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COMMENTARY
NO. 529

# Intergenerational Fairness: Will Our Kids Live Better than We Do?

*Today's youngest and future generations face very high net fiscal burdens: higher than those of any other generations, especially those born from the mid-1950s to the 1990s. Generally speaking, babyboomers and their children fare well in this scenario, but the grandkids of babyboomers do not.*

Parisa Mahboubi

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## The Study In Brief

While large government deficits and debt raise concerns regarding intergenerational fairness, their long-term intergenerational impacts can significantly differ, depending on demographic shifts and future economic policy. In particular, population aging in Canada has accelerated during the past decade due to declining fertility and improving life expectancy. This demographic transition poses new fiscal challenges since it dampens growth in government revenue while putting pressure on government spending, particularly in healthcare and public pensions.

Generational accounting is a powerful tool for assessing the lifetime fiscal burden on current and future generations, given demographic and economic projections. The method requires estimating the present value of government's current and future net revenues to cover all current and future spending plus net debt. A large imbalance between the net tax burden faced by current and future generations over their lifetimes, in favor of current generations, would mean that existing fiscal policies are unfair and unsustainable.

Using generational accounting, this *Commentary* shows that the projected lifetime fiscal burdens of the youngest generation (born since 2005) and future generations are very high: higher than those of any other generations, especially those born from the mid-1950s to the 1990s. Generally speaking, babyboomers and their children fare well in this scenario, but the grandkids of babyboomers do not.

Looking to the future, we also specifically compare the prospective net tax burden faced by today's newborns with those that will be faced by future generations. Here, the results are less troubling. We find future generations of Canadians are expected to face a slightly lower lifetime tax burden than newborns, implying relative intergenerational balance looking out into the future.

However, small changes to the baseline scenario can make that balance tip unfavourably for future generations. For example, both higher-than-expected interest rates and lower-than-expected population growth would lead to generational imbalance by imposing higher net tax burdens on future generations. Also, failing to restrain the growth of healthcare spending below its recent experience (1996 to 2010 average) could shift the tax burden to future, unborn generations, and lead to a large and likely untenable imbalance.

To ensure future intergenerational fairness and sustainability, policies that improve labour market outcomes of youth, women and immigrants, and that encourage a longer working life, should be supported. Restraining the growth of healthcare spending at a sustainable level is also a must.

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## Large government deficits and debt raise concerns regarding intergenerational equity or fairness. Is it fair that future generations bear the cost of current fiscal policies?

However, a focus on the yearly deficits, common in short-term budget cycles, cannot alone yield realistic estimates for the long-term implications and intergenerational impacts of current fiscal policies (Kotlikoff 1986, 1988). While different policies may lead to similar deficit levels, they can differ significantly in terms of their impact on intergenerational redistribution. Furthermore, current budgets often do not reflect potential future upward pressure on government expenditures due to, for example, population aging.

Conversely, generational accounting, which measures the fiscal burdens on future generations, offers a method of looking at current government policies in the light of population aging and demographic transition. This approach has several applications. It can indicate not only the burdens of fiscal policy on different generations, but can also suggest the required policy changes to alter the distribution of such burdens (Auerbach, Gokhale, and Kotlikoff 1994).

In Canada, population aging has accelerated during the past decade due to declining fertility and improving life expectancy. This demographic transition poses new fiscal challenges since the pattern of government spending and taxes greatly depends on population size and its age distribution. In particular, an aging population dampens growth in government revenue while putting pressure on government spending, particularly in healthcare and public pensions.

Applying generational accounting in this *Commentary*, I investigate whether future Canadian generations will need to pay more than current ones for the same basket of public services and transfer payments. A large imbalance between expected lifetime net taxes to be paid by existing and future generations, to the detriment of future generations, would mean that current government fiscal policy is unfair and unsustainable.

An earlier study by Oreopoulos and Vaillancourt (1998, 1999) showed that younger Canadians face higher taxes than their parents. Encouragingly, a comparison of generational accounts across 22 countries showed moderate generational imbalances in Canada, while most developed countries such as the US, Sweden, Japan and Finland suffered from serious generational imbalances (Kotlikoff and Raffelhüschen 1999).

However, this earlier study of Canada was based on a faster projected pace of population aging and did not account for a subsequent immigration policy shift toward more and younger immigrants. In addition, a 1997 Canada/Quebec Pension Plan (C/QPP) reform dealt with severe generational imbalances imbedded in Canada's social security system by making current generations prepay for the disproportionate pension burden they will impose on future generations.

In part due to these policy changes, someone from a future generation of Canadians is expected to face a lower lifetime tax burden than today's

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newborn, suggesting that public finance may now be on an equitable and sustainable path. Price-indexation of Old Age Security (OAS) programs also leads to a greater generational gap in favor of future generations despite an aging population. However, that balance is precarious and susceptible to change. For example, both higher-than-expected interest rates and lower-than-expected population growth would make future generations worse off and lead us back to generational imbalance. Also, should the cost of public healthcare grow at a faster pace than the 1.3 percent per year assumed in our baseline scenario, for example at the average 3.3 percent rate from 1996 to 2010, it would shift the resulting tax burden to future generations and render a large and untenable imbalance.

Furthermore, analysis in this *Commentary* shows that the lifetime net tax burden also varies across current living generations. In my Baseline scenario, the youngest generation (born since 2005) shoulder the greatest tax burden while generations born in the 1960s, 1970s and 1980s face the lowest burdens.

To ensure continuing fiscal sustainability, policies that improve labour market outcomes of youth, women and immigrants, and that encourage a longer working life, should be supported.

## What Is Generational Accounting?

Developed by Auerbach et al. (1991, 1994), generational accounting is a powerful tool for evaluating the sustainability of fiscal policy by assessing the relative benefits and costs accruing to different birth cohorts.

First, generational accounting shows the amount of expected taxes and transfers current generations will pay and receive over their remaining life span. Second, it predicts the amount of net taxes that future generations will have to pay for governments to finance their programs and service their debts. Larger government deficits today may require a higher tax burden on future generations.

To calculate potential future financial taxpayer burdens, generational accounting uses the principle of intertemporal budget constraint, which requires estimating the present value of government's current and future net income to cover all current and future expenditures plus net debt. It is expressed as:

> The present value of total net tax payments (taxes minus transfers) of the existing generations + the present value of total net tax payments of future generations = present value of current and future government expenditures + existing government net debt.

Any change to one of these components due to a policy reform requires a response from at least one of the remaining factors in the government's intertemporal budget constraint. However, the main question for generational accounting is who pays for an increase in government spending: current or future generations.

Some assumptions are needed to project the future path of government expenditure and of net taxes paid by the current generation. They involve:

- age and gender-specific relative profiles of current taxes and transfers;
- age and gender-specific population projections; and
- fiscal projections.

The age-specific relative profiles – relative average amount of taxes paid and transfers received by age – represent the current status of our fiscal policy. Generational accounts assess the sustainability of present fiscal policy across time. Therefore, generational accounts extrapolate into the future by projecting all taxes and expenditures, using both the relative profiles of individuals, depending on their age and gender, and demographic projections.

We also need to determine a discount rate to obtain the present value of government receipts and payments. This rate should be higher than the real rate of interest on riskless assets such as government bonds, since future receipts and expenditures are uncertain (Auerbach, Gokhale and Kotlikoff

1991).[1] According to modern economic growth theory, the riskless interest rate cannot be lower than the growth in real income per capita (Ambler and Alexander 2015). Therefore, the discount rate for the Baseline scenario is set at the productivity growth rate of 1.3 percent, the average rate over the past four decades.[2] Because of population aging, this discount rate will be slightly higher than the average growth of real income per capita, which is appropriate given that the discount rate should be somewhat higher than the projected riskless rate.

Furthermore, the tax burden on generations not only depends on demographic and fiscal projections, but also on existing government debt. At the end of 2016, the net consolidated Canadian general government debt (all levels) stood at $1,156.4 billion.[3]

## Preview of Results

The key objective of generation accounting analysis is to compare the projected lifetime tax burden of a recently born individual to that of someone born in the future. A large relative difference would signal generational unfairness and imbalance in the country's fiscal policies. A large relative imbalance in favour of the current generation signals room for increasing taxes in the present. Such a large relative imbalance suggests future generations will be asked to subsidize the consumption and quality of life enjoyed by current Canadians – an unsustainable fiscal situation.

Net tax burden projections in this study are taxes net of age-specific spending on healthcare and education as well as of cash transfers (i.e., child, employment insurance and elderly benefits).

C/QPP benefits are modelled separately and do not enter the calculation of net tax burdens.

The next two sections describe the population estimates, taxes, transfers and age-specific spending (healthcare and education) that impact the projections of remaining lifetime net taxes for each cohort. Next, detailed results are presented for both the remaining lifetime of current generations and the projected lifetime of future generations. Finally, an estimate of the past and future net tax burden of living Canadians, by age, is presented, followed by a policy discussion.

Our Baseline scenario adopts fairly conservative projections about (i) the growth of healthcare spending per capita by age groups, (ii) the rate at which future taxes and payments are discounted, reflecting lower expectations for future interest rates, and (iii) future net immigration rates of working-age individuals, reflecting current high targets.

Under these projections, future lifetime net taxes for the newborn cohort will exceed, by a relatively small margin (16 percent), average projected lifetime net taxes of those who are yet to be born (Figure 1). Therefore, our Baseline scenario shows a relatively generationally fair path for Canada's fiscal policy, consistent with Kotlikoff and Raffelhüschen (1999).

This relative balance, however, is fragile and depends heavily on government policies.

For example, elderly benefits (OAS, Guaranteed Income Supplement (GIS) and Allowance) are currently price indexed. On top of price indexation, however, benefits have also historically been raised by multiple governments on an ad hoc basis, protecting the poorest seniors from falling below the poverty line. The Baseline scenario assumes all cash transfers, including elderly benefits, grow in line with the productivity growth rate.

