The Lifetime Tax Burden for Canadians from Federal Debt Accumulation

by Jake Fuss and Milagros Palacios

Summary

■ Federal debt has risen substantially during the COVID-19 pandemic and is projected to continue rising for the foreseeable future. Large deficits come with costs and Canadians will have to pay for our borrowing today through additional taxation implemented at a later date.

■ This bulletin demonstrates that Canadians aged 16 to 80 in 2025 can expect to pay an additional $332.5 billion in personal income taxes over their lifetimes (on a present value basis) to pay for the projected federal debt accumulation since 2019. On average, Canadians between the ages of 16 and 80 will each pay $10,498 in additional taxes.

■ Younger Canadians will bear a disproportionately large amount of the burden to pay for the increase in federal debt. For instance, individuals aged 16 to 25 are expected to collectively pay an additional $117.9 billion in personal income taxes over their lifetimes. This translates to 35.5 percent of the total burden imposed on all age groups.

■ On a per-person basis, all individuals who are 16 to 25 can expect to pay a lifetime tax burden of at least $20,000 as a consequence of the increase in federal debt. This means that, while the growth of the public debt should be a concern for all Canadians, it should be a special concern for younger Canadians.

■ There is also a significant risk for Canadian taxpayers due to the potential for higher interest rates in the future. Specifically, rising interest rates could increase federal debt accumulation and impose a larger tax burden on all Canadians relative to our baseline projections.

Introduction

The COVID-19 pandemic has had a profound impact on the state of federal finances in Canada. Emergency spending on measures such as the Canada Emergency Response Benefit (CERB), wage subsidies, and increased transfers to provincial governments were among the many initiatives prioritized by Ottawa during this time (DOF, 2021a). As a result, federal deficits increased dramatically compared to pre-pandemic levels. Indeed, the federal government estimates it will run deficits totaling $354.2 billion and $154.7 billion in 2020/21 and 2021/22, respectively (DOF, 2021b). To put this in perspective, these are some of the largest annual deficits as a percentage of the Canadian economy since World War II (DOF, 2020).

Debt accumulation has also spiked during the pandemic. Over a two-year span between fiscal years 2019/20 and 2021/22, the country is projected to have added more than $500 billion in federal debt (total liabilities minus total assets) (DOF, 2021b). Moreover, debt accumulation will continue in future years, as Budget 2021 specifies that deficits are expected until at least 2025/26 (DOF, 2021b).

Of course, there are consequences associated with these policy decisions. Large deficits come with costs and Canadians will have to pay for our borrowing today through additional taxation implemented at a later date (Bazel et al., 2018). Put differently, today's deficits are tomorrow's taxes. This bulletin aims to demonstrate how much Canadians will have to pay in additional taxation over their lifetimes to pay for current debt accumulation. These "lifetime tax burdens" will also be broken down by age to show which Canadians will shoulder heavier burdens than others. To be clear, this paper does not assess whether the level of federal debt accumulation was appropriate during the pandemic. Although there can be reasonable debates over the appropriate size of deficits, the goal of this bulletin is merely to highlight the direct consequences of federal debt accumulation.

Measuring the Tax Burden

In this bulletin, we calculate the present value in 2025 of the increase in personal income taxes that will be necessary to pay for the federal debt accumulated since 2019. Our assumption is that the increase in the debt-to-GDP ratio between 2019 and 2025 is permanent based on the projection that federal deficits are expected to continue indefinitely, and debt grows at the same rate as the economy post-2025.[1] For these calculations, we only consider the tax burden that would be required to pay for the projected increase in federal debt and do not account for the additional taxation required to actually reduce the outstanding debt.

Several variables and assumptions outlined in this paper are used to help calculate the discounted value of personal income taxes that typical individuals aged 16 to 80 can expect to pay over their lifetimes due to the increase in federal debt. Most assumptions come from the values contained in the Budget 2021 document from the federal government (DOF, 2021b). Important variables include the long-term real GDP growth rate (g), federal debt-to-GDP ratio in 2025 (b), long-term inflation rate (i), real return on government

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1   The present value is calculated in 2025 because this is the last year of fiscal projections included in Budget 2021.

debt in 2025 (r), and the discount rate applied for the present value calculations.[2]

According to the economic literature, the increase in federal debt should not be a large burden to Canadians if the real GDP growth rate (g) exceeds the real return on government debt (r) over the long term (Blanchard, 2019). In contrast, there is an additional tax burden imposed on Canadians if the real return on government debt (r) instead exceeds real GDP growth (g). However, there is also another, less well-known consideration documented in economic literature.

