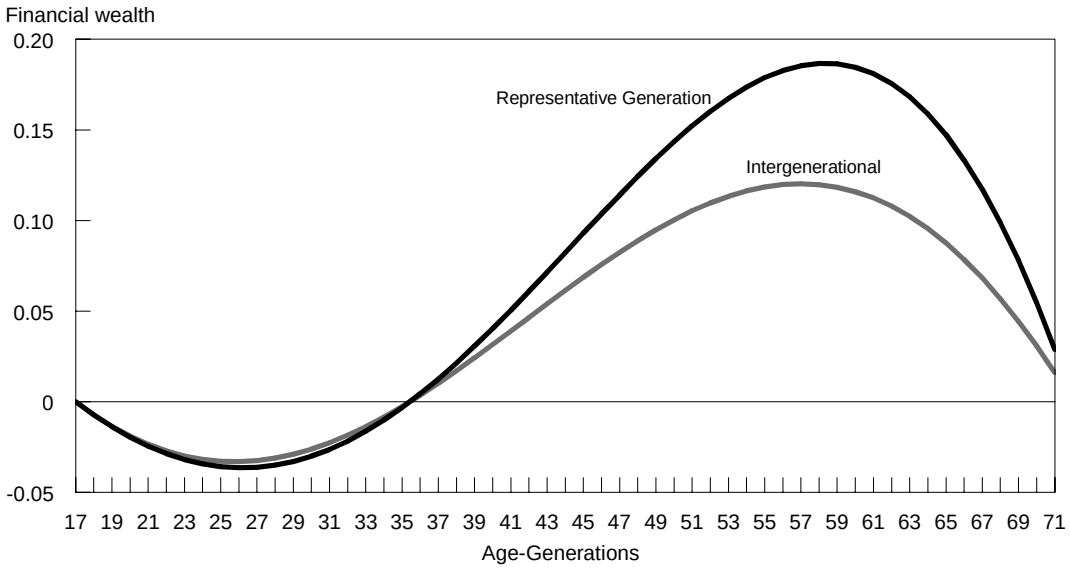


Figure 7.4
Age-Tax Incidence

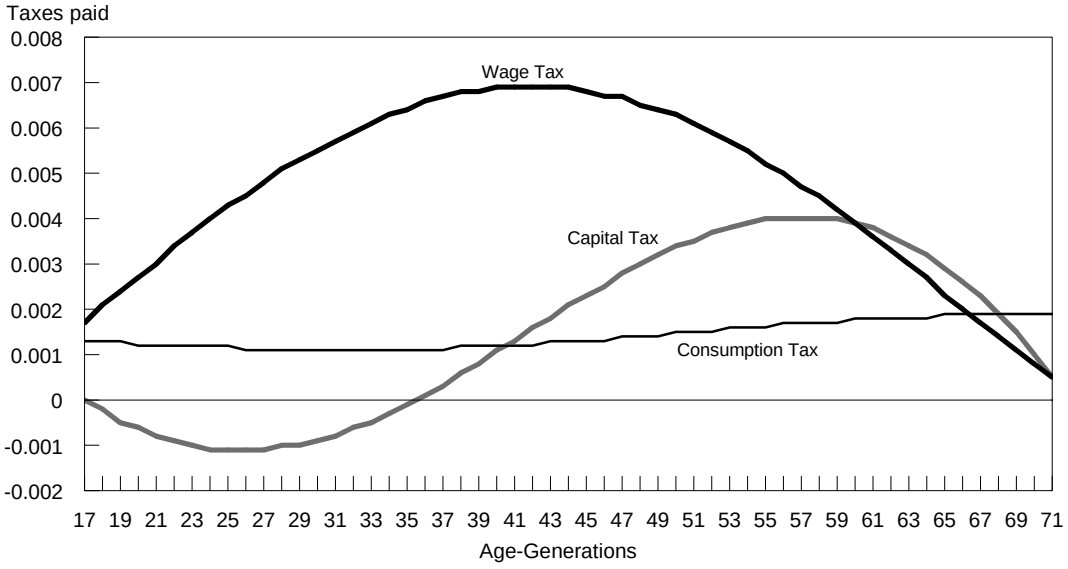


Table 7.2
Time Allocation*

Age	Time Endowment (Hours)	Education (percentage)	Leisure (percentage)	Working (percentage)
15-24	11.4	27.2	47.4	25.4
25-34	9.8	4.1	49.0	46.9
35-44	9.8	2.1	46.9	51.0
45-54	9.9	2.0	52.5	45.5
55-64	9.0	.02	68.9	30.0
65+	8.2	0	93.9	6.1

* The numbers were calculated by the author. Endowment time corresponds to the sum of productive activity and free time in the report. Percentages are with respect to total hours. Education time corresponds to educational activity, and leisure to free time.
Source: Harvey (1991).

It is useful at this point to examine some important lifecycle and age incidence profiles. Figure 7.1 reports the time allocation of a typical generation.[9] Time allocated to human capital formation (education time) is over 50 per cent at 17 of age and then declines steadily to zero. The working time profile has a bell shape with a maximum at the beginning of the 40's. The leisure time profile has a convex shape absorbing almost all time endowment at 71 years old. Because human capital formation is realized mainly at a young age but depreciates at a constant rate, the lifecycle profile of human capital stock is concave, as shown by the darker line in Figure 7.2. Human capital increases rapidly initially, but as education time declines the depreciation rate dominates and the stock starts to decline at age 55. Since growth is constant on the balanced growth path, each new generation starts at age 17 with a human capital endowment higher than that of the previous generation. The intergenerational profile of the stock of human capital at a point in time is therefore smoother as shown by the lighter line in Figure 7.2. The darker line in Figure 7.3 represents the financial wealth profiles of a representative generation while the lighter line represents the intergenerational profile at a point in time. Notice that financial wealth is negative until aged 37 and becomes positive thereafter. Because savings serve to smooth consumption, wealth declines during old age and the amount left at aged 71 is spent entirely to finance last period consumption. The positive growth rate in the stationary state implies that the standard deviation of wealth across generations is lower than the deviation over the life of each generation. The leisure preference parameter that was necessary to derive these profiles is convex with respect to age, declining slowly from age 17 to 31, then rising continuously until age 71. Finally, Figure 7.4 illustrates the intergenerational tax incidence of the three type of taxes in the model. Consumption taxes are equally distributed across generations, while the middle-aged and the old bear the bulk of the wage tax and interest income tax, respectively.

It should be emphasized that the profiles generated by the calibration procedure do not exactly correspond to the facts, but are nonetheless realistic. On time allocation, Jones (1995) reports a declining trend in formal education with respect to age. Harvey (1991) reports hours per day allocated to productive and leisure (free time) activities for age group of ten years. As explained in Table 7.2, the numbers of hours reported suggest a bell shape profile with respect to age for working time, and a non-linear shape profile for leisure activity as the one illustrated in Figure 7.1. The human capital profile follows from the education time profile. The financial wealth profile is typical of life-cycle models. It is known that explaining financial wealth accumulation solely on the basis of zero bequests generates a relatively low saving rate and ratio of financial wealth to income. The profiles generated by the calibration procedure are similar to those reported by Auerbach and Kotlikoff (1987) and Davies and Whalley (1991).

4. Simulation Analysis

The experiment considered is a permanent reduction in the total government debt-to-GDP ratio of 5 percentage points. To fully understand the role of the different policy instruments in growth and welfare, the resulting reduction in debt

Table 7.3
Level Effects: Percentage Change at Year 2020
With Respect to Base Case

			GDP	GNP	Foreign Indebtness
Transfers	one-year case		.03	.62	-1.10
	five-year case		-.04	.32	-0.72
Consump. Tax	one-year case		.39	1.99	-2.59
	five-year case		.07	.49	-0.63
Wage Tax	one-year case	exogenous	-.051	2.16	-4.17
		endogenous	-.034	2.18	-4.37
	five-year case	exogenous	.012	1.31	-2.39
		endogenous	.016	1.37	-2.50

servicing costs is channelled into proportional reductions of the same instrument used to reduce the debt-to-GDP ratio. A one- and a five-year case are considered. The five-year case debt cut is gradual, that is with a 1 percent debt-to-GDP ratio cut for each year. It is supposed that the policy mix is implemented in 1995 without advance notice. As the government is credible, the incremental debt-to-GDP cuts in the five-year case are anticipated once the policy mix is implemented. The welfare analysis is based on Lucas (1987) and was used for growth analysis by King and Rebelo (1990). Welfare changes are measured in permanent consumption units.

The small open economy assumption implies that both the world rental rate and the long-run growth rate are given. If the long-run growth rate differs from the rest of the world, the small economy assumption would not be sustainable: either the economy would disappear or would become a large one. The simulation experiments are conducted under the hypothesis that government expenditures and transfers grow at the same rate as on the benchmark balanced growth path. Because the long run growth rate is given, the analysis concentrates on the transition path.

The government's intertemporal budget constraint implies that the temporary tax increases or transfer cuts enable future taxes to be lowered or transfers increased once the debt-to-GDP ratio has been stabilized at a new lower level. The debt reduction thus implies a redistribution of taxes net of transfers across generations. The older generations should lose from the tax increases as they only partially benefit from the subsequent tax reductions. However, younger and future generations should benefit from the lower tax rates since they face them either over significant portions of their lives or over their entire lifetime. In this model, the temporary tax net-of-transfers increases clearly will contract the budget opportunities of initial older generations and expand those of young and future generations.[10]

Intergenerational Transfer Reduction using Lump-Sum Transfers

In this experiment, lump-sum transfers are temporarily reduced by an equal amount across all generations to achieve the 5 percentage point cut of debt-to-GDP ratio. The subsequent fiscal dividends emanating from lower interest payments take the form of higher transfers. As lump-sum transfers are assumed to be equally distributed across generations, this experiment is useful in identifying a saving channel independent of the intergenerational distribution of transfers.

Transfers do not affect human capital formation because the opportunity cost remains unchanged. The change in the growth rate along the transition path is small and stems from labour supply revisions in response to the change in the dynamic path of transfers. For both the one- and five-year cases, GDP growth increases initially, then falls slightly below the base case rate until around the year 2020 (see Figure 7.5). The one-year case generates larger growth rate deviations initially (between 1995 and 2000). Table 7.3 reports that the initial rise in the growth rate is strong enough in the two cases to generate in year 2020 and thereafter a higher GDP level than the base case. As expected, GNP and net foreign indebtedness changes are more significant than GDP changes.

Figure 7.5
Transfers
Growth Rate Differences

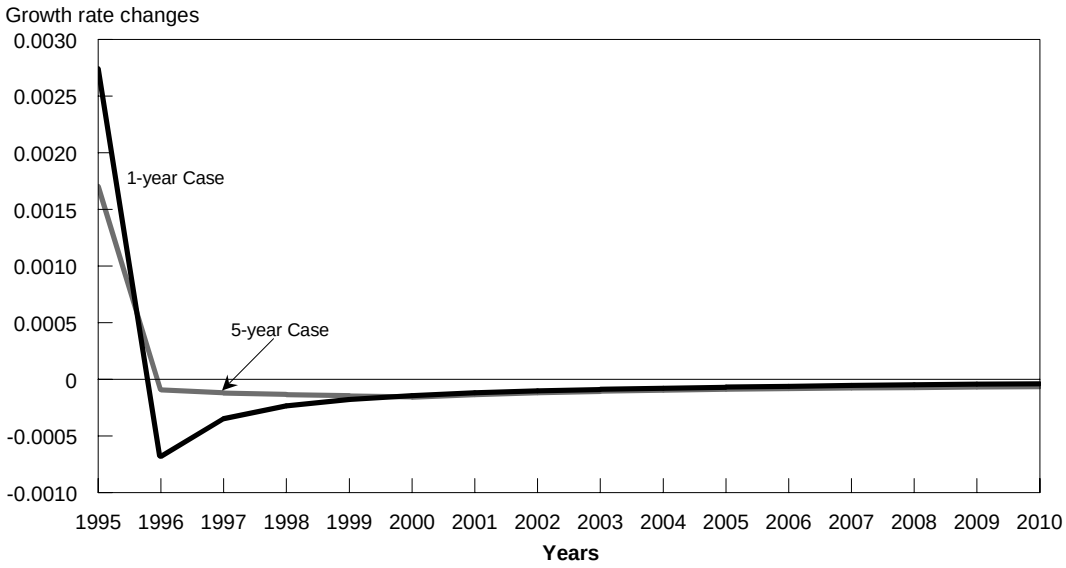
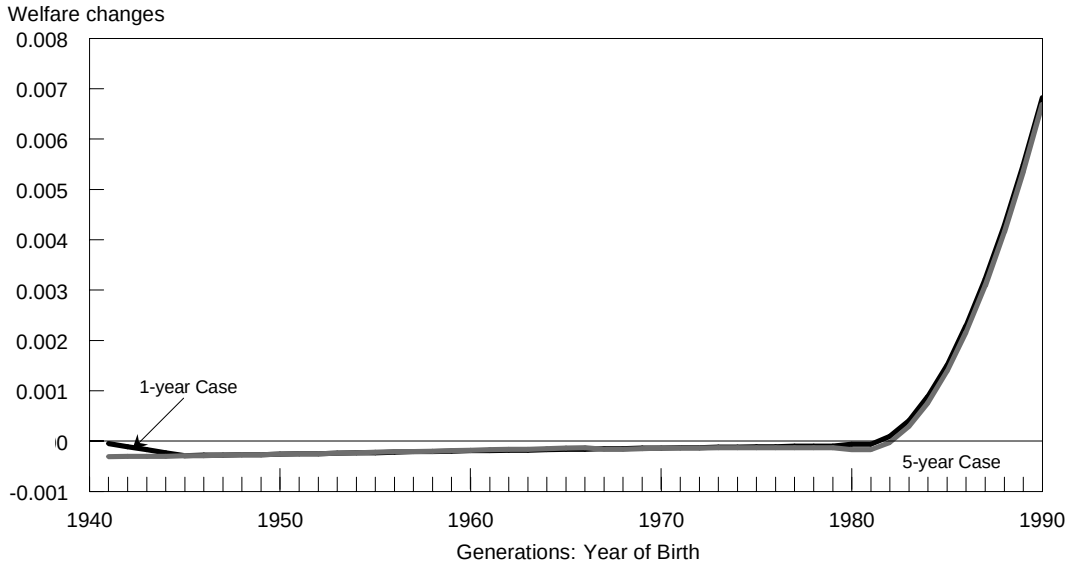


Figure 7.6
Transfers
Intergenerational Welfare



The impact on welfare across generations is similar for both cases. As consumption is a function of lifetime wealth, the large decline in transfers affects the oldest generations the most since their rest-of-life horizon is shorter. Labour supply changes (in percentage terms) are thus more significant for these generations. Figure 7.6 shows that the 1995 welfare of generations born in the model between 1941 and 1981 (1982 for the five-year case) deteriorates very slightly.[11] The younger and future generations all benefit from the debt cut. To make the welfare figures readable, the welfare effects of all current and future generations are not reported. The unreported welfare effects follow the pattern of the last generations reported in the figures. In Figure 7.6, for instance, the generation that will be 17 years old in year 2020 (not appearing in the figure) is indifferent between the policy measure taken and a situation in which the debt-to-GDP ratio remains at the base case but its final goods and leisure consumption are increased by 8.1 per cent (8.4 for the five-year case).

Intergenerational Transfer Reduction using Consumption Taxes

The consumption tax policy resembles the transfer policy in two ways. First, the impact of the cut on human capital formation is small given the leisure and human capital production function specifications. Consumption taxes would distort human capital formation more if the production function were specified with a flow of final goods as input (as first used by Ben-Porath, 1967). Second, the consumption tax burden is rather equal across generations (see again Figure 7.4). However, the consumption tax does distort the leisure-consumption choice. This explains the larger change in the growth rate along the transitional path illustrated in Figure 7.7. The pace at which the debt-to-GDP reduction is achieved mainly affects the transition between 1995 and 2000. The one-year case policy involves larger transitional changes in the GDP growth rate. There is a significant decline at the impact period 1995—followed by significant rise in 1996. Although the changes are not as drastic as in the one-year case, the five-year case results in a negative growth change in 1995 but positive changes for the rest of the policy implementation period. The debt-to-GDP reduction through consumption tax instrument generates larger GDP, GNP and net foreign indebtedness reduction level changes than through the lump-sum transfers instrument (Table 7.3). The one-year case leads to higher level changes than the five-year case.

The impact on welfare across generations is similar to the lump-sum transfers case. The oldest generations' welfare falls slightly while that of younger and future generations improves. However, because the consumption tax is distorting, the number of generations negatively affected declines (see Figure 7.8). Welfare losses occur for generations born in 1958 and earlier in the one-year case, and for those born in 1967 and earlier in the five-year case.

Intergenerational Transfer Reduction using the Wage Tax

Unlike the previous cases, the wage tax affects human capital formation by changing the ratio of the future to the current wage rate. The wage tax also has an intratemporal (consumption versus leisure) and intertemporal (lifetime profile) distortion effect on labour supply. Moreover, the wage tax is borne mainly by middle-aged generations (see Figure 7.4). To gauge the induced effects of human capital formation, the simulations are conducted assuming both exogenous and endogenous human capital formation.

When Human Capital formation is exogenous, the temporary increase in the wage tax means lower after-tax wage income and human capital wealth for many generations. Although the temporary increase is followed by a permanent decrease in the wage tax rate, for most generations (aged 30 and older), this decrease occurs at a point in life when the preference in leisure is increasing. The overall effect on labour supply of these generations is initially negative. For younger generations, the tax rate changes occur at a time where their preference in leisure is declining, and hence, their labour supply grows more rapidly. As a result, the aggregate labour supply decline is small initially, which does not reduce the tax base significantly.

As in the previous cases, the pace of adjustment primarily affects the first few years of the transition. The one-year case generates larger short-run changes in the growth rate and a faster adjustment to the long-run growth rate (Figure 7.9). Also, the level changes on GDP are small in both cases, but GNP increases and net foreign debt declines significantly (Table 7.3). These level changes are more important under the one-year case.

Figure 7.7
Consumption Tax
Growth Differences

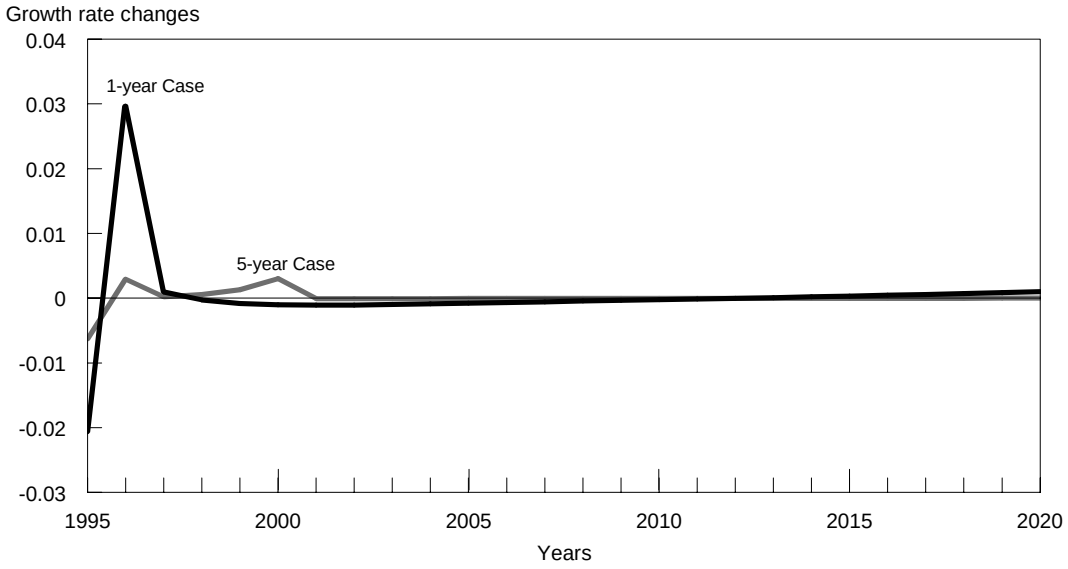
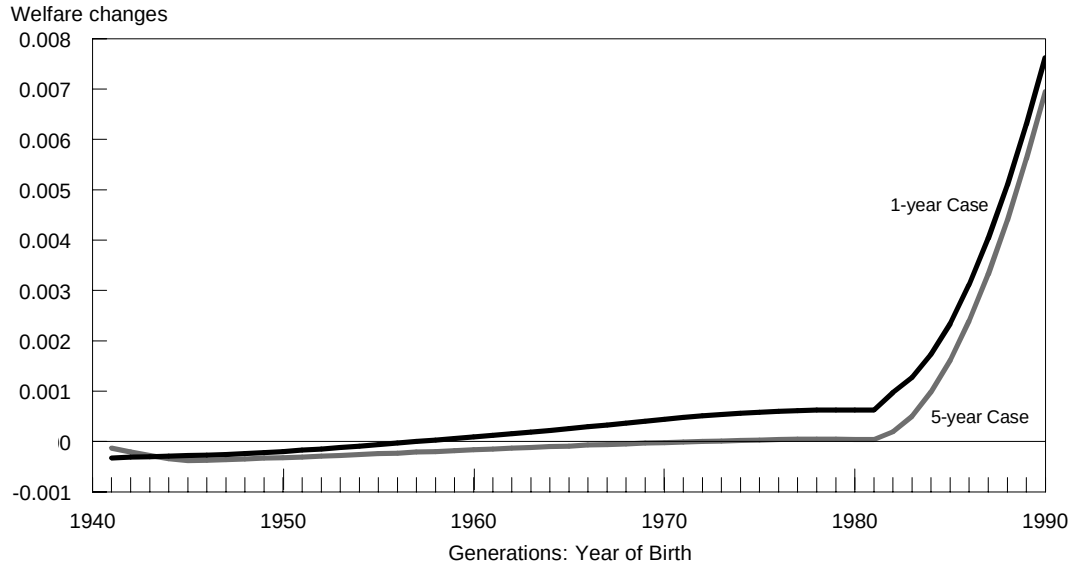


Figure 7.8
Consumption Tax
Intergenerational Welfare



Although it is still the case that younger and future generations' welfare improves while older generations' welfare deteriorates, the welfare effect across generations is not straightforward. The irregular shape of the welfare impacts across generations in Figure 7.10 is best explained through the effects on leisure activity rather than the effects on consumption. The oldest generations (born in the beginning of the 1940s) benefit slightly because their utility gain from increased leisure exceeds the loss from reduced consumption level. This group has a relatively strong preference for leisure. The welfare of generations born between 1944 and 1956 deteriorates slightly in the one-year case. This range is between 1945 and 1972 in the five-year case. The younger and future generations' welfare improves except for those whose preference for leisure is diminishing at the time of the policy implementation (generations born between 1982 and 1995 for the one-year case and between 1982 and 1986 for the five-year case).

