Public Finance Implications of Population Ageing:
An Update

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July 2002

Department of Finance Working Paper
2003-03

Department of Finance

Economic and Fiscal Policy Branch

Abstract

This paper provides an update to the King and Jackson (2000) study, which analysed the fiscal implications of population ageing using a debt-to-GDP projection framework. Since the publication of the original study, there have been a number of important fiscal policy changes implemented by all governments across Canada. As well, the long-term demographic outlook has changed somewhat. The updated paper improves upon the treatment of federal intergovernmental transfers and the methodology used to project nominal GDP. Using a simple projection and accounting framework, this paper analyses the impacts of population ageing on key revenue and program spending categories over the long term, given an approximation of the existing fiscal structures of federal and provincial/territorial governments. The resulting projected net public debt-to-GDP ratio paths are then assessed based on a simple criterion of long-term sustainability. The detailed long-term projections presented in this paper, are not to be regarded as precise fiscal forecasts nor do they represent, in any manner, official government projections. Purely mechanical accounting relationships are used to generate government budget balances and debt-to-GDP ratios over the long term and there is of course considerable uncertainty surrounding the underlying parameter assumptions. Based on our definition of existing fiscal structures and our criterion of long-term fiscal sustainability, most governments are projected to be in a fiscally sustainable position over the long term. However, and more importantly, whether current federal and provincial/territorial fiscal structures will in fact remain in place over the long term is an entirely separate question that is beyond the scope of this paper.

Résumé

Ce document est une mise à jour de l'étude réalisée par King et Jackson (2000), qui analysait les répercussions financières du vieillissement de la population grâce à un cadre de projection de la dette au PIB. Depuis la publication de la première étude, de nombreux changements fiscaux importants ont été mis en œuvre par tous les gouvernements au Canada. Aussi, les perspectives démographiques à long terme ont quelque peu changé. Cette mise à jour apporte des améliorations en ce qui concerne le traitement des transferts intergouvernementaux fédéraux et la méthode utilisée pour projeter le PIB nominal. Grâce à une projection simple et à un cadre comptable, ce document analyse les répercussions à long terme du vieillissement de la population sur les principales catégories de recettes et de dépenses de programmes, compte tenu d'une approximation des structures fiscales actuelles des gouvernements fédéral et provinciaux et territoriaux. Les trajectoires projetées du ratio de la dette publique nette au PIB sont ensuite évaluées en fonction d'un critère simple de viabilité à long terme. Les projections à long terme détaillées présentées dans ce document ne doivent pas être considérées comme des prévisions financières précises et elles ne représentent pas non plus, de quelque façon que ce soit, des projections officielles du gouvernement. Des rapports comptables purement mécaniques sont utilisés pour établir les soldes budgétaires gouvernementaux et les ratios de la dette au PIB à long terme et les hypothèses des paramètres sous-jacents comportent bien entendu beaucoup d'incertitude. Selon notre définition des structures fiscales

actuelles et notre critère de viabilité financière à long terme, la situation financière de la plupart des gouvernements devrait être soutenable à long terme. Toutefois, et ce qui est encore plus important, ce document n'essaie pas de répondre à la question entièrement distincte de savoir si les structures fiscales actuelles des gouvernements fédéral et provinciaux et territoriaux demeureront en place à long terme.

1   Introduction

This paper provides an update to the analysis undertaken by King and Jackson (2000), which presented a detailed examination of the fiscal implications of demographic change on government revenues and expenditures. One of the main objectives of the King and Jackson study was to determine whether the fiscal challenges associated with demographic change were reconcilable with various fiscal structures. In order to assess these fiscal challenges, long-term projections of revenue and spending categories -- incorporating demographic components -- were used to project future debt paths for federal and provincial/territorial governments under various policy regimes and alternative assumptions. In their framework, the projected trajectory of a government's net debt-to-GDP ratio was used to assess the long-term sustainability of a given fiscal structure, where sustainability was implicitly defined as a debt ratio that "does not rise considerably". Based on their results, King and Jackson (2000) conclude that under a range of scenarios, most governments could substantially reduce their net debt-to-GDP ratios within a horizon of twenty years.

Since the publication of the King and Jackson study there have been several significant fiscal policy changes implemented by federal and provincial/territorial governments.[1] For example, almost all governments have implemented or announced significant tax reduction plans in conjunction with spending measures targeted at areas such as health care. Moreover, the long-term demographic outlook has also changed somewhat as projected fertility rates have been adjusted downward and life expectancy upward. Thus, it remains an open question whether the public finance implications of population ageing are reconcilable given existing fiscal structures.

Following King and Jackson (2000), this paper examines the fiscal implications of population ageing with regard to the long-term sustainability of existing fiscal structures. While the analytical framework is essentially the same as the initial study, this paper modifies the original treatment of federal intergovernmental transfers in order to bring them more into line with the structure of existing programs. In addition, a model-consistent methodology is used to project nominal GDP. This paper however does not update every projection scenario generated in the original study. Instead, the point of departure for this paper is to assume that the existing fiscal structure, defined as the budgetary positions in fiscal year 2000/01 and any implemented and/or announced revenue measures, is maintained out to 2040/41. Nonetheless, this paper does provide some alternative fiscal projections to help gauge the sensitivity of the baseline projections.

Before proceeding further, it is necessary to provide some important caveats. First, while detailed long-term projections are presented in this paper, it should be borne in mind that these projections are not to be regarded as precise fiscal forecasts nor do they represent, in any manner, official government projections. The objective of this paper is

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[1] In King and Jackson (2000) revenue and spending projections are extrapolated from fiscal year 1999/00 using data from Budget 1999 for the federal government and from the June 1999 Public Accounts for provincial and territorial governments.

not to provide forecasts of what we believe will likely happen over the long term, but rather it is to overlay the existing federal and provincial/territorial fiscal structures onto a set of long-term demographic and economic projections. Long-term projections presented in this paper are the result of purely mechanical accounting relationships and there is of course considerable uncertainty surrounding the underlying parameter assumptions. Thus these projections should be regarded, as Oreopoulos and Vaillancourt (1998) suggest, as a "what if" scenario. Despite the considerable uncertainty surrounding these types of projections, exercises in long-term fiscal policy analysis are useful nonetheless. In their analysis of the long-term U.S. fiscal position, Auerbach and Gale (2000) argue that, "the presence of uncertainty should not lead us to ignore long-term issues. Indeed, under reasonable assumptions, the potentially serious consequences of a relatively bad long-term outcome should spur a precautionary policy response".

The remainder of the paper consists of five sections. Section 2 discusses the fiscal incidence of projected demographic changes. Section 3 provides an overview of the projection methodology and discusses key assumptions. Section 4 highlights the direct impact of population ageing on some major revenue and spending categories. In Section 5, projections of federal and provincial/territorial net public debt-to-GDP ratios are presented and analysed and Section 6 concludes.

2   The Fiscal Incidence of Demographic Change

This section briefly discusses the projected change to the age structure of the population over the next forty years as it relates to key areas of program spending and revenue.

2.1   Demographic Transition, 2000 to 2040

The demographic landscape in Canada is projected to change dramatically over the next forty years through slowing population growth and a shifting age structure. The projected 'double-ageing' process, arising from the sharp decline in fertility rates following the post-war baby-boom[2] and falling rates of mortality, will increasingly alter the ratio of the elderly to young age groups. These elements of the ageing process may have different implications for government revenues and program spending.

Population growth is currently low, but positive, estimated at 0.8% per year. However, growth is expected to cease altogether by 2040 and Statistics Canada projects that population growth will turn negative shortly before 2050.[3] Over the same period, the average age of the population is projected to rise from 37.8 years in 2000 to 45.8 years by 2040. Currently, the young, those between the ages of 0 and 14 years, comprise 19% of the population while those over the age of 65 make up 13%. By 2013, the population shares of the young and elderly are expected to be equal at 15%. Thereafter, the elderly

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[2] Generally defined as those born between the years 1947 and 1966.

[3] Projections to 2040 are based on *Population Projections for Canada, Provinces and Territories, 2000-2026* (March 2001, Catalogue no. 91-520). See Section 3 for further details.

share will rise rapidly, reaching 25% by 2040 while the share of young people is expected to fall to 14% (see Chart 1).

Chart 1: Canadian Population Projection, 2000-2040
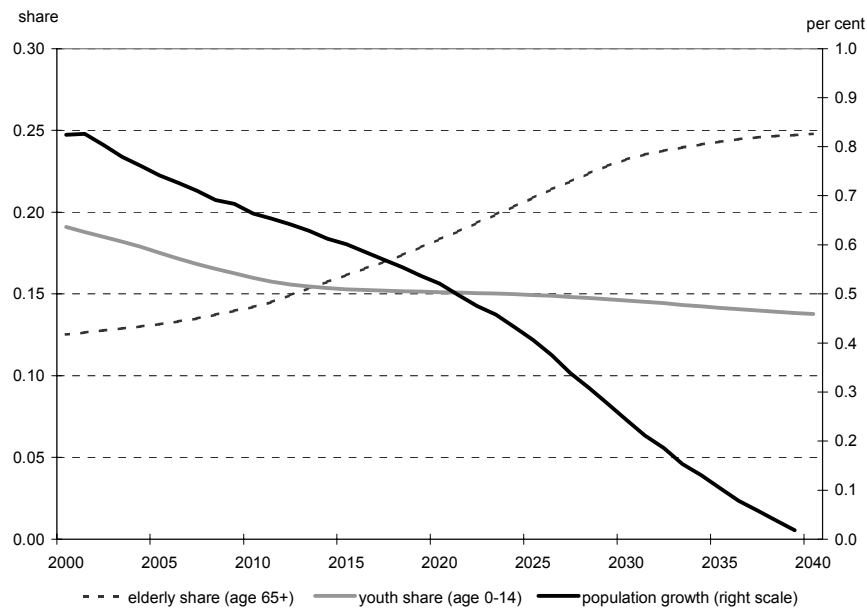
The impact of demographic change on federal and provincial/territorial revenue and spending has received increasing attention over the past several years[4], particularly as governments and the public debate whether increases in health care expenditures due to population ageing are manageable within the current fiscal framework. Federal and provincial/territorial governments collect the bulk of their revenue from the working age population, while the majority of government spending is directed to the young, for health and education, and to the elderly for health care and income security. Therefore, as the demographic structure of the population changes over the next forty years, governments may experience some financial relief from the smaller size of the young population requiring education and health services, but this is likely to be more than offset by the pressure of the baby-boomer cohort on the health care system.

As mentioned earlier, the elderly share of Canada's population is projected to nearly double from 12.5% in 2000 to 24.8% by 2040. However, the degree of ageing in each province or territory is not uniform across the country. Table 1 provides estimates of the projected changes in elderly and youth population shares for the provinces and territories, between 2000 and 2040. The Atlantic provinces are projected to experience the largest increases in their elderly population shares, with Newfoundland facing an almost 20-percentage point rise, while Ontario and Manitoba are projected to face smaller increases of about 11 percentage points. Over this same period, however, the share of young people in Canada's total population is projected to decline by 5.3 percentage points as fertility rates remain low at about 1.5 births per woman. The considerable

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[4] A number of recent papers on the subject include: Dang et al. (2001); Lewis, et al. (2001); Brimacombe et al. (2001); Hogan (2001); Provincial and Territorial Ministers of Health (August 2000).

variation in projected dependency ratios across Canada underscores the need to examine the implications of population ageing for each jurisdiction separately.

Table 1. Projected Elderly and Youth Population Shares, 2000-2040

	Elderly (65+ years) share of total population (%)			Youth (<15 years) share of total population (%)		
	2000	*2040*	*%-point Δ*	*2000*	*2040*	*%-point Δ*
Newfoundland and Labrador	11.7	31.1	19.5	17.4	11.0	-6.4
Prince Edward Island	13.0	26.9	13.9	19.8	13.4	-6.4
Nova Scotia	13.2	28.8	15.6	18.2	11.7	-6.5
New Brunswick	12.9	30.7	17.8	18.0	11.0	-7.0
Quebec	12.8	26.7	13.9	17.9	12.9	-5.0
Ontario	12.6	23.5	10.9	19.5	14.2	-5.2
Manitoba	13.5	24.4	10.9	21.0	15.1	-5.9
Saskatchewan	14.5	26.1	11.6	21.6	14.6	-7.0
Alberta	10.0	24.2	14.1	20.9	14.5	-6.3
British Columbia	13.0	24.6	11.6	18.1	13.5	-4.6
Territories	3.6	16.1	12.5	28.6	18.3	-10.4
Canada	12.5	24.8	12.3	19.1	13.8	-5.3

2.2   *The Incidence of Revenue and Program Spending by Age Group*

Many government programs are directed primarily to particular age groups, for example, Old Age Security (OAS) payments are directed exclusively to those over the age of 65 while spending on education is directed primarily towards the young. All age groups make use of health care services, but average utilisation of the health care system tends to rise rapidly after age 65. Therefore, projections of government spending depend crucially on both utilisation rates and the age distribution of the population. As the population becomes more concentrated in elderly age groups, government programs that are directed to these groups will experience the most rapid growth. In contrast, the bulk of government revenues are generated from individuals in their mid-thirties to mid-sixties.

In this paper, projections of revenue and spending categories (excluding intergovernmental transfers) are based on the assumption that current fiscal structures -- as they relate to the existing age distribution of revenue and spending -- are maintained over the long term. Essentially, we overlay the current fiscal structure onto a set of long-term demographic projections. Thus, the resulting fiscal projections ensure that the initial incidence of revenue and spending by age group is maintained in relative terms throughout the projection period. Charts presented at the end of this section show the (relative) distribution for various program spending and revenue categories by age group.[5] The charts also include population shares for the years 2000/01 and 2030/31. The age profiles, in conjunction with the evolution of the population shares, give a good indication of whether spending in a particular category can be expected to increase or decrease as the demographic structure changes.

The Direct Impact of Population Ageing on Program Spending

The federal Old Age Security (OAS) program and the income-tested Guaranteed Income Supplement and Spousal Allowance programs, which together make up federal spending on elderly benefits, are directed at individuals over the age of 65 years (see Chart 2A)[6]. The population shares indicate an increasing concentration of the population in the 65-and-over age groups between 2000/01 and 2030/31. Therefore, the ageing of the population, coupled with the program's target age group, suggests a sharp increase in federal spending on elderly benefits over the next forty years. Some researchers posit that federal spending on GIS and SPA as a share of GDP will decline over the period under observation since future retirees may be wealthier than current retirees, and both GIS and SPA are income-tested programs. A changing income distribution may well have implications for government spending on these and other programs, however incorporating a change in the relative income distribution is beyond the scope of the paper. As mentioned above, we assume that relative age distributions of revenue and spending remain constant throughout the projection period and therefore consistency suggests that we also assume no change in the relative age distribution of income over the long term.

Health care is a program directed to all age groups, although it is used most heavily by the very young and the elderly.[7] Since the provision of health care services largely rests under provincial jurisdiction, these governments will likely face rising costs as the baby boomers move into the high expenditure age groups after the age of 65 (see Chart 2B). The evolution of health care costs, and the direction the health care system will likely take is a subject of considerable debate. Section 2.4 will further highlight some of the issues surrounding the underlying projections of provincial health spending.

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[5] The age distributions in Chart 2 are presented in relative terms, so that spending by age is calculated in relation to a particular "numeraire" age group.

[6] Chart 1 shows some payments directed to individuals between the ages of 60 and 64. These are payments made under the Spousal Allowance program which are terminated once the individual becomes eligible for payments under the OAS program at age 65.

[7] Canadian Institute for Health Information. National Health Expenditure Trends, 1975-2001, p. 28.