Research demonstrates that higher debt levels are associated with higher interest rates on government debt. Specifically, two studies indicate that the interest rate on government debt increases by between 2 and 4 basis points for every one percentage point increase in the government's debt-to-GDP ratio (Gamber and Seliski, 2019; Grande et al., 2013). Therefore, in this bulletin, we will not only examine the difference between the r and g variables for Canada, but also account for the increase in interest rates as federal debt rises over time. In the analysis, our assumption is that the interest rate increases by 3 basis points (at the halfway point of the range established in the two studies) for every one percentage point increase in the federal debt-to-GDP ratio. This variable is particularly important in calculating the increase in personal income taxes that Canadians will pay due to the increase in federal debt.

To calculate the increase in the tax-to-GDP ratio (τ) as federal debt rises, we use the following formula:

$$d\tau = (1 + i) * \left(r - g + b * \frac{dr}{db} \right) * db$$

where i is the long-term inflation rate (2025 onwards)[3], r is the real return on government debt in 2025, g is long-term real GDP growth, b is the federal debt to GDP ratio in 2025, dr/db is the increase in the real return on government debt as federal debt-to-GDP rises, and db is the increase in the federal debt-to-GDP ratio between 2019 and 2025. Using the assumptions provided in Budget 2021, the increase in the tax-to-GDP ratio ($d\tau$) associated with the rise in federal debt-to-GDP from 2019 onwards is equivalent to 0.0008.[4]

The real discount rate applied in our present value calculations is derived from the condition for equilibrium growth of private consumption:[5]

$$\rho = r - \frac{g}{\sigma}$$

where ρ is the real discount rate, σ is the intertemporal elasticity of substitution, r is the real return on government debt in 2025, and g is the long-term real GDP growth rate. In our base model, the intertemporal elasticity of substitution is assumed to be 0.5 (Groneck, 2010, 2011; Thyme, 2017). Based on this formula, the real

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2   The real return on government debt in 2025 is calculated to be 0.69 percent based on an inflation rate of 2 percent and a 10-year bond interest rate of 2.7 percent (DOF, 2021). Long-term real GDP growth beyond 2025 is equivalent to 1.7 percent in our assumptions based on the average annual growth rate the federal government estimates between 2020 and 2025 (DOF, 2021).

3   The steady state debt-to-GDP ratio is lower the higher the rate of inflation for given tax and spending GDP ratios. If the growth rate exceeds the real rate of return on government debt, as is the case in the current context, then a higher inflation rate lowers the required tax ratio.

4   Our assumption is that there will be no change in the government spending to GDP ratio associated with the increase in federal debt to GDP ratio.

5   This is known as the Keynes-Ramsey rule for optimal growth. See Barro and Sala-i-Martin (2004).

discount rate used in the present value calculations equals -0.027.[6]

The next step in computing the discounted value of taxes that Canadians can expect to pay over their lifetimes is to calculate the share of personal income taxes paid by each age group. For this calculation, we use data from Statistics Canada's Social Policy Simulation Database and Model (SPSD/M) Version 28.1 to find the breakdown of personal income tax revenues in 2019. **Figure 1** displays the share of personal income taxes paid by age in five-year increments. Unsurprisingly, the share of taxes paid is

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6   The fact that saving rates are relatively high in spite of the low real rates of return on a safe asset means that individuals place a higher value on future consumption than current consumption. This implies a negative real discount rate. Note that if consumption is not anticipated to grow in the future, the implied real discount rate, 0.007, is very close to zero.

highest for middle-aged Canadians and lowest for younger individuals who are just beginning their careers or are in school.