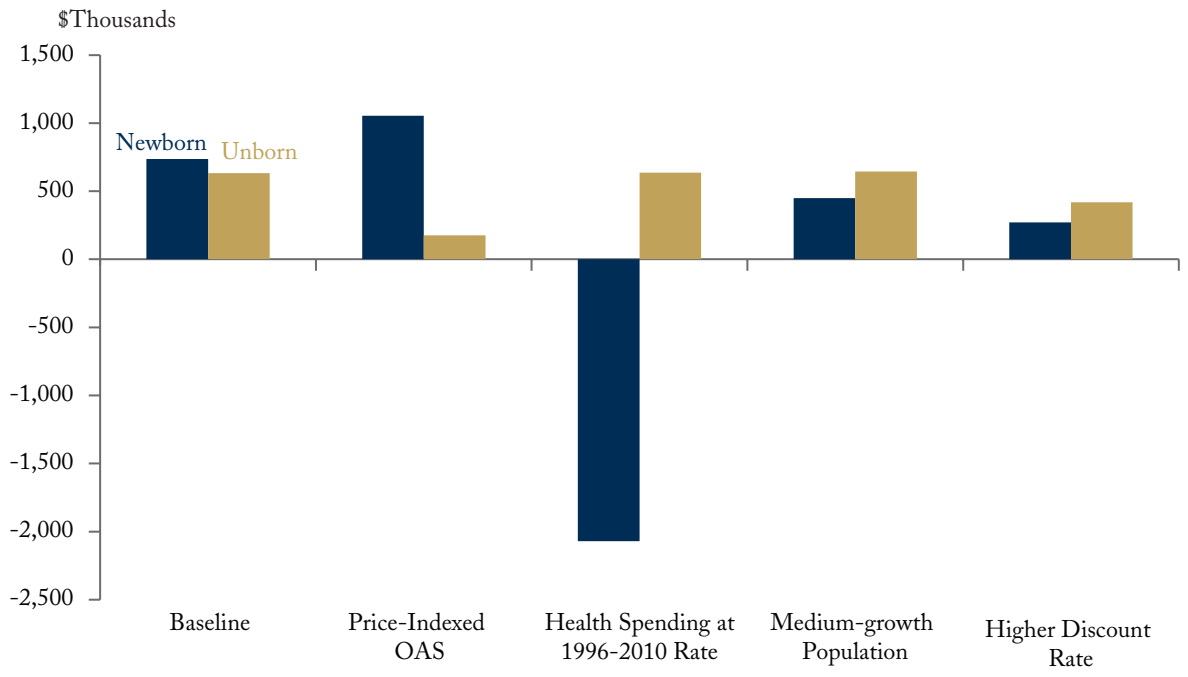
Another scenario would see elderly benefits price-indexed and thus constrained to remain

1 The average long-term, real-return bond rate was 0.63 percent in 2017.

2 I also consider a higher discount rate in an alternative scenario.

3 The net debt is expressed as net financial worth, according to government balance sheets since generational accounting excludes tangible assets, such as land and highways, that provide services to people. However, including tangible assets has no notable impact on generational accounts.

**Figure 1: Lifetime Net Tax Burden on Newborn and Future Generations, Various Scenarios**




Source: Table 2 on p. 17.

constant in real terms over the 100-year projection period – which means that they would become a relatively minuscule share of the economy over the very long term. Under this alternative scenario, the net tax burden of newborns increases by 40 percent, relative to the Baseline scenario, and future generations would pay significantly less net taxes (Figure 1).

Conversely, failing to contain the growth of healthcare spending below its recent experience could have catastrophic consequences. If future per-capita health spending grows at its historical 1996-2010 rate, it would create a very large imbalance between current and future generations. Current generations would underpay for their health services, shifting forward the tab for future generations (Figure 1).

Failing to meet target levels for attracting young working-age immigrants, or failing to maintain these ambitious levels, and failing to promote longer working lives would also create a small generational imbalance in favour of the newborn generation. A slightly higher old-age dependency (OAD) ratio of retired seniors to workers as a result of weaker immigration, lower fertility and work-life policies could mean projected lifetime net taxes of a future cohort exceeding the burden on the newborn cohort by 44 percent (Figure 1).

The economic environment also influences the predictions. Projecting a return to high interest rates and, consequently, adopting a higher real discount rate of 3.3 percent instead of 1.3 percent, would reduce the present value of net tax payments across the board, but more so for existing generations.

It would thus create a generational imbalance in favour of the newborn generation by 55 percent (Figure 1).

Lastly, the projections are generated by gender, and there is a large discrepancy between the projected lifetime net tax burdens of males as opposed to females. Females are expected to earn less than males and, consequently, pay less tax on average. As well, they generally receive greater fiscal benefits. Newborn cohorts of females are projected to enjoy a small lifetime net benefit on average, while males are expected to support a larger lifetime net tax burden.

## Age Specific Taxes, Transfers, and Expenditures

Individuals pay and receive various types of taxes and transfers over the course of their lives. To construct generational accounts for current and future generation, I consider six types of age-specific tax streams and seven types of age-specific transfer payments. Taxes include income taxes, commodity taxes on goods and services, property taxes, payroll taxes, workers' social contributions (employment insurance contributions (EI) and workers' compensation contributions) and other taxes. Transfers consist of child benefits, EI benefits, elderly benefits [(OAS), (GIS) and Allowance], GST tax credits and social assistance.[4] To complete the list of seven, I treat healthcare and education as age-specific spending, making them similar to transfers to individuals for this analysis.

I obtained the breakdown of government budgets (all levels combined) for the latest available year (2016), mainly from Statistics Canada reports.[5] Other sources of data include the Office of the Chief Actuary 2016 report on elderly benefits, and the Canadian Institute for Health Information (CIHI) 2016 for health expenditures. Social assistance captures all transfers to individuals, after excluding elderly benefits, EI benefits, child benefits and GST tax credits, which are modelled separately.

Followed by commodity taxes, as shown in Figure 2, taxes on income, profits and capital gains are the largest tax-revenue sources for Canadian governments, $324.1 billion in 2016. Health and education are the largest government expenditures that are age specific. These expenses collectively stood at more than $256 billion in 2016.

To obtain age-specific taxes, transfers and expenditures, I, first, apportion the 2016 aggregate taxes and benefits by age and gender breakdown, using profiles from Statistics Canada's Social Policy Simulation Database and Model (SPSD/M), Release 26.0.[6] For calculating age-specific income taxes, I distribute total taxes on income, profits and capital gains based on the personal income tax profiles. The age distribution of workers' social contributions and payroll taxes are based on profiles for EI contributions. Then, I divide the age and sex-specific aggregate values of taxes and benefits by the total number of persons in the corresponding age group to obtain per-capita taxes and transfers by age and gender. I assume that other taxes are evenly borne by persons aged 18 and over.

Per-capita healthcare expenditures by age and gender are from the CIHI 2015 figures. Education expenditures include spending on primary, secondary and post-secondary education. Primary and secondary education expenditures are uniformly distributed among those five to 17 years old, while the distribution of post-secondary education expenditures is among those in the 18-24 age group.

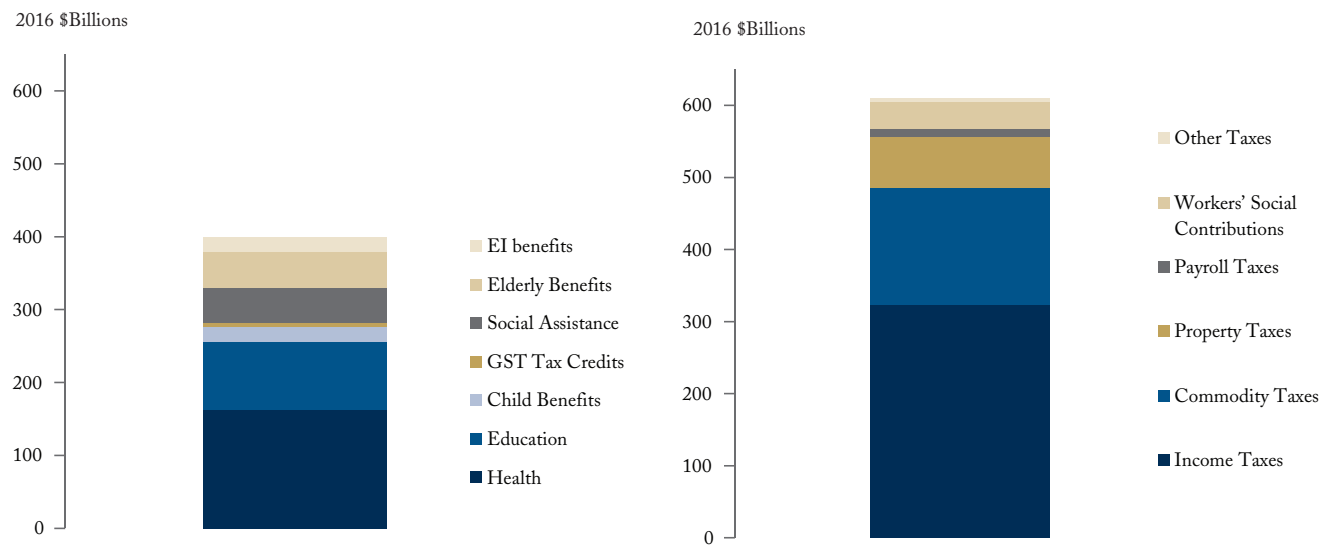
Figures 3a and 3b show how the amount of these age-specific taxes, transfers and expenditures per

4 The results for C/QPP net burdens or transfers are calculated and reported separately.

5 These include Canadian government finance statistics for consolidated governments, government economic accounts, and the Canadian Classification of Functions of Government.

6 Responsibility for calculations and interpretation lies with the author.

**Figure 2: Breakdown of Aggregate Benefits (left) and Taxes (right)**




Sources: Statistics Canada, Tables 10-10-0147-01, 36-10-0450-01and 10-10-0005-01; Office of Chief Actuary (2017); and CIHI 2016.

male differ by age in 2016. The same observations are also true for females.[7] In particular, the burden is higher among working-age cohorts due to payroll taxes, social contributions and higher income taxes, while benefits and expenditures increase as people age. As such, demographic shifts toward an older population will have substantial impact on government budgets.

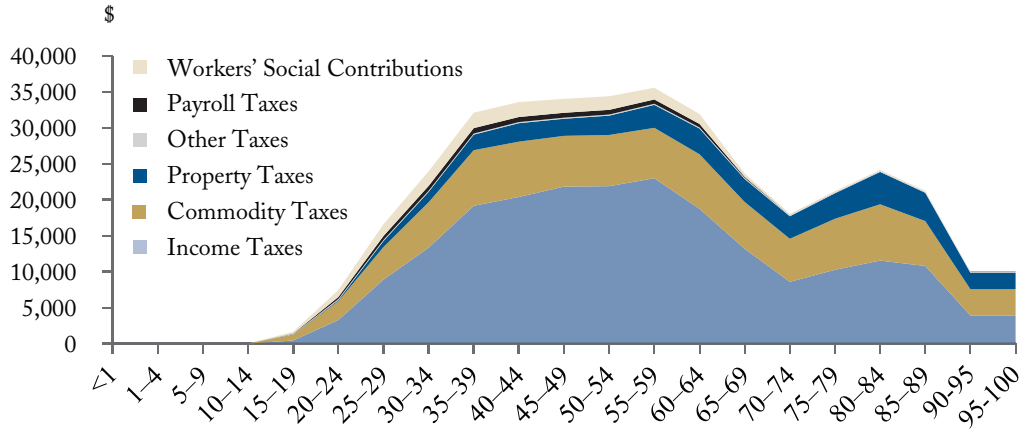
Income taxes represent the largest average tax burden prior to age 85. Commodity taxes and property taxes are the next largest tax burdens on a taxpayer of any age. Regarding the expenditure structure, older people, particularly those 85 years and older, receive substantial benefits through publicly funded healthcare.

Although male and female age-specific relative profiles tend to have similar shapes, the level of taxes and transfers differs significantly in some cases (Figures 4 and 5).[8] The gap in income tax between males and females is particularly significant since women earn, on average, less than men and, therefore, pay less in income and work-related taxes at almost any age. They also pay less in commodity taxes. Conversely, females receive higher social assistance transfers and seniors' benefits since they live longer than males.