Figure 7.10 displays a sequence of welfare gains and losses across generations. This contrasts sharply with the consumption tax case, where in Figure 7.8 welfare losses of old generations are followed by welfare gains of young and future generations. The differences are explained by the distinct life-cycle patterns of preferences towards consumption and leisure. In the model, preferences towards consumption are smooth over the life cycle whereas preferences towards leisure are non-linearly related to age. With consumption smoothing preferences, the welfare impact of a rise followed by a fall in the consumption tax depends mostly on the contraction (in the case of old generations) or expansion (in the case of younger and future generations) in budget opportunities. In this wage tax case, the marginal impact of the rise in the tax rate is not equal across generations since their preferences towards leisure differs. To be technically precise, the second derivative of the utility function with respect to leisure is age-related. Therefore, the individual welfare results in the wage tax case depend not only on the change in the budget opportunities but also on the change in the marginal utility towards leisure. For future generations the budget opportunity effect always dominates the marginal utility effect, hence their welfare rises. For some of the current generations the opposite relationship applies, hence their welfare falls. It is also notable, that the relative strength of the two effects depends on the policy implementation speed since the welfare line of the one-year case crosses the welfare line of the 5-year case at some point. The welfare comparison of the two cases is thus less straightforward.

All generations are aware that debt reduction raises wage taxes in the short run, but reduces them later. An increase in the current tax rate reduces the current net of tax wage rate, which is the opportunity cost of human capital investment. A reduction in the future tax rate increases the future net of tax wage rate, which is the benefit of investing in human capital. Therefore, investment in human capital is encouraged by the debt reduction policy and it is therefore important to permit human capital to be endogenous.[12]

More human capital investment has clear effects on growth and welfare. Growth effects are amplified during the transition path since the generations now have another avenue by which they can respond to changes in the tax rates. In the short term, it means lower effective labour supply because the generations are allocating more time to human capital formation. Lower labour supply implies a lower tax base, which necessitates a higher tax rate to attain the debt reduction objective. In the medium term, it means higher effective labour supply because the generations now have larger accumulated stocks of human capital. In the long term, the net of tax wage rate stabilizes, as do the incentives to invest in human capital. The welfare effects improve for most generations, compared with the exogenous human capital formation case, for two reasons. First, the human capital stock is an argument in the leisure activity specification. Second, higher human capital investment implies higher output in this model, and consequently a higher standard of living.

The growth rate of the transition paths for the one-year and five-year case are presented in Figures 7.11 and 7.12. As expected, the endogenisation of human capital implies larger growth deviations (with respect to the initial steady state growth rate) in both cases. These deviations are more significant for the one-year case due to the greater short-run changes in the tax rate. Output levels are also higher in the long run in both cases (Table 7.3).

Figures 7.13 and 7.14 report the intergenerational effects on welfare with and without endogenous human capital formation. With endogenous human capital formation, the welfare results improve for most generations,

Figure 7.9
Wage Tax (Exogenous Human Capital)
Growth Differences

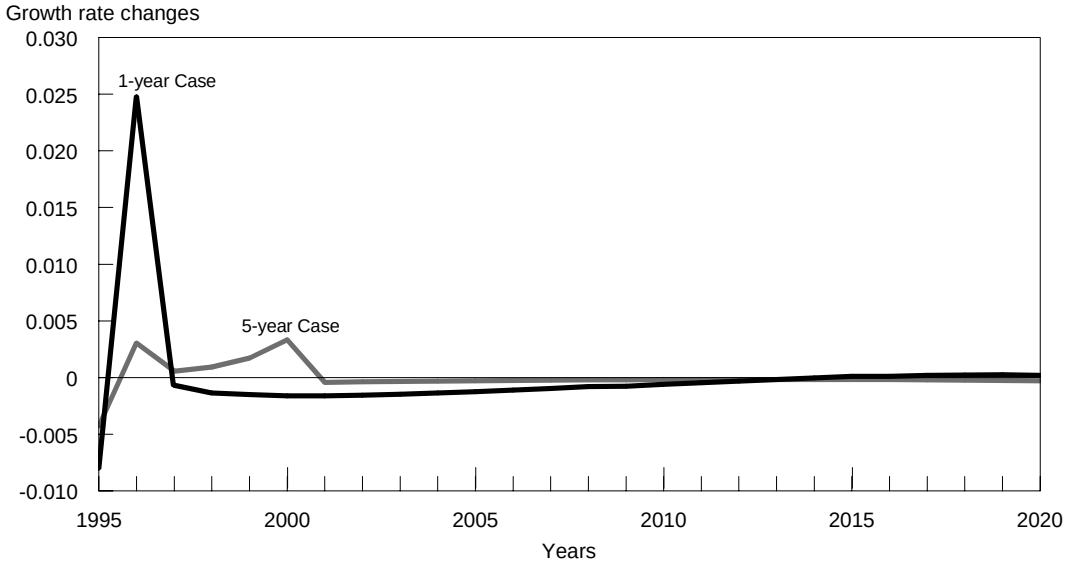


Figure 7.10
Wage Tax (Exogenous Human Capital)
Intergenerational Welfare

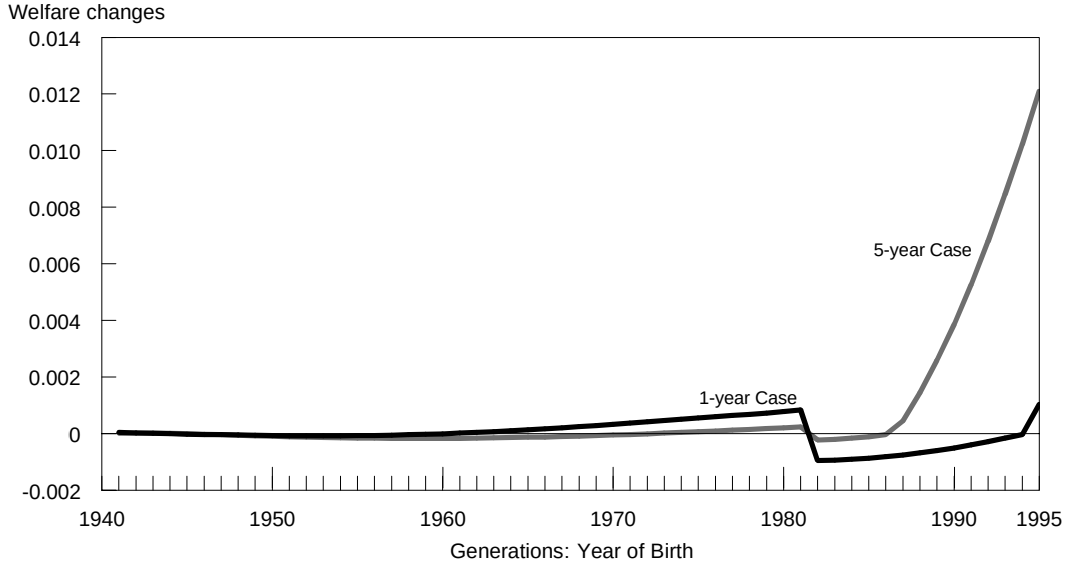


Figure 7.11
Wage Tax One-Year Case
Growth Differences

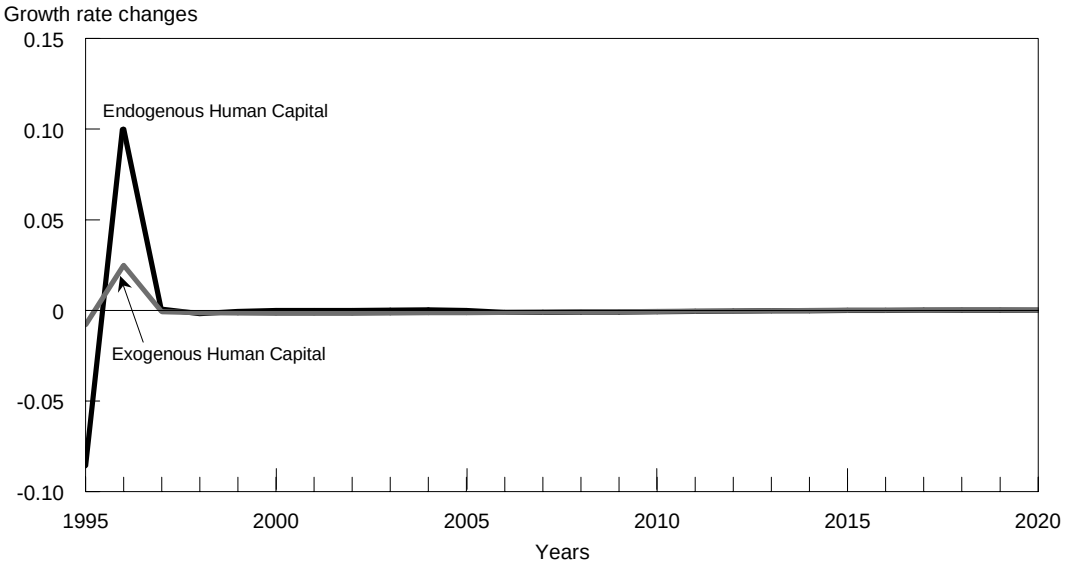


Figure 7.12
Wage Tax Five-Year Case
Growth Differences

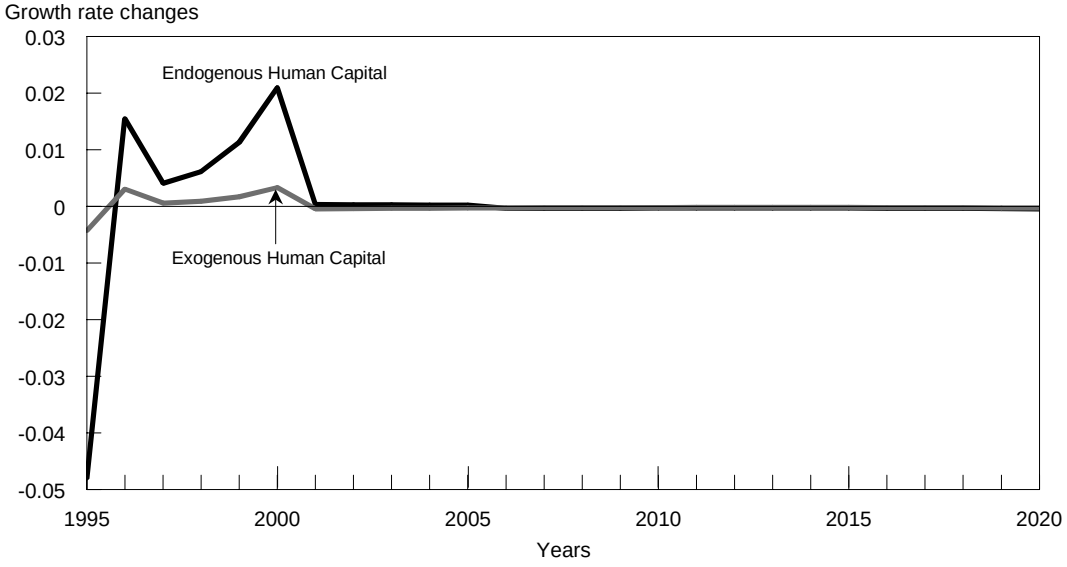


Figure 7.13
Wage Tax One-Year Case
Intergenerational Welfare

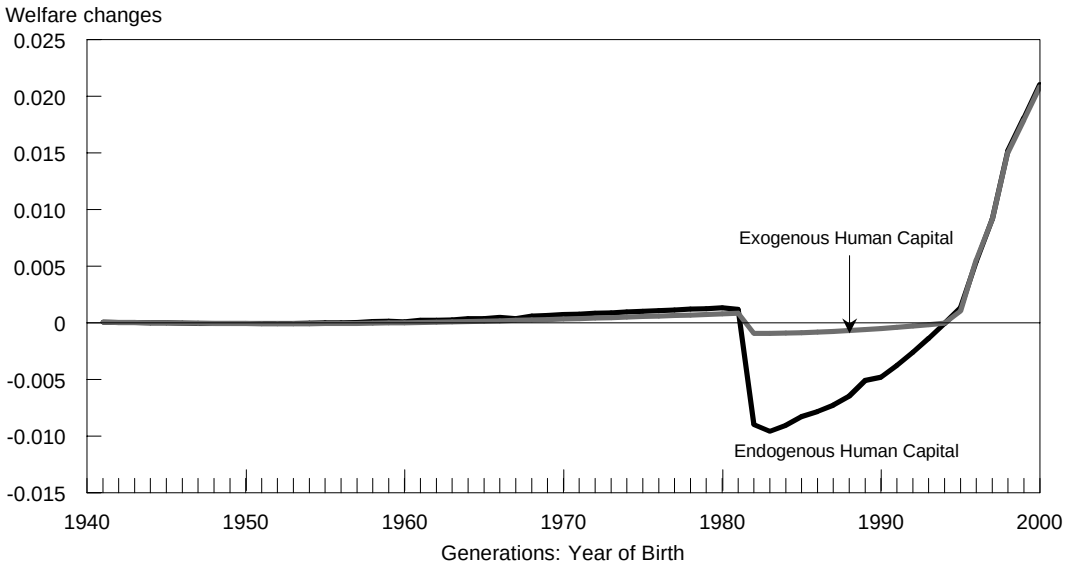
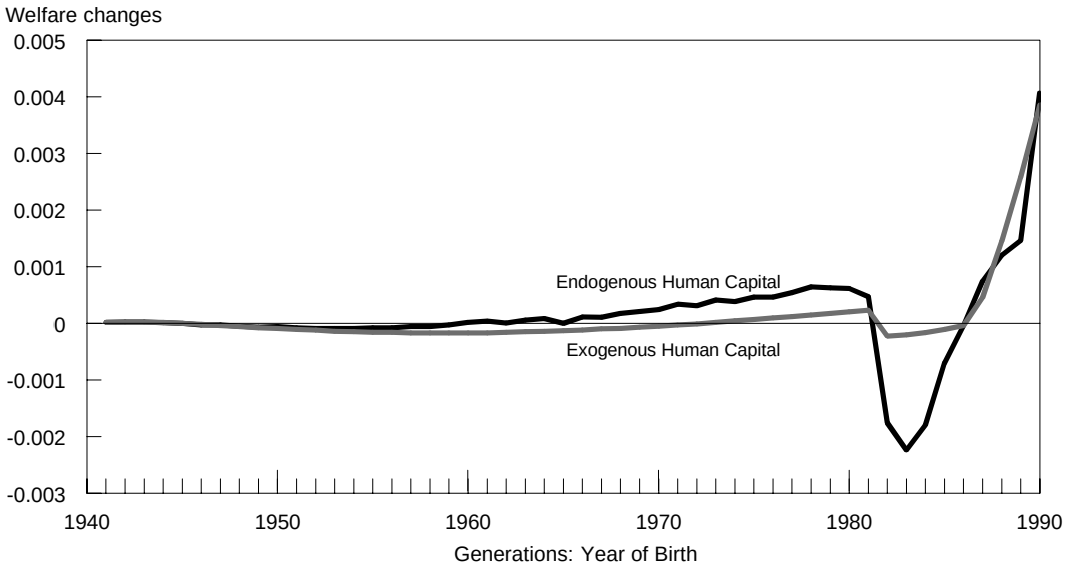


Figure 7.14
Wage Tax Five-Year Case
Intergenerational Welfare



independently of the pace of the debt cut. They deteriorate, however, for those whose preference towards leisure, and thus towards human capital, is diminishing at the time of the policy implementation (generations who are born between 1982 and 1995 for the one-year case and between 1982 and 1986 for the five-year case). Furthermore, the number of generations suffering a welfare loss declines slightly in both cases. The five-year case generates a smaller number of generations suffering welfare losses under endogenous human capital formation, whereas the one-year case generates a smaller number under exogenous human capital formation.

5. Conclusion

This chapter investigates and quantifies how output and welfare across generations are affected by debt-to-GDP reduction policies. A computable 55 overlapping generations model, calibrated to the Canadian economy, is used to conduct the analysis. The simulations consider debt-to-GDP reductions achieved through temporary increases (decreases) in taxes (lump-sum transfers), followed by permanent decreases (increases) in taxes (transfers). The focus is thus on the effects of shifting the generational burden of taxes net-of-transfers. The following five points summarize the results of the simulation experiments.

First, growth and welfare changes are greater when the debt-to-GDP reduction is achieved through increases and subsequent reductions in the consumption or the wage tax, rather than through reductions and subsequent increases in transfers. This result is not surprising since transfers are non-distortionary while taxes are. Second, old generations suffer small welfare losses while the welfare of future generations increases significantly. This result is intuitive and is explained by the contraction and expansion in budget opportunities. Old generations bear the cost of the debt reduction policy but cannot completely reap the subsequent benefits, while the opposite applies for future generations.

Third, faster debt reductions generate larger growth deviations, a higher rise in long-run GNP and in most tax cases, a lower number of generations suffering welfare deterioration. In the case of the wage tax, which approach generates the lowest number of generations suffering welfare losses depends on the endogenisation of human capital investment. Furthermore, those who lose in the wage tax experiment suffer more under the one-year than under the five-year case. Thus, it is not possible, at least under the Pareto criterion, to disentangle the trade-off between the two approaches. What can be said is that the higher the weight of future generations in the social welfare function, the faster the debt should be reduced. However, if the objective is to minimize deviations in the growth path and welfare change disparities across generations, a more gradual approach would be appropriate.

Fourth, shifting the generational consumption tax burden causes welfare losses for fewer generations than other scenarios considered in the paper. It is unclear, however, if this result would still hold if the human capital production function included inputs subject to the consumption tax. A combination of lump-sum transfer cuts and subsequent reductions in the consumption or wage tax would be preferable to any of the scenarios considered. Since transfers are non-distortionary in the model but taxes are, the number of generations suffering welfare losses would be reduced. Of course in reality, the government may not have recourse to lump-sum transfers. Actual transfers may create disincentives that distort labour supply and savings decision. Cuts in these transfers would magnify the gains still further. Transfers may also be motivated by distributional goals, and their role in social welfare would also need to be assessed when making policy recommendations.

Fifth, human capital accumulation magnifies the growth and welfare effects of debt-to-GDP reduction policies. This result has important implications for debt reduction analysis since only a portion of the education output is recorded in public and national accounts (mainly as teachers' salaries). It does suggest that observed data may underestimate the absolute effects of debt-reduction policies on growth and welfare. For instance, the increases and subsequent reductions in wage tax stimulate investment in human capital in the model. This investment, mainly through time reallocation, is not recorded even if it will be beneficial to future GDP. If non-recorded activities (home production is another one) were taken into consideration, evaluation and predictions of government policies would be enhanced.

The growth and welfare results have been obtained using a simulation model that is a simplification of the actual economy. The existence of imperfect competition, involuntary unemployment, bequest motives, intra-generational heterogeneity, multiple final goods, public productive capital, uncertainty, bounded rationality, and differences between marginal and average tax rates could alter the results. The simulation results must therefore be interpreted cautiously, particularly with respect to drawing firm policy conclusions.

End Notes

I wish to thank Steven James, Mireille Laroche, Miles Corak and two anonymous referees for helpful comments. All errors are my own. This paper does not necessarily reflect the views of the Department of Finance.

[1] Another approach emphasizes invention, innovation, imitation and absorption as the engine of growth. It requires imperfect competitive markets to ensure profit-seeking investment in knowledge. Total factor productivity is the main source of growth. For examples of these types of models, see Romer (1990), Grossman and Helpman (1991), Aghion and Howitt (1992) and Keller (1994).

[2] Although not used for that purpose, the increasing returns to scale model of Romer (1986) would also generate strong growth effects. King and Rebelo (1990), Pecorino (1993), Jones, Manuelli, and Rossi (1993) and Devereux and Love (1994) report a strong negative effect of (income) tax on the long-run growth rate. However, Kim (1992) and Lucas (1990) find only moderate and weak effects, respectively. Stokey and Rebelo (1995) investigate the sources of the sharp differences in the growth effects, and find that the results are sensitive to the assumptions regarding the production function of human capital, the depreciation rate and its tax treatment, and the elasticity of the labour supply.

[3] Symmetric production functions are those that depend on the same inputs and have the same elasticities of substitution.

[4] See for instance the discussion in Lucas (1990).

[5] Theoretical analyses with OLG framework have been presented by Buiter and Kletzer (1991, 1993) and Liu (1994). The main reference for tax policy investigation under numerical OLG model is Auerbach and Kotlikoff (1987). Growth is however exogenous in this important study.

[6] The structural equations of the model are presented in a technical appendix available from the author.

[7] If public investments were an input in the final goods production function, increases in domestic physical capital could stimulate growth indirectly by raising government revenues and hence government investment. See, for example, Xu (1997) and Mérette (1997b).

[8] Not much is lost by sticking to a Cobb-Douglas production function. Stokey and Rebelo (1995) find that the elasticities of substitution in production are rather insignificant for the quantitative impact of tax reform.

[9] Time endowment is defined here as 24 hours a day minus time taken for personal care (sleeping, etc.).

[10] There is no fiscal illusion of the kind discussed in Auerbach and Kotlikoff (1987).

[11] A generation is born in the model when it is 17 years old. That means that the generations born between 1941 and 1981 are aged between 71 and 31 years old in 1995.

[12] If households were liquidity constrained, a debt reduction could enforce this constraint and discourage human capital investment. See Drazen (1978).

Bibliography

AGHION P. and P. HOWITT (1992). “A Model of Growth through Creative Destruction.” *Econometrica*. Vol. 60, 323-351.

AUERBACH, Alan J. and Laurence J. KOTLIKOFF (1987). *Dynamic Fiscal Policy*. Cambridge: Cambridge University Press.

BARRO, Robert (1974). “Are Government Bonds Net Wealth?” *Journal of Political Economy*. Vol. 82, 1095-1117.

BECKER, Gary S. (1965). “A Theory of the Allocation of Time.” *Economic Journal*. Vol. 75, 493-517.

BEN-PORATH, Y. (1967). “The Production of Human Capital and the Life-Cycle of Earnings.” *Journal of Political Economy*. Vol. 75, Part I, 352-365.

BUITER, Willem H. (1981). “Time Preference and International Lending and Borrowing in an Overlapping-Generations Model.” *Journal of Political Economy*. Vol. 89, 769-797.

BUITER, Willem H. and Kenneth M. KLETZER (1991). “Persistent Differences in National Productivity Growth Rates with a Common Technology and Free Capital Mobility: The Roles of Private Thrift, Public debt, Capital Taxation and Policy Toward Human Capital Formation.” *Journal of the Japanese and International Economies*. Vol. 5, 325-353.

_____ (1993). “Permanent International Productivity Growth Differentials in an Integrated Global Economy.” *Scandinavian Journal of Economics*. Vol. 95, 467-493.

BURGESS David F. (1996). “Fiscal Deficits and Intergenerational Welfare in Almost Small Open Economies.” *Canadian Journal of Economics*. Vol. 29, 885-909.

DAVIES Jim and John WHALLEY (1991). “Taxes and Capital Formation: How Important is Human Capital?” NBER Working Paper, No. 2899.