Finally, the formula for the present value in 2025 of the lifetime tax burden from the increase in the federal debt- to- GDP ratio is described by:

$$PV\ Real\ Burden = \left(\sum_{t=0}^{n-j} \frac{s_j * d\tau * (1+g)^t * Y_0}{(1+\rho)^t} \right)$$

where n is the number of years between age 16 and 80, j is equal to the age of the individual subtracted by 15, s_j represents the share of personal income taxes paid by an individual of age 15+j, $d\tau$ is the increase in the tax-to-GDP ratio, Y_0 is the real GDP level in the base year 2025, g is the long-term real GDP growth rate, and ρ is the real discount rate. This formula is repeated (n=65) to calculate the discounted value of the tax burden for Canadians from age 16 to 80.

Figure 1: Share of Personal Income Taxes Paid by Age Group, 2019
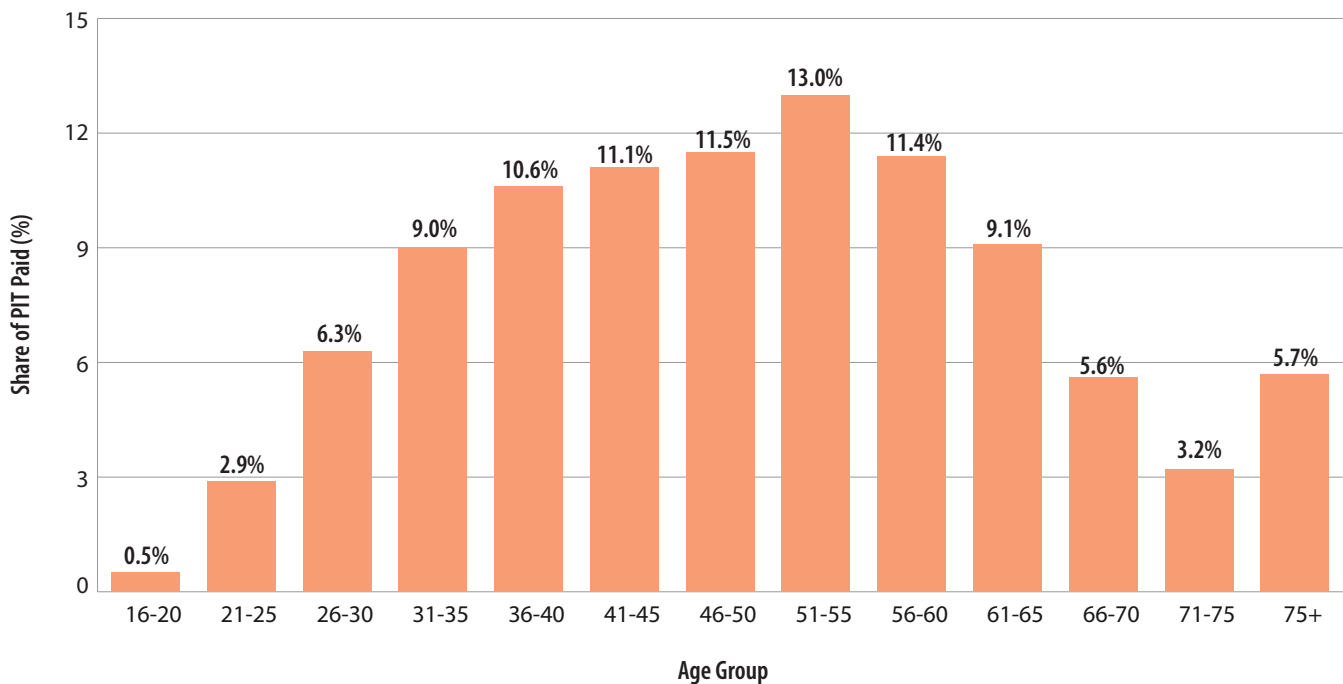
Sources: Statistics Canada Social Policy Simulation Database and Model Version 28.1; calculations by authors.

Table 1 summarizes the various assumptions described in the entire methodology section.[7]

Table 1: Assumptions for the Base Model

Description	Variable	Value
Federal debt to GDP in 2025	b	0.4920
Change in debt-to-GDP, 2019 to 2025	db	0.1800
Long-term real GDP growth	g	0.0170
Inflation rate	i	0.0200
10-year bond interest rate, 2025	IR	0.0270
Real return on government debt	r	0.0069
Real discount rate	ρ	-0.0270
Elasticity of intertemporal substitution	σ	0.5000
Increase in tax to GDP ratio	$d\tau$	0.0008
Increase in interest rate as debt-to-GDP rises	dr/db	0.0300
Real GDP, 2025 (billions of $)	Y_0	2,869.0

Sources: DOF (2021); Gamber and Seliski (2019); Grande et al. (2013); Groneck (2010, 2011); Thyme (2017); calculations by authors.