7 Figures A.1 and A.2 in the Appendix show age-specific taxes and transfers per female.

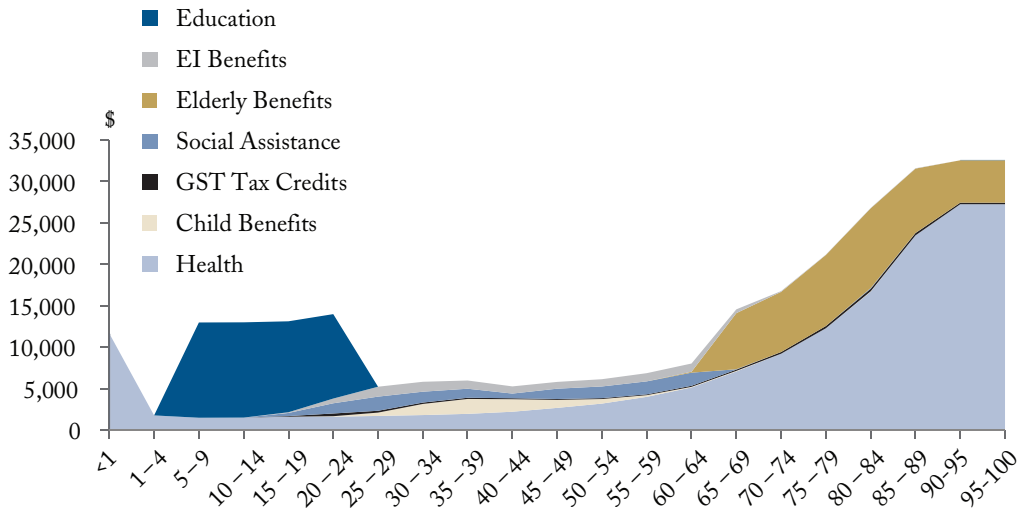
8 For child benefits, the program considers mothers in couple families as receivers of benefits. For explicitly paid property taxes, Statistics Canada assigns the head of households to be contributors and assumes males as the head in couple families. According to these allocations, females become the main beneficiaries for child benefits and males become the main contributors for property taxes. However, in reality, both couples enjoy equally or pay for these types of payments. Therefore, in this study, child benefits and property tax payments are distributed equally between spouses in married or common-law families.

## Figure 3a: Average Taxes and Contributions per Male by Age Group (2016)



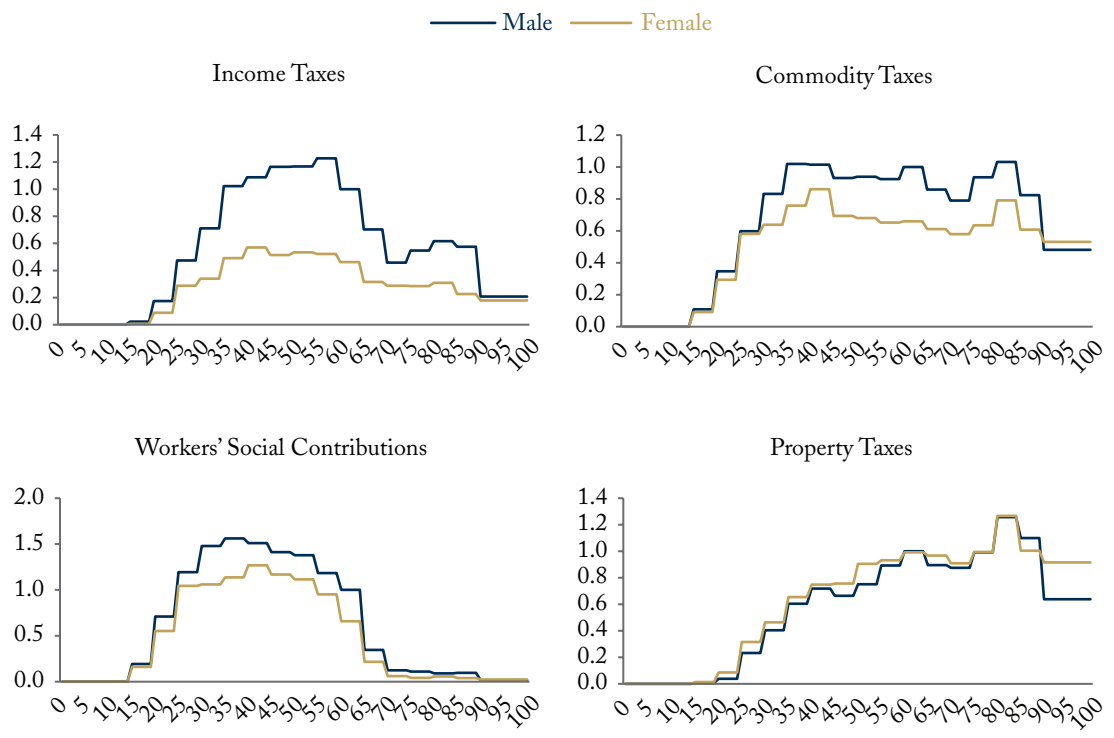

Source: Author's calculations, using Statistics Canada's Social Policy Simulation Database and Model (SPSD/M) and data sources in Figure 2.

## Figure 3b: Average Cash Transfers and Spending per Male by Age Group (2016)




Source: Author's calculations, using Statistic Canada's SPSD/M and data sources in Figure 2.

**Figure 4: Relative Age and Gender-Specific Tax Profiles (Index: 60-Year-Old Male = 1)**




Note: Payroll taxes are not presented since their profiles are similar to workers' social contributions. The profiles for other taxes are identical between male and females aged 18 and over.

Source: Author's calculations, using Statistics Canada's SPSD/M and data sources in Figure 2.

These dissimilarities in per-capita taxes and transfers between males and females lead to significant differences in the amount of lifetime net taxes by sex, with women having a clear advantage.

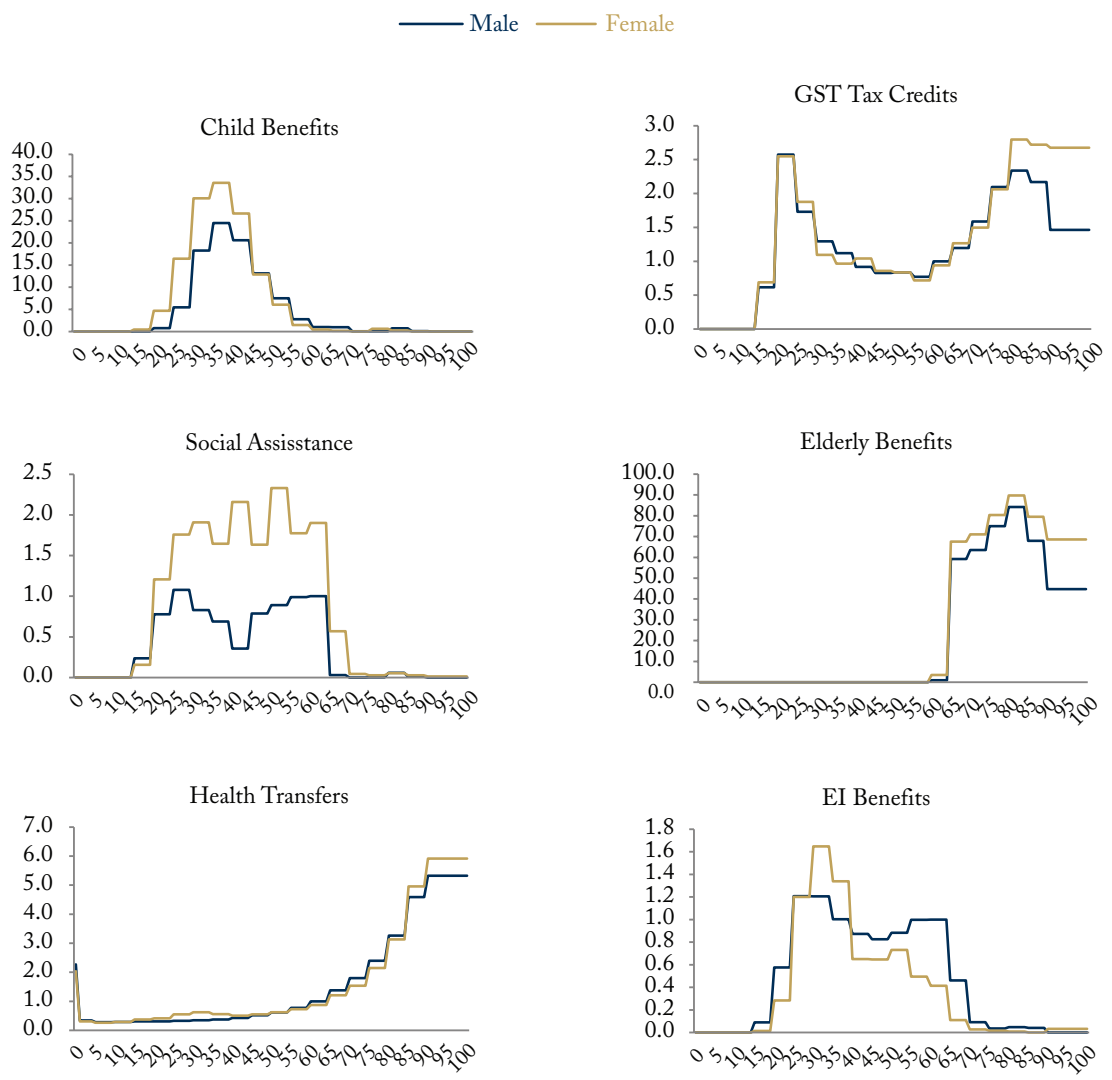
In this study, government expenditures is total government expenses (all levels combined) less age-specific transfers, healthcare and education spending and other non-age-specific government revenues such as rent and property income. I assume government expenditures are uniformly distributed among the Canadian population.

## Population Projections: Baseline Scenario

Age and gender-specific population projections are the other essential data sets required to estimate generational accounts for existing and future generations. Existing generations here refers to those aged 0 to 100 in 2017. Future generations are those who are born after 2017.

Population data come from a C.D. Howe Institute model, based on the assumptions in Robson and Mahboubi (2017). Table 1 presents

**Figure 5: Relative Age and Gender-Specific Transfer and Expenditure Profiles (Index: 60-Year-Old Male = 1)**




Source: Author's calculations, using Statistics Canada's SPSD/M and data sources in Figure 1.

the main demographic assumptions and results for population projections in the Baseline scenario. In particular, the model assumes that the female fertility rate in each province remains at 2017 levels and that improvements in life expectancy continue at rates similar to Statistics Canada's "medium" rate for each sex. The immigration rate is assumed to increase to 0.9 percent of the already-resident population by 2020, reflecting the government's recent targets, and stays at that level afterward. The emigration rate remains at its 2017 level of 0.13 percent of the population.