DEVEREUX Michael B. and David R.F. LOVE (1994). “The Effects of Factor Taxation in a Two-Sector Model of Endogenous Growth.” *Canadian Journal of Economics*. Vol. 27, 509-536.

DRAZEN Allan (1978) “Government Debt, Human Capital, and Bequests in a Life-Cycle Model.” *Journal of Political Economy.* Vol. 86, 505-517.

GROSSMAN Gene M. and Elhanan HELPMAN (1991). *Innovation and Growth in the Global Economy*. Cambridge: MIT Press.

HALEY, William J. (1976). “Estimation of the Earnings Profile from Human Capital Accumulation.” *Econometrica*. Vol. 44, 1223-1238.

HARVEY, Andrew S. (1991). *Where Does Time Go?* Ottawa: Statistics Canada, Catalogue No. 11-612E.

HECKMAN J. (1976). “A Life-Cycle Model of Earnings, Learning, and Consumption.” *Quarterly Journal of Economics*. Vol. 84, 511-544.

JONES, Frank (1995). “Human Capital and the Use of Time.” Statistics Canada. Analytical Studies Branch, Research Paper No. 79.

JONES Larry E. and Rodolfo E. MANUELLI (1990). “A Convex Model of Equilibrium Growth: Theory and Policy Implications.” *Journal of Political Economy*. Vol. 98, 1008-1038.

_____ (1992). “Finite Lifetimes and Growth.” *Journal of Economic Theory*. Vol. 58, 171-197.

_____ and P.E. ROSSI (1993). “Optimal Taxation in Models of Endogenous Growth.” *Journal of Political Economy*. Vol. 101, 485-517.

JORGENSON, Dale W., Frank M. GOLLOP and Barbara M. FRAUMENI (1987). *Productivity and U.S. Economic Growth*. Cambridge: Harvard University Press.

KALDOR, Nicholas (1963). “Capital Accumulation and Economic Growth.” In F.A. Lutz and Douglas C. Hague (eds.). *Proceedings of a Conference Held by the International Economics Association*. London: Macmillan.

KELLER, Wolfgang (1994). “Absorptive Capacity: Understanding the Creation and Acquisition of Technology in Development.” Yale University, unpublished.

KIM, S. (1992). “Taxes, Growth and Welfare in an Endogenous Growth Model.” University of Chicago, Ph.D Dissertation.

KING, R.G. and S. REBELO (1990). “Public Policy and Economic Growth: Developing Neoclassical Implications.” *Journal of Political Economy*. Vol. 98, S126-S150.

LIU KAM W. (1994). “Do Capital Income Taxes Always Reduce Growth?” *Public Finance Quarterly.* Vol. 22, 383-396.

LUCAS R. (1987). *Models of Real Business Cycles,* New-York: Blackwell.

_____ (1990). “Supply-Side Economics: an Analytical Review.” *Oxford Economic Papers*. Vol. 42, 293-326.

MÉRETTE Marcel (1997a). “Income Taxes, Life-Cycle and Growth.” Unpublished.

_____ (1997b). “Taxation, Spending and Growth in an Endogenous Growth Model.” Unpublished.

MINCER, Jacob (1974). *Schooling, Experience and Earnings*. New York: Columbia University Press.

MULLIGAN, Casey B. and Xavier SALA-I-MARTIN (1993).“ Transitional Dynamics in Two-Sector Models of Endogenous Growth.” *Quarterly Journal of Economics.* Vol. 108, 737-773.

PECERINO Paul (1993). “Tax Structure and Growth in a Model with Human Capital.” *Journal of Public Economics*. Vol. 52, 251-271.

PERSSON, Torsten (1985). “Deficits and Intergenerational Welfare in Open Economies.” *Journal of International Economics.* Vol. 19, 67-84.

REBELO S. (1991). “Long-Run Policy Analysis and Long-Run Growth.” *Journal of Political Economy*. Vol. 99, 500-521.

ROMER P. (1986). “Increasing Returns and Long-Run Growth.” *Journal of Political Economy*. Vol. 94, 1002-1037.

_____ (1990). “Endogenous Technological Change.” *Journal of Political Economy*. Vol. 98, S71-S102.

STOKEY N.L. and S. REBELO (1995). “Growth Effects of Flat-Rate Taxes.” *Journal of Political Economy*. Vol. 103, 519-550.

TINBERGEN J. (1942). “On the Theory of Trend Movements.” In Jan Tinbergen, *Selected Papers*. Amsterdam: North-Holland.

XU Jing (1997). “The Dynamic Effects of Taxes and Government Spending in a Calibrated Canadian Endogenous Growth Model.” Department of Finance, Canada. Unpublished.

Chapter 8

Historical Generational Accounting with Heterogeneous Populations

M.C.WOLFSON, G.ROWE, X.LIN, S.F.GRIBBLE

The intergenerational fairness and long-term sustainability of Canada's social programs, such as pensions and health care, have recently re-emerged as an issue. The last time this issue had any prominence was more than a decade ago, as part of Canada's "great pension debate" of the late 1970s and early 1980s. As before, the issue is being driven by concerns over population aging.

To this, a new factor has been added: the tax increases and expenditure cuts required to reduce government deficits and accumulated debt ("government" throughout refers to public sector activities at all levels of jurisdiction). The issue is sometimes expressed rather starkly for those who will be of working age in the first third of the next century. The concern is that they will face increased payroll and other taxes to finance pension and health care benefits for their parents— the baby boom generation who will be retired by then—as well as a large share of the burden of reducing accumulated government debt.

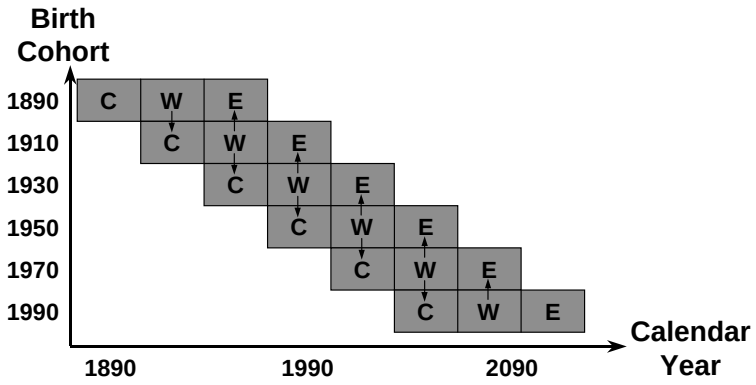
In this chapter we provide a new perspective on the question of intergenerational fairness by estimating the flows of selected government taxes and transfers for all generations who have lived in the 20th century. (The term "generation" is used throughout in a sense equivalent to a birth cohort.) The analysis considers each generation in some detail in order to reflect as accurately as possible the variety of their educational attainments, marital status and labour market experiences, and hence heterogeneous patterns of taxes and transfers over their lifetimes. The basis for considering intergenerational fairness and fiscal sustainability is the net effects, for representative populations of individuals in each generation, of their taxes paid and transfers received over the course of their entire lifetimes.

Concerns over intergenerational fairness are of course not new. For example, in connection with public pensions, a number of federal government reports consider the issue (Canada, 1979; Canada, 1982; House of Commons, 1983). A central aspect is the flow of taxes paid, and cash transfers and in-kind benefits received by different generations.

But a caveat is in order. These reports, as well as the paper by Osberg in the next chapter, note that in principle it is necessary to go beyond this arithmetic since intergenerational fairness ultimately depends on future working age generations' "ability to pay" for transfers to the then elderly. This in turn depends on society's future productive capacity: the wealth or "capital stock" current generations will have bequeathed to future generations. Society's capital stock should be very broadly defined in this kind of analysis, for example to include the state of the environment and accumulated knowledge, as well as more conventional productive assets like roads and factories. The processes determining future inheritances therefore include the myriad intergenerational transfers occurring within families, the evolving state of the natural and built environment, private sector investments, and public sector revenues and expenditures.

Most of these transfers, however, are not readily measured in money terms. So judgements of intergenerational fairness based only on monetary flows are necessarily partial. It is even more restrictive to focus only on those monetary flows associated with the public sector. Doing so leaves out financial flows within families, as well as the accumulation of private assets by businesses. For practical reasons we focus on those intergenerational transfers associated with government taxes and expenditures. This portion of intergenerational flows still covers an important

Figure 8.1
Basic Generational Accounting Framework



range of transfers, and in any event provides an essential starting point for judgements of intergenerational fairness.

In the next section we begin the analysis by contrasting our approach to several others for judging intergenerational fairness and sustainability, particularly a new approach called Generational Accounting or GA (Kotlikoff, 1992; Oreopoulos and Kotlikoff, 1996; Oreopoulos and Vaillancourt in chapter 2). The driving factor in this GA analysis is accumulated government debt, rather than population aging. We then present results based on a new form of generational accounting using the LifePaths microsimulation model developed at Statistics Canada. LifePaths GA generates estimates for large samples of realistically heterogeneous individual socio-economic life histories for all generations born during this century. These estimates can be used to provide information useful for judging the intergenerational fairness and sustainability of Canada's current tax/transfer system. But they lead us to conclude that "generation" is not the most useful category when assessing the redistributive effects of government; income and individual circumstances are more important.

1. Judging Intergenerational Fairness and Sustainability

A widely agreed upon norm for **intra**generational fairness is progressivity, that is the tax/transfer system should be redistributive from those with higher to those with lower **lifetime** income. However, there is no agreed approach to judging whether a society's tax/transfer system is **inter**generationally fair or sustainable. There are several norms which appear commendable. One is a form of intergenerational golden rule: one generation, when it becomes old and frail, should not expect to be treated any better by its children than it treated its parents' generation in their old age. This norm was endorsed in the federal pension reform reports cited earlier. Another is a form of sustainability: the world parents bequeath to their children should be at least as good as the one they in their turn had inherited. This norm is at the heart of the recently developed form of generational accounting or GA. Yet a third is a process norm: a tax/transfer system is sustainable and fair if it is the outcome of a continuing democratic consensus.

Figure 8.1 provides a convenient schema for illustrating these norms. Birth year is shown on the vertical axis, and calendar time along the horizontal. Each horizontal bar represents one generation or birth cohort born at time b. Their lifetimes have been divided into three broad phases: childhood (C_b), working (W_b), and elderly (E_b). Intergenerational transfers then arise, in this analysis, only from government tax/transfer activities, and generally speaking involve either $W_b \rightarrow C_{b+1}$ or $W_b \rightarrow E_{b-1}$ flows, as indicated by the short vertical arrows in the diagram.

The first norm implies that the public pensions and health care services expected by the current working age generation when it is old should not be any larger, relative to the size of the economy, than the transfers it is financing for the current elderly. In terms of Figure 8.1, this norm implies that the sequence of transfers indicated by the vertical arrows from W_b to E_{b-1} should be non-increasing over time.

The second norm suggests that it is unfair to bequeath to future generations any kind of substantial liability, such as a large public debt.[1] This norm is consistent with rising lifetime consumption or disposable income, comparing one generation to the next, that is each generation of parents sacrificing at least somewhat so their children can have a better life. In terms of Figure 8.1, this means that the transfers to their children while working ($W_b \longrightarrow C_{b+1}$) less those received later when elderly ($E_b \longleftarrow W_{b+1}$) should be increasing from one generation to the next. But if the $W_b \longrightarrow C_{b+1}$ transfers are growing from one generation to the next (for example via increased public funding for post-secondary education), then this norm could be consistent with rising $E_b \longleftarrow W_{b+1}$ transfers, provided the latter are rising less rapidly than the former. While it might appear that this is a conflict between the golden rule norm and the sustainability norm, a more appropriate interpretation is that a *ceteris paribus* assumption of the golden rule norm (that is, constant $W_b \longrightarrow C_{b+1}$ transfers) is not holding.

Application of the third norm in the context of Figure 8.1 is difficult. The main reason is that the population of eligible voters at any point in time includes not only members of different generations, but also individuals within a generation who are in widely different circumstances. In a word, each generation is heterogeneous. It could be, for example, that a tax/transfer system is progressive in a way that lower and middle income individuals from whatever generation have more in common than those with high and low incomes within a given generation. Thus, "block voting" by generation, or generational politics, may not be in many individuals' self-interest. Thus, the democratic process norm need not be consistent with either of the other two norms.

In any case, judgements of a given tax/transfer system against one or another norm require basic information that can be structured as a form of financial account. The core of any such account is estimates of the complete set of flows of taxes and transfers both by year and by generation, and both among individuals within the same generation, and between individuals in different generations. As shown in Hicks (chapter 4) and Murphy (chapter 5), these are myriad.

The basis of the Kotlikoff (1992) form of GA is the sustainability norm. The genesis of this form of GA was a concern that current methods of accounting for the public sector, particularly the core concept of the government's deficit, are too narrow, reflecting balance or imbalance only at a single point in time. GA's proponents argue that it is fundamentally important to consider the government's fiscal balance dynamically, as a trajectory into the future. This approach to accounting for the public sector accepts that governments can run either deficits or surpluses. The essential question is whether over long periods of time, these balance out: in other words whether the government is on a "sustainable" fiscal path. A related question is whether the changes to taxes and spending required to achieve fiscal sustainability are fair to future generations. In practice, most instances where these kinds of GAs have been estimated there is high accumulated debt. As a result, the main effect of these GAs has been to quantify and highlight the magnitude of the "burden" being passed (the implication is unfairly) to future unborn generations.

The empirical base used by Oreopoulos and Kotlikoff (1996) and by Oreopoulos and Vaillancourt in chapter 2, the most recent and extensive GA estimates for Canada, is more restricted than that shown in Figure 8.1. Figure 8.2 helps to clarify these restrictions.

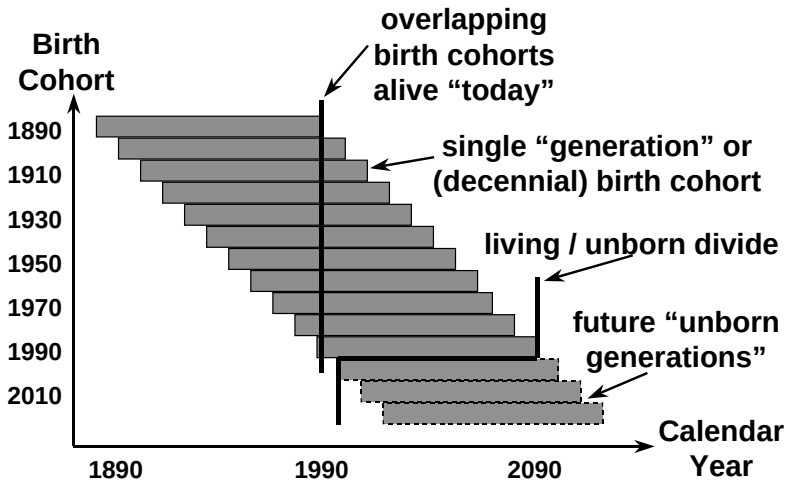
Their GA analysis starts with four simplifying assumptions.

[1] Each generation or birth cohort (horizontal bar in Figure 8.2) is represented by at most two individuals, an "average" or "representative" male, and an average female.

[2] "History" is generally ignored; the analysis goes from "today" forward considering only "the amounts of taxes, net of transfers, [paid] by an average member in a generation for the **remaining** portion of his or her life" (Oreopoulos and Kotlikoff, 1996, p.7, emphasis added). For example, the taxes that have been paid by the current elderly in earlier decades when they were of working age are not considered.

[3] The economy, after some transition period, follows a steady-state growth path for the infinite future. Government revenues and expenditures generally follow a similar steady-state growth path, so they remain constant as proportions of GDP (though, as will be discussed below, in chapter 2 Oreopoulos and Vaillancourt modify this assumption substantially). In turn, GDP per capita is assumed to grow indefinitely at a constant real rate, typically on the order of 1% per annum.

Figure 8.2
The Generational Accounting Framework Again



[4] Fairness is judged entirely in terms of the differences between two **groups** of generations, rather than the full sequence of generations shown. These two groups are all those alive "today" (whenever born), and all those who will be born at any time in the future (even millions of years hence)—indicated in Figure 8.2 by the "living / unborn divide."

The main focus, given these assumptions, is the difference in taxes required from generations currently alive and from those yet to be born in order that the government's overall revenues and expenditures will be in long run balance. In other words, the central (and hypothetical) question posed and answered by this style of "ARAnt" (ahistorical, representative agent) GA is the following: what tax increase is required of future unborn generations, all combined as a group, in order that "today's" accumulated government debt will be exactly amortized by the end of time?[2] Generational fairness is then judged by the magnitude of the hypothetical tax increase required to balance the government's books over this infinite time horizon.

For example, Oreopoulos and Kotlikoff state that, 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" (1996, p.21). Their analysis then goes on to suggest the kinds of tax increases and government spending cuts that would be required to bring the two groups of generations back into "balance". *The Economist* notes, "This deceptively modest idea (generational accounting) is in fact an ingenious way to make future pension liabilities explicit, and to shame policy-makers into concentrating on the long-term implications of current policies" (Sept 9th, 1995 p.78).

In contrast to Oreopoulos and Kotlikoff (1996), Oreopoulos and Vaillancourt (chapter 2) use more realistic assumptions on the transition path for Canadian fiscal policy, taking account of recent budgetary changes, as well as reflecting more accurately the impact of indexing provisions. As a result, they reach much less alarmist conclusions about the extent of generational imbalance, concluding that "fiscal policy, currently and projected, [is] at approximately a sustainable level."[3]

Another kind of empirical accounting focuses narrowly on only a part of the tax/transfer system: public contributory pensions like the Canada and Quebec Pension Plans (C/QPP), or social security in the U.S. For these public plans, there are earmarked payroll taxes called contributions, and retirement benefits that depend on the same lifetime history of earnings that were the base for the earmarked payroll taxes. It is therefore natural to ask what rate of return is implicit in a typical individual's stream of contributions and benefits. The Chief Actuary has estimated these rates of return as one overall figure for each

generation (OSFI, 1995 p.101). The general perception is accurate that future generations will receive much lower rates of return, while the generations who were the first beneficiaries received a large windfall.

This situation is consistent with the intergenerational golden rule norm. But at the same time, it risks generating a form of taxpayer revolt, as younger generations start questioning why they should continue supporting a C/QPP system that gives them such a "raw deal" relative to those who "got in early" (even if their rate of return remains positive). Thus, from the perspective of internal rates of return by generation, the current system with constant benefits but rising contributions (both as proportions of average wages) may fail to be sustained by the democratic process. However especially in Canada (less so with U.S. Social Security), focusing on the C/QPP in isolation from other major age-related government programs like OAS/GIS, education and health care, and other sources of government revenue like income taxes, gives a very limited and potentially misleading picture.

We develop a different kind of generational account for Canada, based on more detailed estimates of the flows of taxes and transfers implicit in Figure 8.2. This GA shares with ARAnt GA a fundamental incompleteness, since it considers only a number of taxes, cash transfers and in kind benefits, rather than the very broad range of non-governmental and/or non-quantified transfers noted at the outset. On the other hand, it draws on more detailed data, and is premised on more realistic assumptions.

[1] The analysis focuses only on those generations with members alive during the 1990s, rather than projecting out to an infinite time horizon.

[2] Each generation is represented by a large sample of realistically heterogeneous individuals (hundreds of thousands and even millions), rather than one or two representative individuals.

[3] The generations are described from birth, not just from "today" forward, and thus, to the extent allowed by available data, reflect actual historical patterns.

[4] Relatedly, the anticipated future for these generations is based not only on demographic projections and summary trends for taxes and transfers, but also on the best available projections of key factors such as education, employment, and legislative details determining future government tax and spending patterns.

[5] And the analysis considers each generation individually. Thus, unlike ARAnt GA, the analysis goes beyond a simple dichotomy between the currently living (of whatever generation) on the one hand, and the infinite future of all unborn generations on the other.

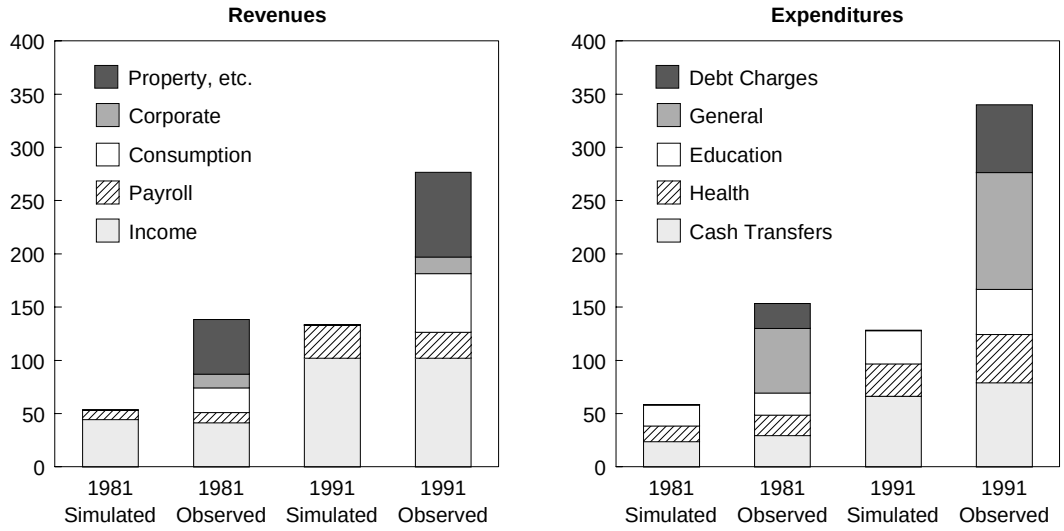
We refer to this as historical generational accounting with heterogeneous cohorts, or LifePaths GA for short, given the LifePaths microsimulation framework on which the analysis is based (Wolfson, 1996).

LifePaths GA supports several views of generational fairness. Implicitly, it allows each of the three major kinds of government redistribution to be assessed: cross-sectional (at a point in time among individuals and families, including those within the same birth cohort); over individuals' life cycles (for example, CPP premiums in relation to CPP retirement benefits, individual by individual); and intergenerational (between groups of individuals as members of successive birth cohorts). Alternatively, LifePaths GA can be thought of as encompassing both inter- and intra-generational accounts, including both annual and lifetime perspectives.

In this chapter, we focus on two of the norms just discussed. One is sustainability in somewhat the same sense as in ARAnt GA: what is the net transfer received by each succeeding generation. The other is democratic process: are we likely, over coming decades, to enter a period where a majority of voters (a "blocking coalition") will find it in their self-interest to seek to amend pension, tax and related government structures for reasons of perceived generational unfairness, irrespective of the generation to which they belong?