The changing population structure is expected to provide some spending relief in education where the size of the program's target population is projected to decline over the next 40 years (see Chart 2C). The share of the population under the age of 25 is expected to decrease from 33% of the population in 2000 to 26% in 2020 and 24% in 2040. However, the potential relief on provincial/territorial budgets provided by a drop in education expenditures is unlikely to completely offset the increase in health expenditures. In 2000/01, on a Public Accounts basis, total provincial/territorial education expenditure was $38.5 billion while health expenditures were nearly double, at $63.4 billion. Meanwhile the projected increase in the share of the population over the age of 65 years is about 3.5 times the decline in the population under the age of 25.

The Direct Impact of Population Ageing on Revenue

The impact of ageing on revenues depends on an individual's consumption/saving and labour/leisure decisions as they age. As the magnitude and direction of these effects are more uncertain, so too are their impact on revenue. The impact of demographic change on government revenues may stem from several sources. First, a lower fertility rate reduces the size of the workforce relative to that of retirees. Therefore, fewer workers must support a larger retired population. If government programs are structured on a pay-as-you-go system, or even a partially funded system, taxes on the working age population must increase or benefits to the larger elderly population must decrease if the government is to retain its commitment to a balanced budget. As labour input declines, economic growth is likely to fall, leading to slower growth of income and consumption driving revenue growth rates below those experienced in the past. Population ageing may have repercussions on the whole spectrum of government revenues.

Another path through which a change in the population structure may affect government revenues is through typical lifetime patterns of income and consumption. Age-income and age-consumption patterns tend to be roughly bell shaped, so that income and consumption peak between an individual's mid-forties and mid-fifties and then decline with age. Government revenues from income and consumption taxes will therefore follow approximately the same age distribution (see Chart 2D). As a large fraction of the population moves out of their peak earning and spending years, tax revenue growth can be expected to show somewhat slower growth.

Chart 2: Population Distribution and tax/spending age profiles by Single-Year Age Cohort

A: Old Age Security

B: Public Health Care

C: Education

D: PIT Revenues
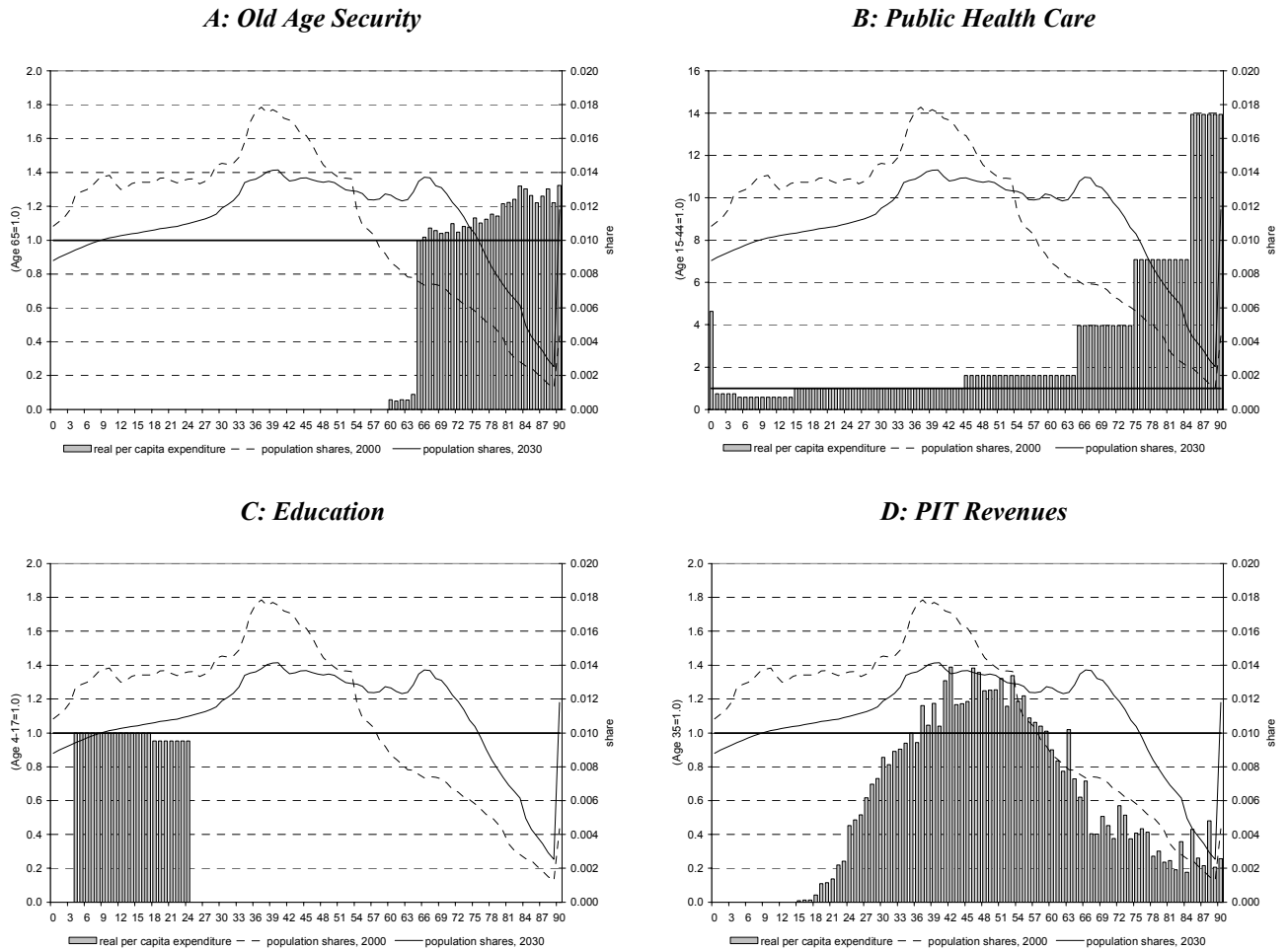
2.3   Some Possible Offsetting Factors

As mentioned, the projections of government revenue and program spending presented here do not take into account the full range of effects that may stem from changes in the age composition of the population. Projections presented in this paper are the result of purely mechanical accounting relationships and identities. Thus, several key factors in particular that are not incorporated into the model are worth mentioning.

First, the projections are based on current utilisation patterns of government spending and age distributions of revenues, however these patterns are likely to change over the long term. For example, individuals are not only living longer, but they tend to be living healthier lives. Therefore, the increased intensity at which older individuals use the health care system may be pushed further and further into the future. This also means that there may be a decline in prolonged illness which requires lengthy, and expensive, hospital treatment. Also, if the economy begins to experience labour shortages, as the birth rate falls and the population ages, one would expect wage rates to rise. This would encourage some individuals to re-valuate their retirement decision and perhaps stay in the

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workforce longer than otherwise, increasing revenue. A smaller workforce would also boost the productivity of labour in relation to capital, thereby raising the return to labour. Increased productivity would translate into higher wages for the smaller workforce thereby increasing government revenues and enabling the smaller workforce to fund government services for the large group of retirees.[8]

Immigration can also affect labour force growth. If immigration is driven by economic imperatives, then a significant future slowdown in GDP growth could be offset somewhat by an increase in immigration. However, maintaining current labour force population growth rates would require an increase in immigration that far exceeds current targets. Furthermore, this assumes that the emphasis would be on economic-class rather than family-class immigrants, and that their integration into the labour market would be quick and relatively costless.

Finally, as highlighted by Mérette (2002) one potentially very important offset to revenue loss exists in the regime of tax sheltered private pension plans. Currently, revenue losses to the government associated with tax deductions on contributions to private pension plans, and the fact that earnings in those plans are not taxable, exceed revenue gains from the taxation of withdrawals. In 2000/01, the revenue loss to governments as a result of these plans was projected to reach $31 billion, or about 3.0% of GDP.[9] In the future, the number of people in the baby-boom generation entering retirement and making taxable withdrawals will be relatively large compared to those individuals remaining in the labour force who are still making tax-deductible contributions. While this may not lead to a positive revenue gain with respect to GDP, the current loss of 3.0% could drop substantially. Mérette (2002) projects total net tax expenditures from RRSPs and RPPs in the context of an ageing population and finds that by 2040, tax revenue from these programs could amount to 2% of GDP.

2.4 *Population Ageing and Provincial Health Expenditure: Caveats and Related Issues*

This paper provides long-term fiscal projections that incorporate underlying projections of provincial health spending. While the projections of debt-to-GDP ratios presented here are used to assess the long-term sustainability of current fiscal structures, these projections cannot be used to determine whether the current health care system is, in itself, sustainable or not. Our projections of provincial health spending capture only the direct impact of population ageing given current utilisation rates and assumptions about real per capita (age-adjusted) enrichment, inflation and demographics over the long term. An assessment of the sustainability of existing provincial health care systems is beyond the scope of this paper. This caveat notwithstanding, it would be difficult to

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[8] Merette (2002) highlights the importance of these potential offsetting factors.

[9] Department of Finance. (1999). Estimates include tax expenditures for registered retirement savings plans and registered pension plans.

write a paper on the public finance implications of population ageing without addressing some of the salient issues in health care financing and system reform.[10]

Some researchers once believed that population ageing would so overwhelm the system that a second (private) tier of health care would be inevitable. For example, David Gratzer writes: "For all the problems in our health-care system today – nursing shortages, ER overcrowding, inadequate home care – none compares with the coming demographic crunch".[11] However, the supposedly catastrophic impact of ageing on the public health-care system is no longer stated as a foregone conclusion. Rather, many researchers accept that the effect of population ageing on provincial budgets is manageable assuming sound fiscal management and some degree of public sector saving before the bulk of the baby boomers begin to retire during the middle of the next decade.[12]

As mentioned previously, the projected ageing of the population stems from two key factors: the sharp decline in fertility rates following the post-war baby boom and projected increases in life expectancy (i.e., declining mortality rates). Since the projection framework used in this paper assumes that the relative age profile of health spending is maintained over the next forty years, the two factors driving population ageing, all else equal, will both contribute to increasing health spending at the aggregate level as a larger proportion of the population enters into the higher cost age groups (reflecting reduced fertility) and requires this higher level of spending for a longer period of time (reflecting reductions in mortality rates). In this case, our framework implicitly assumes that health expenditures increase with age for each individual and that this relationship will be maintained over the projection period. [13]

However, the relative age profile of health spending in the base-year (Chart 2B) is also consistent with the finding that health expenditures tend to remain flat throughout an individual's lifetime, spiking only toward the last year(s). And since the probability of being in one's last year(s) of life increases in line with age, the resulting health spending age profile would mirror Chart 2B. However, moving forward (all else equal), a decline in mortality rates would serve to postpone the high health-cost years and the age profile would likely shift down except for the oldest age group, resulting in a postponement in projected increases in overall health spending.

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[10] Several commissions have delivered or are in the process of writing reports on health care reform. See, for example, Saskatchewan Commission Report on Health Care (April 2001), Standing Senate Committee on Social Affairs, Science and Technology (March 2001), Alberta Premier's Advisory Council on Health (December 2001), Commission on the Future of Health Care in Canada (February 2002).

[11] Gratzer, D. (1999), quoted in Walkom T. (September 8, 2001b).

[12] See Walkom, T. (September 8, 2001a); Hogan, S. (March 2001); Dang, Antolin and Oxley (2001) also make the point that pre-emptive public sector saving can considerably reduce the pressure on government finances as the population ages.

[13] See Pollock (2001) and Hogan and Pollock (2002) for a detailed discussion of demographic change and cost pressures.

Health spending projections presented in this paper do not account for potential changes in the relative age profiles for several reasons. First, the extent to which high-health-cost years of life may be postponed is unclear, and an additional set of assumptions would be required to incorporate delayed spending into our mechanical projections. Second, and perhaps more important, declining rates of mortality may have implications for other areas of government budgets. For example, as discussed in Section 2.3, healthier life may reduce the number of workers who retire, involuntarily, from the workforce, due to illness. This could affect the whole spectrum of government revenues. The projections described in this paper, therefore, incorporate both changes in rates of fertility and mortality, however, we assume that age-expenditure/revenue profiles for all components of the government budget are held constant.

While research has reduced concerns that population ageing will place unmanageable pressure on government budgets, new concerns have emerged around other aspects of the system, some of which include: the cost effectiveness of technology and treatments, the rapid growth rate of public expenditure on drugs, and the public financing of homecare and long-term care services for the elderly.[14]

These various effects, therefore, could have a considerable impact on health expenditures, however they are the most difficult cost drivers to quantify. Most authors rely on estimates of productivity growth to approximate an overall utilisation/enrichment rate (e.g., see Robson (2001)) since it is not possible to use historical data to accurately separate the contributions of each cost accelerator from the overall real per capita age-adjusted growth rate. Due to the difficulty of estimating an enrichment rate, the approach taken in this paper (which is discussed in the next section) is to suggest a baseline growth rate of health care spending over and above growth due to demographics and inflation. We then posit an alternative real per capita age-adjusted growth rate in order to test the sensitivity of provincial government finances to a change in the enrichment rate without suggesting, in particular, what comprises that rate.

3   A Long-Term Fiscal Projection Model

The previous section highlighted the importance of projected changes in the age structure of the population given age distributions of key revenue and program spending categories. This section incorporates projected demographic changes and revenue/spending age distributions into a model which is used to generate long-term federal and provincial/territorial fiscal projections.

3.1   *Projecting Revenue and Program Spending*

The objective of the projections is to simulate, in the context of an ageing population, the long-term structural evolution of government revenue and program spending. Categories of revenue and spending are modelled as a function of their

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[14] See for example, King and Jackson (2000), Provincial and Territorial Ministers of Health (August 2000), Alberta Premier's Advisory Council on Health (December 2001).

structural determinants, using an accounting framework and a set of demographic and economic assumptions. The key structural components that we focus on are: economic (inflation and real income per capita growth) and demographic (population growth and composition). This projection approach follows the Generational Accounting (GA) literature, which has also assessed the implications of population ageing on public finances and intergenerational equity.

It is important to stress that the projections generated in our framework are long-term and structural in nature and therefore they should not be regarded as precise fiscal forecasts. As well, these types of projections do not take into account behavioural responses or feedback. The projections are mechanical in nature and are based on a number of accounting relationships. Therefore, our projections should be treated as approximations that "mimic the long-run structural behaviour of government revenue and expenditure" (King and Jackson (2000: p.12)). Moreover, it should be borne in mind that there is considerable uncertainty surrounding any long-term fiscal projection. This fact in itself, however, does not diminish the usefulness of long-term projection exercises. In their study of long-term fiscal imbalance in the United States, Auerbach and Gale (2000) assert that the presence of uncertainty should not lead policymakers and researchers to ignore long-term issues such as population ageing. Oreopoulos and Vaillancourt (1998), in their GA study for Canada, highlight the flexibility of long-term fiscal projections and suggest that they should be regarded as "what if" scenarios that can be easily modified.

The long-term model projects the aggregate amount of revenue/spending such that it is consistent with the assumption that the current fiscal structure (i.e., with respect to the age distribution of a particular revenue or program spending category) is maintained in relative terms. For example, if current health spending on individuals aged 45 to 64 is (on average) 60 per cent larger than current spending on individuals aged 15 to 44, then this relationship is maintained over the projection period. Thus essentially, we overlay the existing fiscal structure onto a set of long-term demographic projections. In addition, the projected aggregate amount is consistent with the assumption that revenue/spending on a real per capita/per age group basis increases at the annual rate of real income per capita (age-adjusted) growth.[15] Extrapolating aggregate revenue and program spending categories using this approach basically requires a starting point, base-year age distributions for revenue/spending categories and population projections by age group.