**Table 1: Baseline Scenario Assumptions and Results**

| | 2017 | 2018 | 2068 | 2118 |
|---|---|---|---|---|
| Life Expectancy at Birth (years) | | | | |
| Male | 81.0 | 81.2 | 87.7 | 87.7 |
| Female | 84.7 | 84.8 | 89.2 | 89.2 |
| Fertility Rate | 1.67 | 1.67 | 1.67 | 1.67 |
| Net Immigration (as % of resident population) | 0.62 | 0.71 | 0.77 | 0.77 |
| Population age 0-17 (millions) | 7.1 | 7.2 | 12.6 | 20.5 |
| Population age 18-64 (millions) | 23.4 | 23.6 | 39.9 | 64.0 |
| Population age 65 and over (millions) | 6.2 | 6.3 | 14.5 | 24.9 |
| Total Population (millions) | 36.7 | 37.1 | 67.1 | 109.4 |
| Old-Age Dependency Ratio 65+/18-64 (percent) | 26.4 | 26.9 | 36.4 | 38.9 |

Note: Values for 2017 are estimates from the latest available data. Values for the period after 2017 are projections. Net international migration is immigration minus emigration, excluding non-permanent residents. Immigration is expected to meet the government's target levels of 310,000 in 2018, 330,000 in 2019 and 340,000 in 2020.

Source: Statistics Canada and author's calculations.

However, the number of non-permanent residents has changed significantly from year to year because of frequent policy changes. For simplicity, the model assumes that the net stock of non-permanent residents remains at the 2017 level of 105,988 in the following years.

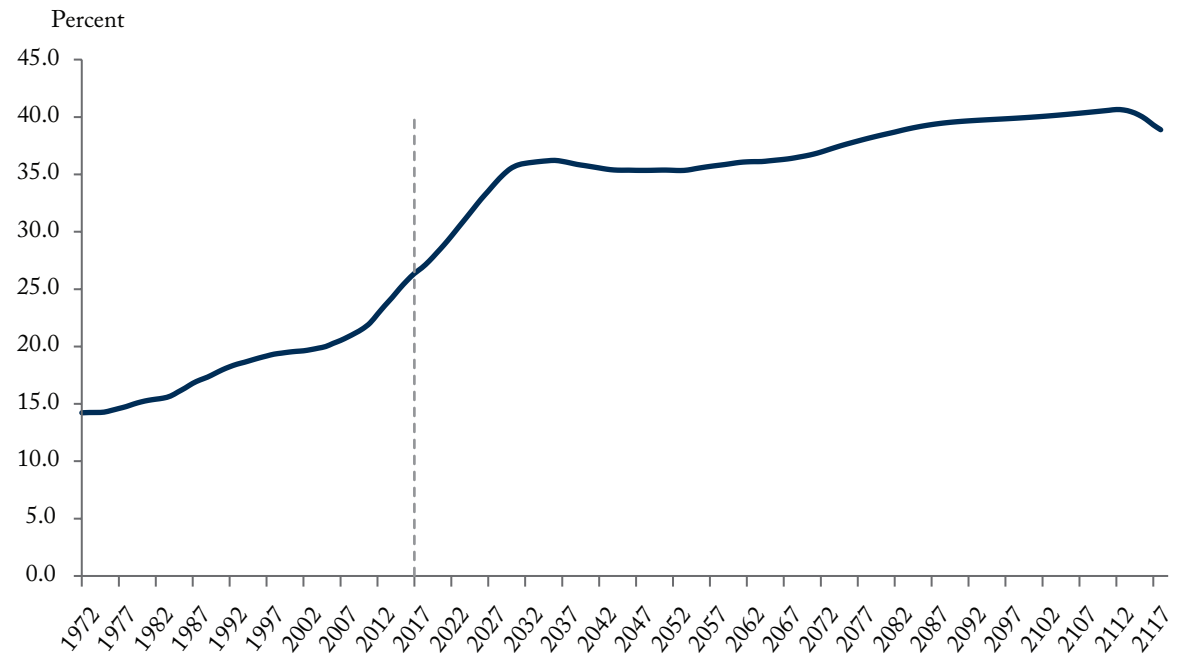
One important aspect of population structural change that has a significant impact on generational accounts is an increasing average age as a consequence of lower fertility rates and longer lifespans. The aging of the population has accelerated in Canada during the past decade – measured as the ratio of people aged 65 and over to the working-age population (18-64) (Figure 6).

## Fiscal Projections: Baseline Scenario

Fiscal projections are needed to estimate generational accounts. Given uncertainty about future government revenues and expenses, making standard assumptions is necessary for fiscal projections (Auerbach, Gokhale, and Kotlikoff 1994). Consistent with the literature, I assume that taxes, transfers and expenditures will grow to keep pace with productivity growth and demographics. Therefore, aggregate amounts of tax and transfers are affected by demographic changes such as an aging population. This places emphasis on the impact of demographic changes when the long-term implication of our present fiscal policy is assessed.

As noted above, the productivity growth rate is set at 1.3 percent to match the historical average growth rate of real output per working-age population. For this study, I assume that age-specific per-capita taxes and spending increase in parallel with the productivity growth rate. To account for demographic structural changes, I multiply these age-specific per-capita taxes and transfers with the corresponding population. Then, I sum across ages by year to obtain aggregate taxes, transfers and healthcare and education spending.

**Figure 6: Actual and Projected Old-Age Dependency Ratio in the Baseline Scenario**




Sources: Statistics Canada and author's calculations.

The demographic adjustment for child benefits projections, however, is based on the changes in population ages 0 to 17 rather than on populations who receive this type of transfer on behalf of their children. Government expenditures are projected to increase at the productivity growth rate, after adjusting for total population change.

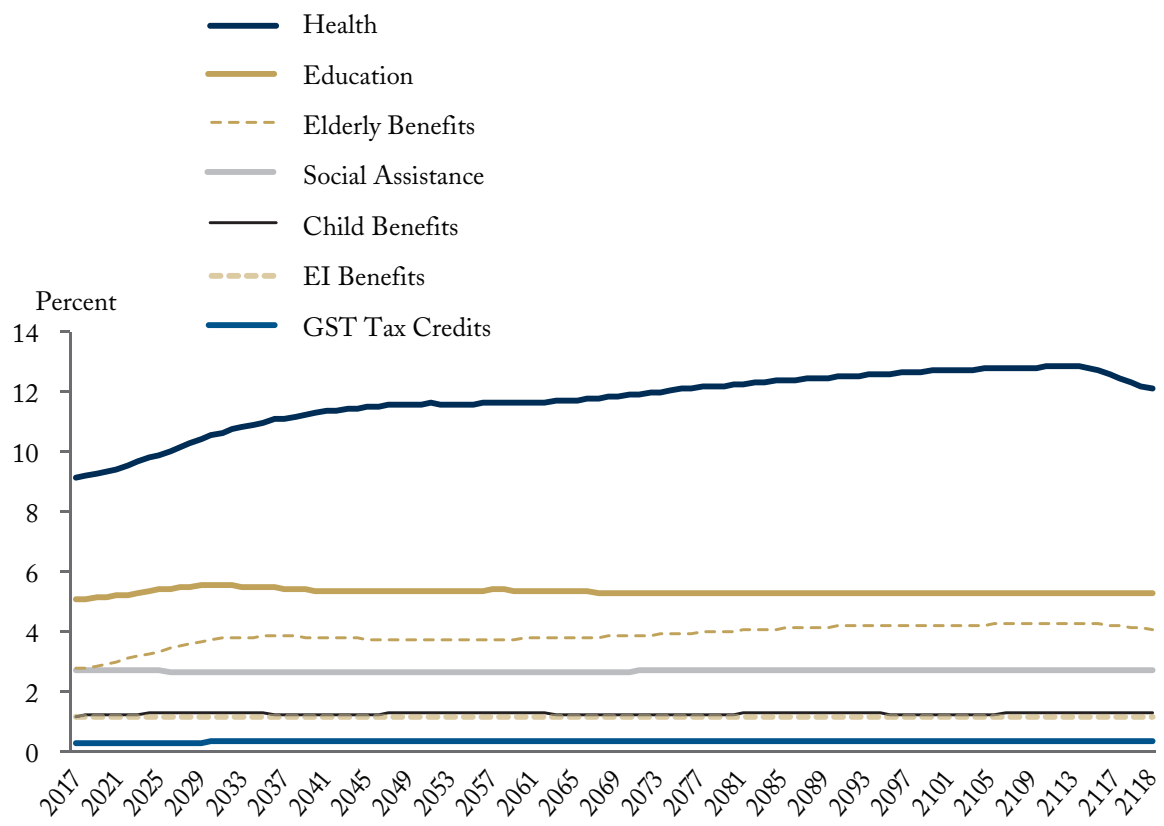
Aging means that government spending sensitive to age, such as healthcare and elderly benefits, will grow faster than other benefits (Figure 7). In particular, healthcare expenditures are expected to rise from 9 percent of GDP in 2016 to about 13 percent in 2113. By 2118, the rate still remains above 12 percent. The remaining benefits will remain more or less flat relative to GDP during the projection period.[9] Taxes and contributions also remain relatively unchanged relative to GDP (Figure 8). Income taxes as a share of GDP will have the largest increase, by about one percent. Overall, healthcare expenditures may pressure government budgets and, consequently, can create a burden on current and future generations since they typically grow faster than taxes.

## The Intergenerational Impacts of Present Policies: Baseline Scenario

As mentioned earlier, generational accounts show the amount of projected taxes and benefits that current generations will pay and receive over the remainder of their lifetimes by age. The government intertemporal budget constraint lets us predict the

9 GDP projections are based on annual increases in GDP per working-age population (18-64) at 1.3 percent productivity growth rate, multiplied by the working-age population.

**Figure 7: Projected Transfers and Age-Specific Expenditures as a Share of GDP, 2017-2118**




Source: Author's calculations.

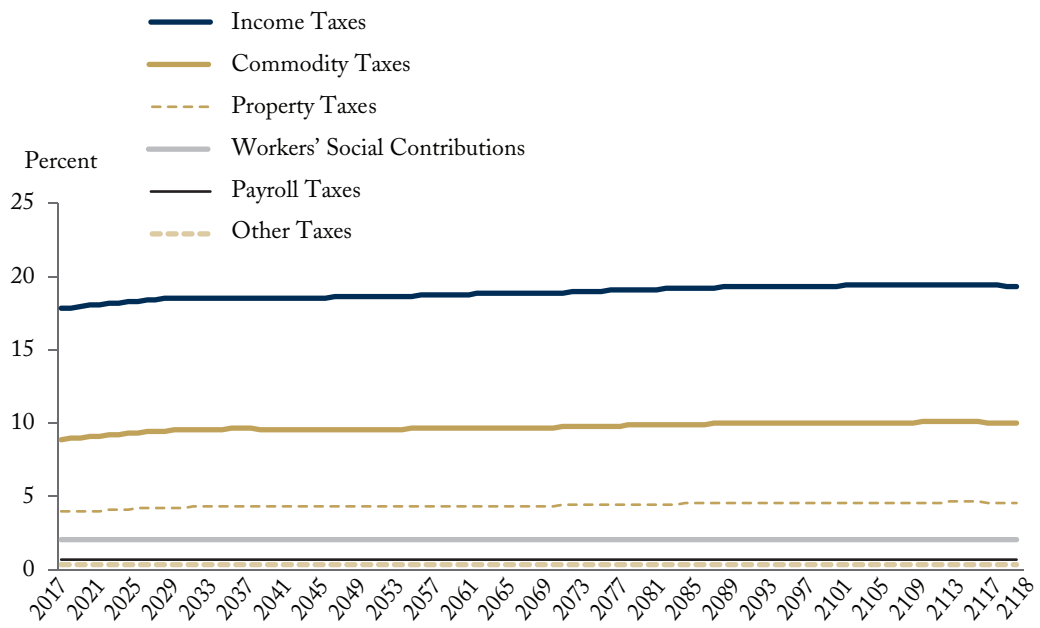
amount of net taxes that future generations will have to pay in order for the government to meet projected expenditures. Generational accounting, therefore, assumes that the benefits of non-age specific government expenditures (e.g., defence, policing, social services, infrastructure and so forth) are spread evenly among generations.