One conjecture is that because the tax/transfer system is broadly progressive in its cross-sectional redistributive impact, there will be significant numbers of both "winners" and "losers" **within** each generation—both at any point in time and over their lifetimes (an aspect that is invisible in "representative agent" styles of analysis). Moreover, the numbers may be such that even though on average, future working age **generations** may appear to be "losers", a majority of future voting age **populations** (looking both within and across generations alive at a given time) may be "winners". Alternatively, it would be possible to explore which kinds of policy

Figure 8.3
Revenues and Expenditures Simulated and Observed, 1981 and 1991 (Billions of Dollars)



scenarios would be consistent with a sequence of such outcomes. We can then define generational "sustainability" for a given tax/transfer system as a policy **trajectory** where "blocking coalitions" never arise.[4]

Finally, and perhaps most importantly, the microanalytic foundations of LifePaths GA, with its explicit representation of heterogeneity within as well as between generations, allows us to ask just how useful "generation" is as a category for judging fairness.

The data and methods of the LifePaths model are briefly described in the appendix. The next section presents an initial set of LifePaths GA estimates. The analysis concludes with quantitative results relating both to the sustainability of current arrangements, and to the importance of "generation" when considering fairness.

2. Results

LifePaths GA has been used to recreate historical generations born each decade from the 1890s to the 1990s, and to project their market incomes and selected interactions with government to the end of their lifetimes, by the end of the next century. In effect, the LifePaths GA provides estimates of a complete set of lifetime biographies of taxes paid and transfers received every year of their lives for members of each of the generations shown in Figure 8.2 above the "living / unborn divide". In an important sense, the result of a LifePath GA simulation (comprising hundreds of thousands of synthetic life paths) is a generational account with explicit microanalytic foundations.

As noted in the appendix, a major effort has been made to ground these estimates empirically. However, the combination of an absence of detailed historical data, with the need to make long run projections, means that relatively stylized representations of the main socio-demographic processes and components of Canada's tax/transfer system have had to be used.

To begin, Figure 8.3 shows the government revenues and expenditures explicitly included in the analysis ("simulated"), and compares them to "observed" figures at two time points, 1981 and 1991. On the revenue side, the simulated amounts account for about one half of the 1991 total, since property, corporate and commodity taxes have not been included; only payroll and income taxes have been explicitly modelled. On the expenditure side, about one-third has been covered, specifically most cash transfers to households, and education and health care services treated as transfers in-kind. It may be noted that part of the difference between simulated and observed cash transfers is disability pensions under the C/QPP and veterans pensions, while simulated education spending excludes capital purchases, student aid and research. It should also be noted that these

relationships between observed and simulated aggregates vary over time.

The amounts explicitly included in this analysis are not as comprehensive as those in ARAnt GAs, which in principle seek to cover the whole of "observed" government revenues and expenditures. However, their data requirements are less onerous, since ARAnt GAs allocate revenues and expenditures only as averages by age and sex, and not also by income and other socio-demographic characteristics at the micro level. Moreover, Oreopoulos et al. (1996, chapter 2) do not allocate any "non-transfer" government expenditures, which in Oreopoulos and Kotlikoff (1996, Table 18) amounted to almost half of the total. These amounts of excluded spending (essentially purchases of goods and services, including education) are treated as a kind of inevitable cost with no discernable benefit for any specific generation.[5] Thus, de facto, similar proportions of government spending are excluded from both ARAnt and LifePaths GAs.

The main focus in LifePaths GA is the actual flow of taxes and transfers over an individual's full lifetime, for a representative sample of individuals in each of a sequence of generations. Instead of asking how much accumulated debt is being passed on to future unborn generations, valued as some sort of effective tax rate, as in ARAnt GA, this analysis examines the actual historical and projected experiences for those currently alive.

As a first set of results from the LifePaths generational accounts, net present values (NPVs) have been computed for the taxes, cash transfers and in kind transfers explicitly modelled, generation by generation. The underlying simulations have all been done in nominal dollars, assuming CPI increases of 3.5% per annum from 1997 on, and real per capita wage growth at 1% per annum, the same assumptions used by the Chief Actuary (OSFI, 1995). CPI and real wage growth from 1890 to 1996 reflect actual historical experience.

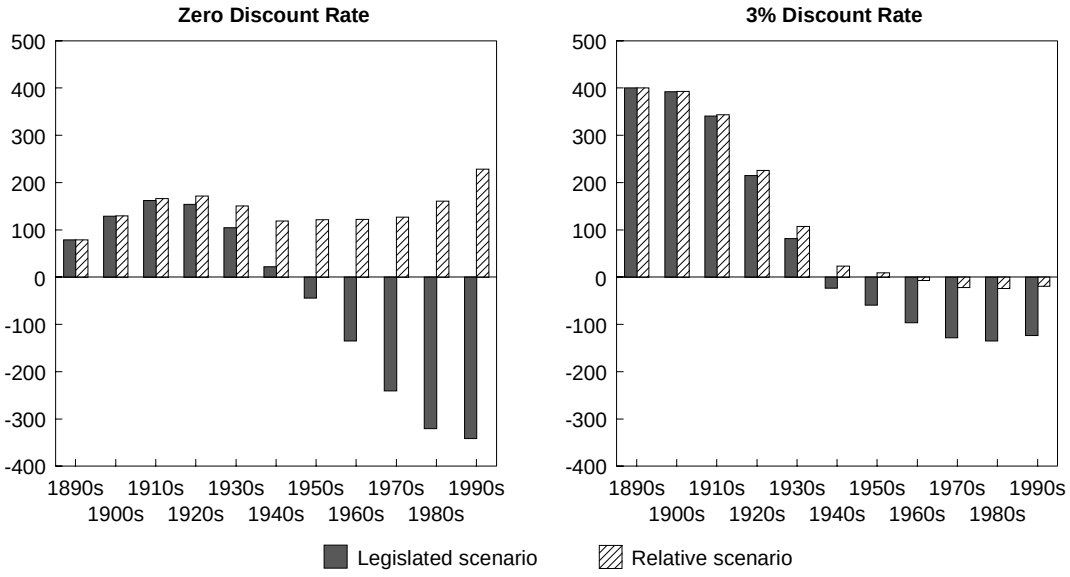
The selection of a specific discount rate to use in computing NPVs is subject to considerable controversy. Many economists tend to favour discount rates reflecting long run pre-tax market rates of interest. Oreopoulos et al. (1996, chapter 2) use a rate of 5%. On the other hand, many environmentalists and a number of health analysts argue for a zero discount rate. Yet another perspective is that the discount rate should represent individuals' subjective rate of time preference, where a rate of 0.5% is considered reasonable by Fullerton and Rogers (1993). The Chief Actuary is projecting a long run real interest rate of 3%, and this is the discount rate recommended in a recent major review of cost-effectiveness in health and medicine (Gold et al., 1996). As Baker (1995) shows, lower discount rates tend to reduce ARAnt GA estimates of generational "imbalance". In order to assess the sensitivity of our results to this choice, a range of discount rates between zero and three percent have been used.

In addition, two alternative assumptions have been used for projecting the tax/transfer system. They correspond generally to the "legislated" and "relative" scenarios analyzed in Murphy and Wolfson (1991) and Wolfson and Murphy (1997). The first assumes that current legislation will **not** be amended for the next century. This is certainly unrealistic, but is intended to highlight the impacts of the CPI and CPI-3% indexing trajectory for various aspects of the personal income tax system, refundable tax credits, and public pensions, and is similar to the assumption used in chapter 2 by Oreopoulos and Vaillancourt. The other "relative" scenario is closer to the "proportional growth" assumed by Oreopoulos and Kotlikoff (1996). Here, we have assumed that income tax brackets, refundable tax credit and public pension amounts all grow at a rate that maintains their magnitude relative to the average wage (that is, average wage rather than CPI or CPI-3% indexing, where wages are assumed to grow at 1% real per annum). The difference between these two scenarios accounts for much of the rather dramatically different conclusions of Oreopoulos and Kotlikoff (1996) and Oreopoulos and Vaillancourt.

The results are shown in Figure 8.4. The graph on the left shows the zero discount rate results, while that on the right is for a 3% discount rate. Within each graph, the bars are in pairs, each pair representing a decennial birth cohort. The bar within each pair on the left is for the "legislated" scenario, while that on the right is for the "relative" scenario.

The results are clearly sensitive both to the discount rate chosen, and to the scenario assumed for future indexing of taxes and transfers. Cohorts born before the1940s are all substantial net beneficiaries, irrespective of the tax/transfer indexing scenario and the discount rate (for the subset of government taxes and expenditures that have been explicitly modelled). However, after this point, the choice of indexing

Figure 8.4
Net Present Values by Discount Rate, Birth Cohort, and Projection Scenario (Thousands of 1996 Dollars)



scenario has a very large impact. The slower indexing under the "legislated" scenario results in cohorts becoming substantial net losers, for either discount rate. The "relative" scenario leaves virtually all cohorts net winners if zero or lower discount rates are assumed; but at a 3% discount rate, even this indexing scenario results in slightly negative NPVs.

Under both indexing scenarios and discount rate assumptions, generation-specific NPVs show non-linear and possibly cyclical trends. This highlights the importance of considering each generation on its own.

Of course, each of these decennial cohorts is quite heterogeneous, and the LifePaths generational account has been expressly designed to support analysis of these heterogeneities. One obvious distinction is between male and female members of successive birth cohorts. Figure 8.5 shows the same results as Figure 8.4 for the 3% discount rate, but broken down by gender.

This pair of graphs makes it clear that Canada's tax/transfer system provides massive redistribution from men to women (though typically in the cases of Social Assistance, Family Allowances and other child benefits, from men to women on behalf of children).

This exploration of intra-cohort heterogeneities can be extended to show not only redistribution between men and women, but also vertically. For this purpose, individuals have been grouped according to average lifetime earnings. Specifically, an average full-time equivalent earnings figure was defined as average hourly earnings times 40 hours per week times 52 weeks per year. Then lifetime earnings groups were defined in terms of annual earnings averaged over all working years in ranges of less than 10%, 10 to 50%, 50 to 100%, 100 to 200%, and over 200% of full-time equivalent earnings. Table 8.1 shows the distribution of each cohorts' lifetime earnings in these terms.

There is a larger proportion of earlier birth cohorts at lower lifetime earnings levels. The main reasons are the lower employment/population ratios of women, and lower educational attainments (hence lower earnings rates) for these turn of the century birth cohorts.

Figure 8.6 shows average net present values broken down by gender, lifetime earnings group, and birth decade, again at a 3% discount rate, for each of the two indexing scenarios: legislated indexing in the top two panels, and relative or wage indexing in the bottom two. Note that the scale of the vertical axis in Figure 8.6 is over twice that in Figure 8.5. The reason, simply, is that

Figure 8.5
Net Present Values by Sex, Birth Cohort and Projection Scenario (Thousands of 1996 Dollars)

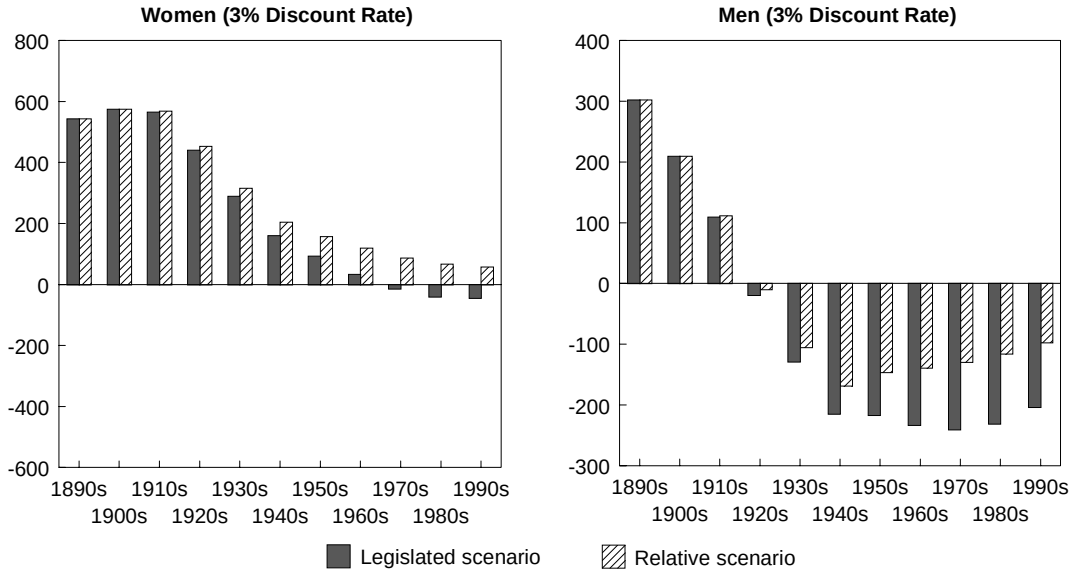


Table 8.1
Number of Individuals by Birth Cohort and Earnings (for those who survived at least 15 years)

Cohort Born in Year	Lifetime Average Annual Earnings as a Proportion of the Average Wage					
	< 0.1	0.1 to 0.5	0.5 to 1.0	1 to 2	2+	All
1890s	266	124	174	142	13	719
1900s	505	348	378	270	25	1526
1910s	718	600	612	461	40	2431
1920s	729	734	814	604	61	2942
1930s	561	682	924	731	80	2978
1940s	618	886	1465	1244	146	4359
1950s	680	1063	1914	1603	178	5437
1960s	654	1010	1925	1646	178	5413
1970s	623	1029	1930	1679	188	5449
1980s	657	1073	2090	1777	198	5795
1990s	670	1159	2180	1891	202	6102

there are wide variations in NPVs **within** each birth cohort, even when broken only into a few lifetime earnings ranges.

These results show clearly that there is major redistribution within birth cohorts by lifetime earnings group. For most cohorts, both men and women, and either indexing scenario, around half of the population appears to be net gainers. (Recall from Table 8.1 that the earnings groups are not of equal size, and the first three hold at least two-thirds of each cohort's population.)

A further result is that within generation variation in NPVs can be larger than that between generations. Thus, the main focus of ARAnt generational accounting, namely between-generation differences, looks to be a relatively small part of the story.

In fact, birth cohort + lifetime relative earnings group + gender account for a relatively small portion of the variance of NPVs over the representative sample of **individual** life paths in the underlying simulation. This impression from

Figure 8.6
NPVs by Birth Cohort, Sex, Lifetime Earnings Group, and Indexing Scenario (3% Discount Rate)

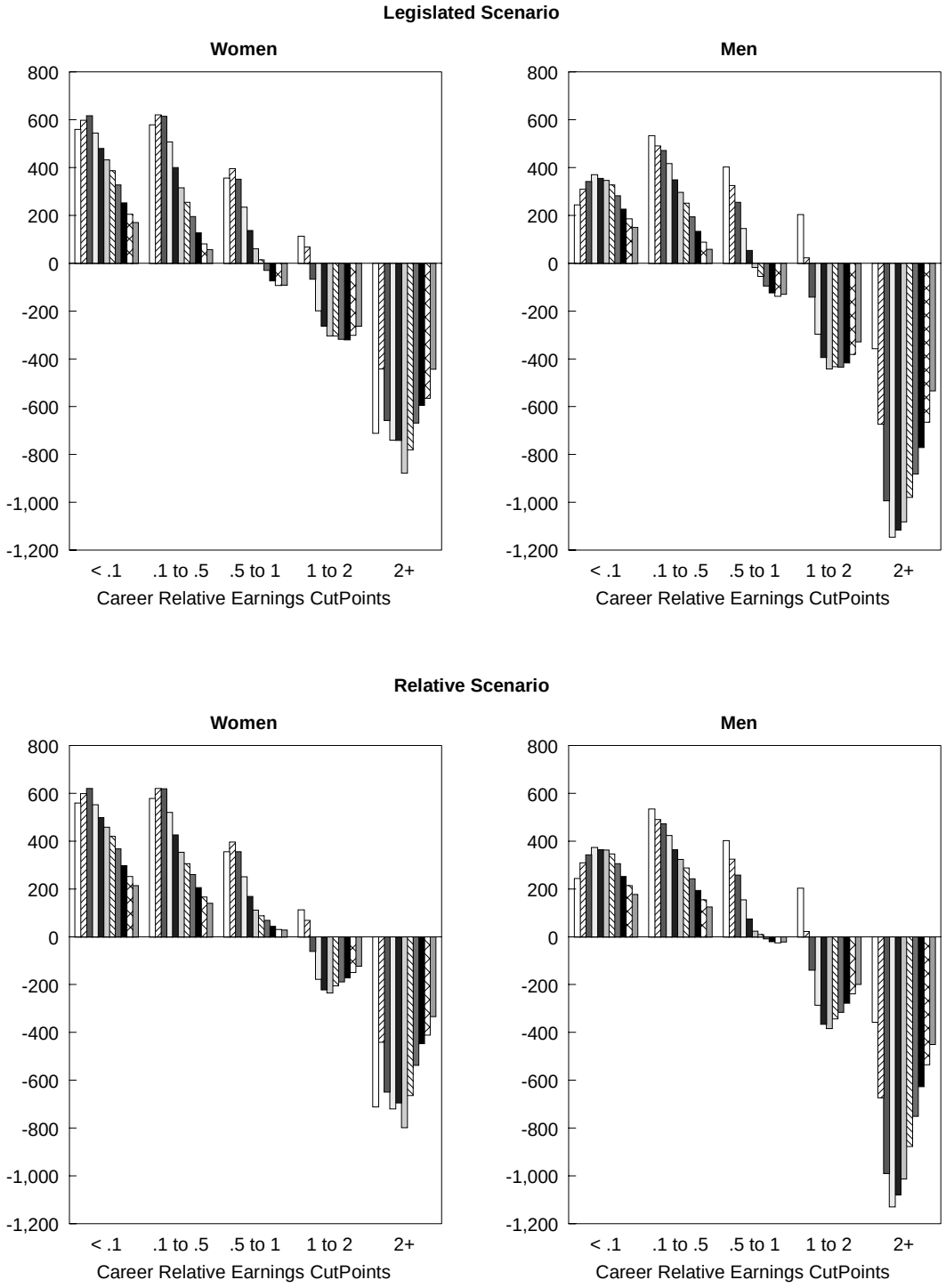


Table 8.2
Analysis of Variance of NPVs by Indexing Scenario

Source of Variation	Degrees of Freedom	Proportion of Total Variance (%)	
		Legislated	Relative
Birth Cohort	10	2.28	1.05
Earnings Group	4	20.34	16.51
Gender	1	0.04	0.08
Birth Cohort x Earnings Group	40	8.93	5.21
Birth Cohort x Gender	10	0.00	0.00
Earnings Groups x Gender	4	2.45	1.17
Birth Cohort x Earnings Group x Gender	40	0.17	0.14
Individuals within Groups	725,268	65.78	75.83

Figure 8.6 is supported by an analysis of variance (ANOVA) shown in Table 8.2.

This ANOVA provides a decomposition of the variance in lifetime NPVs into components attributable to birth cohort, relative lifetime earnings group, gender, and interactions among these three factors. The decomposition of variance was complicated by the fact the earliest cohorts are over-represented in the lowest earnings level. Moreover, cohorts are not of equal size. Consequently, the simulated lifetime NPV microdata are unbalanced: there are not equal numbers of observations within each of the 110 cells defined by cohort, relative lifetime earnings group, and gender. To adjust for this lack of balance, the partitioning of variance was carried out by a weighted least squares procedure (Winer, 1971 p.416).[6]

The ANOVA clearly indicates: [1] cohort effects are relatively minor on their own; [2] relative lifetime earnings level effects are important, indicating substantial transfers from "rich" to "poor"; [3] the relatively large interaction between cohort and earnings group suggests that cohort differences are best interpreted within each earnings group; and [4] most of the variability is not accounted for by any of the factors.

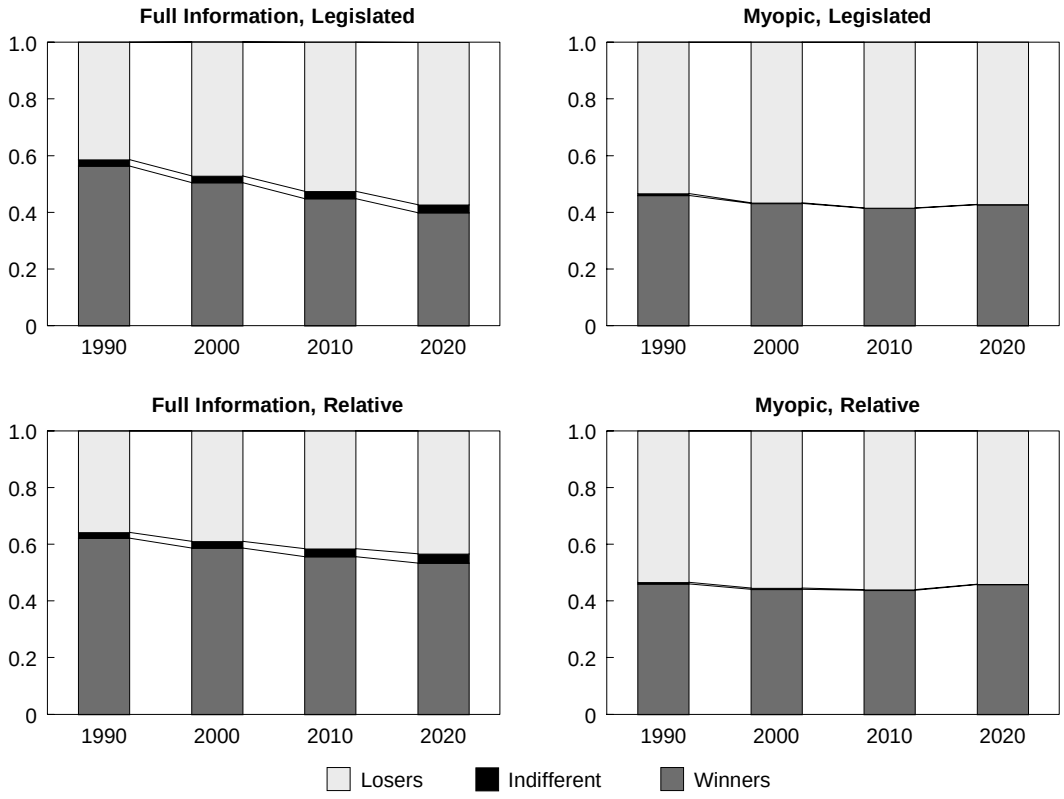
The results so far have not been used to draw any judgments as to the intergenerational fairness of the current tax/transfer system. Rather, the analysis has shown that "generation" (that is birth cohort) is not a very useful classification for this purpose. Another approach discussed earlier appeals to a democratic process norm. Can we foresee a period in the future when the electorate will be sufficiently "unhappy" with the tax/transfer system that individuals from a range of birth cohorts will be able to form a coalition that can make significant amendments? As a first very simple attempt at answering this question, we explore two rather naïve voting behaviours.

For the first "full information" voting behaviour, each individual is somehow able to consult his or her own personal actuary, who supplies them with an estimate of the NPV of their own lifetime taxes and transfers. Individuals under this voting behaviour only become "unhappy" with the tax/transfer system when their NPV is less than -$10,000; they are "happy" when their NPV is greater than $10,000, and they are indifferent for values in between.