This structural projection framework can be described in algebraic terms. First, consider a starting point for a particular category of revenue or program spending (e.g., personal income tax revenue or health spending in nominal terms) denoted as X_t. In the base-year (which we assume is fiscal year 2000/01), this aggregate amount is allocated to 91 single-year age groups indexed by i, ranging from age 0 to 90+ years ($X_{i,t}$ for $i=1$ to 91). The allocation by age group X_i is usually based on survey data or microsimulation

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[15] In standard GA calculations for Canada, it is often assumed that average taxes and expenditure per age group grow in line with inflation and real income per capita growth. For example, see Oreopoulos and Kotlikoff (1996), Oreopoulos and Vaillancourt (1998) and Matier and Fougère (1999).

models.[16] Next, it is necessary to obtain population projections by age group ($POP_{i,t}$) for the period in question and a price index P. With this information the aggregate base-year value can be expressed in terms of three components: the average real per capita levels by age group $A_{i,t} \equiv \dfrac{X_{i,t}}{P_t \cdot POP_{i,t}}$, the number of individuals in each age group $POP_{i,t}$ and the price index P.

$$(1) \qquad X_t = \sum_{i=1}^{91} A_{i,t} \cdot POP_{i,t} \cdot P_t$$

Equation (1) can be advanced forward and with some algebraic manipulation, the equation describing the future evolution of X can be represented as,

$$(2) \qquad X_{t+1} = \left(\sum_{i=1}^{91} A_{i,t+1} \cdot POP_{i,t+1} \Big/ \sum_{i=1}^{91} A_{i,t} \cdot POP_{i,t} \right) \cdot (P_{t+1}/P_t) \cdot X_t .$$

One of the standard assumptions employed in the GA framework is that average real per capita levels by age group grow at the assumed (constant) rate of real income per capita growth g. As well, it is also assumed that the relative age profile of X (defined as $R_{i,t} \equiv \dfrac{A_{i,t}}{A_{j,t}}$, where A_j is the numeraire age group) is maintained over the projection period (i.e., $R_{i,t} = R_i$). These assumptions, along with that of a constant rate of inflation π, are embodied in equation (3) which describes the structural evolution of X over the projection period.

$$(3) \qquad X_{t+1} = (1+g) \cdot \left(\sum_{i=1}^{91} R_i \cdot POP_{i,t+1} \Big/ \sum_{i=1}^{91} R_i \cdot POP_{i,t} \right) \cdot (1+\pi) \cdot X_t$$

Projecting GDP

For most categories of revenue and program spending, we project their aggregate amounts using equation (3). In order to project nominal GDP such that it is consistent with the fiscal projection framework and its underlying assumptions, equation (3) is used. As a proxy for the age profile of nominal GDP, the age profile of market income (by age group) from Statistics Canada's SPSD/M database is used. Projecting nominal GDP in this manner follows the approach used in Ruggeri et al. (1993) however it is adjusted to reflect year-over-year changes in population growth and population composition.

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[16] GA studies for Canada typically use Statistics Canada's SPSD/M microsimulation database and model to generate age profiles for tax and spending categories. See Bordt et al. (1990) for further details.

3.2 Revenue and Program Spending Categories

Federal and provincial/territorial categories of revenue and program spending, shown in the table below, are essentially the same as those used in King and Jackson (2000). The accounting framework is based on the Public Accounts. While FMS data has advantages in terms of ensuring conformity across provinces and levels of governments, Public Accounts data is used instead because it is more familiar and it is available on a more timely basis.

Unless otherwise noted in the table below, future values of the revenue and program spending categories (as well as GDP) are projected to evolve according to equation (3), where growth in a particular category is determined by: inflation, population growth, population composition and an assumed real per capita/per age group growth component. Following most GA and long-term projection studies, we assume that the real per capita/per age group growth component is set equal to the rate of real income per capita growth for most revenue/expenditure categories. In addition, we assume constant annual inflation and real income per capita growth rates of 2.0% and 1.5% respectively.

Federal Revenue Categories	*Provincial/Territorial Revenue Categories*
Personal Income Tax: *announced tax changes included*	Personal Income Tax: *announced tax changes included*
Corporate Income Tax: *announced tax changes included*	Corporate Income Tax: *announced tax changes included*
Employment Insurance Premium: *announced tax changes included*	Retail Sales Tax
Goods and Services Tax	Other Revenue: *base-year adjustment for natural resource revenues*
Other Revenue	Federal Transfers (*see Federal Spending*)
Federal Program Spending Categories	*Provincial/Territorial Program Spending Categories*
Elderly Benefits	Health
Employment Insurance Benefits	Education
Other Program Spending	Social Services
CHST: *cash payments rise to $21 billion in 2005/06, then grow at an annual rate of 3.5%*	Other Program Spending
Equalization: *model-consistent projection with ceiling determined by nominal GDP growth*	
Alternative Payments for Standing Programs: *grows in line with national nominal GDP*	
Territorial Formula Financing: *grows in line with national nominal GDP*	

The base-year for the above categories is fiscal year 2000/01 taken from recent federal and provincial/territorial budgets and budget updates.[17] Future values of most categories were extrapolated from their base-year values according to the equation (3) described above. Fiscal projections presented below cover the period 2000/01 to 2040/41.

Federal and provincial own-source revenue categories grow from their base-year levels in line with inflation, population, real income per capita growth and population compositional change.[18] We also incorporate announced future changes to various federal and provincial/territorial tax categories. For the federal government, announced future tax measures were taken from *The Budget Plan 2001* and the *Economic Statement and Budget Update 2000*. For the provincial/territorial governments, announced future tax measures were taken from various provincial and territorial budgets.[19]

Growth in all program spending categories reflects population growth, population composition, inflation and a real per capita (age-adjusted) enrichment factor. The assumption that all program spending categories (except intergovernmental transfers) are "enriched" on a real per capita/per age group basis by the rate of real income per capita growth departs from King and Jackson (2000), which assumes that there is zero enrichment in Elderly Benefits, Social Services and other program spending categories. By employing an across-the-board enrichment factor to program spending categories (following the GA literature), our assumptions reflect the "what if" nature of our fiscal projections. While growth in the revenue categories is more likely to be directly related to real income per capita growth, assumptions about enrichment factors on the expenditure side are more difficult to substantiate.[20] Rather than choosing different rates for the various expenditure categories, we apply the same rate -- equal to projected real

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[17] Most of the age profiles of federal and provincial/territorial categories of revenues and program expenditure were obtained using Statistics Canada's Social Policy Simulator Database and Model (SPSD/M). The age profile for health spending is taken from CIHI's *National Health Expenditure Trends*, 1975-2000 (Canadian Institute for Health Information). For education, spending is allocated based on data from Statistics Canada's Education Quarterly Review (Catalogue no. 81-003). Flat relative profiles (i.e., equal per capita/per age group profiles) are assumed for federal direct program spending and provincial/territorial other program spending as well as federal and provincial/territorial other revenue.

[18] More specifically, federal revenue projections from 2001/02 to 2006/07 are taken from *The Budget Plan 2001*. Federal program spending projections from 2001/02 to 2003/04 are also taken from *The Budget Plan 2001* and then extrapolated according to equation (3).

[19] We also adjust natural resource revenues for the western provinces, given the extraordinary increases in oil and natural gas prices in 2000/01. Beyond 2000/01, we assume that the relevant base for projecting natural resource revenue is the level of natural resource revenue in 1999/00. While this assumption is admittedly arbitrary, the choice of this base is roughly consistent with the size of natural resource revenues as a share of GDP over the period 1981-1999. Beyond 2000/01, the path of natural resource revenues is assumed to evolve according to equation (3).

[20] For example, the current structure of the Old Age Security program is such that benefits are not fully indexed to real wage/income growth. Thus, a short-term structural forecast would likely assume a real per capita enrichment rate of zero per cent. Given the long-term nature of our structural projections, a zero real enrichment rate for OAS/Elderly Benefits over 40 years appears unreasonable.

income per capita (age-adjusted) growth -- to all categories. It is important to note that given the flexibility of the projection model, assumptions regarding enrichment rates can easily be changed, thus enabling us to gauge the sensitivity of our baseline projections.

3.3   *Projecting Federal Intergovernmental Transfers*

Federal intergovernmental transfers constitute a significant share of federal program spending and provide a key source of funding for provincial/territorial governments. The modelling of these transfers has important implications for both orders of government and thus it is necessary to attempt to capture some of the key elements of the actual programs. However, due to the complexity of these programs, it is not feasible to incorporate all aspects and features of the individual transfer programs into a tractable long-term modelling framework.

The Canada Health and Social Transfer (CHST)

The CHST is a block-funded cash and tax transfer that provides financial support to provincial and territorial governments for health care, post-secondary education and social services. CHST cash payments (and other CHST-related transfers for health care) to provincial/ territorial governments are projected to increase from $16.5 billion in 2000/01 to $21 billion in 2005/06 under current legislation. Following the September 2000 First Ministers' Meeting, the base for the CHST was set at $15.5 billion beyond 2003/04. The current federal CHST funding commitment extends to 2005/06, however in order to project CHST cash transfers beyond 2005/06 it is necessary to make some assumptions. Following Matier, Wu and Jackson (2001), we assume that CHST cash payments increase at a constant annual rate of 3.5% from their 2005/06 levels.[21] Obviously the assumed 3.5% growth rate in CHST cash transfers is arbitrary however, this rate reflects the average annual growth in total CHST cash over the five-year period of federal funding that was committed at the September 2000 First Ministers' Meeting.[22] Previous studies such as King and Jackson (2000) assume that CHST entitlements grow with nominal GDP or with provincial health spending, while others (e.g., Ruggeri (2001)) assume no growth, freezing CHST cash at $21.0 billion base beyond 2005/06.[23]

Another transfer related to the CHST is Alternative Payments for Standing Programs (APSP). The APSP represents recoveries of federal tax-point abatements under

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[21] While CHST cash transfers (in aggregate) grow at 3.5% per year beyond 2005/06, the cash payment to each province is allocated on an equal per capita basis. However, over the period 2001/02 to 2005/06, CHST entitlements (cash and tax transfers) are in fact allocated on an equal per capita basis. For simplicity, it is assumed that there is a shift to an equal per capita cash allocation beyond 2005/06.

[22] Under the September 2000 federal funding commitment, total CHST cash is projected to rise from $18.3 billion in 2001/02 to $21.0 billion in 2005/06.

[23] In various scenarios, King and Jackson (2000) assume that growth in CHST entitlements is linked to nominal GDP growth and alternatively, to growth in provincial health spending. The authors also assume that CHST tax transfers grow in line with nominal GDP and therefore CHST cash is determined residually (i.e., as entitlements minus tax transfers). As a result, in some health spending scenarios, CHST cash is projected to grow considerably faster than nominal GDP.

contracting-out arrangements from the province of Quebec. CHST cash payments to Quebec are reduced by the amount of the APSP (e.g., $2.5 billion in 2000/01) however this recovery has no impact on net federal transfers or on Quebec's net receipts. We assume that APSP grows in line with (national) nominal GDP, following the *Economic Statement and Budget Update 2000*.

The Equalization Program

Payments under the Equalization program are determined by a formula set out in legislation. Federal transfers are made to provinces that exhibit a per capita revenue-raising capacity below a five-province standard.[24] Equalization payments bring below-standard provinces up to the five-province standard so they have sufficient revenues to provide reasonably comparable levels of public services at reasonably comparable levels of taxation. Legislation also provides for a ceiling on Equalization transfers, stipulating that the growth in annual entitlements cannot exceed the growth in nominal GDP.

As King and Jackson (2000) note, modelling Equalization transfers in the same way in which they are calculated is not practical and instead, they project Equalization entitlements (on a per capita basis) using historical trend growth rates. While this approach incorporates an interaction with changes in the population of Equalization-receiving provinces, it does not account for the interaction between the relative provincial fiscal capacities over the projection horizon, which also drives Equalization entitlements. Therefore, we attempt to project Equalization in a more "model-consistent" manner that allows for changes in relative provincial disparities and the imposition of a ceiling on aggregate entitlements.[25]

The Equalization Model

While the actual Equalization program is quite complex, the general formula can be expressed in relatively simple terms. Following the notation in Hermanutz (2000), for a given year, E_i represents a province's Equalization entitlement, F_i is the province's fiscal capacity (i.e., its hypothetical revenues computed under the assumption that national average tax rates are applied to standardised provincial tax bases), F_S is the fiscal capacity of the five-province standard; P_i and P_S respectively, represent population in province *i* and the population in the five provinces which comprise the standard.

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[24] The five-province standard includes: British Columbia, Saskatchewan, Manitoba, Ontario and Quebec.

[25] In the case of Equalization, the current legislation covers the period 1999/00 to 2003/04 and the ceiling for entitlements is determined by applying the growth rate in nominal GDP to the level of entitlements in 1999/00 of $10.0 billion. Following the September 2000 First Ministers' Meeting, the federal government agreed to remove the ceiling for 1999/00, which resulted in an increase of $0.8 billion in entitlements for that year.

(4)
$$E_i = P_i \cdot \left[\frac{F_S}{P_S} - \frac{F_i}{P_i} \right], \quad E_i \geq 0$$

Hermanutz (2000) uses an identity to project aggregate Equalization entitlements. This identity can be expressed in terms of individual provincial entitlements,

(5)
$$E_i = R \cdot \left[\frac{P_i}{P} \right] \cdot \left[\frac{F_S/P_S - F_i/P_i}{F/P} \right],$$

where R represents revenues to be equalised, P is total population and F is national average fiscal capacity (i.e., $F = R$). Hermanutz (2000) refers to the final term as a fiscal disparities index, denoted as FDI. In terms of growth rates, this identity can be rewritten as,

(6)
$$E_{i,t} = \left[\frac{R_t}{R_{t-1}} \right] \cdot \left[\frac{P_{i,t}/P_t}{P_{i,t-1}/P_{t-1}} \right] \cdot \left[\frac{FDI_{i,t}}{FDI_{i,t-1}} \right] \cdot E_{i,t-1}.$$

Following Hermanutz (2000) we choose variables to proxy the growth components in equation (6). For the growth in revenues to be equalised, we use the growth in provincial own-source revenue (net of interest income) as a proxy, which will permit us to capture the interaction between provincial tax reductions and Equalization entitlements. The growth in the second term relating to population shares is based on our underlying by-province demographic projections. To proxy growth in fiscal disparities we follow Hermanutz (2000) and use growth in GDP per capita, based on our by-province GDP projections. Therefore, the fiscal disparities index can be re-written as

(7)
$$FDI_{i,t} = \left[\frac{Y_{S,t}/P_{S,t} - Y_{i,t}/P_{i,t}}{Y_t/P_t} \right]$$

where Y_S, Y_i and Y respectively refer to nominal GDP in the five-province standard, nominal GDP in province i and national nominal GDP. Lastly, in order to account for the ceiling on Equalization entitlements, we project a ceiling by applying our (projected) national nominal GDP growth rates to the 1999/00 base of $10 billion (adjusted for actual growth in 2000/01).[26]

While our projection for Equalization incorporates model consistent features, interactions with provincial revenues and a ceiling on entitlements, we make, out of necessity, the potentially strong assumption that non-Equalization receiving provinces in the base year remain non-recipients over the projection period. This assumption is

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[26] An adjustment ensures that total entitlements do not exceed the ceiling by reducing each Equalization-receiving province's entitlement in proportion to its population share (i.e., in equal per capita terms) until the ceiling is reached.

consistent with the projection methodology in King and Jackson (2000), which extrapolates future entitlements from the base-year value.[27] However, compared to King and Jackson (2000), our extrapolation is somewhat more comprehensive and model consistent in that it captures the interaction of provincial tax reductions and it takes into account the growth in relative fiscal disparities, which are approximated by the underlying economic and demographic projections rather than historical growth rates.

Territorial Formula Financing (TFF)

TFF is a federal transfer to the territorial governments of the Yukon, the Northwest Territories and Nunavut. This transfer recognizes the "unique challenges and higher costs of providing public services in the north". In projecting TFF, we assume that total TFF payments to the territories remain constant as a share of (national) GDP. There is no attempt to model the actual program.