In this section, I first show projected net tax burdens for the remaining lifetimes of currently living individuals, by age. Then, I compare the full lifetime tax burden that will fall on an average unborn individual relative to the generation born in the base year (2017).

## Impact on Current Generations

With a real discount rate of 1.3 percent, the difference between the present value of all taxes that a member of each generation, on average, would pay and the present value of all transfers (including age-specific public expenditures on healthcare and education) that he/she would receive over his/her remaining life gives us the present value of projected net tax for each living generation. Figure 9 illustrates the present value of these remaining real lifetime net tax burdens (generational accounts) for people born in or before 2017. A positive

**Figure 8: Projected Taxes, as a Share of GDP, 2017-2118**




Source: Author's calculations.

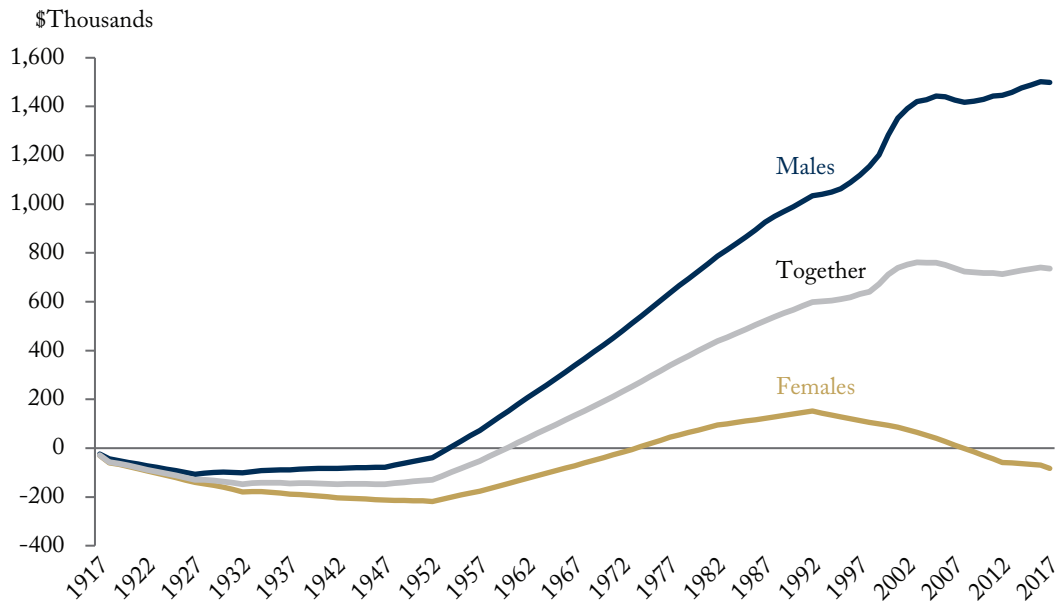
(negative) number indicates a net tax-paying (benefit receiving) situation.

While younger individuals are expected, on average, to pay more in taxes than they receive in transfer payments and in health/education services, seniors are expected to receive net benefits for the rest of their life. This implies that an increase in the number of seniors relative to the rest of the population in a specific year reduces government tax revenues and increases its transfer payments.

There are also substantial variations between males and females in terms of their net taxes. As expected, the net tax burden on males at any age is higher than on females, but the gap diminishes significantly among older cohorts. Females born in 2017 enjoy a net lifetime benefit of $82,400 since projected transfer payments and health/education expenditures exceed projected taxes, while their counterpart males are expected to pay a lifetime net amount of $1.5 million (taxes minus transfers and health/education expenditures) in present value. Of all females, only those born between 1974 and 2007 (aged 11 to 44) are projected to shoulder a positive net tax burden, up to $152,000, for the remainder of their lives. However, remaining life net-tax burdens for this female group are still negligible compared to that of males younger than 58 (born after 1960). Older male cohorts aged 65 and over (born before 1954) also enjoy a net tax benefit up to $107,000. Meanwhile, as noted above, women generally fare better because they contribute less to income and commodity taxes while receiving more social assistance and child benefits (Figures 4 and 5).[10]

10 Despite the assumption of equal splitting of child benefits between parents in couple families, the fact that there is a much larger number of single-mother families compared to single-father families skew child benefits toward females.

**Figure 9: Remaining Lifetime Net Taxes for Current Generations by Date of Birth**




Note: Generational accounting shows the remaining lifetime net tax for each cohort. A negative number implies that transfers exceed taxes.
Source: Author's calculations.

Since generational accounts exclude past taxes and transfers, comparing projected net taxes of a newer generation with those of an older generation is meaningless. The only meaningful comparisons are between the base-year cohort (newborn in 2017) and an average future generation since their net tax burdens represent their projected lifetimes from birth to death (Auerbach, Gokhale, and Kotlikoff 1994).

## Impact on Future Generations

Generational accounting is a useful tool to examine the long-term implication of our present fiscal policy by estimating the difference between lifetime payments for a newborn cohort and a representative future cohort, assuming that all future generations pay the same amount of net taxes in present value.

Table 2 on page 17 shows that, under the Baseline scenario, a representative future generation is projected to shoulder a lower lifetime net tax burden than that of a newborn generation. In particular, the base-year generation (born in 2017) is projected to support a net lifetime tax burden of about $736,000, some $103,000 more than that of a representative unborn generation. Therefore, there is an imbalance in favour of future generations governments would be able to collect enough net taxes from current generations to pay their bills, suggesting that the general government fiscal policy is sustainable in the long run. This fiscal sustainability requires that the immigration rate remains high, the working-age population (immigrants and non-immigrants) fully participates in the labour market, and that taxes and spending grow at the current pace.

However, studies show that recent working-age immigrants experience difficulties in fully integrating into the labour market and that immigrants, in general, experience poorer labour market outcomes relative to non-immigrants

(Plante 2010, Bonikowska, Hou and Picot 2011, Smith and Fernandez 2017). In the US, Auerbach and Oreopoulos (2000) found that immigration is unlikely to alleviate the fiscal imbalance as a consequence of an aging population.

Furthermore, labour market prospects of youth aged 24 and younger have deteriorated (Morissette 2016), likely due to rising educational attainment requirements and labour market changes that demand higher skills. Therefore, the level of uncertainty around these overall intergenerational results is high.

## Generational Accounts: Alternative Scenarios

Generational accounting is superior to budget deficit measures in evaluating the sustainability of long-term government fiscal policy. However, as noted above, one limitation of generational accounting is its sensitivity to different assumptions.

To examine how generational differences vary under different assumptions, I consider several alternative scenarios.

1. A "Price-indexed OAS" scenario, in which elderly benefits (OAS, GIS and Allowance) per capita are based on Chief Actuary projections, with the benefits remaining at their current level in constant prices.
2. An "Inflated Health" scenario, in which real healthcare expenditures per capita grow by 3.3 percent by age group rather than 1.3 percent.
3. A "Medium-growth Population" scenario, which assumes a lower immigration rate.
4. A "Higher Discount Rate" scenario, in which the choice of discount rate to calculate present value of taxes and transfers is based on the real long-term interest rate of 3.3 percent during the period of 1962-2016 in Canada, according to the World Bank.

### *Price-indexed OAS Scenario*

Under the Baseline scenario, elderly benefits are assumed to rise at the rate of productivity growth. Currently, these transfers are legislated to rise with the rate of annual inflation, which means that they shrink as a share of one's pre-retirement earnings when earnings increase faster than inflation. Historically, this relative loss of retirement living standards has been addressed by periodic increases in benefit levels.

In the Price-indexed OAS scenario, elderly benefits per person, based on Chief Actuary projections in its 14th Actuarial report, are multiplied by the number of potential persons in the baseline population projection. As a result, and consistent with the Chief Actuary's projections, elderly benefits as a share of GDP would peak in 2030 and shrink thereafter (See Figure 10). By 2118, these benefits drop to less than one percent of GDP – more than three percentage points below elderly benefits in the Baseline scenario.

Lower elderly benefits significantly increase the net tax burden on a newborn generation and lower it on future generations. As a consequence, under the Price-indexed OAS scenario, future generations' net tax burden is some $878,000 less than that of the base-year, newborn generation – a difference eight times higher than in the Baseline scenario (Table 2).

### *Inflated Health Scenario*

Total real healthcare expenditures per capita have increased, in most years, at a rate above the productivity growth rate used in this study (1.3 percent): on average, by 3.3 percent from 1996 to 2010 (CIHI 2017). To account for a potential high growth in healthcare expenditures, I consider an alternative scenario in which age-specific health spending per capita increases at 3.3 percent throughout the projection period

Figure 11 shows that if healthcare spending follows its previous historical growth pattern, it will reach 88 percent of GDP by 2118 – 76 percentage points above healthcare expenditures in the Baseline scenario. Such an increase significantly shifts the generational imbalance from current to