The other "myopic" voting behaviour posits that individuals only become unhappy when the net of their taxes and transfers in the current year is less than -$100. While this is obviously far less "rational" behaviour from the viewpoint of economic theory, it is arguably more realistic than the "full information" behaviour.

Of course, both of these voting behaviours are seriously unrealistic in several other respects. Most people are not so individualistically selfish that they fail to consider the well-being of their spouses and co-resident children when judging the tax/transfer system. They also recognize that changes in the tax/transfer system for members of other contemporaneous birth cohorts can have a variety of effects on their own economic well-being: the most direct being prospective bequests from, or (on the flip side) care needs of, elderly relatives. These kinds of very real factors are ignored in the selfish economistic and myopic voting behaviours being considered.

Figure 8.7
Proportions of Gainers and Losers by Indexing Scenario, Calendar Year, and "Voting" Behaviour



In any case, Figure 8.7 shows the proportions who would win (bottom bar), lose (top bar) or be indifferent (middle bar in each set of stacked bars) in selected years according to the two voting behaviours and two indexing scenarios (legislated in the top two panels, relative in the bottom). In all cases, only the population age 20 and over in the given year is considered, as a rough indication of those eligible to vote; and the discount rate assumed is 3%.

The basic results of this simplistic analysis are clear enough. If individuals voted only myopically, on the basis of their then current net benefits (for the subset of government activities explicitly considered), even current arrangements would appear unsustainable (that is in 1990). The indexing scenario for this kind of voting behaviour makes little difference.

On the other hand, if individuals take a lifetime perspective, and use the kind of actuarial calculations embodied in these simulations, a majority over the next 30 years will find the subset of the tax/transfer system under a relative indexing scenario in their narrow self interest. However, under legislated indexing, the system would become a net loss within a few decades. The results are qualitatively similar at a zero discount rate.

Of course, major caveats are in order. First, the NPVs used as the basis for "voting" are highly dependent on just which taxes and transfers are included. Including more of government expenditures as benefits would raise all NPVs, while adding other taxes like commodity or property taxes would lower them all. Second, the policy choices most likely to be faced by voters over coming decades will not include the complete abolition of this set of taxes and transfers. Rather, it is more likely that there will be a range of modifications proposed. Thus, the results shown in Figure 8.7 should only be taken as illustrative. They provide a new perspective for judging the sustainability of Canada's tax/transfer system, but no substantive results.

4. Conclusion

Public pensions, in conjunction with an aging population and large government debt, raise major concerns about the burdens being passed to future generations. Generational Accounting provides a framework for assessing the character and magnitude of these burdens, and hence their fairness. Generational accounts as estimated to date, however, are based on several strong assumptions, particularly ignoring history (both retrospect and prospect), and reliance on stereotypical individuals to represent entire populations.

The analysis developed here presents an alternative more realistic form of Generational Accounting. We pay particular attention to and incorporate actual historical patterns, the likely evolution of Canada's tax/transfer system (of which public pensions are a major part), and the wide variety of individual specific circumstances.

Several major results emerge from this richer and more detailed form of Generational Accounting. Perhaps the most important conclusion is that the very idea of framing the issue of the sustainability of government tax/transfer arrangements, including public pensions, in terms of generational equity may be seriously misleading. The reason, simply, is the vast heterogeneity of individuals within each generation. This heterogeneity swamps generation, defined as a birth cohort. For example, if we examine "winners" and "losers" in terms of the net present value of their lifetime benefits in relation to taxes, every generation has substantial numbers of both. The number of "winners" alive and of voting age over coming decades (depending on how individuals make this judgment) could well be large enough that majority support for central elements of the tax/transfer system will be sustained.

It is certainly a major over-simplification to conclude that one generation or another is being unfairly treated by Canada's tax/transfer system. Individuals' life paths show such tremendous variety that birth cohort is unlikely to be a category or grouping with central political import.

Appendix

This analysis draws on extensions to the LifePaths family of models being developed at Statistics Canada, particularly a model of income contingent student loans (ICL) created for the federal ministry of Human Resources Development (Wolfson, 1996). These are dynamic monte carlo microsimulation models which generate representative population cohorts. The cohorts are built up as longitudinal samples of thousands of synthetic but highly realistic individual biographies or life paths—particularly in respect to their educational participation and attainment, employment, earnings, fertility, nuptiality, government taxes and transfers, and mortality trajectories over their lifetimes—hence their LifePaths.

The analysis starts with the cohort born in the 1890s, and extends for two centuries, to the ultimate demise of the children being born in the current decade. A major effort has been made to ground the analysis using quantitative data. However, the combination of an absence of detailed historical data, with the need to make long run projections, means that relatively stylized representations of the main socio-demographic processes and components of Canada's tax/transfer system have had to be used.

Table 8A.1
Cohort Life Expectancies

Cohort Born Year	Female	Male	All
1890s	65.7	62.0	63.5
1900s	67.7	62.3	65.0
1910s	71.0	64.6	67.8
1920s	75.4	67.9	71.7
1930s	78.3	70.8	74.5
1940s	80.9	73.6	77.3
1950s	82.7	75.2	79.0
1960s	84.5	77.3	81.0
1970s	86.3	79.1	82.7
1980s	87.9	80.3	84.1
1990s	88.9	81.4	85.2

1. Births and Longevity

The analysis begins by simulating a number of individuals born in each decade that is proportional to the actual figures from 1890 to 1990. More specifically, the probability of a birth in a given year is determined by the number of such births that would have had to have taken place in order to reproduce the 1991 population census age-sex structure, given the historical mortality rates experienced by each cohort. The births generated in fact correspond both to births within Canada and to foreign births; and age at immigration is randomly assigned at the same time as year of birth such that the resulting distributions of age at immigration correspond to the distributions observed for each age-sex group

Table 8A.2
Completed Educational Attainment Distributions by Sex and Birth Cohort

Cohort Born Year	Females			Males		
	Primary	Secondary	Post Secondary	Primary	Secondary	Post Secondary
	(per cent)					
1890s	75.2	16.0	8.8	75.2	17.3	7.5
1900s	72.7	17.1	10.3	73.1	18.6	8.3
1910s	68.7	20.3	11.0	66.4	23.2	10.3
1920s	62.4	23.6	13.9	58.8	27.2	14.1
1930s	51.5	27.3	21.2	48.3	32.2	19.5
1940s	37.5	33.1	29.4	35.8	35.8	28.4
1950s	31.8	36.4	31.8	33.2	38.9	27.9
1960s	29.0	35.7	35.3	31.4	40.2	28.4
1970s	28.7	35.9	35.4	30.8	40.8	28.4
1980s	28.1	35.7	36.1	30.2	41.1	28.7
1990s	28.2	35.7	36.2	29.8	41.0	29.2

in the 1991 Census. Individuals are then exposed to the appropriate historical mortality rates for their age and birth cohort. For the coming century, projected mortality rates are used, drawn from the latest report of the Chief Actuary (OSFI, 1995). Table 8A.1 above shows the resulting estimates of cohort life expectancy.

2. Education

The starting point for simulating participation in formal education and educational attainment is the model for the late 1980s and 1990s developed for the ICL model (by the Social and Economic Studies Division of Statistics Canada). This model incorporates very detailed sets of transition probabilities for progression from one school year to the next, and then to various levels of educational attainment, based on age, sex, type of institution, and course of study.

Since detailed historical data are generally unavailable, a rough approximation to earlier decades' transitions has been developed by working backwards. The analysis starts with educational attainment distributions by birth cohort, again drawn from 1991 Census data. The 1980/90s transition probabilities were than scaled and applied to earlier decades in such a way as to reproduce the educational attainments currently observed in the Census data.[7] Current levels of educational attainment are assumed to continue into the future. Table 8A.2 provides a summary of the resulting patterns.[8]

3. Employment

A key variable in this analysis is annual labour market earnings. Each individual's earnings is simulated in two main stages. The first is the number of weeks spent each year in paid employment. (The other stage, earnings rates, is described further below.) As with education dynamics, this analysis builds on the module of employment dynamics developed for the ICL model. This module was estimated from a combination of the Labour Market Activities Survey (LMAS), the Labour Force Survey (LFS), and the Census. The module is designed to reproduce both cross-sectional employment/population ratios within age- and sex -groups, and to reflect the best data available on longitudinal dynamics. The module is fundamentally dynamic, with employment behaviour represented by waiting time distributions. They were estimated so as to reproduce the employment/population ratios observed in the census, the sub-annual dynamics observed in the LMAS, and the multi-year patterns of stability in job holding reflected in job tenure responses in LFS, and job mobility patterns inferred from census responses regarding weeks worked. These waiting time distributions were estimated as functions of sex, marital status and educational attainment groups (less than secondary, secondary grad, some post-secondary, community college grad, BA or first professional, MA, and PhD).

Table 8A.3
Employment/Population Ratios by Age Range, Sex and Time Period

	Females by Age Range				Males by Age Range			
Period	15 - 25	25 - 45	45 - 65	65 +	15 - 25	25 - 45	45 - 65	65 +
(1902,1912)	0.223				0.181			
(1912,1922)	0.367	0.277			0.496	0.781		
(1922,1932)	0.393	0.262			0.489	0.824		
(1932,1942)	0.424	0.283	0.192		0.501	0.839	0.875	
(1942,1952)	0.418	0.272	0.213		0.500	0.855	0.882	
(1952,1962)	0.405	0.320	0.259	0.015	0.464	0.855	0.853	0.082
(1962,1972)	0.397	0.445	0.331	0.018	0.407	0.834	0.824	0.045
(1972,1982)	0.422	0.593	0.419	0.019	0.420	0.828	0.807	0.036
(1982,1992)	0.444	0.687	0.528	0.019	0.441	0.830	0.803	0.037
(1992,2002)	0.432	0.726	0.633	0.020	0.427	0.820	0.807	0.039
(2002,2012)	0.431	0.734	0.667	0.023	0.426	0.819	0.813	0.045
(2012,2022)	0.474	0.734	0.672	0.028	0.475	0.820	0.806	0.056
(2022,2032)	0.650	0.736	0.677	0.031	0.685	0.823	0.804	0.056
(2032,2042)		0.754	0.681	0.028		0.836	0.806	0.050
(2042,2052)		0.766	0.674	0.027		0.837	0.804	0.050
(2052,2062)			0.612	0.027			0.769	0.047
(2062,2072)			0.533	0.024			0.667	0.042
(2072,2082)				0.014				0.022
(2082,2092)				0.008				0.014
(2092,max.)				0.003				0.007

max. = maximum.

Since the ICL module was designed only for future projections, it was necessary to extend its capabilities backward so it could reproduce data over the past century. For this purpose, an historical time series of age- and sex-specific employment-population ratios (or the closest concept available) was assembled, drawing particularly on historical decennial population censuses. Then a set of cohort-specific adjustment factors was developed such that the early 1990s transition dynamics, when adjusted, corresponded reasonably closely to the historical employment-population ratios.

For future decades, the early 1990s transition dynamics (the parameters of the conditional waiting time distributions) were held fixed for subsequent years. Note that this still allows some trends in the resulting employment/population ratios because time-varying covariates, like educational attainment which determine simulated employment durations, are themselves evolving, albeit not dramatically. Table 8A.3 gives a summary overview.[9]

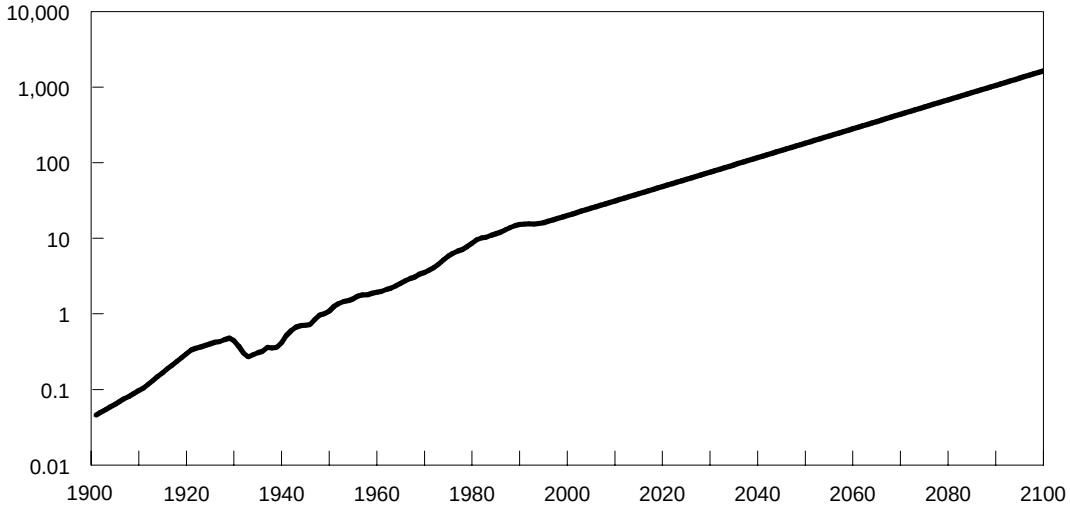
4. Earnings

The other component in annual labour market income is earnings per unit of time. Annual earnings are the product of hourly dollar earnings rates, weekly hours, and week to week employment over the year. The week to week employment module was just described. Hourly earning rates are based on data from 1991 Census distributions for those who worked full-time and full year during the previous calendar year, and full time during the reference week. For this sub-population, hourly earnings rate distributions were estimated by assuming that the usual hours worked during the reference week had applied during all of the previous calendar year.

These distributions of hourly earnings were estimated separately by sex, educational attainment group and duration since graduation. In addition, individual trajectories through these various distributions are simulated in a way that depends not only on individual (and sometimes time-varying) characteristics, but also on a random serially rank correlated element based on an observed labour force entry cohort from the National Graduates Survey.

The second component, weekly hours distributions, was also based on the 1991 Census, but this time considering everyone who worked in the reference week. This population

Figure 8A.1
Time Series of Log Nominal Average Hourly Earnings



was disaggregated by age group, sex, educational attainment, and whether their work in the previous year was mostly full- or part-time. For each new spell of employment, and at least once a year, individuals' weekly hours were drawn (conditionally independently) from the appropriate distribution. This algorithm induces an appropriate serial correlation in full- or part-time hours.

Thus, with these individual-level hourly earnings rates and weekly hours modules, combined with the weekly employment status module described above, LifePaths is able to generate synthetic but realistic annual earnings trajectories, including correlations with covariates such as age, sex, education, and marital status.

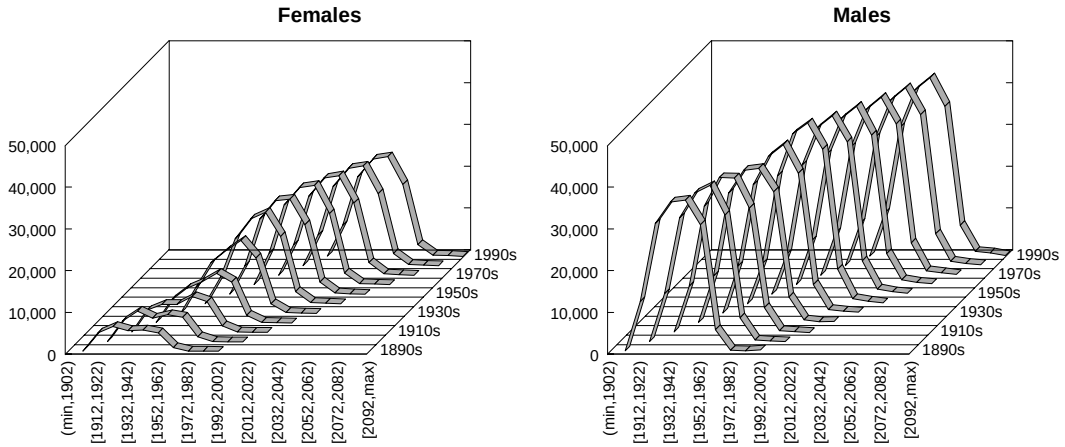
However, the earnings dynamics and nominal values are appropriate to the early 1990s. The last main task is to create cohort-specific adjustment factors so that each cohort's earnings trajectories match as well as possible the historical data. To some extent, this is already accomplished by the dependence on educational attainment. Since educational attainment is lower for earlier birth cohorts, these cohorts' earnings will be correspondingly lower.

The last step, therefore, has been to apply an adjustment to nominal dollar values of hourly earnings rates so that simulated aggregate wages approximate National Accounts values for total labour income. More precisely, a series of "full time equivalent" average hourly earnings was constructed from the National Accounts aggregates, based on the same historical census employment/population ratios, and an assumption of 52 weeks worked per year and 40 hours per week. The resulting series was then used to scale all years' hourly earnings in relation to the observed 1990 average hourly wage.

Note that this algorithm puts all of the adjustment on hourly earnings rather than on some mixture of hourly earnings and weekly hours, which would likely be more realistic. However, in this analysis, the only earnings that matter are annual earnings, so this assumption makes no difference.

From 1995 onward, individual-level earnings are assumed to grow at a nominal rate of 4.5%, the rate assumed by the Chief Actuary in his latest report, (that is at a real rate of 1.0% point, given his projected CPI growth rate of 3.5%, OSFI, 1995. Figure 8A.1 shows the resulting time series of average nominal hourly earnings on a log scale. It is interesting to note that with the approach being taken, the main impact of the depression of the 1930s is visible here, rather than in the historical employment/population ratios derived from decennial censuses. Also, the growth rate assumed for the coming century, following the Chief Actuary, is below that of the past.

Figure 8A.2
Average Annual Earnings by Cohort Birth Year, Sex, and Time Period (1996 Dollars)



Finally, Figure 8A.2 shows the results of a complete simulation of cohort- and sex-specific average annual age-earnings profiles. The current nominal values used in the underlying simulation have been expressed in 1996 dollars by using the ratio of average hourly earnings each year (shown in Figure 8A.1 above) to the 1996 value. In other words, these age-earnings profiles are expressed relative to the average wage.

5. Nuptiality

The basis for marital status transitions is an analysis of retrospective data collected in the 1984 Family History Survey (Rowe, 1989). Simulated transitions from initial never-married status into either common-law unions (CLUs) or into legal marriages are governed by probabilities that vary with age, employment experience, CLU experience and fertility history (transition probability, or hazard functions). These probabilities also vary by cohort—reflecting the growing trends favouring CLUs as a precursor to marriage. Separation and divorce transitions are governed by probabilities that vary with marriage duration, family composition, and employment experience. Separation and divorce probabilities exhibit a dramatic increase after 1969, reflecting the effect of changes to divorce legislation. In order to match the historical experience of the Canadian population as closely as possible, the hazards were subject to simultaneous scalar adjustments which produced close agreement with census estimates of the proportions ever married by cohort and with cohort estimates of the relative hazards of marriage versus common-law union formation from the 1990 General Social Survey. It has been assumed throughout, that the general age pattern of marriage and of CLU formation is fixed (peaking soon after the typical school leaving age and trailing off slowly thereafter). Future nuptiality transition probabilities are conditionally fixed at current patterns (the coefficients of the underlying transition probability density functions remained fixed), though the resulting union formation and dissolution rates vary with endogenous time varying co-variates such as educational attainment, fertility, and employment. (Also, in the case of employment, marital status exerts a reciprocal influence as a time-varying co-variate itself.)

6. Fertility

The chances of a birth are determined by a woman's age, marital status and number of previous births. Due to the complexity of estimating parity-specific fertility rates, only two basic fertility schedules have been used, one reflecting high fertility prior to 1961, and the other contemporary low fertility, with interpolated fertility rates in the intermediate period. These schedules were then scaled up or down to approximate completed cohort fertility (total children ever born) for those decennial cohorts whose complete fertility histories are known, to reflect current ratios of completed fertility among women grouped by educational attainment, and

to introduce correlation with calendar year trends in total fertility rates. Future fertility rates are assumed to remain fixed at current levels.

7. Income Taxes

Personal income taxes, and C/QPP and UI payroll taxes are modelled explicitly, assuming somewhat simplified structures. For example, the personal income tax as modelled includes basic personal exemptions (pre 1988) or non-refundable personal tax credits (post 1987), tax rate brackets, provincial income taxes as a weighted average proportion of basic federal tax, refundable child and sales tax credits, and the various indexing regimes. In particular, current CPI or CPI-3% partial indexing is assumed to continue into the future, under the "legislated" scenario considered. This is a critical assumption, as shown in Wolfson and Murphy (1997).

8. Cash Transfers

The major cash transfers are explicitly modelled, though again in a stylized manner. These include Old Age Security, Guaranteed Income Supplement, Spouse's Allowance Canada and Quebec Pension Plan retirement and survivors pensions, Family Allowances refundable Child Tax Credits child benefits, Social Assistance and unemployment (now employment) insurance. Other cash transfers such as workers compensation and veterans benefits are not explicitly modelled, since their size and/or structure is such that they have at most a modest impact on total intergenerational flows.

9. In Kind Transfers

The major in kind government transfers are health care and education. These are modelled based on unit costs by age, and sex in the case of health care, and unit costs based on the kind of educational institution attended: elementary/ secondary, community college, university (Cameron and Wolfson, 1994).

The results of all this historical data analysis, synthesis, and simulation model development is a new variant of the LifePaths model for generational accounting.

End notes

The authors would like to acknowledge very helpful comments on an earlier draft from the editor and anonymous referees. We remain responsible for any errors and infelicities.

[1] It also implies more generally that it is unfair to bequeath to the next generation an impaired productive capacity, though as noted, such broader aspects are beyond the scope of this analysis. Thus, the rate of per capita economic growth is assumed fixed and exogenous in all that follows.

[2] The analysis is silent on the fact that this implies a rather peculiar tax system: one set of tax rates for those born before "today", and another higher set of rates for those born after, both applying at the same time over the next century while members of both groups of birth cohorts are alive.

[3] The change in conclusion from Oreopoulos and Kotlikoff (1996) to Oreopoulos and Vaillancourt (Chapter 2) parallels a more general change in Canada's policy discourse. To the end of 1996, the debt and deficit were treated by the federal government as the major issue. But early in 1997, informed journalistic discussion of Canada's fiscal situation began to recognize that coming decades will see "the next overarching fiscal issue ... [as] fiscal **surpluses**" (Little, 1997: emphasis in original). The fact that Canada's fiscal structure has been on a long run track toward surplus has been noted by OECD analysts (Leibfritz et al. 1995), Murphy and Wolfson (1991), and Wolfson and Murphy (1997). By May 1997 in the federal election campaign, a central issue has become how to "spend" the impending fiscal surplus.

[4] We are indebted to A.R.Dobell and a conversation he and Wolfson had in 1982 as part of the work of the Parliamentary Committee on Pension Reform for this idea. Unfortunately, it has taken 15 years longer than originally anticipated to develop the tools and data required for the analysis.

[5] Payments of interest on and amortization of the national debt are excluded in ARAnt GA to avoid double counting. Such payments are also exluced in LifePaths GA, though the reasons are different. First, LifePaths is an "open system" insofar as unborn cohorts are not included, even though their taxes could contribute to amortizing the debt. Second, there are major uncertainties as to the pace with which the debt will be reduced. And finally, there are important practical and conceptual difficulties in determining the incidence of debt reduction at the micro level, a problem that is avoided by the simplifying assumptions of ARAnt GA.