Other Federal Transfers to Other Levels of Government

The transfers described above are referred to as "major" transfers to other levels of government in federal budget documents. However, there are several smaller transfers from the federal government. Vaillancourt (2000) summarises and briefly evaluates these small transfers. Given their number and complexity, we again do not attempt to model these transfers; we simply assume that they grow in line with direct federal program spending.

3.4   *Economic and Demographic Assumptions*

Long-term structural fiscal and GDP projections are extrapolated under the assumptions that annual inflation and real income per capita (age-adjusted) growth are both constant at 2.0% and 1.5%, respectively. We assume constant annual rates in order to isolate the impact of population growth and changes in population composition on revenue and program spending categories. The 2.0% assumed rate of inflation is consistent with the mid-point of the Bank of Canada's inflation target band (1.0% to 3.0%). Our assumed constant rate of real income per capita growth, 1.5% (on an age-adjusted basis), follows Ruggeri (1993) and is also close to Robson's (2001) assumption of 1.6% annual growth in real output per working-age person, which the author uses to project GDP out to 2040.

Effective Interest Rates on Net Public Debt

In the net public debt projection model, which is described in the following sub-section, the relevant interest rate is constructed as a net effective interest rate (i.e., gross debt charges minus investment (interest) income). Since debt charges are reported on a gross basis in the Public Accounts, we subtract from debt charges the income generated

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[27] In order to allow for the possibility of current non-recipients becoming recipients in the future we would require a measure of the level of fiscal capacity by province which would necessitate modelling individual tax bases and tax rates separately.

from financial assets, which corresponds to net public debt (liabilities minus financial assets). For the federal government, the net effective interest rate was approximately 7.0% in 2000/01 and the average rate for the provinces and territories was approximately 8.5%. For the provincial and territorial debt projections, we assume that the average provincial/territorial net effective interest rate applies to each province and territory, given the wide variation in interest rates. Moreover, we assume that the 7.0% and 8.5% net effective rates are constant over the projection period. While these assumptions are somewhat restrictive, they are helpful in isolating the impacts of the demographic transition by equalising key economic assumptions across provinces. This approach is consistent with Robson's (2001) analytical framework, which projects provincial health spending, revenue and GDP by province, using a common set of economic assumptions. A more detailed by-province projection model would be required to capture all of the idiosyncrasies of provincial economies and public finances. A model with this level of detail is beyond the scope of this paper.

Demographic Assumptions

Demographic projections are based on Statistics Canada's "medium" projection scenario. There are four key component assumptions underlying this projection scenario.[28] First, fertility, defined in terms of births per woman of childbearing age, is assumed to be 1.48. Next, life expectancy at birth for women (men) is assumed to rise to 84.0 (80.0) in 2026. Immigration is assumed to be 225,000 persons per year. Finally, in terms of inter-provincial migration, the medium projection scenario assumes that the central and western provinces are the largest net recipients of migrants. Demographic projections by single year age groups are extended beyond 2026 by assuming that the above component assumptions remain constant at their 2026 levels.

3.5 Debt Projection Model

The debt projection model used in this paper conforms to the Public Accounts. On a Public Accounts basis, for a given level of government, net public debt D is equal to the sum of all previous years' budgetary balances BB (i.e., $D_t = D_{t-1} - BB_t$). The primary balance, PB, in this framework is defined as revenue (i.e., total revenue net of income from financial assets) minus program spending. The net effective interest rate on net public debt is given by i. In terms of the primary balance, the path of net public debt can be represented as equation (8).

$$(8) \qquad D_t = (1+i) \cdot D_{t-1} - PB_t = D_{t-1} + i \cdot D_{t-1} - (R_t - PS_t)$$

Given a starting point for net public debt (fiscal year 2000/01), an assumed constant net effective interest rate i and projections for revenue and spending categories, net public debt for each jurisdiction is extrapolated according the above equation.

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[28] See *Population Projections for Canada, Provinces and Territories, 2000-2026* (March 2001, Catalogue no. 91-520).

By construction, equation (8) assumes that all primary balance surpluses or deficits are applied to the previous year's debt and debt-servicing costs. This treatment follows King and Jackson's (2000) base-case scenario where all budgetary surpluses (deficits) are applied to debt reduction (accumulation). Thus in this case, no assumptions are made about future discretionary decisions regarding anticipated surpluses or deficits. By maintaining this assumption, we can provide an indication of the maximum amount of fiscal room available (if any) for implementing additional tax reductions and/or enriching program spending above and beyond that encapsulated by the initial revenue and program spending projections. To highlight the impact of debt reduction, we also entertain the alternative assumption that all anticipated budgetary surpluses are exhausted through one-time fiscal measures.

Projecting debt-to-GDP ratios in this manner provides a check on the sustainability of the existing fiscal structures of federal and provincial/territorial governments. If projecting the current fiscal structure forward results in an explosive rise in the debt-to-GDP ratio, the current fiscal structure is said to be unsustainable. The conventional definition of fiscal sustainability (which is discussed in more detail in Section 5) requires that debt cannot grow faster than its interest rate. Given that debt projections presented in this paper only cover the period 2000 to 2040, a useful guide in assessing whether the current fiscal structure is sustainable over the long-term -- based on the conventional definition -- is to determine whether the projected debt-to-GDP ratio in 2040 exceeds its base-year level.[29]

4 Projections of Government Revenue and Program Spending

This section presents projections of some of the key categories of revenue and spending that are likely to be impacted by population ageing.[30] Health expenditure projections by province are also presented. The final sub-section highlights federal intergovernmental transfers.

4.1 *Impact on Program Spending and Revenue*

The projection framework employed in this paper highlights two main channels through which demographics impact spending and revenue. The first channel captures, through the age distributions, the degree to which different types of spending/revenue are targeted to different age groups (e.g., health care, education and elderly benefits). The second channel captures changes in the size of the individual age groups, which impacts the size of the target population. Changes in the size of the age groups follow from the demographic assumptions regarding fertility, life expectancy, internal migration and immigration. Thus, the "demographic" component underlying the aggregate fiscal

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[29] Matier, Wu and Jackson (2001) assess the sustainability of federal and (consolidated) provincial/ territorial governments using the fiscal gap approach developed in Auerbach (1997). Their approach assesses sustainability over an infinite horizon. This paper however focuses on the 2000-2040 period only and projects debt-to-GDP ratios in order to facilitate comparison to other studies.

[30] Additional fiscal projections for federal and provincial/territorial governments are available upon request.

projections can be decomposed into changes in population growth and changes in population composition (i.e., the "ageing" effect). While the former refers to the overall size of the population, the latter component isolates, given the age profile of spending/revenue, the impact of changes in the targeted population.

Provincial Health-Care Spending

Chart 2 below presents the projection of (consolidated) provincial/territorial public health-care expenditure.[31] In aggregate, public health expenditure is projected to increase from 6.0% of GDP in 2000/01 to 9.4% of GDP in 2040/41, which in nominal terms translates into an average annual growth rate of just over 5.0%. Chart 2 also shows the path of health expenditure in the absence of ageing effects -- which is fairly stable as a share of GDP over this period -- reaching 6.3% of GDP in 2040/41. This suggests that by 2040/41, the ageing of the population will add approximately three percentage points of GDP to provincial/territorial public health spending.

Chart 2: The Impact of Ageing on Provincial Health Spending
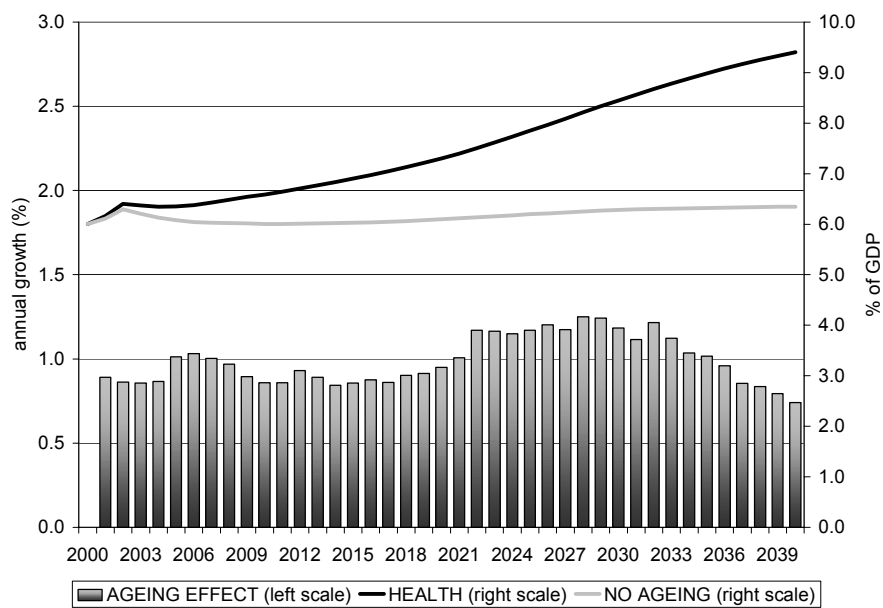
The ageing effect presented in Chart 2 shows the annual growth in health spending attributable to changes in the composition of the population. The projection of the ageing effect generally tracks the movements of the baby-boom age cohorts through the age profile of health spending. The ageing effect jumps in 2022 as the first wave of

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[31] The projection of total provincial/territorial health spending could be generated in one of two ways; either by summing across individual provincial/territorial public health projections, or by using total provincial/territorial public health spending as the base from which to project. Projections presented in Chart 2 are generated using the latter method.

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the baby-boom cohort enters the higher cost age group of 75-84 years.[32] The ageing effect then remains fairly stable until 2032 after which it decreases significantly as the baby-boom cohort dies off.[33] The maximum ageing effect, which coincides with the baby-boomer bulge as it moves from the 45-64 age cost category into the 65-74 age category, is projected in 2028 at approximately 1.25%.

The (consolidated) provincial/territorial health spending projection presented in Chart 2 is in line with recent long-term structural projections presented in Robson (2001) and Brimacombe et al. (2001). This is however not entirely surprising given that all these studies adopt essentially the same projection approach and incorporate similar economic and demographic assumptions.[34] Robson (2001) and Brimacombe et al. (2001) project health spending to rise from 6.0% of GDP in 2000 to 7.4% and 7.1% of GDP, respectively, by 2020 – compared to 7.3% of GDP projected in Chart 2.[35] While these projections as a share of GDP are remarkably close, the underlying projection in level terms is also quite similar. Brimacombe et al. (2001) project GDP using the Conference Board of Canada's long-term economic model and they estimate the growth in health expenditure (on an average annual basis) at 5.2% to 2020, which is identical to the underlying health spending growth rate projected in Chart 2 out to 2020/21.

Robson (2001) also estimates the real per capita (age-adjusted) enrichment in health spending over the 1980-2000 period and finds that it averaged 1.3% annually, however, for projection purposes he assumes 1.6% which is equivalent to his estimate of average growth in real output per person of working age over the same time period. Brimacombe et al. (2001) estimate enrichment rates by age group over the same time period and calculate a combined (average) enrichment rate of 1.4%. Thus, our assumption of 1.5% real per capita (age-adjusted) enrichment is entirely consistent with recent studies.

Federal Elderly Benefits

Chart 3 shows the projection of elderly benefits (i.e., OAS, GIS/SPA) rising from 2.3% of GDP in 2000/01 to 4.7% of GDP in 2040/41. When the ageing effect is removed from the projection, elderly benefits are projected to be relatively stable as a share of

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[32] There is a moderate spike in 2006/07 at just over 1.0%, as the bulge of the baby-boomers (i.e., those individuals aged 37 to 40 years in 2000/01) moves into higher cost age groups of 45-64 years from the relatively lower cost group of 15-44 years.

[33] In comparison, King and Jackson (2000) project 2012 as the peak of the ageing effect. Their estimate however is based on an age profile for health expenditure comprising only four age groups while the profile used in this paper consists of eight age groups. Their estimate of 2012 coincides with the first wave of the baby-boom cohort entering the highest cost age category of 65+ years old. In addition, King and Jackson (2000) use a different set of demographic projections out to 2040.

[34] Unlike the approach used in Robson (2001) and in this paper, Brimacombe et al. (2001) use historical data to estimate the trend enrichment rate of health spending by age group and then apply this trend to their projection. The other studies assume that trend enrichment for all age groups is set equal to income per capita or output per person of working age.

[35] Robson (2001) projects beyond this horizon and estimates health expenditure in 2040 at 10.0% of GDP.

GDP, reaching 2.4% of GDP in 2040/41, which suggests that ageing contributes about 2.4-percentage points of GDP to expenditure on elderly benefits by the end of the projection period. In terms of the annual growth in expenditure on elderly benefits, the ageing effect rises steadily from the base-year and peaks in 2012/13 as the first wave of the baby-boom cohort turns 65 and collects these benefits. The maximum ageing effect for elderly benefits is projected well in advance of health spending (2012/13 versus 2028/29) given that the baby-boom cohort enters the highest spending age groups at an earlier date (65+ years old for elderly benefits compared to 85+ years old for health). Moreover, it is important to note that the ageing effect for elderly benefits is considerably larger than the effect for health expenditure, averaging 1.8% versus 1.0% per year over the projection horizon. This is due to the fact that spending on elderly benefits is targeted exclusively to older age groups while health expenditure is spread across all age groups.

Chart 3: The Impact of Ageing on Federal Elderly Benefits
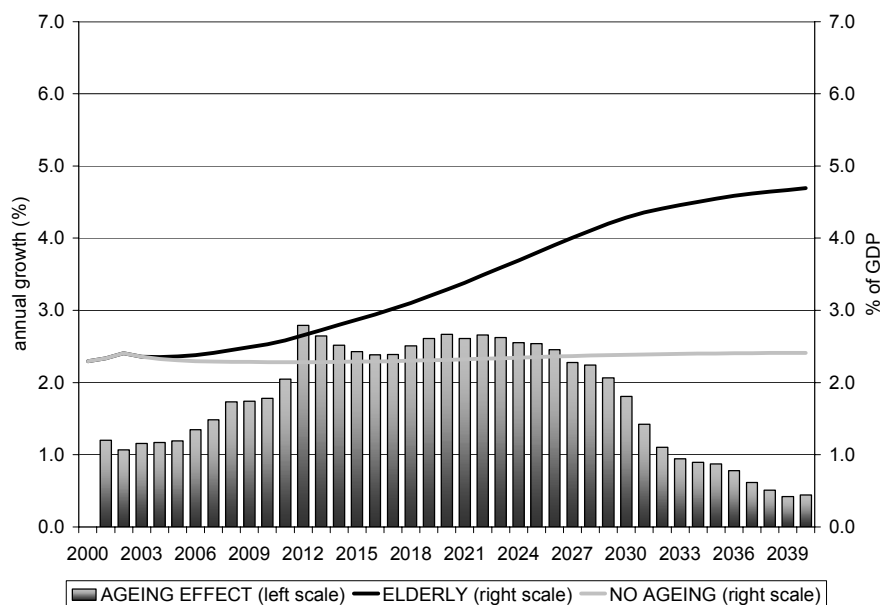
Provincial Education Spending

In the case of education expenditure, presented in Chart 4 below, long-term projections suggest that there is the potential for some offset to ageing effects on health spending above.[36] Aggregate provincial expenditure on education is projected to decrease from 3.6% of GDP in 2000/01 to 2.9% of GDP by 2040/41. In the absence of ageing effects, expenditure would be projected to remain relatively stable as a share of GDP, rising only marginally to 3.9% of GDP by 2040/41, thus indicating a (negative) ageing effect of 1-percentage point of GDP at the end of the projection period.

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[36] Projections of provincial/territorial education expenditures are also generated from the consolidated base (see footnote 30).