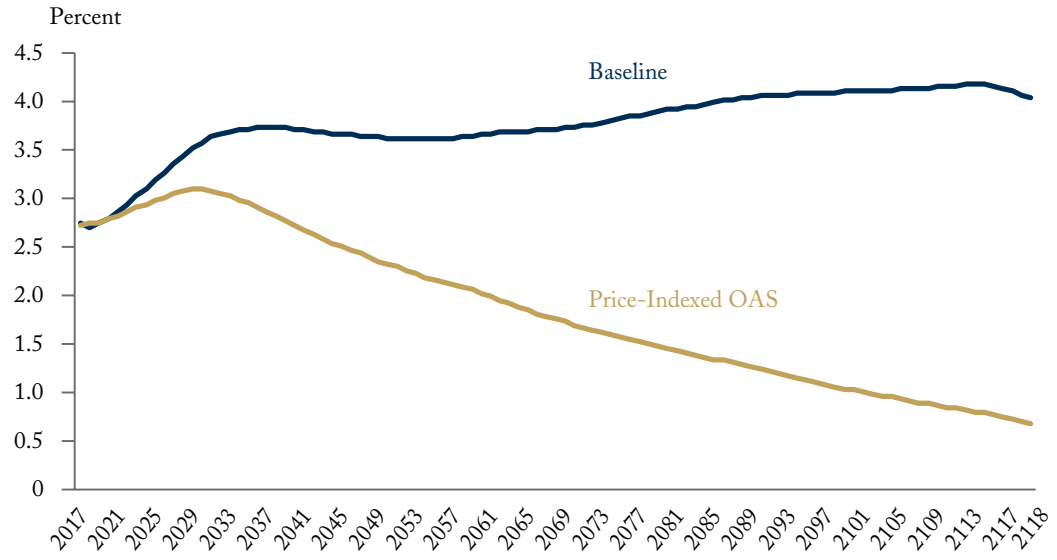
**Table 2: Scenarios for Present Value of Remaining Lifetime Net Taxes, by Year of Birth (Average for males and females, $ thousands)**

| Year of Birth | Baseline | Price-Indexed OAS | Inflated Health | Medium-growth Population | Higher Discount Rate |
|---|---|---|---|---|---|
| 1917 | -29.1 | -29.1 | -29.1 | -29.1 | -29.1 |
| 1927 | -129.4 | -128.0 | -136.5 | -137.9 | -122.8 |
| 1937 | -144.3 | -138.2 | -168.0 | -164.4 | -124.5 |
| 1947 | -148.1 | -129.6 | -208.7 | -161.6 | -109.4 |
| 1957 | -52.8 | -14.1 | -179.6 | -58.6 | 3.5 |
| 1967 | 133.6 | 194.3 | -95.3 | 133.6 | 182.6 |
| 1977 | 338.8 | 424.3 | -42.9 | 333.6 | 348.2 |
| 1987 | 521.7 | 638.5 | -86.8 | 500.8 | 454.9 |
| 1997 | 632.0 | 796.1 | -370.1 | 545.6 | 448.9 |
| 2007 | 737.0 | 994.4 | -1143.7 | 508.9 | 383.4 |
| 2017 (Newborn) | 735.9 | 1053.7 | -2070.1 | 448.4 | 270.2 |
| Future Generations | 633.3 | 175.4 | 635.5 | 644.4 | 418.1 |
| Difference between future generations and newborns | -102.6 | -878.3 | 2705.6 | 196.0 | 148.0 |

Note: The estimates assume a real discount rate of 1.3 percent unless stated otherwise.

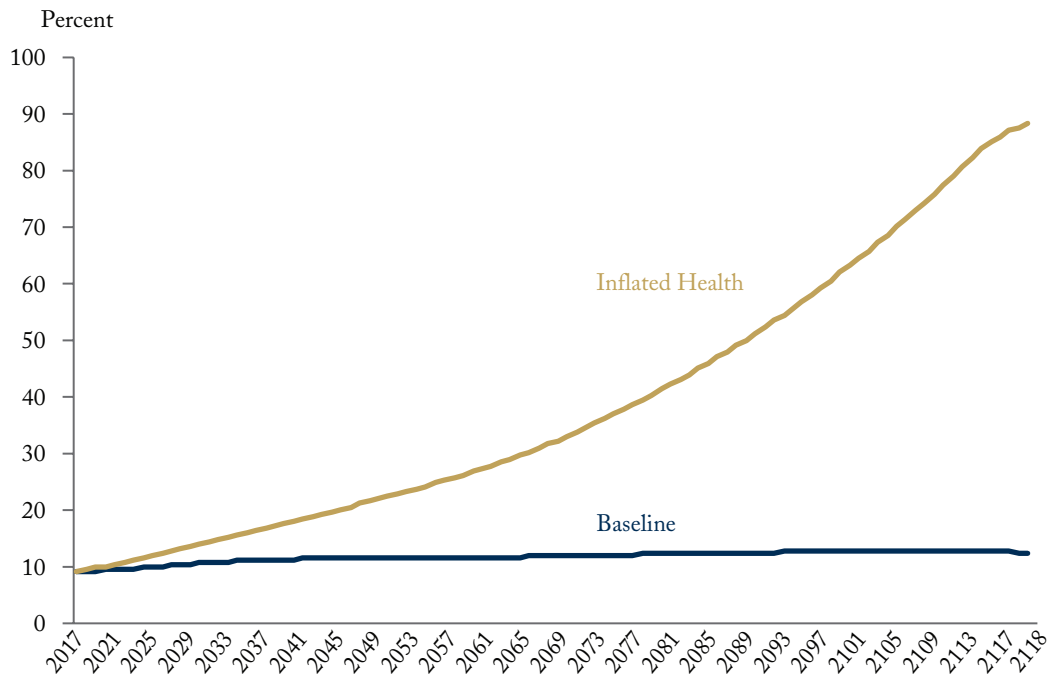
Source: Author's calculations.

**Figure 10: Projected Total Elderly Benefits, as a Share of GDP, 2017-2118**




Source: Author's calculations and Office of Chief Actuary (2016).

**Figure 11: Projected Total Health Expenditures, as a Share of GDP, 2017-2118**




Source: Author's calculations.

future generations. The generational difference in the Inflated Health scenario is more than $2.7 million in favour of newborns: they become net beneficiaries at an expected average net lifetime benefit of $2.1 million. As well, under this scenario remaining lifetime net taxes drop significantly for older individuals. Conversely, future individuals will be net taxpayers without seeing any real improvement, despite receiving higher lifetime transfers through healthcare expenditures. They will have to pay higher taxes relative to the Baseline scenario so governments can meet their expenses (Table 2).

The lesson to learn from this exercise is that future increases in government spending improve the intergenerational tax burden for the current generation at the expense of future generations.

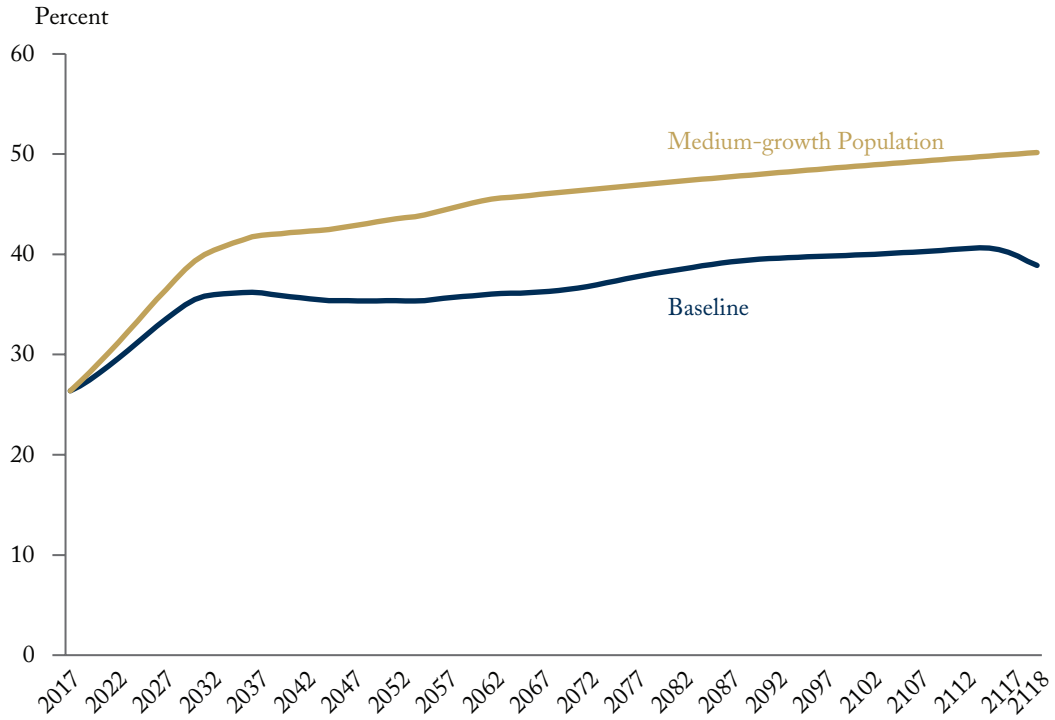
### *Alternative Population Projection*

Generational accounting also depends on population projections. Factors that affect the population structure are fertility, mortality and migration rates. Therefore, different assumptions on the future paths of these factors lead to different population projections and, consequently, affect the projections for taxes and transfers.

For comparisons, I use Statistics Canada population projections in a Medium-growth POP scenario to consider alternative predictions.[11]

11 This scenario provides predictions for the period of 2013 to 2063. I replace data before 2018 with actual data. For years after 2063, population increases at their corresponding 2063 growth rates by age.

**Figure 12: Projected Old-Age Dependency Ratio, 2017-2118**




Sources: Statistics Canada and author's calculations.

Figure 12 highlights the differences among population projections due to variations in demographic assumptions. The OAD ratio, those not in the labour force compared to those within, increases faster in the Medium-growth Population (POP) scenario, in which net immigration is 0.56 percent of population. (For more information, see Statistics Canada 2015). By 2117, the OAD ratio would stand at 50.1 – about 11 percentage points above the Baseline. Clearly, changes in population projections also affect the projections of government revenues and expenditures.

The impact of higher OAD ratios on generational accounts is straightforward: a greater number of seniors relative to the working-age population demands higher transfers and spending. Increased spending has to be financed with higher taxes, according to the government's intertemporal budget constraint.

Table 2 shows that the demographic change in the Medium-growth POP scenario leads to a generational imbalance in favour of the newborn generation: future generations are projected to support an extra $196,000, on average per individual, over their lifetimes. The net tax burden on the newborn generation would be $448,400 in the Medium-growth POP scenario, $286,700 lower than in the Baseline scenario, while the net tax burden on future generations would increase to $644,400.

Clearly, demographic changes, particularly due to immigration policies, impact the tax burden on newborn and future generations. This is because a lower immigration rate leads to a decline in

the number of the working-age population and generates less tax revenue for government while increasing its spending. Therefore, future generations would pay more to balance the government's budget.

### *Higher Discount Rate*

Generational accounting is also sensitive to the choice of discount rate used to determine the present value of net taxes. The appropriate discount rate is based on future cash-flow expectations. A higher discount rate reflects greater uncertainty and reduces the present value of future payments (Auerbach, Kotlikoff, and Leibfritz 1999).

Putting the discount rate at the productivity growth rate used in the Baseline scenario is close to a riskless rate. An increase in the discount rate by two percentage points to 3.3 percent in the Higher Discount Rate scenario reduces the present value of the projected lifetime net tax burden on all generations, relative to the Baseline scenario.

A higher discount rate, however, shifts the generational net burden imbalance from the newborn cohort to future generations (Table 2).[12] The reason is that present values of projected lifetime net payments are reduced at a greater total discount the closer those projected payments are to the present. While newborns would pay $270,200 net tax in present value in the Higher Discount Rate scenario, the amount future generations are expected to pay is $418,100.

## Canada/Quebec Pension Plan

In addition to taxes and the transfers discussed earlier, workers make C/QPP contributions and receive C/QPP benefits. C/QPP started in 1967 as pay-as-you-go pension systems. The plans underwent major reforms in 1997 to address rapidly growing and anticipated intergenerational unfairness in which future generations would have to pay more than double what current generations were paying to fund their benefits. Under the reformed plans, excess contributions are invested to generate investment income in order to cover funding shortfalls when expenditures exceed contributions. The CPP contribution rate gradually increased from 3.6 percent in 1966 to 9.9 percent in 2003 (the QPP underwent additional contribution rate increases from 2012 onwards) to deal with the fiscal impact of an aging population, ensuring sufficient income to cover future needs. Major intergenerational transfers are built into these systems for the late 1990s/early 2000s working-age cohorts.