[6] Similar adjustments for lack of balance were necessary to decompose the mean squared error into components of variance (Winer, 1971 p.165). Note that the term "components of variance" is strictly applicable only to random effects, which gender and earnings level cannot be. Nevertheless, we use the term here to refer to a decomposition of mean squared error into components whose magnitudes reflect the relative importance of factor effects.

[7] The individuals observed in the 1991 Census data at a given age are a biased sample of the original birth cohort. There is very good evidence of a gradient in mortality with socio-economic status. However, no association between mortality and educational attainment has been assumed. Thus, members of historical cohorts who died prior to observation in the 1991 Census likely have their educational attainment biased upward. In turn, their in kind benefits from public education are biased upward, and given the positive relationship between education and earnings described below, so are their earnings.

[8] Note that "high school" also includes trade/ vocational certification.

[9] Note that the decline in the female employment/population ratio in the 45 to 65 age group for the last few decades is a reflection of selection bias. The women remaining in this age group are, on average, getting closer to age 65, and therefore showing lower employment rates. An analogous bias exists for the 15 to 25 age group in the early years.

Bibliography

BAKER, Dean (1995). *Robbing the Cradle? A Critical Assessment of Generational Accounting.* Washington, D.C.: Economic Policy Institute.

CAMERON, G. and M.C. WOLFSON (1994), "Missing Transfers: Adjusting Household Incomes for Non-Cash Benefits." IARIW 23rd General Conference, St Andrews, New Brunswick.

CANADA (1979). *The Retirement Income System in Canada: Problems and Alternative Policies for Reform* (Lazar Report). Ottawa: Queen's Printer.

CANADA (1982). *Better Pensions for Canadians* (Green Paper). Ottawa: Queen's Printer.

FULLERTON, D. and D.L. ROGERS (1993). *Who Bears the Lifetime Tax Burden*. Washington, D.C.: The Brookings Institution.

GOLD, M.R., L.B. RUSSELL, J.E. SIEGEL, and M.C.WEINSTEIN (1996). *Cost Effectiveness in Health and Medicine.* Oxford: Oxford University Press.

HOUSE OF COMMONS (1983). *Report of the Parliamentary Committee on Pension Reform* (Frith Committee). Ottawa: Minister of Supply and Services.

KOTLIKOFF, L.J. (1992). *Generational Accounting: Knowing Who Pays, and when, for What We Spend*. New York: Free Press.

LIEBFRITZ, W., D. ROSEVEARE, D. FORE and E. WURZEL (1995). "Aging Populations, Pension Systems and Government Budgets: How Do They Affect Savings?" OECD, Economics Department, Working Papers No. 156.

LITTLE, Bruce (1997). "Let the Good Times Roll, The Disappearing Deficit." *Globe and Mail,* Saturday, February 8, page D1.

MURPHY, B. and M.C. WOLFSON (1991). "When the Baby Boom Grows Old: Impacts on Canada's Public Sector." *Statistical Journal of the United Nations Economic Commission for Europe.* Vol. 8, No. 1.

OREOPOULOS, P. and L.J. Kotlikoff (1996). "Restoring Generational Balance in Canada." *Choices Public Finance*. Montreal: Institute for Research in Public Policy.

OSFI (1995). *Canada Pension Plan: Fifteenth Actuarial Report as at 31 December 1993*. Ottawa: Office of the Superintendent of Financial Institutions.

ROWE, G. (1989). "Union Dissolution in a Changing Social Context." In J. Legare, T.R. Balakrishnan and R.P. Beaujot (eds.). *The Family in Crisis: a Population Crisis?* Ottawa: Royal Society of Canada.

WINER, B.J. (1971). *Statistical Principles in Experimental Design.* New York: McGraw-Hill.

WOLFSON M.C. (1996). "LifePaths: A New Framework for Socio-Economic Accounts." IARIW 24th General Conference, Lillehammer, Norway.

WOLFSON, M.C. and B. MURPHY (1997). "Aging and Canada's Public Sector: Retrospect and Prospect." In K. Banting and R. Boadway (eds.). *Reform of Retirement Income Policy: International and Canadian Perspectives.* Kingston: Queen's University, School of Policy Studies.

Chapter 9

Generational Accounting and Government Policy: Competing Perspectives

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How to Conduct Fiscal Policy in the Long-Term

LAURENCE J. KOTLIKOFF

Although Generational Accounting is only seven years old, it has already been applied to 18 countries: Argentina, Australia, Belgium, Brazil, Denmark, Germany, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Thailand, the United Kingdom, the United States, and—as the chapters in this book clearly demonstrate—Canada.

Much of this Generational Accounting is being done by or with the substantial participation of governmental bodies including the Argentine Ministry of Planning, the Bank of Japan, the U.S. Congressional Budget Office, the New Zealand Treasury, the Norwegian Ministry of Finance, and the Bank of England. The Generational Accounts for Sweden and Thailand were produced by the International Monetary Fund and The World Bank. Generational Accounting has also been the subject of detailed studies by the U.S. Congressional Budget Office, the European Commission, the Organization for Economic Cooperation and Development, and the Bundes Bank.

In the following remarks I argue that Generational Accounting is a central tool for conducting fiscal policy in the long-term, and that in order to break the fixation of politicians with annual budgetary measures independent government agencies should be directly responsible for calculating the Generational Accounts. Developments in Canada and the U.S. are particularly illustrative of this point. In particular, while the Canadian Generational Accounts point to the restoration of generational balance as a result of recent changes in fiscal policy, they also warn against imprudent changes in policy even if a government starts running a "surplus."

1. Canada's Long-Term Fiscal Challenges

My work with Oreopoulos (Oreopoulos and Kotlikoff, 1996) illustrated that Canada, like the United States, is facing a long-term fiscal crisis that imperils the next generation. We showed that unless current generations are asked to pay more in taxes or accept less in transfer payments, or unless the Canadian government dramatically cuts its spending, future Canadian children will face, over their lifetimes, net taxes (taxes paid net of transfer payments received) that are more than twice as large as a share of their labour incomes than are the net taxes facing current Canadians. This represents an enormous imbalance in Canada's generational policy. Doubling the lifetime net tax rates of tomorrow's Canadians would destroy both their economic lives and the Canadian economy.

To put the Canadian generational crisis in perspective, let me mention that of the countries that have now constructed generational accounts, Canada appears to have the fourth largest generational imbalance in its fiscal affairs. The three countries with even larger generational imbalances are Italy, the United States, and Japan.

In Chapter 2 of this volume Phillip Oreopoulos and François Vaillancourt point out there are ways to restore generational balance in Canada's fiscal affairs, and it appears that the Canadian government is now taking some real steps toward achieving generational balance. Indeed, they suggest that recent budgets and the legislated increases in C/QPP contributions combined with more accurate projections of fiscal policy have put Canadian fiscal policy on a sustainable path. These adjustments for

achieving generational balance may be very painful, but the biggest worry is not that Canada's generational cure will hurt; the biggest concern is that Canada will not continue down this path, and end up in even worse shape. The difference between the conclusions reached by Oreopoulos and Kotlikoff (1996) and Oreopoulos and Vaillancourt illustrate, in part, how the prudent conduct of fiscal policy can turn the Generational Accounts around. At the same time they also illustrate the importance of staying the course, and of using the Generational Accounts (rather than annual budget balances) as a guide for fiscal policy. The danger ahead is that the forecast of annual surpluses will lead to policy changes that threaten the gains made in restoring generational balance. This underscores the importance of the Generational Accounts as a long-term tool for government policy.

2. Bringing Generational Accounting Home

In my view it is absolutely essential that the Canadian government start doing Generational Accounting in-house. Statistics Canada, the Department of Finance, and other government agencies should team up to put out, on an annual basis, an official Generational Accounting for Canada. In reading through the chapters of this book, I was struck by the substantial amount of human capital in the government sector that could easily be brought together to do generational accounting. Indeed, Oreopoulos's Generational Accounting program, which, he assures me, is available for use by the Canadian government free of charge, is chock full of data generated by, or with the help of, the Canadian government. So Canadian Generational Accounting is, in large part, already a government product, but it needs to be an official one. I hope that Oreopoulos and Vaillancourt will be involved in Generational Accounting for years to come, but the proper home for this analysis is the government.

Were I the head of Statistics Canada, I'd bring together Chantal Hicks, Brian Murphy, Michael Wolfson, Goeff Rowe, Xiaofen Lin, and Steve Gribble and ask them to produce not only Generational Accounts, but also **Intra-**generational Accounts. All the work that these economists have presented represents key inputs into a comprehensive set of generational and intragenerational accounts that will show how the government is treating not only different generations, but also different groups within each generation. With my Statistics Canada team in place, I'd go to the Department of Finance and the Provinces and recruit their top revenue and expenditure forecasters and ask them to refine and extend their long-term revenue and expenditure forecasts.

Now I know that government ministries are reluctant to put forth numbers which are speculative. And it's certainly the case that to do Generational Accounting one must entertain lots of estimates (really guesstimates) of future government receipts and expenditures. But the alternative policy—recording only current receipts and expenditures—represents sticking one's head in the sand and ignoring the future. Governments have an obligation to think ahead and to plan ahead. To me, it's incredible that governments of most developed countries around the world are able to get by without doing any systematic and comprehensive long-term fiscal planning.

3. Deficit Delusion

The major obstacle in persuading government agencies to do Generational Accounting on a formal basis is that they have, by and large, bought into the proposition that their current method of fiscal accounting, which is deficit accounting, provides a solid basis for considering their fiscal affairs. Nothing can be further from the truth. Neoclassical economics teaches us that the budget deficit is not a well defined economic concept. I mean this in a mathematical sense. Write down the equations of any neoclassical model with rational economic agents. Let this model include uncertainties of any type, including uncertainties about future government policy. Let the model incorporate fiscal distortions, credit market imperfections, and any other features you feel are central to modelling a real-world economy.

In specifying the model's fiscal policy, don't think of the policy in terms of "taxes," "transfers," or "borrowing," but simply in terms of the net cash that flows each period between the government and each particular household and the marginal prices, including marginal wages and marginal rates of return, that each particular household faces. Once you've written your model in label-free terms, you'll immediately realize two things. First, you don't really need to describe your model's fiscal policy in terms of "taxes," "transfers," or "deficits" and second, you are now free to label the net cash flows in your model any way you'd like. Indeed, you are free to label the model such that it generates any time-path

of "deficits" or "surpluses" you'd like, notwithstanding the fact that the underlying fiscal policy in the model as well as the economic performance generated by the model are the same.

Choosing alternative and inherently irrelevant fiscal labels to describe your model's underlying fiscal policy is like choosing whether to discuss your model in English, French, or Spanish. The model's the model, no matter what language you use to describe it. From a scientific perspective, the logical implication of all this is that the budget deficit is content-free. It bears no fundamental relationship to a country's true fiscal policy. This fact makes the use of Generational Accounting for describing a country's generational policy not just an option, but an imperative. One simply cannot hope to learn about a country's generational policy or any other feature of its fiscal affairs by considering its past, present, or projected future budget deficits. Fixating on them is fixating on your government's vocabulary, not its actions. Just as we would not say a country's fiscal policy is good or bad because its population speaks Spanish rather than French or English, we cannot say a country's fiscal policy is good or bad because it is "running a deficit," or for that matter a "surplus."

4. Politics and Generational Accounting

Having argued that Generational Accounting needs to be done by governments for its own sake and to move politicians away from mindless deficit accounting, let me now suggest how politics can intervene in the actual formation of Generational Accounts by governments.

In the U.S., Generational Accounting was adopted by the government, but only briefly. It made a three-year appearance in the President's *Budget* which is produced annually by the Office of Management and Budget (OMB). The first two *Budget* chapters on Generational Accounting appeared in President Bush's last two *Budgets*, and the third chapter appeared in President Clinton's 1993 *Budget*. These chapters were co-authored by myself, Alan Auerbach, Jagadeesh Gokhale, and OMB staff.

Each of these chapters occupied roughly 7 pages of a 1000-plus page document. But that fact, notwithstanding, they received what appeared to be more press coverage than the entire rest of the Budget. This pleased me to no end, but in 1993 it apparently made the political operatives in the Clinton White House very unhappy. Here they were trying to sell a tax cut and spend a bundle on a new health-care system, and here we were pointing out that future Americans already faced an 84 percent lifetime net tax rate given how little of the government's bills current Americans were slated to pay.

In preparing the 1994 Generational Accounting chapter for OMB, we knew that there was going to be trouble when we started being handed ludicrous forecasts of future government spending. These forecasts were chosen by OMB not because OMB thought they were credible, but because they wanted to keep the Generational Accounts from looking **too** bad and being censured by the White House's censorship. The forecasts they handed us involved federal government spending disappearing over time relative to the size of the economy. We resisted these patently bogus forecasts and were able to include Generational Accounts based on alternative, reasonable federal spending scenarios in the final draft of the chapter. But all our internal bargaining with OMB proved a waste of time. Two days before the Budget was to be published the administration decided to excise the Generational Accounting.

Now why am I telling you this? I tell you this because getting a government to do Generational Accounting is no guarantee that it will do it honestly or that it will keep doing it once it sees the results. For this reason, the ideal government agency to do Generational Accounting is a very independent one. In the U.S. that would be our General Accounting Office, the Social Security Administration, or the Federal Reserve. Alternatively, the U.S. government could establish a separate independent agency called, perhaps, "The Bureau of Long-term Fiscal Planning," whose directors would have long-term appointments.

5. Generational Accounting's Limitations

Having helped kick off what I hope will be a permanent revolution in long-term fiscal planning, let me acknowledge some of the shortcomings of Generational Accounting and suggest ways in which it can be improved. At the outset, let me say that Generational Accounting is, in my mind, a second-best tool of generational policy analysis. The best tool we have available is, I believe, realistically formulated and empirically calibrated simulation models. The excellent papers by

Marcel Mérette, Steven James and Chris Matier are examples of such models. (See chapters 6 and 7.)

If I had my way, I'd put together the best dynamic stochastic general equilibrium simulation model I could and force the politicians, the press, and the public to digest its results. This model would capture lots of things that Generational Accounting either fails to capture or captures poorly. The most important of these is general equilibrium feed backs, excess burdens arising from economic distortions, and the proper risk adjustment of uncertain future variables, including fiscal variables.

Alas, I don't have my way. Given that we can't transform politicians, the press, and the public into economic modellers or even into consistent consumers of model outputs, Generational Accounting appears to be the best tool we have to communicate the nature of generational policy. Our goal then should be to make Generational Accounting as good as possible. As I've already mentioned, one way to do that is to improve the fiscal forecasts which are inputs into Generational Accounting's outputs. A second way is to use the results of economic theory and simulation studies to refine Generational Accounting's underlying incidence assumptions. For example, in the chapter by Oreopoulos and Vaillancourt, corporate income taxes are allocated to various age- and sex-groups based on their relative labour income, that is, corporate income taxes are assumed to be borne by labour. This assumption is appropriate given the fact that Canada is a small and very open economy. Moreover, simulation studies show that allocating corporate income taxes to owners of capital in a small open economy can produce non trivial errors in the calculation of policy-induced change in Generational Accounts. A third and quite important way to improve Generational Accounting is to formulate stochastic simulation models that help us understand the proper ways to risk-adjust our discounting of the expected value of uncertain future net tax payments. In short, then, simulation analysis can provide an important means of refining the practice of generational accounting.

6. Generational Accounting and the Macro Economy

My final comments relate to the relationship between Generational Accounting and macro economic performance. Changes over time in Generational Accounts tell us how the government is redistributing across different generations. But generational account changes can also be related to a nation's saving behaviour, specifically to see whether intergenerational redistribution is affecting a country's saving and through that channel its domestic investment and rate of economic growth.

In the U.S., for example, the enormous and ongoing postwar redistribution from young savers to old spenders has cut the rate of national saving in half. The decline in the U.S. saving rate has produced an almost equally large decline in the rate of U.S. domestic investment. This, in turn, has dramatically lowered U.S. growth rates of labour productivity and real wages. Indeed, in the last four years, U.S. real wage growth averaged only 0.3 percent per year. This rate is just one sixth the rate observed, on average, in the 1950s and 1960s. Incidentally, over the same four year period, real Medicare benefits per beneficiary grew by one-quarter. Last year alone, real Medicare benefits per beneficiary grew 12 times faster than the real wages of the workers paying those benefits.

If one asks who has been doing all the extra consumption in the U.S. in recent decades, the answer is among the elderly. Since 1960, the share of total U.S. consumption accounted for by the elderly has risen four times faster than has their share of the population. In 1960, the typical 70 year-old consumed about two-thirds what the typical 30-year old consumed. Now the typical 70 year-old consumes about twice what the 30 year-old consumes.

The dramatic increase in the absolute and relative consumption of the elderly reflects two factors. First, a dramatic decline in their absolute and relative net taxes (that is, a reduction in their generational accounts), and second a dramatic increase in the propensity of the elderly to consume. The increase in the elderly's consumption propensities is, I believe, related to the substantial increase in the share of the elderly's resources that now comes in the form of annuity payments. Most of these annuities are being provided by the government. The prime examples here are social security and Medicare benefits. So the federal government has not only transferred huge sums to the elderly, but it has also handed them these sums in a form that never runs out no matter how long they live. In so doing, the government has insured the elderly against eating up their resources too quickly. This has led them to do just what their bumper stickers

say, namely eat up their children's inheritances. The message from the U.S. experience is that one needs to consider not just how much one is giving to a particular generation, but also the form in which the transfer is made, to understand the ultimate impact of the transfer on consumption and national saving.

7. Conclusion

Generational Accounting has come a long way, but it still has a long way to go. The Canadian government, like most other governments, needs to do long-term fiscal planning on a systematic and comprehensive basis. Generational accounting is neoclassical economics' prescription for how to do that planning. As the chapters of this book make clear, Canadian economists inside and outside of government have the talent, the knowledge, and the energy to make Canada the world's showcase of Generational Accounting. I hope they'll do just that and allow me and others to sit back and admire the results.

Bibliography

OREOPOULOS, P. and L.J. KOTLIKOFF (1996). "Restoring Generational Balance in Canada." *Choices.* Vol. 2, No. 1. Montreal: Institute for Research on Public Policy.

Meaning and Measurement in Intergenerational Equity

LARS OSBERG

"Intergenerational equity" is a term that can be interpreted in the sense of either: [1] equity between persons in the intergenerational transmission of economic status—often judged by the norm of "equality of opportunity"; or [2] equity in the intergenerational division of aggregate resources, considering all members of each generation as a group. Many of the papers in the companion volume (Corak, 1998) focus on the first meaning, and the determinants of intergenerational social mobility has long been a central issue in sociology and politics. This volume has focussed on the second interpretation, and espoused a "new" type of measurement of "Generational Accounting."

However, intergenerational equity in the second sense is not exactly a new issue. It has always been, and will always be, true that the adults now alive make decisions which affect the future welfare of their children, and their children's children. It has also always been the case, because future generations have nothing to trade and no power to coerce, that the division of resources between present and future generations is determined by the norms of equity of the current generation. And it has been clear for a long time in Canada that a bulge in births in the 1950's would create an uneven generational structure, with long run implications for retirement security issues.

Why is there **now** a new level of concern for this second interpretation of intergenerational equity? Do the chapters in this book add to our understanding of intergenerational equity and hold out the promise for improved policy formulation—or is their selective focus misleading, and likely to produce poorer policy choices? In my comments, I will focus on the issues raised by "Generational Accounting" because, in my view, the conceptual framework underlying accounting conventions is extremely important. By organizing and framing our social perceptions, accounting conventions can shape our understanding of social reality, and thereby significantly influence public policy. Indeed, it is the stated purpose of "Generational Accounting" to highlight a supposedly neglected dimension of equity and to influence public policy.

I will argue that these efforts are fundamentally misleading. Section 1 emphasizes that the relative well being of unborn generations will be determined by the stock of real productive assets which they receive as an endowment, an issue about which the "Generational Accounting" of forecast tax burdens has **nothing** to say. Section 2 argues that since the central social function of the family is intergenerational reproduction, any realistic model of intergenerational transfers must examine seriously the transfer of resources within the family, and the impacts of public policies on those intra-family reallocations. Section 3 notes that in aggregating individuals into groups, on the criterion of birth year, "Generational Accounting" focusses on relatively small differences in average income, compared to the very large

differences in individual income between the rich and the poor of each cohort. Section 4 discusses the type of research programme a statistical agency might adopt to assist the decision making process and why the issue of intergenerational equity has come to the fore.

1. The Real Bequest

Equity between Canadians now alive and Canadians yet unborn is, as I have argued elsewhere (Osberg: 1985, 1992,1993), an important component in societal well-being. However, it should be emphasized from the outset that the aggregate economic well-being of future generations will depend on the aggregate stock of real productive assets which they inherit, minus any net liabilities to foreigners. Future generations will have to combine their own labour power with the endowment of assets which they receive, and they will have to make their own decisions about the distribution of annual output, but the important issue is the legacy of real assets.

The bequest of productive assets left to future generations is not limited to the aggregate stock of physical capital goods and structures (both public and private). In an economy increasingly oriented to the production of information and knowledge services, many would argue that the endowment which this generation leaves to the next in the form of human capital, societal knowhow, culture and research and development will be even more important. Environmental assets, both in the form of resource stocks and in the shape of environmental problems, are also an important component of the intergenerational bequest. The productive potential of future generations will also be heavily influenced by the amount of resources which they have to devote to battling crime or picking up the pieces left by disintegrating families—under the heading of "social capital" one can group the social institutions that create and sustain such traits as honesty, law abidingness and nurturance of the young.[1]

Future generations will have to combine their own labour power with the physical capital, human capital, environmental assets and social capital left to them by previous generations, and out of that stream of income they will make payments on any net debts owing to foreigners. Hence, in analyzing issues of intergenerational equity, it is crucial to measure accurately trends in these stocks. Good data now exist on net financial indebtedness to foreigners and on the aggregate value of the private capital stock (public capital stock figures may be less complete). Canada also has a substantial amount of information on the level of educational attainment of Canadians, and is beginning to acquire data on the quality, as well as the quantity, of schooling. However, information on the aggregate value of training investments by firms, or our stock of research and development, is sketchy at best.

Important aspects of our intergenerational bequest are difficult to measure, but it may be dysfunctional to ignore issues, just because of that difficulty. Resource stocks such as ore bodies, forests or fish stocks present complex problems of valuation and management—but it is surely undesirable to implicitly set their value to zero, by ignoring them. Similarly, future generations will probably not thank us if we ignore our social problems and bequeath to them a society with a higher endemic rate of crime, violence and social decay—even if we also leave them a greater capital stock of penitentiaries.