Chart 4: The Impact of Ageing on Provincial Education Expenditure
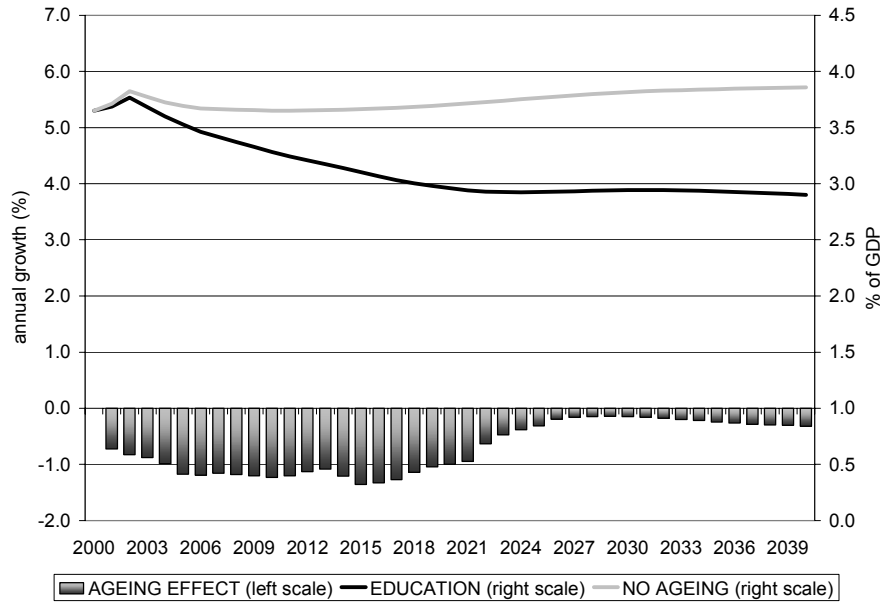

Personal Income Tax Revenue

The impact of ageing on revenue categories can be isolated in the same manner as described above for expenditure. Chart 5 below presents the federal PIT projection and corresponding ageing effect. The first five years of the PIT projection shows a dramatic decline, reflecting tax reductions announced in the *Budget 2000* and the *Economic Statement and Budget Update 2000*. Over the remainder of the period, PIT revenues are projected to remain stable at around 7.3% of GDP beyond 2006/07. In the absence of ageing, PIT would be approximately 0.2-percentage points of GDP higher in 2040/41. The ageing effect (calculated after 2006/07[37]) puts some initial upward pressure on PIT as the baby-boom cohort moves through its peak earning years. As the baby-boom cohort enters retirement, the ageing effect on PIT then turns negative, mirroring the drop in income and PIT paid by older age groups. The projection and ageing effect for provincial PIT exhibits a similar pattern and magnitude.

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[37] Annual ageing effects for federal PIT are calculated from 2007/08 since actual fiscal projections were used from Budget documents out to 2006/07. For the PIT projection out to 2006/07, removing growth due to inflation, productivity and population growth would isolate a residual term that would include both an ageing effect and a tax reduction effect. Equation (3) is used to project federal PIT using 2006/07 as the starting point.

Chart 5: The Impact of Ageing on Federal Personal Income Tax Revenue
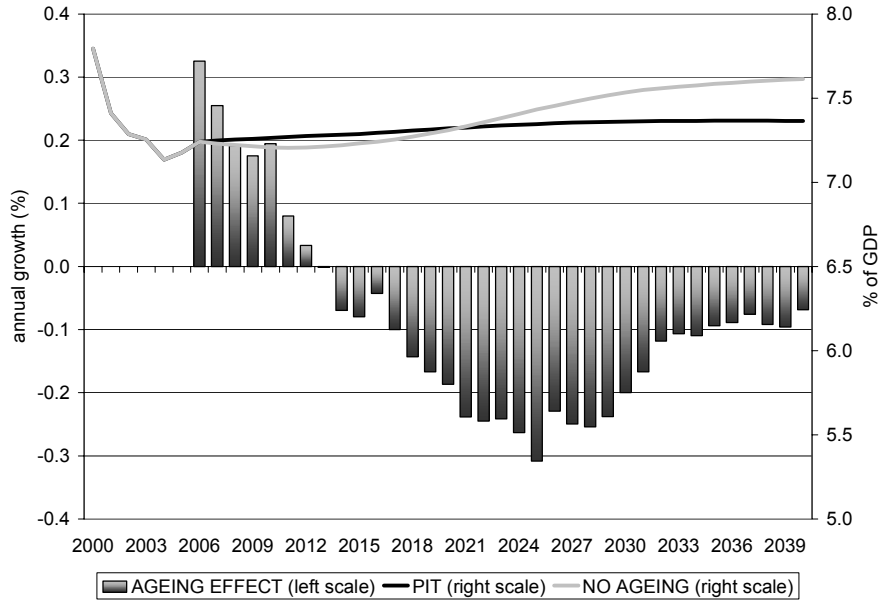
4.2   *Health-Care Spending by Province*

Given the prominence of health-care spending in provincial budgets and the differential demographic transitions identified in Section 2, it is informative to examine briefly the projections of health expenditure by province. Recall that since our framework incorporates the same assumptions about inflation and health enrichment, differences in by-province projections will reflect underlying demographic differences and also differences related to the underlying spending profiles by age.

Chart 6: Health Care Spending by Province 2000-01 to 2040-41
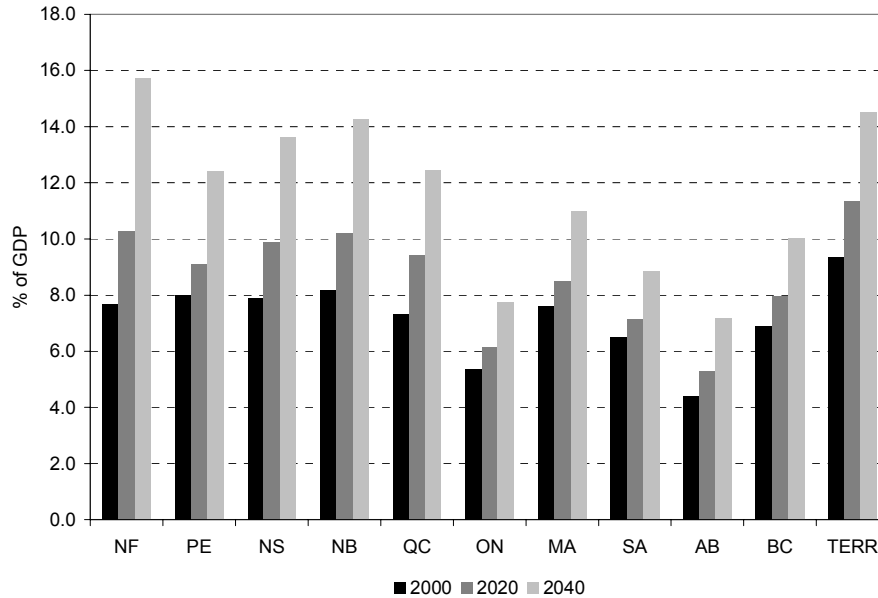
Chart 6 shows that there is considerable variation in projected public health care spending by provincial governments over the long term. In 2000/01, health care expenditure (as a share of provincial GDP) range from 4.4% in Alberta to 9.4% in the Territories. By 2020/21, this range widens to 5.3% to 11.4% and by 2040/41 the range is between 7.2% in Alberta to 15.7% in Newfoundland. In terms of the percentage point increase from 2000/01 to 2040/41, at the low end of the range, health spending in Saskatchewan and Ontario is projected to increase by about 2.4-percentage points of (provincial) GDP and at the high end of the range, an increase of 8.1-percentage points of GDP is projected for Newfoundland. These projections are generally in line with those of Robson (2001) in terms of the relative ranking of projected provincial health expenditure.

4.3   *Federal Transfers to Provincial/Territorial Governments*

Federal intergovernmental transfers constitute a significant component of provincial/territorial revenue and federal program spending and therefore will have important fiscal implications for both orders of government. Chart 7 presents projections for CHST and Equalization as a share of national GDP.[38]

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[38] The projection for CHST cash payments shown in Chart 7 represents the timing of federal payments as they are booked in the Public Accounts. The provincial/territorial CHST path differs slightly over the first few years, however, for 2005/06 and beyond, the paths are identical. Also included in the projections is: $1.0 billion funding for the Medical Equipment Fund, $500 million under Health Information Technology and $800 million under the Health Care Transition Fund for Primary Care, which were committed at the September 2000 First Ministers' Meeting.

Chart 7: CHST and Equalization Payments as a share of GDP
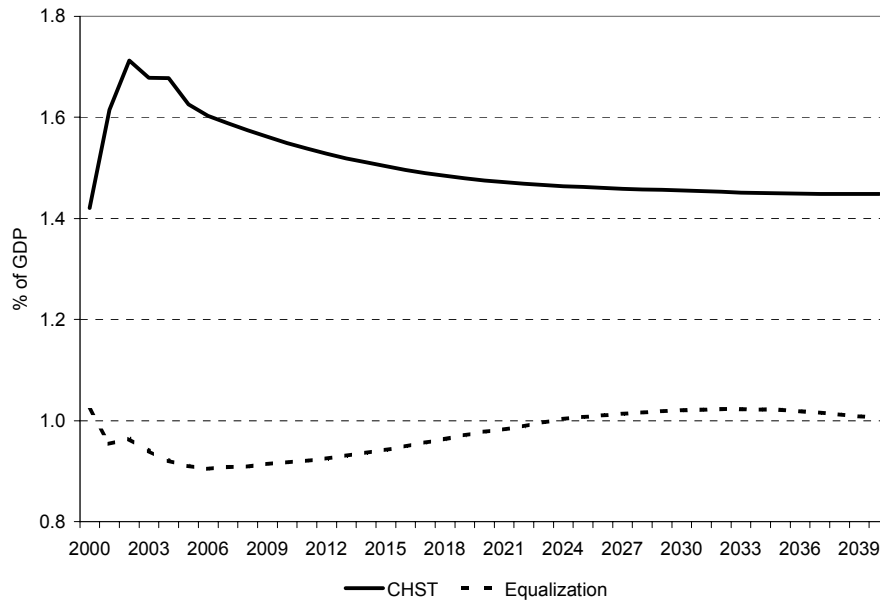
CHST cash payments rise from about 1.4% of GDP in their base-year and peak at 1.7% of GDP toward the end of the period covering the existing federal funding commitment. Beyond 2005/06 -- the period not covered by the existing federal commitment -- growth in CHST cash payments is assumed constant at 3.5% annually. CHST cash payments are projected to fall as a share of GDP over the remainder of the projection period. In fact, by 2040/41, CHST cash payments (as a share of GDP) are projected to be slightly higher than their base-year level.[39]

By contrast, Equalization payments are initially projected to fall from just over one percentage point of GDP in the base-year and then gradually increase over the remainder of the period.[40] The initial drop-off largely reflects the substantial provincial tax reductions (which has implications for growth in revenues to be equalised). After the current and announced provincial tax reductions have been implemented, growth in Equalization payments picks up. In terms of the growth components underlying the Equalization projection model (see p.16), the positive growth contribution of fiscal disparities more than offsets the negative contribution of declining population shares, however, the main contributor to growth in Equalization payments stems from growth in revenues to be equalised.[41] Equalization payments (in aggregate) are projected to grow at

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[39] Alternative Payments for Standing Programs (APSP) is projected to remain constant as a share of (national) nominal GDP. For Quebec, net CHST cash payments (i.e., gross CHST cash minus APSP) are projected to decline from 0.9% of provincial GDP in 2000/01 to approximately 0.3% of GDP by 2040/41.

[40] Federal transfers under Territorial Formula Financing are projected to remain constant as a share of (national) nominal GDP at 0.13%.

[41] Fiscal disparities make a positive contribution to growth in Equalization payments as a result of the relatively larger ageing impacts occurring in the Equalization-receiving provinces compared to the impact in the five-province standard. A larger ageing impact (all else equal) in an Equalization-receiving

an annual average rate of 3.9% from 2000/01 to 2020/21, which is somewhat slower than national nominal GDP growth of 4.2% over the same period. From 2020/21 to 2040/41, Equalization payments are projected to grow at an annual average rate of about 3.6%, roughly in line with nominal GDP growth over this period.

4.4   GDP Projections

Using provincial age profiles for market income, provincial GDP is projected such that it is consistent with the underlying revenue projections (see p.12). Thus, differences in projected provincial GDP growth reflect differences in age profiles and demographic projections, given our common set of economic assumptions. At the national level, GDP growth is projected to fall from 4.2% on an average annual basis (2000 to 2020) to 3.6% in the second half of the projection period, which translates into 3.9% on an average annual basis out to 2040/41. Chart 8 shows average annual provincial GDP growth rates over the two twenty-year periods of the projection horizon.

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province will act to reduce growth in GDP per capita in that province, relative to the five-province standard, which would result in an increase in the index of fiscal disparities and Equalization entitlements for that province.

Chart 8: Average Annual GDP Growth Rates, from 2000/01 to 2020/21 and 2040/41
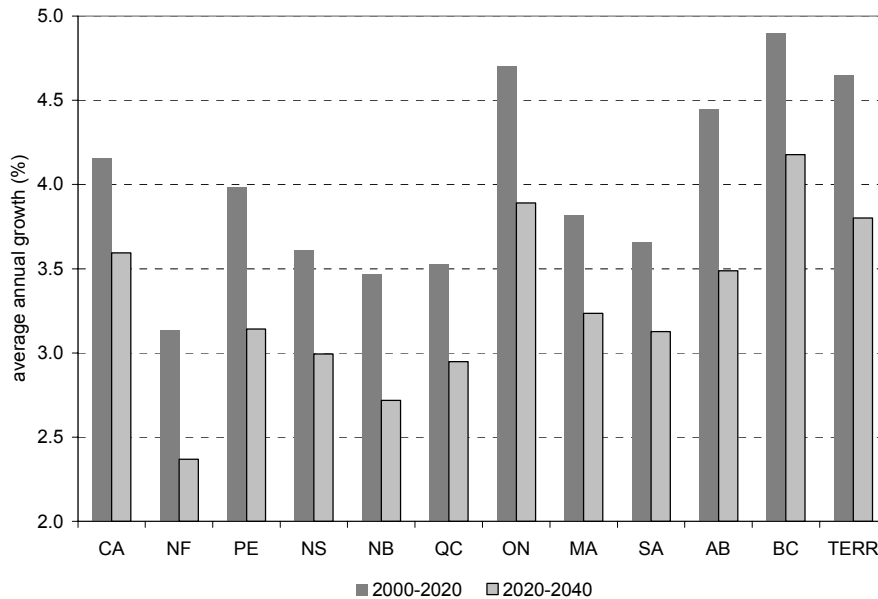
There is considerable variation in projected growth rates across the provinces. For the Atlantic provinces and Quebec, the below-national-average GDP growth rates reflect relatively slower population growth and relatively larger ageing impacts. Ontario, Alberta, British Columbia and the Territories are projected to grow faster than the national average, except for Alberta in the second half of the projection period. Manitoba and Saskatchewan are also projected to grow more slowly than the national average.

5   Projected Debt-to-GDP Paths

This section presents projected debt-to-GDP paths for the federal and provincial/ territorial governments over the period 2000/01 to 2040/41. Debt paths are generated under two alternative assumptions regarding the use of anticipated budgetary balances. A conventional definition of sustainability is used to assess the fiscal structures over the long term while taking into account the impacts of population ageing. In the final sub-section, debt paths are generated under alternative assumptions related to the enrichment of federal spending on elderly benefits and provincial/territorial health spending.