Lifetime Tax Burden by Age Group

Our model demonstrates that the additional tax burden imposed on Canadians due to the increase in federal debt differs significantly based on your age group. For instance, individuals aged 16 to 25 are expected to collectively pay an additional $117.9 billion in personal income taxes over their lifetimes due to the projected increase in federal debt following 2019. This translates to 35.5 percent of the total lifetime tax burden imposed on all age groups in the model. Comparatively, individuals above age 75 are only expected to incur an additional $1.2 billion in personal income taxes during their lifetimes, which is 0.4 percent of the total tax

burden. In total, Canadians aged 16 to 80 can be expected to pay an additional $332.5 billion in personal income taxes over their lifetimes.

There is a clear trend in the data, as shown in **figure 2**. Younger individuals bear a disproportionately large amount of the burden imposed on all Canadians to pay for the increase in federal debt since 2019. This is not surprising given that young individuals are earlier in their careers and have a longer potential duration left to pay taxes than older Canadians. However, it does highlight that the implications of the pandemic will be unevenly felt by Canadians, with noticeable differences in burdens between generations.

Indeed, Canadians that are aged 16 to 45 will be responsible for paying 80 percent of the increase in personal income taxes associated with the uptick in federal debt to GDP. Conversely, those over the age of 65 will pay less than 3 percent of the total tax burden. This means that, while the growth of the public debt should be a concern for all Canadians, it should be a special concern for younger Canadians.

A comparison between age groups on the tax burden per person is also illustrative. **Figure 3** shows that a 16-year-old in 2025 can expect to pay the equivalent of $29,663 over their lifetime in additional personal income taxes as a consequence of the increase in federal debt. This is the highest burden borne by any age group of Canadians in the model. Additionally, all individuals who are 25 or younger in 2025 will face lifetime tax burdens of at least $20,000 due to rising federal debt. Moreover, individuals in the age range of 26 to 35 will pay between $13,014 to $19,233 over their lifetimes. On average, Canadians between the ages of 16 to 80 will each pay $10,498 in additional taxes.