I emphasize the importance of measurement of the legacy of productive capacity which this generation of Canadians will leave to the future, because in this volume there is **not one word** of discussion of these issues. This book does contain a good deal of discussion of the distribution of financial liabilities in the chapters on Workmen's Compensation Board funding, the federal deficit and the distribution of tax liabilities. However, none of these chapters address the issue of whether Canada's stock of real productive assets is increasing over time, or whether it is falling. Hence, the question of whether, in fact, the decisions of this generation are leaving the next generation better off, or worse off, in aggregate terms remains unaddressed. The measurement of trends in real productive capacity is central to assessment of the options that will be open to our children, and to future generations. However, the adults of today should also face the fact that future generations may make fundamentally different social choices than we have, and we will not be able to do anything about it, because we will then be dead.[2] Today's adults can decide the type and amount of their legacy of productive assets, but they cannot bind future generations as to how those assets will be used, or how each generation will decide to distribute its aggregate income.

In Chapter 2 by Oreopoulos/Vaillancourt (henceforth O-V), a trend rate of population

growth, and a trend rate of growth of national income, are assumed, hence real income per capita is exogenously determined, at each and every point of time in the future. One might then wonder what remains to be said about the aggregate economic well-being of different generations. However, the O-V paper, like much of the Generational Accounting literature, is not really about the consumption possibilities, in aggregate, of future generations—rather it is about distribution, whether tax rates might have to be raised in future, or whether current tax rates are sustainable (the O-V conclusion is that "Canadian fiscal policy is nearing sustainability").

Does the relative burden of tax liabilities affect the rate of accumulation of aggregate productive capacity? Only two papers (chapter 6 by James and Matier and chapter 7 by Mérette) consider this issue at all explicitly, although no measurement is attempted in either. These papers are important advances in the discussion because they do at least try to link, in an explicit way, the intergenerational balance in tax liabilities to aggregate capital formation and economic growth. However, even leaving aside the many grounds for skepticism about the output of computable general equilibrium models calibrated with an ad hoc selection of response elasticities[3] and based on the assumption of the non-existence of involuntary unemployment or the business cycle, can these papers tell us anything useful about Canada's legacy of productive capacity?

One does not really have to run the model underlying these two papers to know the conclusion. The strength of the computable general equilibrium methodology is that it forces the analyst to specify clearly and explicitly a full system of equations (unlike the O-V paper). However, such explicitness comes with a price—the assumptions of the model are plain to see. A major assumption of both papers is that all public expenditure is non-productive.

To take a concrete example, governments could today decide to spend more on the maintenance (or creation) of public infrastructure, such as roads or bridges, or governments could decide to spend more on education. Such expenditures would add to the deficit, and thereby increase the tax liabilities of future generations. Would the public capital stock and private human capital which corresponds to these expenditures also add to the incomes of future generations?

In Generational Accounting the answer is assumed to be "no". All government expenditure is assumed to be consumption—the Benefit-Cost ratio of all public sector projects is implicitly set to zero. Since the growth rate of national income is taken as exogenous in the O-V paper, their implicit assumption goes further—**both** the private and the public capital stock are unconnected to the tax burden of different generations—and their model of the income generation process is left unspecified. The James/Matier and Mérette papers are commendably explicit in specifying a model of the link between taxation, the private capital stock and income generation—but they presume the public capital stock not to exist, and public expenditures to be uniformly unproductive. The mathematical appendix to these chapters spells out a complete model of a world in which there is a government sector that produces a public good and transfers income. However, since the government-produced public good does not appear either in the utility function of individuals or in the production function of firms, nobody wants it. Hence, in these models there is no good reason for government to exist.

Since these models also assume that there is no uncertainty, no inequality within cohorts and no barrier to spreading consumption over one's lifetime by borrowing and lending in perfect capital markets, there is also no good reason for government transfer payments to exist. Since the public goods produced by government are assumed to have no benefits in increasing either the utility of individuals or the productivity of firms, and since the taxes required to finance the production of public goods and transfer payments are assumed to have resource misallocation effects, the existence of government is assumed to create social costs, but to have no social benefits. If one believes these models, the optimal size of the public sector is, therefore, clearly zero.

In the private sector, most accountants would think it odd to focus on only half the balance sheet, and consider only liabilities. If one considered only tax liabilities, one could easily reduce the tax liabilities of future generations by closing public schools and by selling off the road network, but it is worth asking if future generations would be better off paying tuition fees and highway tolls. Such questions cannot be considered by a theoretical framework that recognizes only the costs of government, while assuming the benefits of government activity to be non-existent. Strong conclusions are drawn in these papers,[4] but although some organizations emphasize one side of the ledger for explicitly political reasons[5] a balanced

approach would consider both assets and liabilities.

The neglect of value added in the public sector is really quite fundamental to "Generational Accounting." If public sector expenditures, such as those on education, are presumed to be unproductive, their dollar values can be allocated (as "consumption") to individuals, and the dollar value of benefits to individuals is equal to the dollar value of costs to government . The value of total expenditure will then correspond to the discounted dollar value of the taxation required to pay for such expenditures. In the accounting identity stressed by generational accountants, the "tax payments of the unborn" is the residual which balances the tax and expenditure sides of government accounts. However, if expenditures on services such as education yield greater dollar benefits to recipient individuals than their dollar cost to government (that is, the rate of return on human capital is positive), "generational accounts" lose their fundamental accounting identity.

As well, it is worth noting that the Mérette and James/Matier papers present a model of the intergenerational allocation of resources in which children do not exist (adults being born, without cost, at age 17). Their models of higher education can truly be summarized as "the blind leading themselves", since it assumes that only student time is required for learning—no other inputs (such as books, professors, buildings, or laboratories) are needed, hence public expenditure is assumed to play no role in increasing human capital. Although all models must simplify reality in order to be tractable, credibility is lost if essential aspects of the issue under examination are omitted.

The neglect of a public sector role in productive investment may be highly dysfunctional. In fact, Wolff (1996) has argued that the decline in investment in public sector infrastructure in the United States since the early 1970's has been an important source of the slowdown in U.S. productivity growth.

2. Tax Incidence: Who Really Pays?

In the public finance literature, there is a long history of analysis of the incidence of taxation (Vermaeten, Gillespie and Vermaeten, 1994), but in asking the question of who pays a specific tax, the key issue is "compared to what?". The debates of tax incidence analysis often centre around the construction of a convincing counter-factual case, since the issue of what would have happened in the absence of the tax is central to analyzing its distributional impact. It is often the case that the initial incidence of taxation differs from its ultimate incidence, because individuals and markets react.

For example, payroll taxes, even if initially paid by employers, are usually seen in the public finance literature as additions to labour costs which are ultimately borne by labour, in the form of lower wages. Similarly, although property taxes are initially paid by landlords, it is often assumed that the taxes paid on land are passed through to tenants in the form of higher rents.

The distinction between initial and ultimate incidence of taxation is of clear relevance for the analysis of intergenerational tax incidence, since the assumption that there is zero shifting between generations of tax burden or transfer benefit is clearly extreme. Generations share incomes within families while they live together, and much of the private capital stock is left as inheritances within the same family line. Indeed, it can be argued that our primary social unit is the family, and the primary social function of the family is the reproduction of the human species. Hence the family must be at the centre of any discussion of intergenerational equity issues.

In my view, the Ricardian equivalence proposition of Barro (1974) represents an extreme statement, but it is equally extreme to assume (as in the chapters of this book) that individuals have **no** family links between generations. If the "Generational Accounting" of tax incidence is to be taken seriously, there has to be some consideration of tax shifting between generations. The interaction between tax and expenditure policy decisions and the intra-household allocation of resources between generations has to be examined seriously. As Phipps and Burton (1996) have shown, the details of tax and expenditure policy changes matter, since changes in tax or transfer policy which impinge unequally on men and women will differ in their impact on child expenditures.

The provision of in-kind services such as education may also have a different impact than cash. In chapter 4, Hicks mentions the issue of the intra-family division of resources, but to maintain comparability with the Generational Accountants, she devotes most of her attention to distributing taxes and transfers among individuals, ignoring family status. It is not

surprising that (as her Figure 4.1 indicates) this exercise demonstrates that people typically pay net taxes while they are in the labour force, and receive net transfers when (as children or as senior citizens) they are not.

However, her discussion of expenditures on education also illustrates the problematic nature of Generational Accounting. In the debate on funding of post-secondary education, the argument is often made that, since university students tend to come from upper-income families, government subsidies to universities which are financed from general tax revenue are regressive, on average transferring resources from poor families to rich. Implicitly, the assertion is that families (not necessarily co-resident) are the relevant unit for income distribution comparisons, and that government expenditures simply substitute for intra-family intergenerational transfers. The policy prescription is to let tuition fees rise, but student groups (usually composed of young people) tend to argue that, even if this does reduce government deficits and their future taxes, they are not better off with a larger private debt. Figure 4.13 in chapter 4 illustrates the difference it makes to presumed incidence if education expenditures are assigned as a benefit by age of household head, or to students.

In general, although it is more work to assess the degree to which intergenerational transfers within the family are affected by particular changes in tax or expenditure policy, the result will be much more believable than the assumption that there is **no** linkage between generations, except through the state. As Kotlikoff and Summers (1981) have demonstrated, at best some 19% of total U.S. wealth in 1974 could be explained as the result of life cycle savings—the remainder of the U.S. capital stock is transferred within families as intergenerational bequests. Although the models of James/Matier and Mérette assume private intergenerational transfers to be zero, this seems a bad approximation to empirical reality.

The "Generational Accounts" perspective can only be rescued if it is argued that actual intergenerational transfers are all unintentional, and arise due to the uncertainty of lifetimes and the non-availability of annuities. However, this argument implies that:

[1] the failure of capital markets to supply the option of annuities is truly colossal;

[2] the elderly who die leaving multi-million dollar estates (which in fact comprise much of the capital stock) have highly exaggerated ideas of their potential life span, and/or future spending; and

[3] inheritance taxation (even at a confiscatory rate) would have no impact on savings or labour supply behaviour, since all bequests are said to be unintentional.

I do not think it was the intention of Generational Accountants to argue that Inheritance Taxation is the perfect non-distortionary tax and can be set at any desired level without affecting behaviour, but it **is** an implication of their assumption of zero intentional bequests. A more balanced approach should, in my view, consider the optimal inheritance tax as a balance between equity concerns (in the sense of equality of opportunity among individuals) and any behavioural impacts on savings and aggregate capital formation.

3. Aggregation

In considering equity between different generations, we are focussing attention on a particular example of **group** equity. Discussions of group equity are a staple of the political diet, and it is common in political debate to aggregate individuals into groups, and to summarize the well being of each group with a simple average (for example, the average earnings of males compared to the average earnings of females, or the average personal incomes of Ontario residents, compared to the rest of Canada). Among the set of all individuals, both those now alive and those who will be alive in the future, "Generational Accounting" aggregates individuals into groups by birth year, and summarizes the well being of birth cohorts by simple averages of income received, or taxes paid.

Traditionally, economic theorists who consider issues of social welfare have favoured a focus on equity among individuals, rather than among groups, for both principled and practical reasons. On principle, economists have often insisted on the idea that "anonymity" is a desirable characteristic of an ethically defensible social welfare function (Jenkins, 1991). The principle of anonymity expresses the liberal value that individuals are not of greater or lesser social worth because of such characteristics as race, or sex, or age, and requires that aggregate social welfare should be unaffected if any two individuals simply trade places in the income distribution. However, if one's equity comparisons

are limited to looking at the average incomes of the young and the old, and if a rich youth and a poor senior citizen were simply to exchange incomes—with no other change in the income distribution—the average incomes of youths and seniors **would** be affected. Generational Accounting measures of intergenerational equity do not, therefore, satisfy the basic liberal value of non-discrimination.

Empirically, when there is substantial variation within groups, compared to the actual size of between group differences, it might be considered misleading to organize one's data so as to suppress consideration of most of the inequality among individuals, and thereby concentrate attention on a relatively small component of aggregate inequality. Differences among individuals within birth cohorts are much larger in magnitude in Canada than differences between cohorts in average income. Since most Canadians live in families, benefit from economies of scale in household consumption and share incomes within their families, it is misleading to examine only individual income in comparing the well being of birth cohorts.[6] Inequality in the distribution of equivalent annual money income within five birth cohorts of Canadians over the period 1975-1994 is much larger than differences between cohorts. The average equivalent annual income of the top 10% of baby boomers was 6.64 times larger than the average income of the bottom 10% of baby boomers in 1994— if one compares the average incomes of the boomers (born 1946-1959) and Generation X (born 1960-1975), the ratio was only 1.098. Over 95% of aggregate inequality (as measured by the Theil index) can be ascribed to inequality among people of the same birth cohorts, and less than 5% of aggregate inequality can be ascribed to between cohort differences in average equivalent money income (Osberg, 1996). As Wolfson et al. note in chapter 8, differences in average equivalent income **between** birth cohorts are relatively small compared to differences in income **within** birth cohorts.

Indeed, as Murphy notes (chapter 5), because a high proportion of senior citizens have modest incomes, any increase in the tax burden that bears relatively heavily on the top end of the income distribution will also alter the relative average tax burden by age group, to the perceived advantage of older cohorts. Taxation that is progressive among individuals can thereby be transmuted, by the principles of "Generational Accounting," into an assertion of inequity between generations. It is clear that, whatever gloss the generational accountants put on it, rich individuals will gain and the poor individuals will lose if the progressivity of the tax system is eroded. Policy measures to deal with the presumed problem of inter-cohort inequality can have significant impacts on inequality among individuals. This fuels the impression that a false fight is being created in which the poor (of all ages) will be the losers.

Furthermore, although it might be protested that Generational Accounting aims at redirecting transfers (for example to poor children), the more fundamental issue is the overall level of redistribution within society. Kapur (1996) argues that diminished altruism, in public life and within the family, is an important general trend in U.S. values, which underlies the peculiarly American debate over intergenerational fairness (and is also dysfunctional to long run growth). In comparing societies, it is not generally true that more for the old means less for the young: societies with greater social cohesion tend to do more about poverty, and treat dependent groups better, **in general**. Myles (1995, p. 103) summarizes the international evidence as "Countries that spend a lot on old people also spend a lot on children."

4. Conclusion

The allocation of resources between generations will ultimately be determined by what the current generation of adults considers to be "fair." Within families, individuals choose the bequest that they consider fair according to norms that differ widely, and subject to a lifetime income constraint that differs even more. The social dilemma for a liberal society is that the differing values of parents, and the differing resources available to them, inevitably create inequalities of opportunity for their children and grandchildren.[7] As well, since individuals also inherit membership in a society, and a common endowment of public goods to supplement their inheritance of private assets, there is inevitably a **social** decision to be made about the aggregate stock of such assets.

Values clearly differ concerning the relative importance of inequality of opportunity, compared to other dimensions of equity, or the desirable mix between public and private bequest or the appropriate aggregate bequest to be left, in total,

to subsequent generations. Public policy affects each dimension of these issues, and the political process will inevitably be called on to try to find a balance between conflicting values and interests. The role of a statistical agency in this debate is to construct an unbiased fact base—on the presumption that an informed debate will, in a democracy, ultimately produce better social decisions than an uninformed debate.

Currently in Canada one often observes that the same value of "Intergenarational Equity" is appealed to by both the advocates and the opponents of particular policy choices. To take Ontario as an example, cuts to social assistance have been both justified on the grounds that our children must be relieved from the burden of public debt and attacked on the grounds that deepening child poverty will blight the lives of the children whose family benefits have been cut. Although it is probably too much to expect that such debates could ever be divorced entirely from wishful thinking, ideology and the pursuit of self-interest, it would be nice to have a somewhat larger proportion of fact, compared to simple assertion, in these controversies.

However, an informed debate will not be produced if it is fuelled by a biased selection of information. If only the costs of programs are counted, while benefits are not, it is clear that all programmes will fail a cost/benefit evaluation. An agency like Statistics Canada can do a great deal to improve the debate on Intergenerational Equity in Canada, but one thing that I would argue that it should **not** do is to participate in the sort of Generational Accounting exercises that have been presented.

Statistics Canada can, in my view, greatly assist in informing the debate on Intergenerational Equity by improving our knowledge of: [1] trends over time in the stocks of real productive assets of the Canadian economy; and [2] actual transfers of resources within families, and their determinants.

In order to assess whether future generations will on average be better off, or worse off, than current generations, we need to know whether the aggregate endowment of physical, intellectual, environmental and social capital (plus/minus net foreign assets/liabilities) is growing over time. We now have partial information on some of these components, but it is arguable that the components that will be most important in the Information Economy of the next century (intellectual, environmental, and social capital) are the aspects of our bequest which we currently hardly try to measure. This implicitly sets their value to zero in the public policy discussion. It is important to measure the trend over time in these stocks, both as a way of assessing the aggregate value of the intergenerational bequest and as an input into the assessment of tradeoffs between its different dimensions (for example, tradeoffs between environmental and physical capital).

It is striking that in the chapters of this book, it has been generally assumed that the family does not, in any meaningful way, exist. The companion volume focusses on the original meaning of the term "Intergenerational Equity", in which the key idea is the inheritance of relative individual economic status between generations (Corak, 1998). In this discussion, the social institution of the family is central and the implicit point of reference is the ideal of equality of opportunity. This is a very different set of issues, and a very different set of values as to what is really important, but I would argue that the family cannot be ignored even if one is only interested in the aggregate bequest left from one generation, as a group, to the next.

What proportion of the real productive assets left by this generation to the next are bequeathed through decisions made within the family? How are those family decisions influenced by public policy decisions, for example on inheritance taxation? The papers in this book assume the answer to both questions to be "zero," but this cannot be a good guide to public policy.

Finally, one cannot resist the impression that only the Morissette (1998) and Picot/Myles/Pyper (1998) papers are getting at the reason why there is now widespread anxiety about the well being of future generations and why intergenerational equity has become an issue with public resonance. In my view, the current public concern with intergenerational equity arises from the basic fact that compared to earlier generations, youth today face a labour market of lower wages and greater insecurity.[8] Youth are, on average, worse off, but even if the tax man is not the real reason, the relative burden of taxation is an easy target because the average tax load has risen and the public at large has been sensitized to the issue of a burgeoning government debt. More generally, the 1990s have seen a decline in the average real equivalent income of all birth cohorts, and because high unemployment has

lasted so long, the promise of a better material standard of life in the future is seeming less credible to many people of all ages.

Macro-economic policy has a generational equity dimension, because a policy of high interest rates and aggregate demand restraint to contain inflation will provide benefits to asset holders (who tend to be older) while swelling the public debt that youth will have to repay through their taxes. As well, the costs of a slack labour market are borne disproportionately by the youth who are trying to get their first foothold. Osberg and Fortin (1996) and Fortin (1996) have argued that the Bank of Canada's aggressive pursuit of "price stability", using contractionary monetary policy, is almost entirely responsible for the escalation of the public debt in Canada, and the slow growth and chronic high unemployment of the 1990s. The costs of a poorly performing macro economy show up in many dimensions, but there may be a common underlying cause.

End notes

I would like to thank Miles Corak for his helpful suggestions, but not implicate him in my own comments.

[1] The importance of social capital in socially sustainable development is taken up in Osberg (1992). In addition see the discussion by John Helliwell in chapter 10.

[2] For example, faced with a high tax burden due to accumulated debt, future generations might decide to sell off public assets (such as national parks, or the road network), or they could (conceivably) decide to repudiate debt. Either course would alter the distribution of income within generations, but not the aggregate income of each generation. Of course, the option of asset sales only exists if such assets exist.

[3] To anyone familiar with the labour economics literature (for example Heckman's 1993 survey), a base case labour supply elasticity of 1.0 seems implausibly high. Most surveys put the consensus estimate at about 0.1 (Pencavel, 1986). This is half the minimum value of the labour supply elasticity used by Mérette and James/Matier (that is 0.2) and, as they note, their results are sensitive to the choice.

[4] For example: "In contrast to the social welfare impacts observed under the wage tax mix, the impacts under the general tax mix are positive at all reduction speeds." (James and Matier p. 81).

[5] For example, the Fraser Institute, which publicizes annually "Tax Freedom Day" to symbolize the proportion of income in Canada absorbed by taxation, while omitting any corresponding "Public Service Day" to recognize the services which would not exist without such taxation.

[6] Most two year olds do not, for example, possess any individual income, yet the fact that they grow into three year olds, (indeed the fact that society survives, despite the zero income of most children) indicates some degree of consumption pooling. For an explicit analysis of the impact of alternative assumptions concerning the intra-household sharing of resources for the incidence and depth of child poverty, see Sharif and Phipps (1994).

[7] I cannot resist adding that the whole public policy argument of Generational Accounting seems to me rather odd. The model assumes zero private bequests within families (that is we are all assumed not to care about our own children), yet in public policy our concern for disembodied "generations yet unborn" is appealed to.

[8] See also Green and Beaudry (1997), Osberg, Erksoy and Phipps (1994)

Bibliography

BARRO, R.J. (1974) "Are Government Bonds Net Wealth?" *Journal of Political Economy*. Vol. 82, 1095-1118.

CORAK, Miles (editor) (1998). *Labour Markets, Social Institutions, and the Future of Canada's Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

FORTIN, P. (1996). "The Great Canadian Slump." *Canadian Journal of Economics.* Vol. 29, 761-787.

GREEN, D. and P. BEAUDRY (1997). "Cohort Patterns in Canadian Earnings: Assessing the Role of Skill Premia in Inequality Trends." University of British Columbia, Department of Economics. Unpublished.

HECKMAN, J. (1993). "What Has Been Learned About Labour Supply in the Past Twenty Years?" *American Economic Review.* Vol. 83, 116-121.

JENKINS, S.P. (1991). “The Measurement of Income Inequality.” In L. Osberg (editor). *Economic Inequality and Poverty: International Perspectives.* Armonk, New York: M.E. Sharpe Inc.

KAPUR, B.K. (1996). “Ethics, Values and Economic Development.” In M.G. Quibria and J.M. Dowling (eds). *Current Issues in Economic Development: An Asian Perspective*. Hong Kong: Oxford University Press.

KOTLIKOFF, L.J. and L. SUMMERS (1981). “The Role of Intergenerational Transfers in Aggregate Capital Accumulation.” *Journal of Political Economy*. Vol. 89, 706-732.

MORISSETTE, René (1998). “The Declining Labour Market Status of Young Men.” In Miles Corak (editor). *Labour Markets, Social Institutions, and the Future of Canada’s Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

MYLES, J. (1995). “Pensions and the Elderly.” *Review of Income and Wealth*. Series 41, 101-106.

OSBERG, L. (1996). “Economic Growth, Income Distribution and Economic Welfare in Canada 1975-1994.” Paper presented at section 14 American Economic Association, January 5, 1997. Dalhousie University, unpublished.

_____ (1993) “What’s Fair? The Problem of Equity in Taxation.” In A. Maslove (editor). *Fairness in Taxation: Exploring the Principles* Toronto: University of Toronto Press.

_____ (1985). “The Measurement of Economic Well-being.” In D. Laidler (editor). *Approaches to Economic Well-being*. Vol. 26, Royal Commission on the Economic Union and Development Prospects for Canada. Toronto: University of Toronto Press.