Assumptions Governing Debt Projections

Projections of net public debt are generated under two alternative assumptions. First, net debt is projected under the assumption that all primary balance surpluses are devoted to debt-servicing costs and to reducing net debt. In terms of budgetary balances, this implies that all anticipated budget surpluses are used to reduce net public debt.[42]

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[42] It is crucial to distinguish between anticipated and realised budgetary balances. Under the first assumption governing anticipated surpluses, revenue and program spending categories are first projected and then these projections, which form the primary balance, are fed into equation (8); net public debt

Similarly, anticipated budget deficits are added to the existing stock of net public debt and no attempt is made to raise taxes or lower program spending in anticipation of these deficits. While this assumption is somewhat extreme, it is nonetheless helpful in determining the maximum amount of fiscal room available over the long term. If debt-to-GDP ratios are projected to rise substantially under this maintained assumption, they will then of course rise under other scenarios which assume that some portion of anticipated budget surpluses are used to reduce taxes and/or increase program spending. Moreover, by assuming that all anticipated budget balances are applied to the stock of net public debt, we are able to assess the sustainability of the existing fiscal structure. Indeed, this type of projection follows the long-term fiscal projections produced by the Congressional Budget Office (CBO) and the General Accounting Office (GAO) in the United States.

An alternative set of debt projections is presented under the assumption that anticipated budget surpluses are devoted to reducing taxes and/or increasing program spending through one-time measures, resulting in a balanced budget.[43] In this case, the stock of net public debt cannot be reduced below its initial 2000/01 level. As is the case under the previous assumption, budget deficits are simply added to the existing stock of net public debt and no attempt is undertaken to raise taxes or lower program spending in anticipation of these deficits. Thus, by projecting paths of net public debt under these two assumptions, we are able to gauge not only the sustainability of existing fiscal structures over the long term but also the contribution of debt reduction to offsetting the impacts of population ageing.

Assessing Fiscal Sustainability over the Long Term

Several criteria exist that can be used to evaluate the sustainability of fiscal policy over the long term. However, the conventional notion of sustainability is based on the government's intertemporal budget constraint that requires the present value of future primary balances (out to infinity) to equal the base-year level of net debt. Blanchard and Fischer (1989) note however that this requirement "does not imply that the debt is ultimately repaid or even that it is ultimately constant". Essentially this requirement implies that government debt cannot grow faster than the interest rate over the long term. Since our projections extend only to 2040/41, this notion of sustainability needs to be modified. Thus, in light of the conventional notion based on the intertemporal budget constraint, we define fiscal sustainability as a projected debt-to-GDP ratio that does not rise above its initial (2000/01) level at the end of the projection period. This definition of sustainability is based on a measure of fiscal imbalance used by the Social Security

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evolves accordingly. Thus in this case, there is no difference between the anticipated and realised budgetary (or primary) balances.

[43] Under the second assumption governing anticipated surpluses, the initial revenue and program spending projections are adjusted (in a given year) using one-time measures to ensure that the (realised) budget is balanced if and only if budget surpluses are in fact anticipated. However, if budget deficits are anticipated, then the initial revenue and program spending projections are used for that particular year and no attempt is made to ensure that the (realised) budget is ultimately balanced.

Trustees and presented in Auerbach (1997).[44] However, for the purposes of this paper and to facilitate comparison with the King and Jackson (2000)[45] study, we are only concerned with the qualitative finding with respect to the issue of sustainability and therefore do not compute Auerbach's measure of fiscal imbalance.[46]

### 5.1   Baseline Debt-to-GDP Projections: Anticipated Budget Surpluses used to Reduce Net Public Debt

Net public debt-to-GDP ratios for the federal government and each provincial/territorial sector from 2000/01 to 2040/01 are shown below in Chart 9. These debt paths are projected assuming that any anticipated budget surpluses (deficits) -- resulting from the projections of revenue and program spending categories -- are devoted entirely to debt reduction (accumulation). Based on our assumptions, projections indicate that the federal government could eliminate its net public debt by 2031/32. This result suggests that the existing federal fiscal structure is sustainable over the long term.

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[44] More specifically, Auerbach's measure quantifies the degree of unsustainability and provides an estimate of the required change in the projected primary balance (as a share of GDP) that will in fact cause the debt-to-GDP ratio to equal its initial level at the end of the projection period.

[45] King and Jackson (2000) implicitly define fiscal sustainability as a debt-to-GDP ratio that does not "begin to rise considerably".

[46] Matier, Wu and Jackson (2001) adopt Auerbach's measure (based on the infinite horizon calculation) and quantify the degree of fiscal imbalance at the federal and (consolidated) provincial/territorial levels of government.

Chart 9. Projected Debt-to-GDP ratios by Jurisdiction, 2000-2040
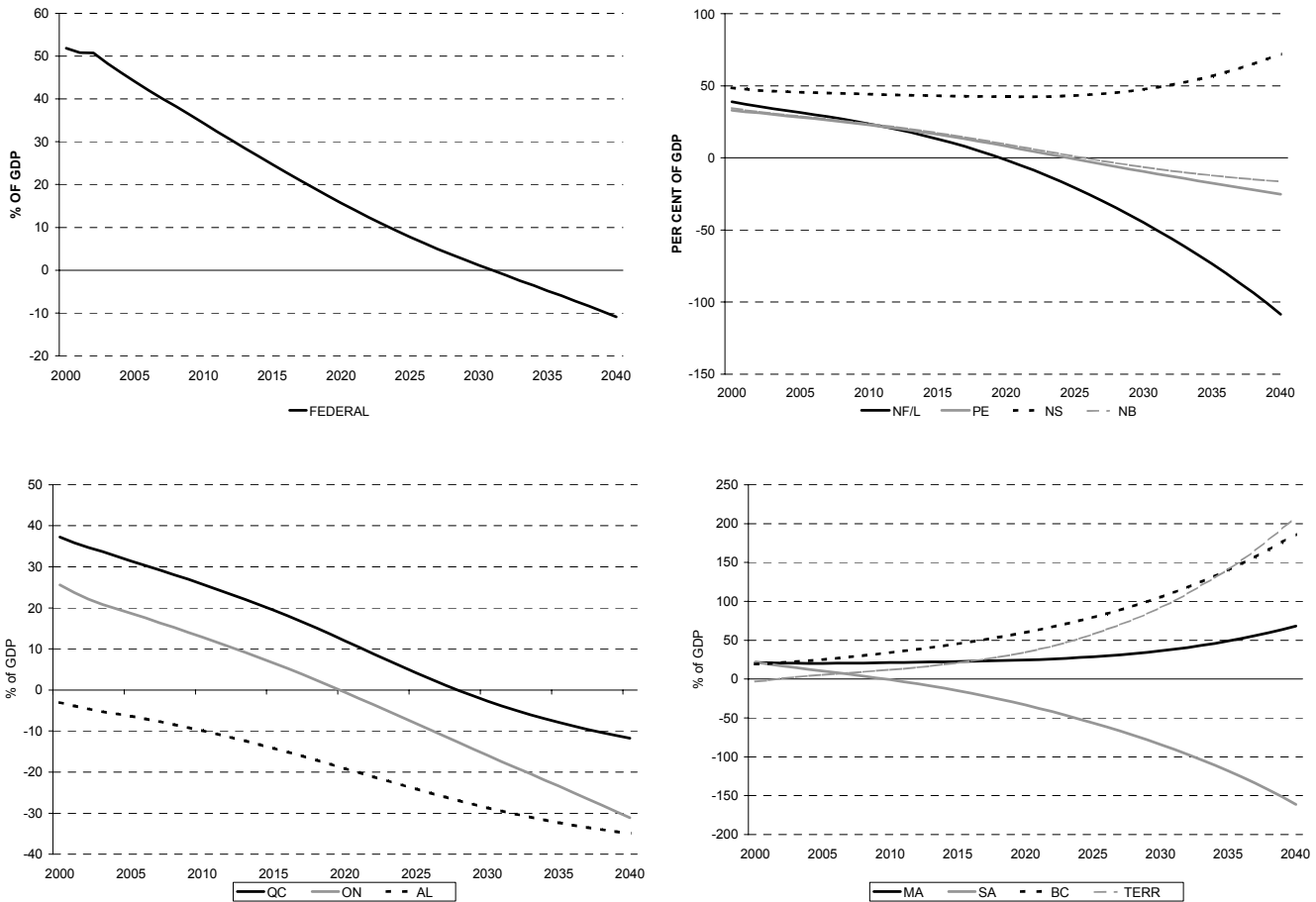
Based on our definition of fiscal sustainability, the existing fiscal structures of four governments (Nova Scotia, Manitoba, British Columbia and the Territories) are not sustainable over the long term. Of these provincial governments, British Columbia's net public debt-to-GDP ratio is projected to rise steadily above its initial level from the onset; Manitoba is projected to exceed its initial debt ratio by 2011/12 and Nova Scotia by 2031/32.[47]

There are a number of key elements underlying the above debt projections. For example, the rate of population growth, the extent of population ageing, the age structure of revenue and program spending and a government's initial fiscal position, are all important contributors to the evolution of the debt-to-GDP ratio over the long term. Moreover, the interaction and timing of these elements also play a crucial role. Governments that are able to run budgetary surpluses before ageing-related pressures

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[47] It is interesting to note that the debt-to-GDP ratios of both Nova Scotia and Manitoba do not begin to rise rapidly until the mid-2020s, the period during which ageing pressures from health spending accelerate. This illustrates the importance of using detailed age profiles of provincial/territorial program spending. For example, King and Jackson (2000) use an age profile for health spending which consists of only four age groups and they find that ageing pressures are projected to peak in 2012/13. Using finer data (eight age groups), we find that the peak of ageing pressures is delayed until 2028/29.

reach their peak are better placed to manage the demographic transition despite large increases in old-age dependency ratios and slower growth in the working age population. By reducing net public debt early on, projected revenue that would have otherwise been used to service the debt is instead used to finance program spending pressures related to population ageing. To illustrate how the different elements feed into the debt path projections presented above, it is helpful to examine situations where the existing fiscal structure is sustainable (e.g., Newfoundland and Labrador) and where it is not sustainable (e.g., Manitoba) over the long term.[48]

Newfoundland and Labrador

As a share of GDP, Newfoundland and Labrador's net public debt is projected to decline steadily from 40%. One of the key contributors to this decline is the strong initial fiscal position. To illustrate the importance of the initial fiscal position and to provide a point of reference, we estimate the size of the primary balance-to-GDP ratio that is required to maintain the debt-to-GDP ratio constant at its initial 2000/01 level.[49] A projected primary balance which exceeds this ratio will tend to cause the debt-to-GDP ratio to decline steadily over the long term and likewise, a primary balance that is continually below this level will force the debt ratio to climb above its initial level. In the case of Newfoundland and Labrador, the primary balance in 2000/01 is approximately twice as large as the amount necessary to maintain the debt-to-GDP ratio constant at its initial value. While the initial fiscal position is indeed strong, the primary balance is projected to remain in a solid surplus position over the entire projection horizon, contributing strongly to reducing the stock of net public debt prior to the onset of ageing-related spending pressures (see Chart 10).
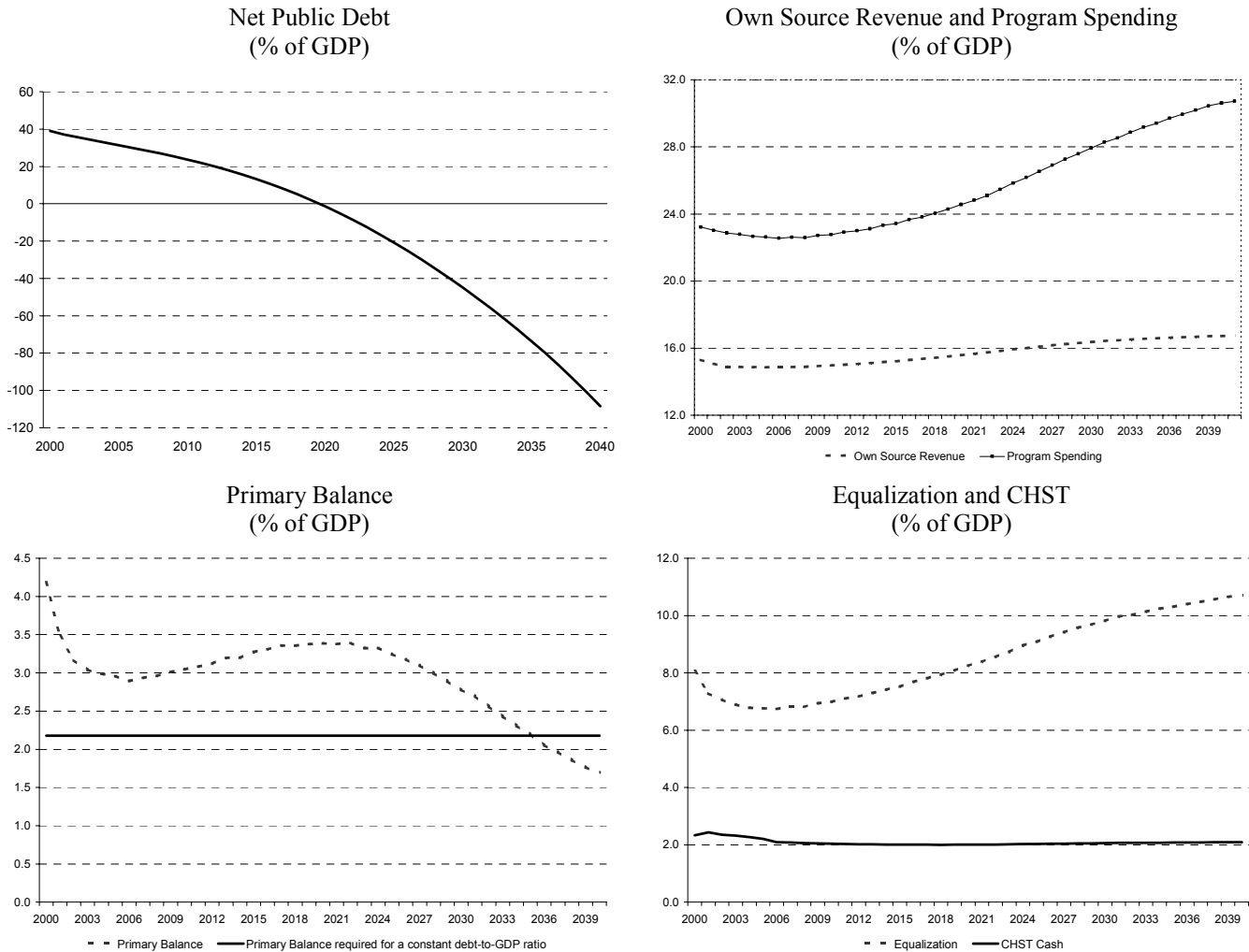
At first glance, the dramatic reduction in net debt may seem surprising, especially given that Newfoundland and Labrador is projected to experience the largest increase in the old-age dependency ratio in Canada. However, while program spending is projected to rise by about 8-percentage points of GDP from its initial level, own-source revenues and federal transfers (Equalization and CHST cash) are also projected to rise in step after 2006/07. The sizeable increase in Equalization payments is largely due to two factors. First, growth in revenues to be equalised, which is proxied by the projected growth in *total* provincial own-source revenues, exceeds provincial GDP growth after 2005/06. The initial decline in Equalization payments stems from slower growth in revenues to be equalised -- most provincial governments are projected to implement previously

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[48] The underlying fiscal projections for other governments are available upon request.

[49] To calculate the size of the primary balance (as a share of GDP) required to keep the debt-to-GDP constant at its initial level, we divide equation (8) by GDP and then solve for the primary balance given the initial debt-to-GDP ratio. This formula can be expressed as $pb = \left(\dfrac{i-g}{1+g}\right) \cdot d_{2000/01}$, where pb and d represent the primary balance-to-GDP and debt-to-GDP ratios respectively; i and g respectively represent the net effective interest rate and the growth rate of GDP. In our calculations the provincial net effective interest rate is assumed constant at 8.5% and the average annual growth rate in GDP over the period 2000 to 2040 is used in the above formula.

announced tax reductions during this period. Second, fiscal disparities in Newfoundland and Labrador are projected to increase as a direct result of population ageing.[50] CHST cash transfers are projected to remain relatively stable as a share of GDP despite the projected slowdown in population growth. While CHST cash transfers after 2005/06 are (assumed) allocated on an equal per capita basis, there is growth in the overall amount of cash transfers of 3.5% per year, which more than offsets Newfoundland and Labrador's declining population share.