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7   Note that the tax burden of debt, in principle, may be offset to some extent by the interest income earned by domestic bondholders.
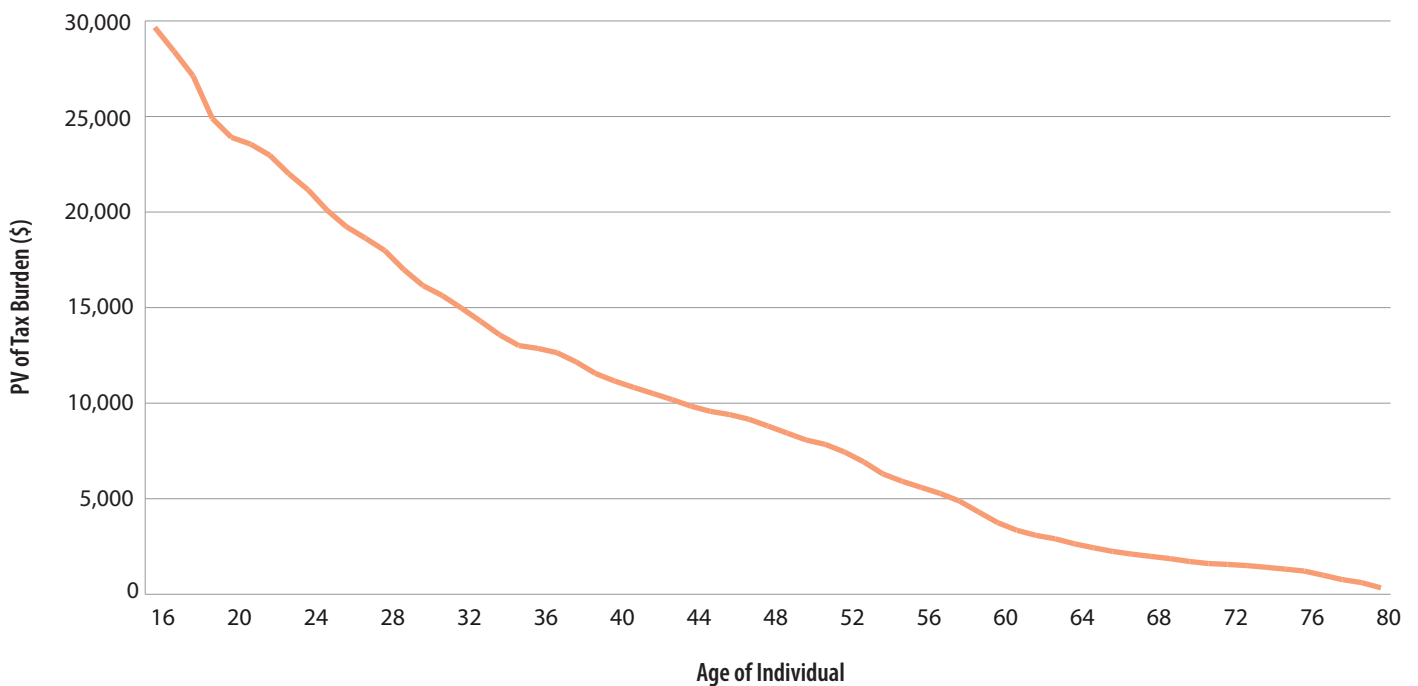
Figure 2: Share of Total Lifetime Tax Burden to Pay for Increase in Federal Debt, by age group, 2025
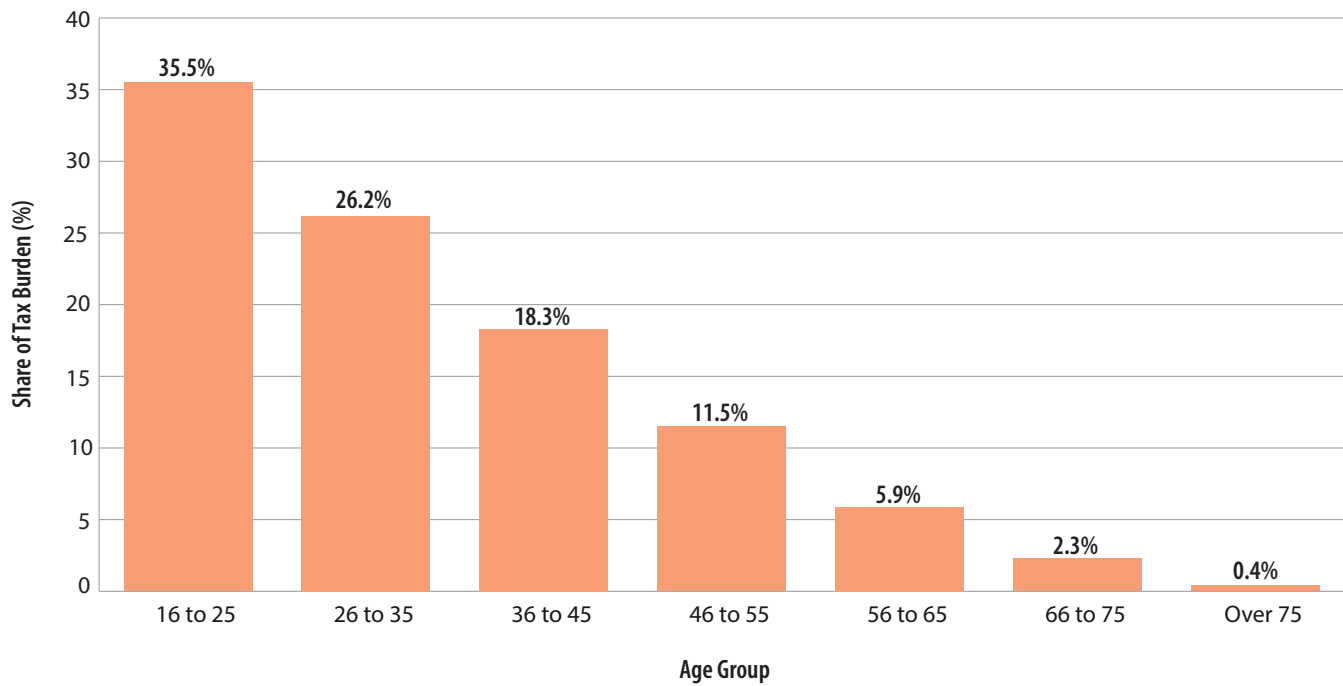
Sources: Figure 1; calculations by authors.