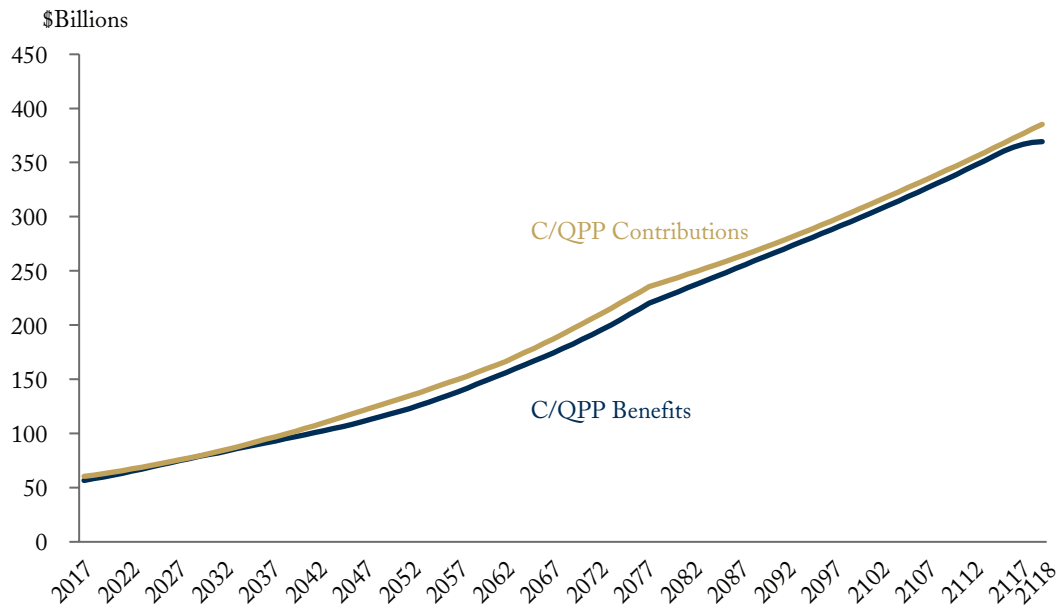
Due to their designs, I separate C/QPP contributions and benefits from other taxes and transfers to calculate the remaining amount of net lifetime contributions or benefits for existing generations. Projected CPP contributions and benefits are based on projected real amounts per person from the Chief Actuary's 2017 report. [13] Quebec's Chief Actuary provides similar QPP projections.[14] Using the projected population in

12 Any discount rate above 1.9 percent leads to a generational imbalance in favour of newborns.

13 Based on data availability, persons eligible to contribute to C/QPP are assumed to be aged 20-64. C/QPP benefits include several categories: retirement, disability, survivor, children and death. Receivers of retirement benefits are aged 65 and over. Individuals aged 60-64 may become eligible to receive disability, while child benefits go to eligible persons aged 0-17. Receivers of survivor and death benefits are aged 20 and over.

14 For missing years in the actuarial reports before the final projection year, I linearly interpolate the numbers. For the years after the final projection year, average values continue to grow at the same rate as they did in the final year of available data. These projections do not include an expanded CPP.

**Figure 13: Projected C/QPP Contributions and Benefits (2016 dollars)**




Source: Author's calculations, using data from Office of Chief Actuary (2016) and Retraite Québec (2016).

the Baseline scenario, I multiply the numbers of potential beneficiaries and contributors, correspondingly, by benefits and contributions per person to obtain total benefits and expenditures.[15] Figure 13 shows that benefits very closely follow contributions, but they remain below contributions throughout the projection period.[16] The real annual excess of benefits over contributions stands at $21 billion in 2118, the final year of projection.

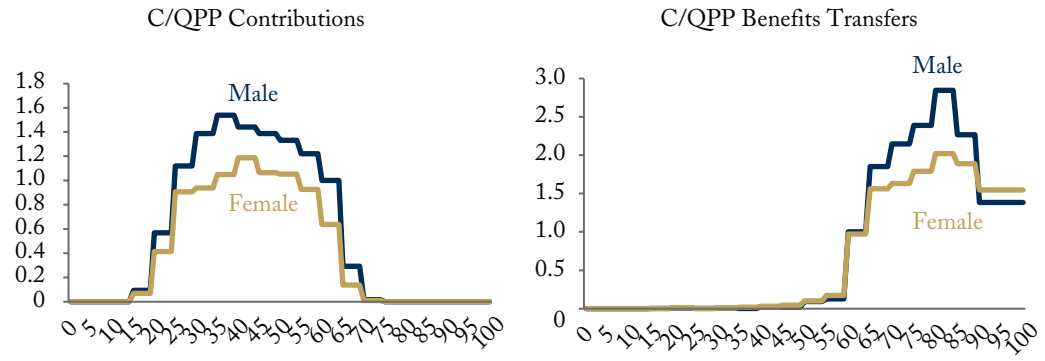
To obtain future age-sex specific contributions and transfers, I apportion the aggregate values of C/QPP contributions and benefits to age and gender groups according to profiles provided by Statistics Canada's SPSD/M, release 26.0. As shown in Figure 14, males contribute more than females at most ages during their working lives, which is consistent with their greater labour force participation and higher earnings. Males aged between 67 and 89 also receive more benefits than females in the same age bracket.

Figure 15 shows that individuals born in 2017 are expected to be net C/QPP beneficiaries: lifetime benefits will outweigh lifetime contributions under the current regimes. In particular, males born in 2017 would receive a small net amount of $7,500 while their counterpart females would receive a net amount of $39,000. The remaining lifetime net contributions for older generations are also negative, indicating that they are expected to receive net benefits – an obvious result since the closer

15 For example, potential beneficiaries of retirement benefits are aged 65 and over.

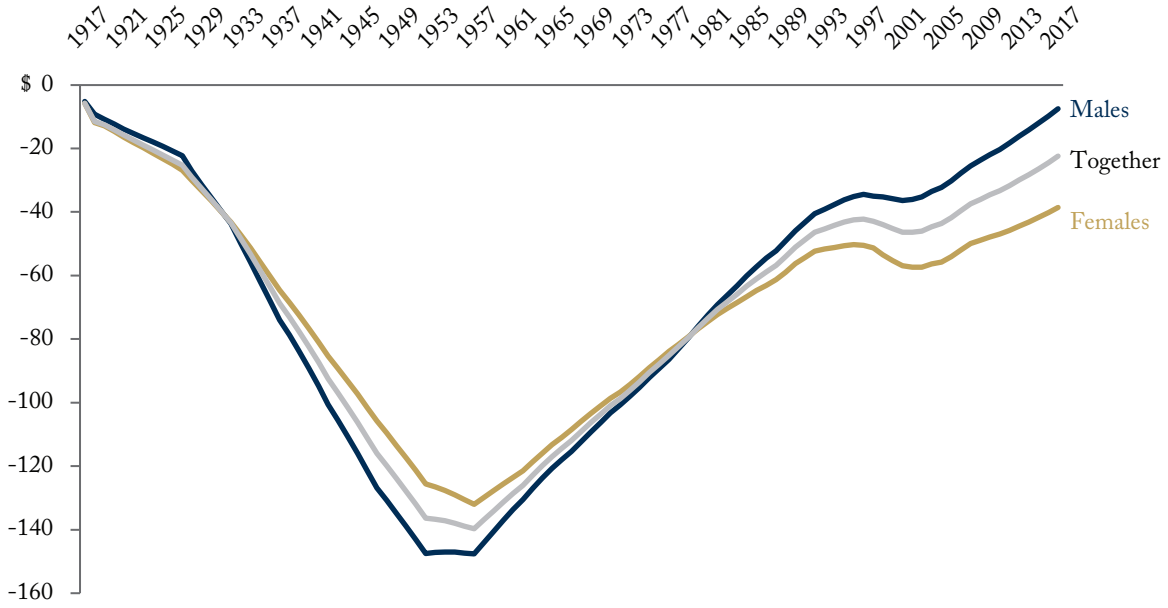
16 The CPP projections from actuarial reports show that benefits exceed contributions after 2020 while QPP benefits exceed contributions after 2018. Variations between projections in actuarial reports and our projections are driven solely by differences in population projections due to differences in demographic assumptions.

## Figure 14: Age and Gender-Specific Tax Profiles, Relative to a 60-Year-Old Male




Source: Author's calculations, using data from Office of Chief Actuary (2016), Retraite Québec (2016) and Statistics Canada's SPSD/M.

## Figure 15: Remaining Lifetime Net C/QPP Contributions of Current Generations, by Date of Birth ($thousand)




Note: A negative value shows that there is a net cash flow from government to individuals, representing net benefits.
Source: Author's calculations, using data from Office of Chief Actuary (2016), Retraite Québec (2016) and Statistics Canada's SPSD/M.

someone is to retirement, the lower the number of contributing years.

## Lifetime Generational Accounts

The traditional generational accounting model provides only the remaining taxes and transfers. Therefore, it provides no insight into intergenerational inequities among currently living generations since that would require obtaining their full lifetime generational accounts. Adding past accounts to future ones provides lifetime generational accounts and makes comparability possible.

This section discusses expected future net taxes and net C/QPP contributions correspondingly, with the estimated amounts of past net taxes and net C/QPP contributions for existing generations, applying the same procedure used for future net payments.[17] The calculations require the aggregation of taxes and contributions, transfers and benefits, as well as populations by age and sex during the 1917-2016 period.[18]

The best practice would be to apply different age and gender taxes as well as transfer profiles for each year. However, the construction of year-specific age and gender profiles requires detailed historical micro data that are largely unavailable prior to 1984. However, since age and gender profiles for healthcare expenditures exist for the years after 1997, I assume the shape of age and gender profiles is time invariant and remains unchanged prior to the earliest available profiles (Ter Rele and Labanca 2011).

Figure 16 shows that estimated real lifetime net taxes vary significantly across generations. They increase as we get closer to the younger generations, reflecting the impact of an aging population. In particular, the youngest generation shoulders the largest burden, while a person from a 1970s cohort faces the lowest tax burden. Introduction of various transfer programs in the 1940s and the 1960s, greater increases in various taxes such as income and commodity taxes, increases in healthcare and education expenditures, circumstances such as wars, and demographic shifts have contributed to variations in tax burdens.

In contrast to net taxes, lifetime net C/QPP contributions experience less fluctuations across generations. The introduction of C/QPP programs in 1967 was, however, slightly more beneficial to the older generations born prior to the late 1950s and generations born after the 1970s (Figure 16).

## Policy Discussion

The main purpose of generational accounting is to look into the future to help determine the sustainability of current fiscal policy, comparing the tax burdens falling on a base-year, newborn generation with a representative unborn future generation. The Baseline scenario shows relative generational balance – the current newborn generation is projected to shoulder a greater lifetime net tax burden than a representative future generation, but only by 16 percent.