Chart 10. Fiscal Projections: Newfoundland and Labrador

Net Public Debt
(% of GDP)

Own Source Revenue and Program Spending
(% of GDP)

Primary Balance
(% of GDP)

Equalization and CHST
(% of GDP)

Manitoba

In contrast to Newfoundland and Labrador, the provincial government of Manitoba is projected to face a rising debt-to-GDP ratio over the long term (see
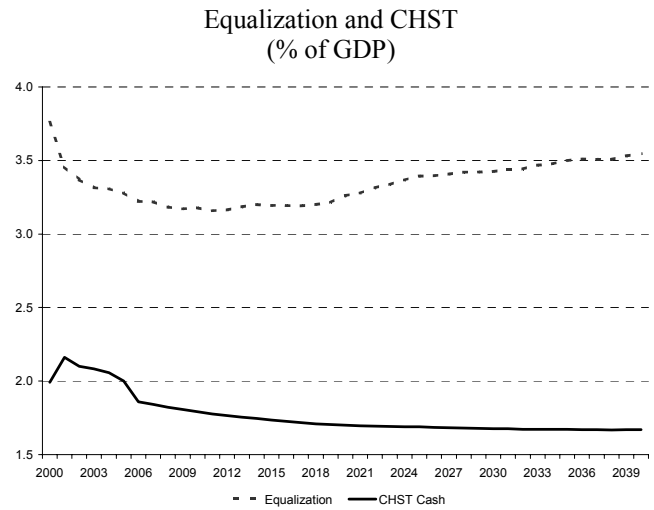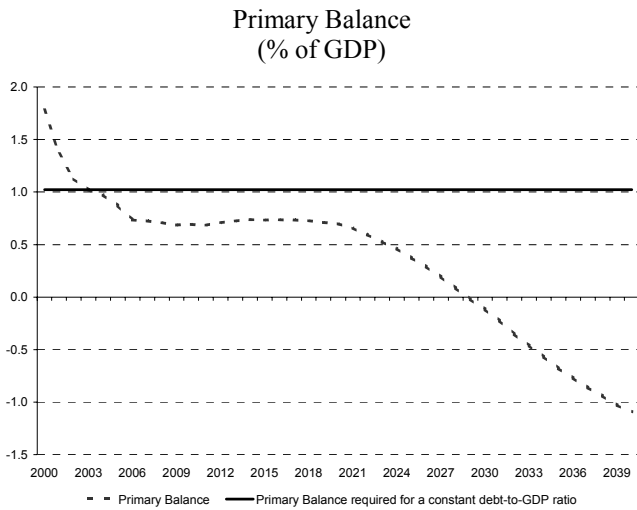
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[50] Recall from footnote 40 that all else equal, a larger ageing impact in an Equalization-receiving province will act to reduce growth in GDP per capita relative to the five-province standard. This increases the provinces fiscal disparity and therefore Equalization entitlements to that province will increase.

Chart 11).   While Manitoba's initial fiscal position is fairly strong, there is a rapid deterioration as the primary balance surplus is projected to fall below the level required to keep its debt ratio constant and is then projected to fall into a deficit position in 2029/30. For approximately the first half of the projection horizon, Manitoba's program spending remains relatively stable and in fact declines somewhat from its initial level. Pressures on program spending however emerge around 2020/21, raising program spending as a share of GDP by about 2.4-percentage points above its 2000/01 starting point by the end of the period, considerably lower than the projected increase in Newfoundland and Labrador.   Although ageing-related spending pressures emerge, Manitoba is in fact projected to experience one of the smallest increases in its elderly population share in Canada.

Over the first twenty years, Manitoba's own-source revenues and federal transfers are projected to decline as a share of GDP. In the second half of the projection horizon, while Equalization payments and own-source revenues (as shares of GDP) rise back toward their initial levels, this additional revenue is not sufficient to finance the ageing-related program spending pressures and increased debt-servicing costs. As mentioned above, the initial decline in Equalization payments is largely due to a slower growth in revenues to be equalised, which stems from provincial tax reductions by a number of governments. The pickup in Equalization payments to Manitoba is not as pronounced relative to Newfoundland and Labrador. After the initial decline, the growth in revenues to be equalised (which raises Equalization payments all else equal) is similar to growth in Manitoba's GDP and therefore does not rise significantly as a share of GDP. Moreover, the degree of ageing (which also raises Equalization payments all else equal) is less pronounced in Manitoba.   Thus, Manitoba is not projected to experience such a significant increase in fiscal disparities, that would have resulted in increased Equalization payments.

Chart 11. Fiscal Projections: Manitoba

Net Public Debt
(% of GDP)

Own Source Revenue and Program Spending
(% of GDP)

Primary Balance
(% of GDP)

Equalization and CHST
(% of GDP)
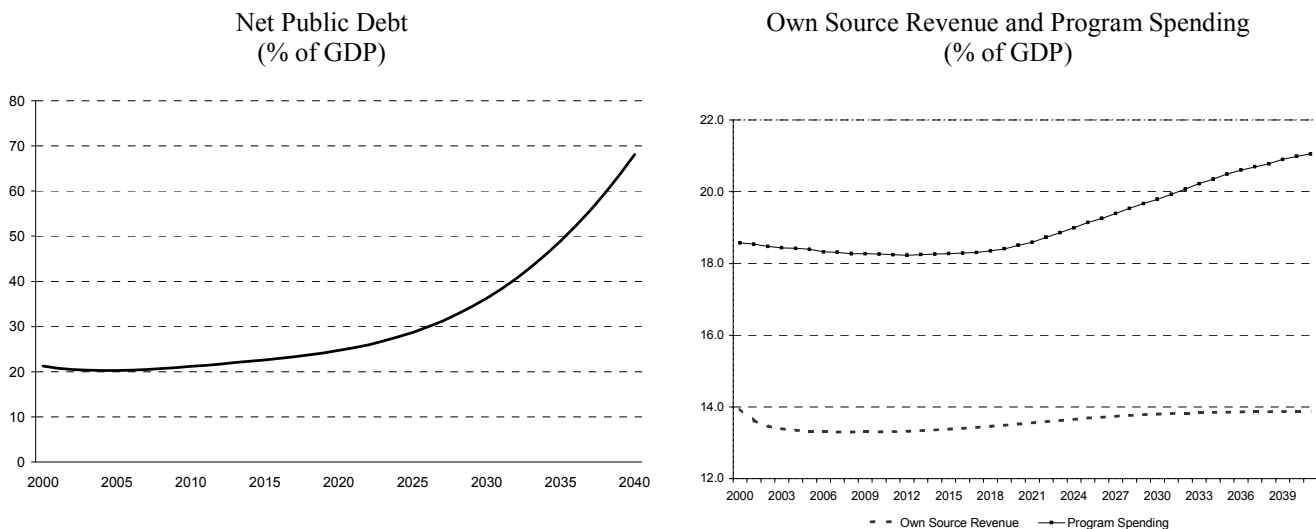
5.2 Debt-to-GDP Projections: No Reduction in the Stock of Net Public Debt

In order to highlight the importance of reducing the stock of net public debt in the face of population ageing, we produce an alternative set of debt projections that are generated under the assumption that anticipated budget surpluses are devoted to reducing taxes and/or increasing program spending on a one-time basis (see Chart 12). These new revenue and spending measures (if any) are implemented in addition to the projected paths of revenue and program spending underlying the previous set of debt projections shown in section 5.1. As in the previous set of debt projections, no actions are taken to offset anticipated budget deficits.

Chart 12. Alternative Projected Debt-to-GDP ratios by Jurisdiction, 2000-2040
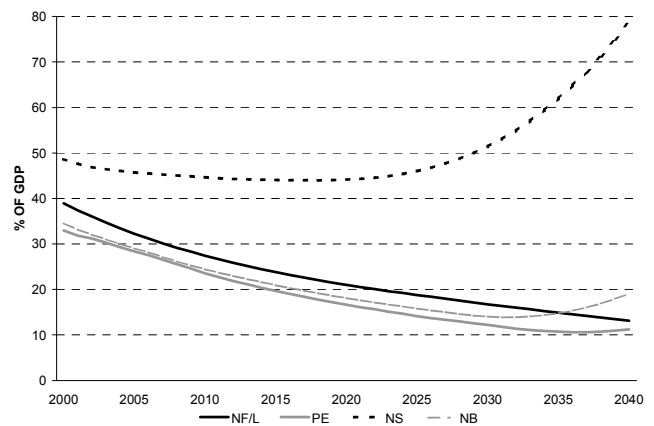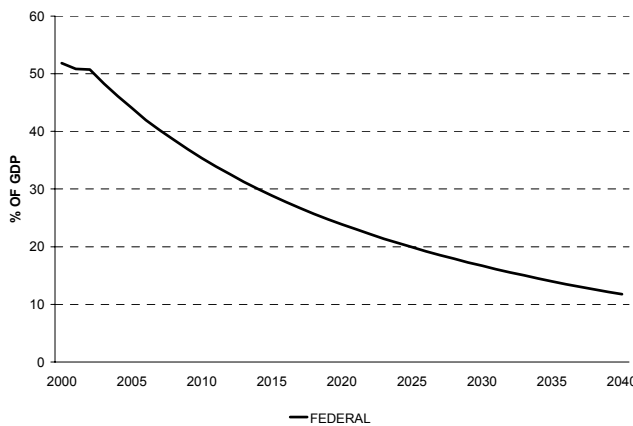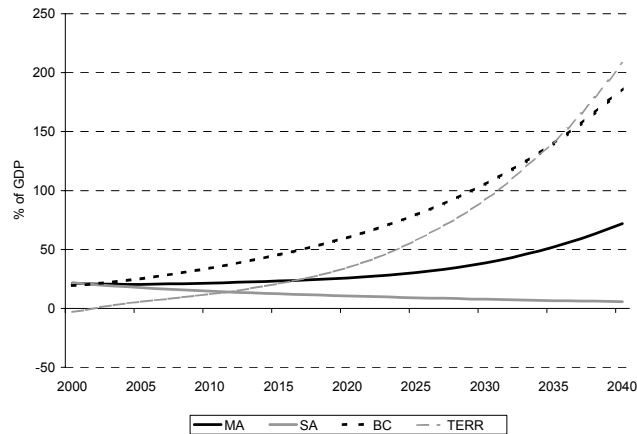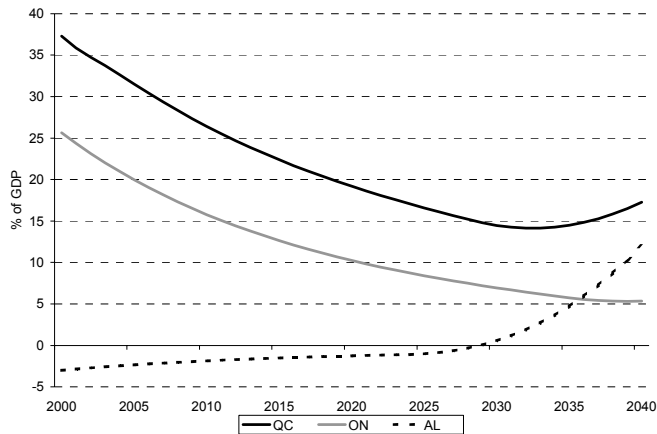
At the federal level, net public debt as a share of GDP is projected to remain below its initial 2000/01 ratio at the end of the projection horizon, indicating that the fiscal structure, assuming no debt reduction, is also sustainable over the long term. While the federal debt ratio declines throughout the projection horizon, substantial new revenue and spending measures are implemented, and thus the speed at which the debt ratio declines is reduced considerably. By the end of the projection horizon, the federal debt ratio stands at approximately 12% of GDP. [51]

Under the assumption that anticipated budget surpluses are used for new one-time revenue and spending measures, only one provincial government, Alberta, switches from a sustainable to an unsustainable position over the long term based on our criterion. While Alberta is projected to maintain a net asset position throughout most of the projection period, its debt ratio rises steadily above its initial level indicating that, according to our criterion, its fiscal structure in this case is not sustainable over the long term.[52] Alberta is projected to shift from a net asset to a net debt position by 2029/30. Not surprisingly, Nova Scotia, Manitoba and British Columbia are projected to face debt ratios that rise above their initial levels. However, assuming no reduction in the stock of net public debt, the year in which these provincial governments rise above their initial debt ratios is advanced by three years (2028/29) and one year (2010/11) for Nova Scotia and Manitoba respectively.

5.3   Debt-to-GDP Projections: Excluding Tax Reductions after 2000/01

In King and Jackson (2000), revenue and spending projections were extrapolated from fiscal year 1999/00. Since then there have been significant changes in both the

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[51] The assumption that anticipated budget surpluses are exhausted through one-time measures also helps to reduce the risk of entering into an unsustainable fiscal position.

[52] We acknowledge that in the case of Alberta our definition of long-term fiscal sustainability may not be entirely meaningful given that Alberta is starting from a net *asset* position. For Alberta, the possibility exists that its net public debt ratio could rise above its initial 2000/01 level but remain in a net asset position by the end of the period, which could be argued to constitute a sustainable fiscal position.

economic and fiscal environment, the most notable of which are the substantial tax reductions announced and/or implemented by both federal and provincial governments. To gauge the impact of these tax reductions over the long term, we generate debt-to-GDP projections under the assumption that all tax reductions after 2000/01 are excluded. In this hypothetical scenario, federal and provincial revenues are projected to grow from their base-year levels according to equation (3). To illustrate the impact of the tax reductions, it is helpful to compare the debt ratios in 2040/41 under this hypothetical scenario with the debt-to-GDP ratios projected in the baseline (see section 5.1).

Our projections indicate that if instead of implementing tax reductions beyond 2000/01, federal and provincial governments were to allocate all available fiscal room to debt reduction, then most jurisdictions would be able to eliminate their net public debt by 2040/41. Under this hypothetical scenario, we project an additional 161-percentage point decrease in the debt-to-GDP ratio of the federal government beyond the baseline debt-to-GDP ratios in 2040/41. Moreover, when the post 2000/01 provincial/territorial tax reductions are excluded, only British Columbia and the Territories are projected to face rising debt-to-GDP ratios (see Chart 13).