Figure 3: Present Value in 2025 of Individuals' Lifetime Taxes to Pay for Increase in Federal Debt, by age

Sources: Figure 1; Statistics Canada (2021a, 2021b); calculations by authors.

Older age groups shoulder a much smaller burden in comparison. A typical 65-year-old can expect to pay $2,433 over their lifetime in additional personal income taxes because of federal debt accumulation. Put differently, a 16-year-old Canadian in 2025 can expect to pay more than 12 times the amount of additional personal income taxes that a 65-year-old will pay. **Figure 4** further highlights these differences between age groups. This highlights the disparity in who will ultimately bear the cost of today's debt accumulation, as well as the debt accumulated in the years following the pandemic. Simply put, deficit-financed spending imposes substantial burdens on future taxpayers.[8]

Interest Cost Risks

The base model that was used to calculate the lifetime tax burden assumed that the real return on government debt (r) will be below the long-term real GDP growth rate (g). However, there is a risk that the lifetime tax burden for Canadians could actually increase should interest rates rise and r instead exceeds g. For instance, consider what happens to the tax burdens if the 10-year bond interest rate on federal debt in 2025 rises from 2.7 to 4.0 per cent. The increase in the interest rate causes the real return on government debt to surpass the real GDP growth rate (r would increase to 1.96%; meanwhile, g is 1.7%), thereby imposing a higher burden on future taxpayers. In this scenario, the total lifetime tax burden for all Canadians due to the increase in federal debt rises from $332.5 billion to $887.0 billion. This represents a 166.8 percent increase

in the lifetime tax burden relative to the baseline model outlined in the previous section.

Examining the data on a per-capita basis further highlights how much interest rates matter. With the increase in the interest rate as outlined in the prior paragraph, a typical 16-year-old can expect to pay $64,882 in additional personal income taxes over their lifetime to pay for the increase in federal debt. That is more than double the amount they would pay in the base scenario. Similarly, the average tax burden for Canadians between the ages of 16 to 80 would increase substantially from $10,498 to $28,006.

However, to highlight the sensitivity of the model to interest rates, we must also briefly outline what would happen if interest rates declined, even if only slightly. For example, if the 10-year bond interest rate in 2025 decreased from 2.7 to 2.6 per cent, then the total lifetime tax burden for Canadians would fall from $332.5 billion to $269.5 billion, a drop of nearly 19 percent.[9] The average tax burden for Canadians between the ages of 16 to 80 subsequently declines from $10,498 to $8,509.

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8   Some COVID-related spending likely benefited younger families and individuals in Canada. For this reason, the tax burden imposed on younger Canadians might be somewhat offset by any benefits they received from the government's debt accumulation.

9   While not detailed in this bulletin, the authors also calculated alternative scenarios to briefly highlight what happens if other variables are changed in the model. Decreasing real GDP growth (g) from 1.7 to 1.6 per cent, for instance, raises the total lifetime tax burden from $332.5 billion to $365.4 billion. Alternatively, if real GDP growth equals 0, the discount rate increases from -0.027 to 0.007 (close to zero) and the total lifetime tax burden is $346.1 billion. Increasing the intertemporal elasticity of substitution (σ) from 0.5 to 0.6 to reduce the real discount rate (ρ) increases the lifetime tax burden to $429.0 billion. Conversely, reducing the intertemporal elasticity of substitution from 0.5 to 0.4 to increase the real discount rate ends up decreasing the lifetime tax burden to $283.9 billion.