_____ (1992). “Sustainable Social Development.” In R.C. Allan and G. Rosenbluth (editors). *False Promises: The Failure of Conservative Economics*. Vancouver: New Star Books.

OSBERG, L., S. ERKSOY and S. PHIPPS (1994). “How to Value the Poorer Prospects of Youth in the Early 1990’s.” *Review of Income and Wealth*. Forthcoming.

OSBERG, L and P. FORTIN (1996). *Unnecessary Debts.* Toronto: James Lorimer Publishers.

PENCAVEL, J. (1986). “Labour Supply of Men: A Survey.” In O. Ashenfelter and R. Layard (eds.). *Handbook of Labour Economics*. Vol. 1. Amsterdam: North Holland.

PHIPPS, S.A. and P.S. BURTON (1996). “Collective Models of Family Behaviour: Implications for Economic Policy.” *Canadian Public Policy*. Vol. 22, 129-143.

PICOT, G., J. MYLES, and W. PYPER (1998). “Changing Labour Market Conditions, Government Transfers, and Poverty Among The Young and Old.” In Miles Corak (editor). *Labour Markets, Social Institutions, and the Future of Canada’s Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

SHARIF, N. and S. PHIPPS (1994). “The Challenge of Child Poverty: Which Policies Might Help?” *Canadian Business* Economics. Vol. 2, 17-30.

VERMAETEN, F., W.I. GILLESPIE and A. VERMAETEN (1994). “Tax Incidence in Canada.” *Canadian Tax Journal*. Vol. 42, 348-416.

WOLFF, E.N. (1996). “The Productivity Slowdown: The Culprit at Last? Follow-up on Hulten and Wolff.” *American Economic Review*. Vol. 86, 1239-1252.

Chapter 10

What Will We Be Leaving You?

JOHN F. HELLIWELL

The inspiration and content of this volume owe much to Larry Kotlikoff, Alan Auerbach and their collaborators for their pioneering work in the development of Generational Accounting. These papers include the latest efforts to apply their accounting framework to Canada as well as numerous extensions of parallel thinking to a far broader range of legacies. Both of these lines of research make use of Statistics Canada's unmatched sources of data and analytical capacities, so the sponsorship and content of this book make a natural match. To help me to see the current papers and future research plans in context, I shall consider how far Generational Accounting could be extended if it were intended to provide a reasonable balance sheet of what current generations are likely to leave behind for their successors. I shall first consider the types of assets or liabilities we are leaving, then the types of organizations whose actions influence the distribution, and finally the interplay of distribution within and between generations. Some of these issues are covered by the papers in this book and by those in the companion volume, while others remain to be dealt with or discarded, depending on taste and resources.

1. What Should Generational Accounts Measure?

Fiscal Deficits and Debts

Fiscal deficits and debts are a good place to start, since it has been the initial point of concentration for Generational Accounting. Of course, as Chantal Hicks notes (in chapter 4), questions of generational transfers and their equity implications have a much longer history and broader scope, but the fiscally-centred Generational Accounts have been a primary focus of much recent research, including that prepared for this book. There have probably been three reasons for this: first, concerns about the size and sustainability of government deficits as populations age; second, the need to have some means of considering the appropriate degree of current funding for future government spending and transfers; and third, perhaps, an attempt to find an ethical basis for the always difficult politics of deficit reduction. The latter point is relevant because the early generational accounts showed that our generation was leaving behind a set of debts and established programs that would require future generations to pay much higher tax rates than we do. Indeed, chapter 3 by Gunderson and Hyatt notes that the fiscal situation may be even worse than the earlier studies indicated if account is taken of unfunded liabilities in the workers' compensation system, and there are no doubt other liabilities lurking in the system, some of which I shall mention later.

In updating the Canadian analysis for this book, Oreopoulos and Vaillancourt (chapter 2) provide the relatively optimistic conclusion (when seen in the light of rather alarming calculations in earlier work) that recent actual and announced fiscal retrenchments have eliminated the generational imbalance. The required tax increases and expenditure cuts are still making their way through the system, but they lead the authors to at least consider the possibility that the end of the tunnel is in sight. The authors recognize that the various taxes used to balance the generational books may have rather different effects on growth and hence on the need for yet further fiscal adjustments, but they follow the first generation of generational accountants in not assessing the growth effects of alternative financing packages. This is, however, the topic of the subsequent papers by James and Matier (chapter 6) and by Mérette (chapter 7), who consider the growth and welfare effects of alternative means of deficit reduction. Neither paper, however, takes up the challenge of Irwin

Gillespie (1997), posed in his comments for the recent C.D. Howe volume on equality, when he noted that the taxes often preferred by the users of representative agent optimizing growth models were often the most regressive, exposing a difficulty for those who would otherwise wish to advocate more use of sales taxes and less use of income taxes.[1] The need to take intra-generational heterogeneity into account is shown clearly by the Wolfson, Rowe, Lin and Gribble finding in chapter 8 that by far the largest part of the variability of lifetime earnings is within rather than among cohorts. This supports the need to study intergenerational issues using data and methods that account at the same time for the variety of situations and incomes within as well as between generations.

Constructed Capital, Infrastructure, and Knowledge

Plant and equipment, public buildings, bridges, airports, parks and knowledge are assets with long enough lives that they need to be brought into the generational accounts. Going from conventional plant and equipment through public spaces to knowledge, the types of asset become less private, less excludable, and more securely the basis on which future generations will be either grim or grateful when they think of what we have done for them. By the same token, and for some of the same reasons, the valuation problems become more severe as the assets become less private and more public. This should not be a reason for leaving public goods out of the accounts, however, as investments in knowledge may well have much higher rates of return, seen from the perspective of the next generation, than any of the more obvious monuments to the energy and self-importance of the current generation.[2] If such investments are left out of the Generational Accounts, they are likely to be under-provided, and their widespread (and hence diffuse) benefits leave them without well-focussed and powerful supporters when fiscal retrenchment is at hand.

Doing the generational accounts for physical capital is relatively straightforward, and estimates of capital stocks have become part of the conventional structure of national balance sheets. Measurement of depreciation rates, however, remains an uncertain business. Going beyond conventional bricks and mortar, establishing appropriate values for long-past decisions to maintain green spaces in cities, or the choice of better or worse corridors for transport and communications, is no mean feat. For knowledge, the situation is even murkier, as original costs cannot be the right measure of the value of the output for such an uncertain process as research. In addition, as Aghion and Howitt (1992) have emphasized, much of new knowledge gets its private return at the expense of others whose previous discoveries are rendered obsolete.

Human Capital

In the category of human capital, I think primarily of physical and mental health and education. The emphasis here is on what assets individuals possess, leaving for later consideration the various institutions that govern communal life, and thereby facilitate peaceful and productive application of human and physical capital. The kind of legacies current generations can pass on to future ones include good health prospects. These flow primarily from the health of the parents, pre-natal care, and good curative and preventive care from infancy to old age. Health care is especially important in the formative early years, and Knighton et al. (1998) show that children of educationally and financially disadvantaged families require more hospital care, and receive less forward-looking preventive care, even in the first year of their lives. This no doubt has implications for their future health and in turn that of their own children.

Other generational health legacies include such alarming innovations as HIV, antibiotic-resistant bacteria and similar genetic accidents waiting to happen to the unlucky and unwary. There may also be genetic improvements possible, especially from early warning and counseling in high risk cases, but eugenics has always had a touch of big brother attached to it, and does not seem a likely bet in an era when individual rights are given more attention than are the parallel responsibilities. On the positive side, the eradication of smallpox, the near-eradication of polio, the on-again off-again control of tuberculosis count as major gains, along with the possibilities for life-enhancing procedures, including replacement of parts of the anatomy ranging from eyes, ears and hips to livers, kidneys and hearts. Thus future generations, at least in favoured parts of the globe, reach their childhood in better shape, and have more options available to stay that way, than ever before.

How should prospective health status enter the generational accounts? In tort law, and in accident prevention, there are calculations made about the value of incremental years of healthy life. These may be inclined to be on the high side

for aggregation into generational accounts, but provide a useful benchmark or starting place for the calculations. Private and social values of education are commonly estimated, and likewise provide a starting point for generational accounting. Some would argue that general increases in education levels are of less value than they appear from the cross-sectional studies, since the gains relate more to relative than to absolute values of education (Nie et al., 1996). I think any required adjustment for this is likely to be small.

Natural Resources and the Physical Environment

Statistics Canada has spent a lot of effort in trying to value stocks of renewable and non-renewable natural resources, with an eye to including them in national balance sheets. To the extent these efforts bear fruit, they provide an obvious component of Generational Accounts. Some of the stickiest issues revolve around the values to be attached to bio-diversity, to foregone future uses of scarce sites, reclamation costs for abandoned sites, disposal of toxic wastes, and the appropriate social evaluation of non-renewable resources. In the case of multiple-use resources, such as the forests, there are the additional complications of valuing competing and co-operating uses among contemporary users, as well as the difficulties of guessing how these uses would be valued by future generations.

There are also interactions between the physical environment and human capital, with clean air and clean water being two of the most obvious linkages.

The Institutional Environment

We start to get into less charted territory when we consider the institutions that make society work. It was always understood that the collapse of communism in Eastern Europe would leave an institutional vacuum that would be difficult to fill quickly, but I think it is safe to say that no experts were predicting in 1990 that the gaps would be so far reaching and so difficult to bridge, especially in Russia, Ukraine, and other parts of the former USSR where the core institutions of modern decentralized societies had either never existed, or had disappeared from the collective consciousness. What are these core institutions? A narrow interpretation would include an efficient legal system facilitating (but not impoverishing) individuals and enterprises in their contacts and contracts; a political system that is responsive to the public interest, while being modest and efficient in the scope of its operations; an education system marked by universal free access at the lower levels and accessibility at the higher levels; and a health care system to which all have access and which can provide timely and appropriate preventive and curative care in a cost-effective way, and finally a secure, effective and widely accepted set of social safety nets.

The importance of the core institutions cannot be stressed too much, even if their evaluation for the Generational Accounts is a significant challenge. The differences between national systems can be very large, even under circumstances where similar systems might have been expected to emerge. For example, it is widely known and appreciated, at least in Canada, that there is no Canadian counterpart to the 15% of the U.S. population that fall through the cracks in the health care system. It is also well known that jobs are changed and moves are made with no regard to whether health care will be freely available in the new job, or in the new location. It is also believed, at least by readers of the *New York Times*, and fuelled by Fraser Institute studies of waiting lists, that many Canadians go south for medical care when they get tired of waiting for their turn in the queue. What is much less well known is that the total of medical care obtained by Canadians in the United States, including its largest component, the care received by the snow birds during their annual time in the sun, is far less than the amount of Canadian health care provided to Americans, some of whom are sent by insurers to save costs, but most of whom simply assume a Canadian identity in order to receive free health care. What is much more important for generational accounting, however, is that nearly 1% more of U.S. than of Canadian GDP goes into the administration of the health care system. The existence of a system that can save 1% of GDP in perpetuity is a hefty legacy for future generations, to the extent it can be maintained in the future. Binary comparisons with one's neighbour may be too simple, however, as health care systems elsewhere in the world are as effective as the one in Canada, and all cost less to operate than either the U.S. or Canadian systems, so the choice of a standard of comparison is not a trivial matter. The important point to make, however, is not the dollar value to attach to either the distributional equity or the administrative efficiency of the Canadian health care system, at least compared to the U.S.

system, but that it matters to Canadians in the current generation, and is likely to matter to their successors. It is also likely that if the Canadian system had not been established when it was, and if the spread of private insurers had followed the style and pattern seen in the United States, that there would by now be no realistic chance of starting again and getting to where we are now. This type of branching structure, where an opportunity not taken may be lost forever, poses great problems for the generational accounts.

Social Capital

Social capital, as defined by Coleman (1988), Putnam (1993) and others, relates to the norms and networks of shared values and activities that do much to determine both the efficiency and harmony with which daily life takes place. Social capital matters for generational accounting because it takes a long time to build and has great staying power. Putnam (1993) documents differences in social capital among the Italian regions that arose over several centuries, and have profound effects on everything from public participation to private trust. Regions marked by high levels of trust offer the possibility of lower transactions costs and a generally denser set of social relations, which in turn tends to develop and maintain mutual regard and shared values. Putnam found that the efficiency of local government operations is significantly higher in regions with high levels of social capital, and there is even some evidence that this translates into higher rates of economic growth, especially when new challenges arise that test the strength of the social glue.[3]

Although social capital appears to have considerable staying power in the regions where it is high, it also inheres in individuals brought up in that society, and travels with them when they move across the globe. The startlingly high levels of trust and participation in Minnesota exist not simply because Minnesota has lots of hockey rinks and adjoins Canada, but because such a high fraction of the population originated in Norway, and brought high levels of trust and participation with them when they migrated some generations ago (Rice and Feldman, 1995). For the moment, there are few measures of social capital available in a form that can be analyzed jointly with individual-level data for economic outcomes. The paper in the companion volume by Corak and Heisz (1998) provides a useful starting point. Using data from income tax files, they find that young men and women who did not move frequently in their youth had significantly higher later incomes, and also find that one proxy for neighbourhood characteristics, average incomes, has a significantly positive effect on the subsequent incomes of young men.

There are also important interactions between social capital and the institutions described earlier. Institutions work better, with less friction and less need for detailed guidelines, rules and court battles, when trust and shared values are widespread. In the reverse direction, trust and participation depend most importantly on education levels, and rise significantly with each additional year of education. Television exposure, especially in the absence of education, is bad for both trust and participation, it appears, but it is hard to see how generational accounting can deal with that.

What are the implications of social capital for Generational Accounting? Clearly it matters, and some measurements of its health can be attempted, but valuation is another matter. For now, it may have to be a memorandum item akin to the qualifications that auditors pin to balance sheets when they find something that they know to be important but to which they cannot establish a dollar value as an asset or a liability.

2. Who Distributes?

My expanded list of generational assets and liabilities suggests that the list of relevant programs and policies is longer than that considered in the early rounds of Generational Accounting. The early accounts relate mainly to the tax, spending and transfer decisions of governments, especially national but also provincial and local. The provincial or state governments are especially important in decentralized federations, and more so in Canada than in the United States. Canadian provinces have broader expenditure responsibilities and financial resources than do U.S. states, especially in the big-budget health and education areas where governments are more active in Canada than in the United States. Furthermore, Canadian provinces generally have and use more freedom to accumulate deficits and debts, and hence to shift the balance of generational accounts.

There are at least three types of actors beyond or beside the governments listed above. First and foremost—as emphasized by Stone et al. (1998)—there is the family, always the main locus of unmeasured giving between the generations. Second, there are the community-

based non-governmental organizations, whether local, provincial, national or international in scope, that create and distribute welfare within and among generations. The strength and value of these organizations depends in large part on social and institutional capital. Whether these organizations have the capacity to substitute effectively for government programs is a vexing issue. Certainly there are cases where voluntary organizations fill gaps in official programs, and many others where the two types of agency could work better together than they do. But will an expanded relative role for the voluntary sector help to fill the gaps left as governments try to balance their own generational accounts? It is clear that both types of organization belong in the accounts, even if the relations between them, and the assessment of their relative effectiveness, remain clouded. Certainly the health care example suggests that the universal safety nets are less likely to leave large gaps than is a system of private charities, since private charities tend to focus on local community needs with the high-social-capital communities hence better served by the results.

Finally, it is necessary to go beyond the boundaries of the nation state, and consider Generational Accounting on a global scale. There are some issues, such as global warming, where the global focus is the only one that makes sense, and there are many agencies with generational mandates on a global basis. These include the multinational agencies, public and private, and could be extended to include bilateral aid as well. Transfers from the current generations in some countries to future generations in others may well represent investments of high social value, even if they appear to worsen the balance of the conventional generational accounts of the donor nation state.

3. Who Matters?

Finally, it is necessary to recognize, as do many of the chapters in this book, the strong linkages between equity within and between generations. Many of the programs that affect distribution within generations also affect distribution from one generation to another, and policies that balance one set of books may worsen the other. I noted previously the concern raised by Irwin Gillespie that tax mixes that may seem efficient to minimize the growth effects of fiscal retrenchment may also worsen income disparities within the current generation. Some of the papers in the companion volume consider some of the implications of current inequalities for future ones. For example, Le Bourdais and Marcil-Gratton (1998) investigate the extent to which family disruption in childhood is the harbinger of similar problems in the next generation. De Broucker and Lavallée (1998) do the same for higher education, and Lefebvre and Fortin (1998), and Corak and Heisz (1998) consider intergenerational income mobility. All four studies show enough persistence that inequalities in one generation leave footprints in future generations. Lefebvre and Fortin find the Canadian income footprint to be surprisingly light, while Corak and Heisz uses, as mentioned, data from income tax returns to expose neighbourhood effects in addition to those flowing from parental income. The paper by de Broucker and Lavallée finds educational persistence to be increasingly important. The latter might be especially disturbing, given the importance of education to so many of the measures of social capital and other aspects of social glue. However, the bright side of this is that there is a secure upward trend in the average level of education moving from one generation to the next.

For family disruption, divorce has been found in other studies to have a strong negative effect on measures of trust and participation. As for the effects of family disruptions on later generations, the paper by Le Bourdais and Marcil-Gratton shows that children of separated families are more likely to co-habit early, and to have children out of wedlock, than are their peers from less disrupted families.

Picot, Myles and Pyper (1998) reveal another aspect of the interaction between intra and intergenerational equity with their accounting of the striking change in the relative incidence of low-incomes in youth and old age, with the post-tax incidence of low incomes among the young remaining fairly constant, but with transfers increasingly replacing earned income. Morissette (1998) shows how this decline in employment income among young males is due to rising unemployment (proportionate increases in line with those for older males) and declines in their real earnings relative to those in earlier cohort. For the elderly, however, the incidence of pre-tax-and-transfer low income has declined slightly, while the post-tax fraction of the over-65s with less than half of median income has plummeted from one-quarter in 1973 to 4.0% in 1994. As Picot et al. (1998) show, this was about one-third due to changes in the education and other characteristics of the elderly, and two-thirds due to reductions in the risk of low incomes for those with given family structures and education. The

reasons for this include the rapidly rising proportion of the elderly covered by the C/QPP over the period.

There is clearly much that can be done, using the data presented and described in many of the papers in the two volumes, to spell out the intergenerational consequences of the levels, changes, and types of inequality within current generations. As the papers show clearly, these inequalities, and their implications, are as great and as persistent for education, health and family structure as they are for more conventional measures of economic opportunities and outcomes. This would tend to support extending the range of Generational Accounting to include more explicit accounting for human and social capital and institutions. Getting a broadly based balance sheet of our legacies will not be easy, but even the efforts should help to focus attention on whatever gaps and imbalances come to light in the process. The immense data resources already available in Statistics Canada, and especially the new longitudinal data, are crucial, as are research efforts and innovations of the type presented in these two books.

End Notes

[1] However, it should be noted that the Canadian innovation of a sales tax credit delivered partially through the income tax system can serve to modify or eliminate the regressive distribution effects of sales taxes when compared to income taxes.

[2] The estimates of Coe and Helpman (1995) of the positive domestic and international spillovers from R&D may turn out to be on the high side, as were some of the earlier estimates of rates of return on physical infrastructure, but various other types of evidence also point to the advantages of a varied and deep pool of fundamental and applied research knowledge.

[3] Helliwell and Putnam (1995) show that even though the 1960s through the 1970s were periods of strong unconditional convergence among the Italian regions, a positive partial effect for social capital could still be found, even though both initial and final regional per capita incomes are positively correlated with the measured regional levels of social capital. The new mettle-testing arose through the devolution of powers to the regions at the beginning of the 1980s. These new powers were used more effectively in the regions of higher social capital, leading to a 1980s reversal, presumably temporary, of the convergence of growth rates.

Bibliography

AGHION, P. and P. HOWITT (1992). "A Model of Growth Through Creative Destruction." *Econometrica.* Vol. 60, 323-51.

COE, D.T. and E. HELPMAN (1995). "International R&D Spillovers." *European Economic Review.* Vol. 39, 859-87.

COLEMAN, James S. (1988). "Social Capital in the Creation of Human Capital." *American Journal of Sociology.* Vol. 94, S95-S120.

CORAK, Miles and Andrew HEISZ (1998). "How to Get Ahead in Life: Some Correlates of Intergenerational Income Mobility in Canada." In Miles Corak (editor). *Labour Markets, Social Institutions, and the Future of Canada's Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

DE BROUCKER, P. and L. LAVALLÉE (1998) "Intergenerational Aspects of Education and Literacy Skills Acquisition." In Miles Corak (editor). *Labour Markets, Social Institutions, and the Future of Canada's Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

GILLESPIE, Irwin (1997). "The Deficit and Debt Reduction Challenge and the Distribution of Income in Canada." In W. Robson and W. Scarth (eds). *Equality and Prosperity.* Toronto: C.D. Howe Institute.

HELLIWELL, John F. and Robert D. PUTNAM (1995). "Economic Growth and Social Capital in Italy." *Eastern Economic Journal.* Vol. 21 No. 3. 295-307.

KNIGHTON, T., C. HOULE, J.-M. BERTHELOT and C. MUSTARD (1998). "Health Care Utilization During the First Year of Life." In Miles Corak (editor). *Labour Markets, Social Institutions, and the Future of Canada's Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

LE BOURDAIS, Céline and Nicole MARCIL-GRATTON (1998). "Intergenerational Equity: The Impact of Family Disruption in Childhood on Adult Outcomes in Canada." In Miles Corak (editor). *Labour Markets, Social Institutions, and the Future of Canada's Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

LEFEBVRE, S. and N.M. FORTIN (1998). "Intergenerational Income Mobility in Canada." In Miles Corak (editor). *Labour Markets, Social Institutions, and the Future of Canada's Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

MORISSETTE, R. (1998). "The Declining Labour Market Status of Young Men." In Miles Corak (editor). *Labour Markets, Social Institutions, and the Future of Canada's Children.* Ottawa: Statistics Canada, Catalogue No. 89-553-XPB.

NIE, Norman H., Jane JUNN and Ken STEHLIK-BARRY (1996). *Education and Democratic Citizenship in America: Creating Enlightened Civic Engagement*. Cambridge: Harvard University Press.

PICOT, Garnett, John MYLES and Wendy PYPER (1998). "Changing Labour Market Conditions, Government Transfers, and Poverty Among the Young and Old." In Miles Corak (editor). *Labour Markets, Social Institutions, and the Future of Canada's Children.* Ottawa: Statistics Canada. Catalogue No. 89-553-XPB.

PUTNAM, Robert D. (1993). *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton: Princeton University Press.

RICE, Tom and Jan FELDMAN (1995). "Civic Culture and Democracy From Europe to America." University of Vermont. Unpublished.

STONE, Leroy, Carolyn ROSENTHAL and Ingrid CONNIDIS (1998). *Parent-Child Exchanges of Supports and Intergenerational Equity*. Ottawa: Statistics Canada. Catalogue No. 89-557-XPE.