Chart 13. Alternative Projected Debt-to-GDP ratios by Jurisdiction, 2000-2040

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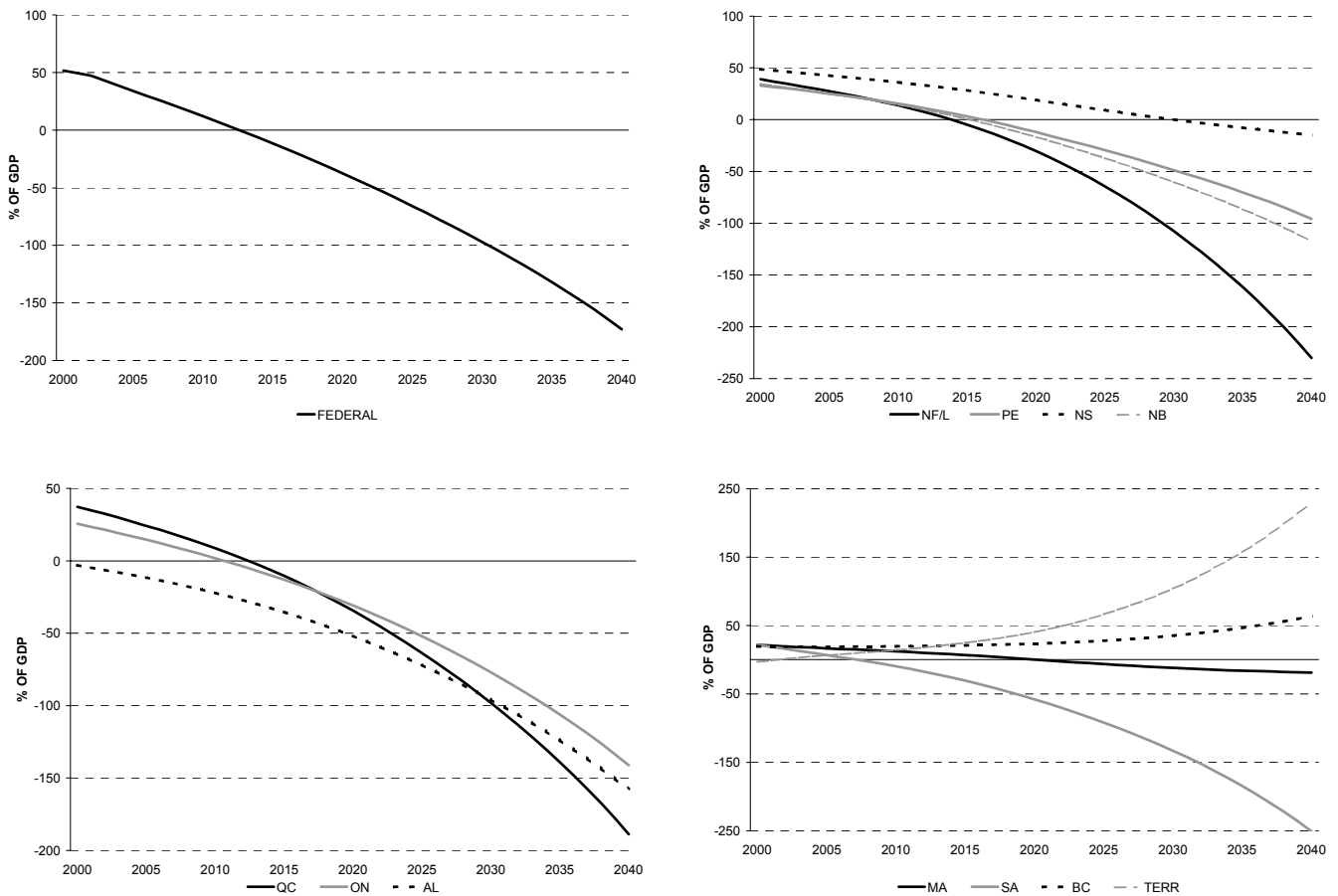
5.4   Alternative Assumptions for Elderly Benefits and Health Spending

It is important to reiterate that the long-term fiscal projections presented in this paper are the result of purely mechanical accounting relationships combined with various economic, fiscal and demographic assumptions. These projections should not to be regarded as actual fiscal forecasts. As mentioned earlier, our objective in this paper is not to provide projections of what will likely happen but rather to overlay the existing federal and provincial/territorial fiscal structures onto a set of long-term demographic and economic projections.

Long-term projections necessarily require assumptions about the future economic environment and fiscal policies implemented by both orders of government. And, of course, there is considerable uncertainty associated with these assumptions. Given the paper's focus on population ageing, we consider some alternative assumptions for key programs that are likely to be most impacted by population ageing (i.e., programs directed primarily to the elderly) such as federal spending on elderly benefits and provincial health care spending.

As mentioned in section 3, both federal spending on elderly benefits and provincial health spending are projected to grow at an annual rate of 1.5% on a real per capita (age-adjusted) basis.[53] However federal spending on elderly benefits, as currently structured incorporates only price indexation[54] and therefore our initial projections may overstate the pressure of federal spending in this area. To gauge the degree of pressure imposed upon the federal government by our assumption of price/wage indexation of elderly benefits, we consider an alternative federal projection for spending on elderly benefits where there is no real per capita age-adjusted enrichment. Next, in the case of provincial health spending, we consider an alternative projection where spending -- on an annual real per capita age-adjusted basis -- grows or is "enriched" at a rate of 2.0%. It is important to note that changing these assumptions does not impact any other revenue or spending category -- including intergovernmental transfers -- for either level of government.[55]

Under the alternate assumption of zero enrichment to federal spending on elderly benefits (on real per capita age-adjusted basis), the federal debt is eliminated eight years earlier, in 2023/24, compared to the baseline debt projection (see Chart 14 below). With reduced pressure from spending on elderly benefits, the federal government's projected underlying primary balance is significantly larger. This means that a greater portion of

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[53] For federal spending on elderly benefits, this is largely consistent with the assumption that benefits such as OAS payments are indexed to inflation and real income per capita growth. We assume the latter fixed at 1.5% on an annual age-adjusted basis.

[54] Moreover, there is also a degree of income testing for some elderly benefits, however, our projections do not capture these institutional details.

[55] King and Jackson (2000) also consider alternative health spending enrichment scenarios however they assume that growth in CHST entitlements is linked to the growth in provincial health spending. In this paper, CHST cash payments are not linked to provincial health spending and grow (in aggregate) at an annual rate of 3.5% beyond 2005/06.

revenues can be used to reduce net public debt and debt-servicing costs, given our assumption that anticipated budget surpluses are used to reduce net public debt.

**Chart 14: Federal debt-to-GDP ratios under differing assumptions about OAS growth (%)**
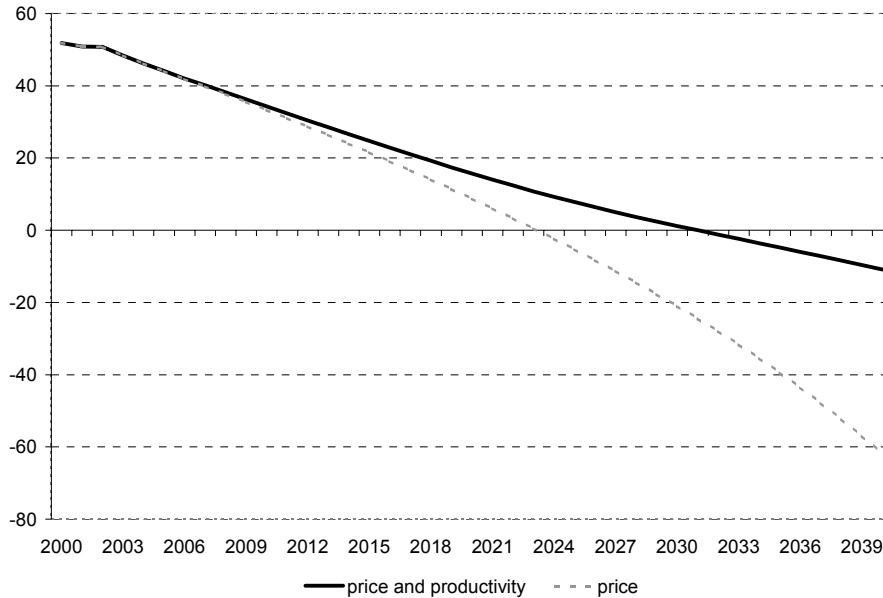
Next we consider an alternate enrichment assumption for provincial health spending where, on an annual real per capita age-adjusted basis, health spending is increased from 1.5% to 2.0%.[56] Given the discussion in section 2 above, the growth rate of real per capita age-adjusted spending on health is of considerable importance. The change in the structure of the population is likely to push the growth of health spending above the growth rate of the economy during the years when the baby boomers pass into the high health-utilisation age groups. However, it has been widely acknowledged that population ageing is only one of the many pressures currently facing the system and these pressures are likely to continue, or intensify, in the future. New technologies, the prevalence of new drugs, homecare, diagnostics, and wages of health care providers, are only some among numerous other factors that have the potential to push the growth rate of health expenditures above the growth rate of GDP. Furthermore, even if efforts to slow the growth rate of health care spending, through major restructuring of the system, are successful, these efforts are likely to involve short- or medium-term costs that could be substantial.

It is evident from chart 15 below that a seemingly small change in the enrichment of health spending can have significant effects on the projected debt-to-GDP ratio. Under the assumed 2.0% real per capita age-adjusted enrichment, only one province,

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[56] Robson (2001) also considers a similar alternate assumption (an increase of 0.5% in utilisation across age groups) for his long-term health spending projections.

Saskatchewan, would be able to eliminate its debt over the projection period; all other provinces are projected to face rising debt paths soon after the baby boomers begin to retire. Based on our sustainability criterion, only three provincial governments (Newfoundland, Saskatchewan and Ontario) are projected to be fiscally sustainable over the long term. However, it is important to remember that this alternative projection assumes that spending on all other categories continues to grow at 1.5% on a real per capita age-adjusted basis. The rising pressure on health spending is not offset by new spending reductions in other areas of the budget, nor is it funded by higher own-source revenues or federal transfers. Moreover, projected federal transfers to the provinces and territories remain unchanged from their baseline levels.

Chart 15 2.0% real per capita, per age group growth in health spending
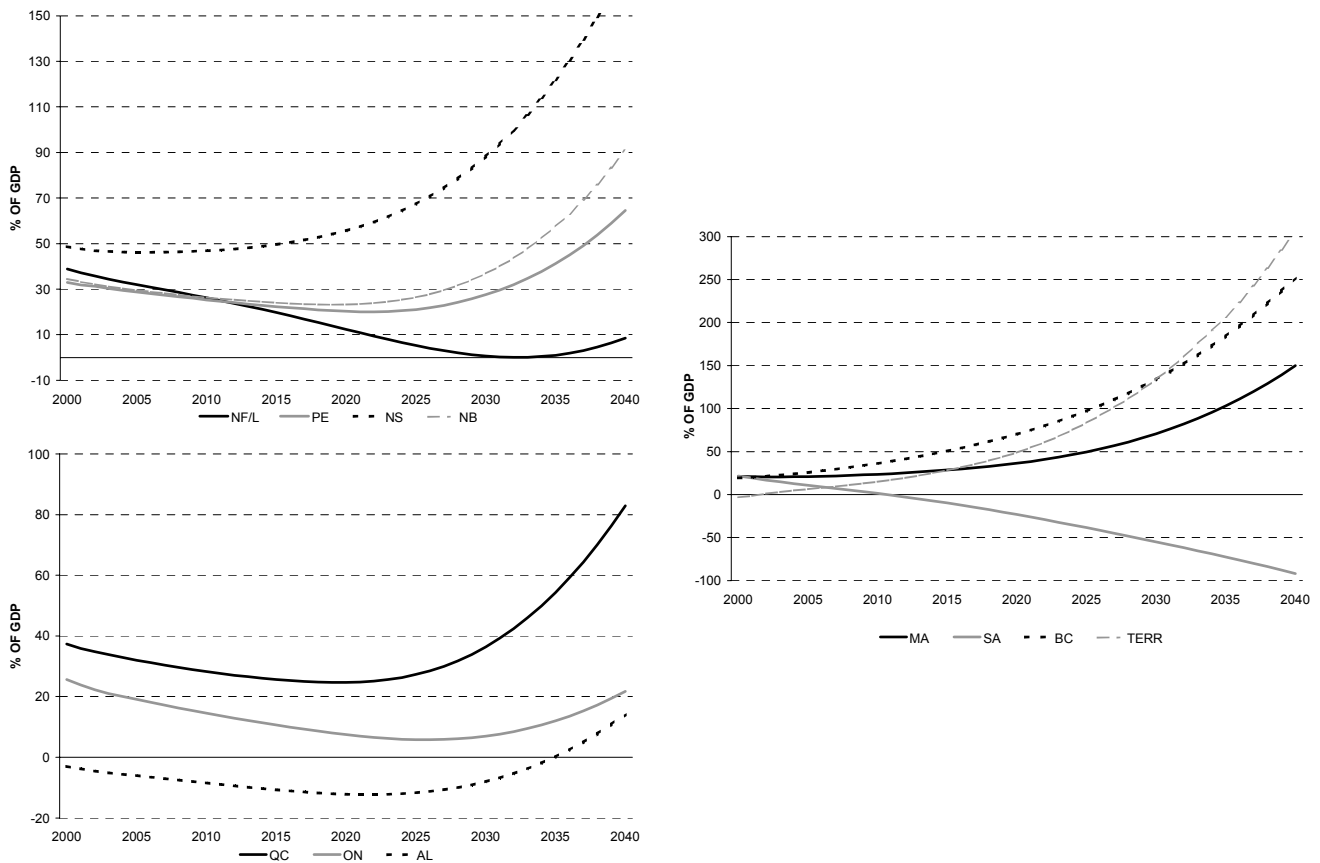
6   Summary and Conclusions

This paper provides an update to the King and Jackson (2000) study, which analysed the fiscal implications of population ageing using a debt-to-GDP projection framework. Since the publication of the original study, there have been a number of important fiscal policy changes implemented by all governments across Canada. As well, the long-term demographic outlook has changed somewhat. This paper uses essentially the same analytical framework, however, it modifies the original treatment of federal

intergovernmental transfers and the methodology used to project nominal GDP. Rather than reproducing an update to the entire set of projection scenarios, this paper develops a baseline scenario which is then used analyse the sustainability of the existing federal and provincial/territorial fiscal structures over the long-term using a criterion of sustainability based on Auerbach (1997).

Long-term demographic projections show significant increases in the elderly share of the population as fertility rates are projected to remain low while life expectancy increases. However, the extent of population ageing across provinces is somewhat varied. Given that the incidence of government spending is not evenly distributed across age groups and largely falls on the young and elderly, the potential exists for spending pressures to emerge in key categories such as health and elderly benefits. It is also possible for population ageing to reduce the growth of government revenue as the large (baby-boom) age cohorts move out of their peak earning years and into retirement. In addition, the future path of federal intergovernmental transfers to provincial and territorial governments will have important implications for both orders of government. Thus, in conjunction with recently announced and implemented revenue reductions, it remains an open question whether all of these aspects are indeed "reconcilable" with fiscal sustainability over the long term.

Using a simple projection and accounting framework, this paper analyses the impacts of population ageing on key revenue and program spending categories over the long term. These projected paths of revenue and program spending are constructed such that they approximate existing fiscal structures. The projections are then used to extrapolate, for each government, a future path of their net public debt-to-GDP ratio. The projected debt ratio paths are then assessed based on a simple criterion of long-term sustainability.

While this paper does in fact present detailed fiscal projections it is important to note that these projections are not fiscal forecasts nor do they represent official government projections. The projections can and should be regarded as "what if" scenarios, where the key question is, "what if the existing fiscal structure of federal and provincial/territorial governments was overlaid onto a set of long-term demographic assumptions?". To reiterate, projections presented in this paper are simply the product of accounting relationships and identities. As is the case with any set of long-term projections, there exists a considerable degree of uncertainty surrounding key assumptions and projections. However, as Auerbach and Gale (2001) argue, this uncertainty should not lead one to ignore long-term issues.

Based on the underlying assumptions and fiscal projections presented in this paper, it appears that population ageing has the potential to impact key categories of program spending and revenue. For the federal government, the baseline projections of revenue and program spending result in a declining debt-to-GDP ratio over the long-term. Some provinces are projected to face debt-to-GDP ratios that rise above their current levels, however, the majority of provincial governments (7 out of 10) are projected to face declining debt ratios over the long term. Despite some modifications to the

projection framework, these results are broadly in line with projection scenario B ("tight fiscal regime") in King and Jackson (2000). Among the numerous scenarios they consider -- 20 sets of projections in total -- this most closely resembles the baseline set of assumptions for projections presented in this paper.[57]

In conclusion, based on our definition of existing fiscal structures and our criterion of long-term fiscal sustainability, most governments are projected to be in a fiscally sustainable position over the long term. However, and more importantly, whether current federal and provincial/territorial fiscal structures will in fact remain in place over the long term is an entirely separate question that is beyond the scope of this paper.

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[57] There are however some key differences regarding spending enrichment factors assumptions and federal intergovernmental transfers.

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