Figure 4: Lifetime Tax Burden (PV) Per Person in Each Age Cohort, 2025
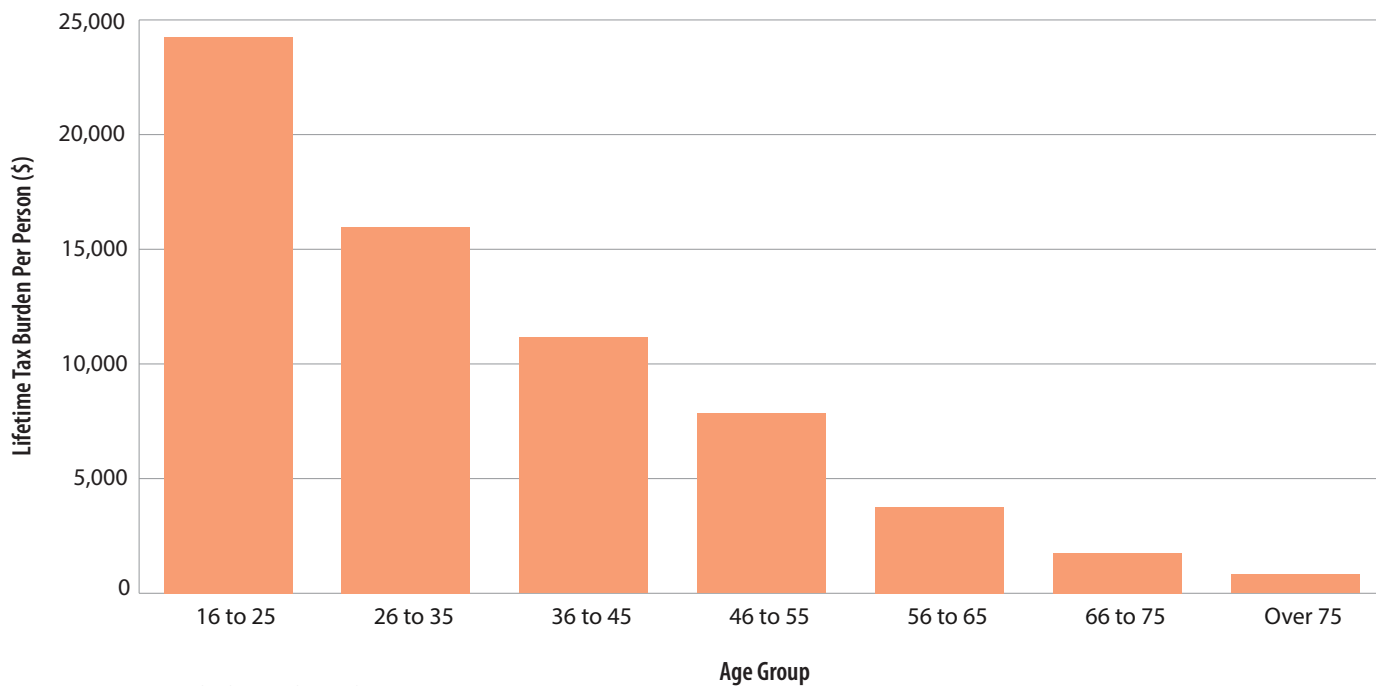
Sources: Figure 3; calculations by authors.

Clearly, interest rates play a significant role in determining the magnitude of the increase in personal income taxes Canadians will be required to pay over their lifetimes as federal debt increases. This signals that there is a significant risk present for the federal government and Canadian taxpayers, particularly younger generations, due to the potential for rising interest rates in the future. Recent data from the Bank of Canada indicates that roughly two-thirds of federal debt securities will mature in the next 5 years (Bank of Canada, 2021). While the federal government is mitigating this risk to some extent by attempting to lock itself into longer-term bonds for the foreseeable future, rising interest rates could still wreak havoc on federal finances should they increase faster or move higher than the government expects.[10]

Conclusion

Federal debt has risen substantially during the COVID-19 pandemic and is projected to continue rising for the foreseeable future. Regardless of whether this debt accumulation was justified, deficit-financed spending imposes a real burden on future taxpayers. After all, today's deficits are tomorrow's taxes. Over their lifetimes, all Canadians can expect to pay thousands of dollars in additional personal income taxes as a consequence of the projected increase in federal debt following 2019. Having said that, it is clear that the consequences of federal debt accumulation will not be evenly felt by all generations of Canadians. Younger Canadians in particular will bear a disproportionately large share of the burden imposed on taxpayers from today's debt accumulation in the long term.

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10   See Budget 2021 for further details about the federal government's current strategy to mitigate long-term interest rate risks (DOF, 2021b).

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