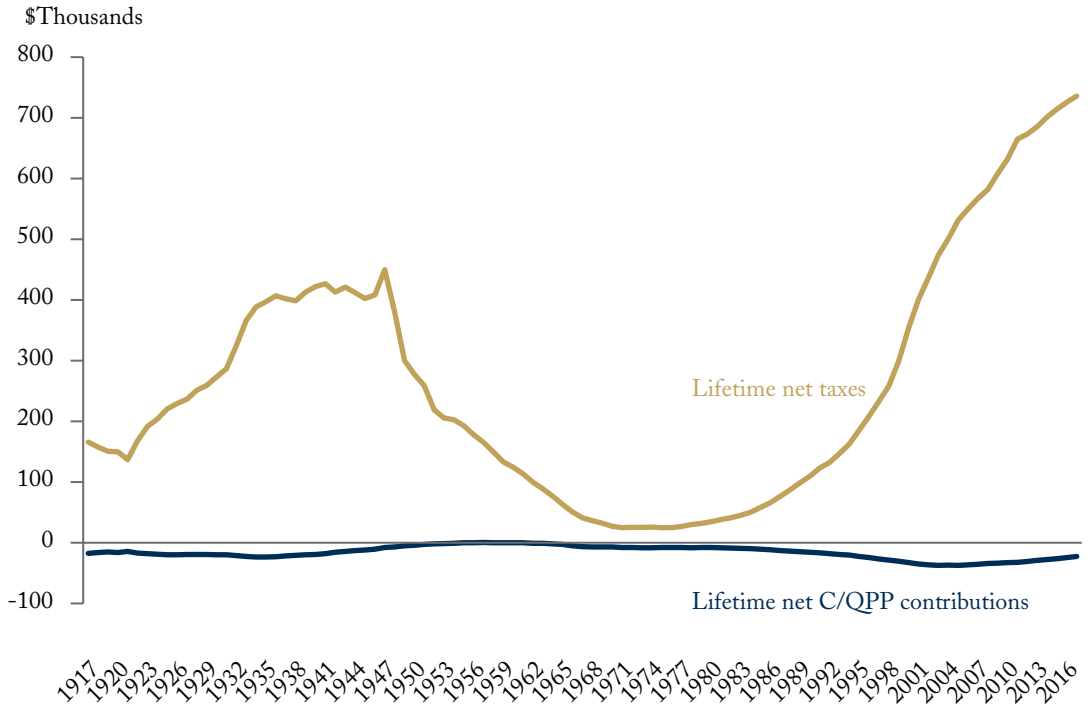
However, governments still need to worry about the consequences of their policy decisions. For example, healthcare expenditures per capita by age group historically grow faster than productivity, our baseline assumption. Therefore, governments need to continue their efforts at limiting the growth of healthcare expenditures. Failing to do so would create a serious and untenable intergenerational imbalance.

Demographic factors can also affect governments' fiscal sustainability. If the OAD ratio increases to

17 To ensure comparability between past and future payments, historical taxes and transfers need to be expressed in real values. Both past and future net taxes are also discounted to birth year.

18 Clearly, not all programs were available in 1917. Elderly benefits were launched in 1928, EI benefits introduced in 1942, child benefits in 1945, workers' social contributions in 1961, C/QPP programs in 1967, payroll taxes in 1970 and GST tax credits in 1990.

**Figure 16: Real Lifetime Net Taxes of Current Generations by Date of Birth**




Note: Past and future expected net payments are discounted to birth year values and then combined. Discount rates for past payments are historical real long-term bond yields, using Bank of Canada data. For missing values between two years, they are linearly interpolated. For missing early years, their values relative to GDP are maintained constant. Historical taxes and transfers are converted to real values, using the implicit price deflator of GDP (or GDP deflator).

Sources: Author's calculations, using data from Office of Chief Actuary (2016 and 2017), Retraite Québec (2016), CIHI, Statistics Canada's SPSD/M, as well as Statistics Canada's CANSIM 385-0040, CANSIM 052-0005, CANSIM 385-0001,CANSIM 478-0001, CANSIM 380-0080, C300-312, CANSIM 385-0032, CANSIM 384-0047, CANSIM 3850042, CANSIM 052-0005, H148-160, H148-160, H304-316, H52-74 and H458-465.

a higher level than projected under the Baseline scenario, that would result in a generational imbalance in favour of the newborn generation. Our Baseline scenario projects the continuation and achievement of ambitious immigration target levels – governments deviating from these targets risk reversing the generational imbalance to the detriment of future generations. Moreover, net tax profiles in this study do not change between immigrants and non-immigrants even though we know that, historically, immigrants experience lower employment and earnings. Therefore, immigration can be an effective way to mitigate the burden on future generations if all immigrants participate fully in the labour market. This requires better settlement programs to assist those most in need of language and workplace skills.

Furthermore, Robson and Mahboubi (2017) show that higher immigration has a limited impact on Canada's age structure. In contrast, longer working life can ease the demographic transition by maintaining the OAD ratio around its current value. Robson et al. (2017) find that increasing the retirement age by two years, from 65 to 67, would mitigate fiscal pressures. Meanwhile, Hicks (2012) argues that such a policy is practical since people

are expected to postpone their retirement by five years over the next two decades due to social and economic pressures.

It is also worthwhile to consider policies that improve labour force attachment and outcomes for youth and women. Compared to other population age groups, youth (ages 15-24) have the highest unemployment rate. Furthermore, youths are increasingly more likely to have precarious employment and their full-time wages have declined over time (Morissette 2016). Work-integrated learning opportunities could help the youth population gain the work experience that prospective employers require to hire them.

Despite improvements in their labour market outcomes over time, women still experience gaps in their earnings and labour force participation, requiring special policy attention. They are also more likely to have precarious work, particularly part-time employment (Busby and Muthukumaran 2016). Household responsibilities and lack of affordable childcare largely influence women with young children to not work or take a part-time position. A generous refundable tax credit for childcare expenses is a practical policy tool to improve labour market outcomes among women (Laurin and Milligan 2017).

## Conclusion

Generational accounting is a powerful tool for assessing the lifetime fiscal burden on current and future generations, given demographic and economic projections. The method requires the present value of government's current and future net revenues to cover all current and future spending plus net debt. A large imbalance between expected lifetime net taxes to be paid by current and future generations, in favor of current generations, would mean that existing fiscal policies are unfair and unsustainable.

Using generational accounting, this *Commentary* shows that the projected lifetime fiscal burdens of the youngest and future generations are very high: higher than that of any living generations. especially those born from the mid-1950s to the 1990s. Generally speaking, babyboomers and their children fare well in this scenario, but the grandkids of babyboomers do not.

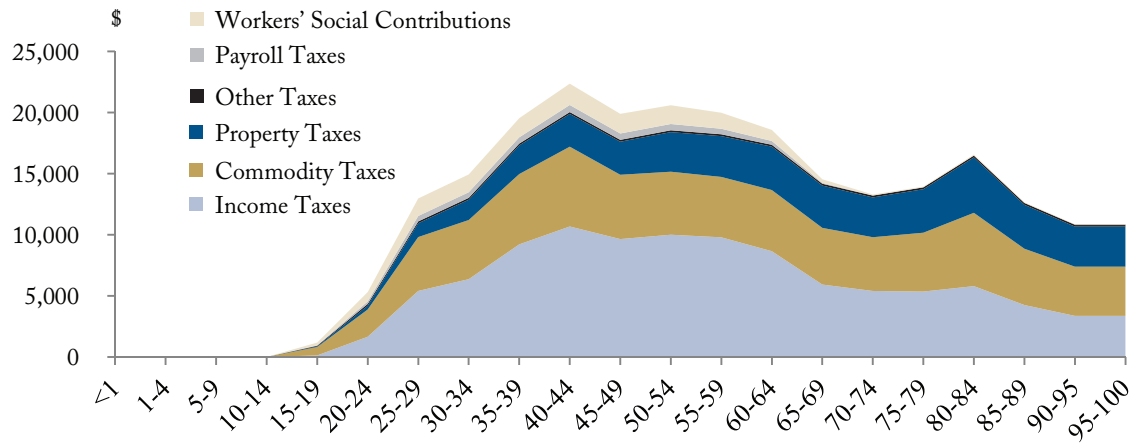
Looking to the future, we also specifically compare the prospective net tax burden faced by today's newborns with those that will be faced by future generations. Here, the results are less troubling. We find future generations of Canadians are expected to face a slightly lower lifetime tax burden than today's newborn, implying relative intergenerational balance looking out into the future.

However, small changes to the baseline scenario can make that balance tip unfavourably for future generations. For example, both higher-than-expected interest rates and lower-than-expected population growth would lead to generational imbalance by imposing even higher net tax burdens on future generations. Also, failing to maintain the growth of healthcare spending below its recent experience (1996 to 2010 average) could shift the tax burden to future generations and lead to a large and likely untenable imbalance.

To ensure future intergenerational fairness and sustainability, policies that improve labour market outcomes of youth, women and immigrants, and that encourage a longer working life, should be supported. Restraining the growth of heath care spending to a sustainable level is also a must.

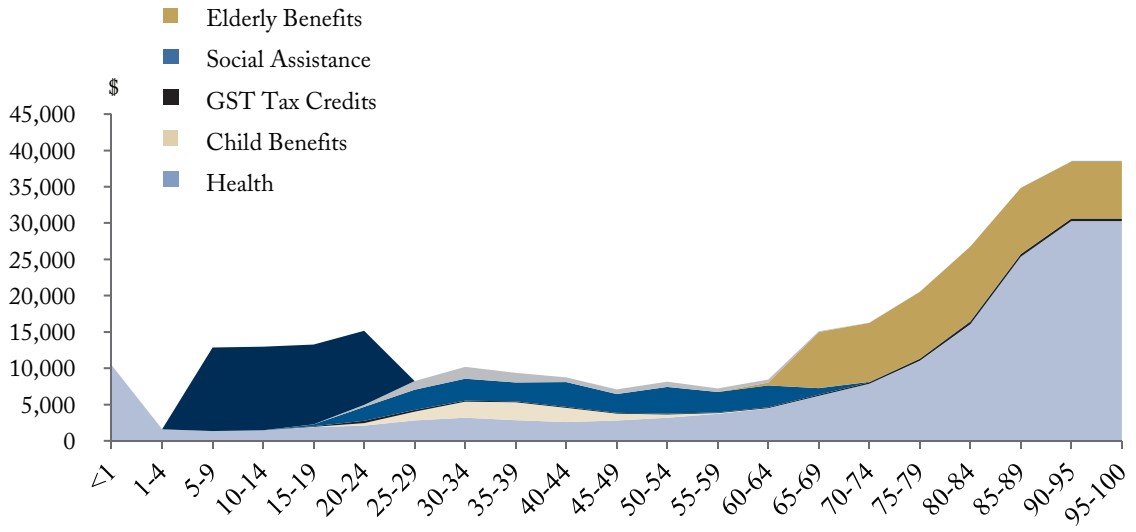
# APPENDIX

## Figure A.1: Average Taxes and Contributions per Female by Age Group (2016)




Source: Author's calculations, using Statistics Canada's SPSD/M and data sources in Figure 2.

## Figure A.2: Average Cash Transfers and Spending per Female by Age Group (2016)




Source: Author's calculations, using Statistics Canada's SPSD/M and data sources in Figure 2.

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