The Effect of Government Debt on Economic Growth in the Canadian Provinces

FRASER INSTITUTE

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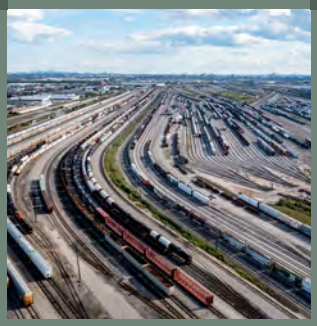

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Contents

Executive Summary

- Provincial and federal government debt has grown significantly in recent years.
- A growing body of literature links government debt to slower economic growth.
- We provide a three-phase analysis linking government debt to slower growth among Canadian provinces.
- Once debt exceeds 100% of GDP, additional debt offers no benefit in terms of short-term economic growth.
- As of 2022, all but three provinces—British Columbia, Alberta, and Saskatchewan—had combined federal and provincial debt loads in excess of the 100% debt-to-GDP threshold.

1. Introduction

Economic growth is essential for improving living standards. Our ability to provide better health care, education, and social services all depend on improving the productivity of at least some sectors of the economy. Yet, the policies and conditions required for meaningful economic growth are not generally understood. If they were, the recent weak performance and continued low expectations for enhanced productivity and growth in the Canadian economy would induce a dramatic policy shift. Both the OECD (Guillemette and Turner, 2021) and the Bank of Canada have raised the alarm about our likely growth trajectory, with the Deputy Governor of the Bank of Canada describing the situation as an emergency (Rogers, 2024).

One policy change that would help foster economic growth is in public finance. In 2010, Reinhart and Rogoff (2010) provided an incredible boost to a new stream of literature focused on the relationship between public debt and economic growth. Later corrected for a data handling error, their work revealed that countries whose governments carried gross debt above a a certain threshold suffered lower economic growth than countries with debts below the threshold. Of relevance to the Canadian case, they find that those advanced economies with debt in excess of 90% of gross domestic product (GDP) experienced slower economic growth.

Reinhart and Rogoff (2010) has been followed by dozens of academic papers examining the relationship between economic growth and government debt. Salmon (2021) offers a summary of the literature published between 2010 and 2020. Of the 40 works covered in the survey, 36 report a negative and statistically significant relationship between public debt and economic growth. A further two studies found that the negative impact of public debt on economic growth could be mitigated by well-functioning institutions and policy. The remaining two studies report only weak evidence of a negative relationship between economic growth and public debt. Among studies focusing on advanced economies that found a threshold level of public debt, the mean threshold was 78% while the median was 82%. None of the studies found that public debt was universally linked to increased economic growth. However, a later survey of 47 works by Heimberger (2023) urges more caution in interpreting these collective results as the potential for publication bias could exclude statistically insignificant negative or even weak positive relationships.

Despite federal government liabilities growing by 47%, rising from just under $1.1 trillion to $1.6 trillion over the most recent five years for which data is available (2018–2023), Canada's federal government debt is well below Reinhart and Rogoff's 90% threshold (Statistics Canada, 2024a, 2024c). Canadian federal government debt was approximately 55% of nominal GDP as of

the fourth quarter of 2023 (Statistics Canada, 2024a, 2024c). While true, this oft-cited statistic is likely misleading. Canada operates as a federation rather than a unitary state. Canadian sub-national governments, provinces, have a great deal of authority over taxation, spending, regulation, and debt. This is clearly demonstrated by the fact that Canada's provinces and territories carry liabilities of $1.4 trillion in addition to those of the federal government. When this and other government debts are consolidated, they total just under $3.5 trillion, or approximately 120% of Canadian nominal GDP—well over the threshold reported by Reinhart and Rogoff (2010).

A perennial challenge for the Canadian federation is that both economic growth and provincial government liabilities differ significantly among provinces. In 2022, nominal economic growth ranged from a high of 29.1% in Saskatchewan to a low of 6.8% in Newfoundland & Labrador. In real terms, growth ranged from 6.0% to –1.7% in the same provinces (Statistics Canada, 2024d). Provincial liabilities in proportion to GDP ranged from a low of 25.1% in Alberta to a high of 77.1% in Quebec (Statistics Canada, 2024b). If we presume that the burden of federal debt is uniformly distributed among provinces on a GDP basis (that is, each province has federal liabilities equal to 55% of their GDP), Saskatchewan, Alberta, and British Columbia are all below the 90% threshold while the remaining provinces exceed it. The lower mean and median thresholds reported by Salmon (2021) put all Canadian provinces at risk of lower economic growth.

Linking debt and growth in Canada

There is currently no consensus on the theoretical link between economic growth and the level of gross government debt. There are several posited links between the two measures that may apply to Canada. The first is the notion of crowding out, in which increased government spending (particularly debt-financed spending) increases the cost of private-sector activity. Excessive government borrowing puts pressure on long-term interest rates as private-sector financing must compete more aggressively with a large supply of risk-free government debt. While the most discussed mechanism for debt-financed spending by government to crowd out private-sector activity is this effect upon interest rates, it need not be the only mechanism. In an economy with shortages of skilled construction workers, new public works projects necessarily increase the costs (wages) for private-sector projects.

Another means of linking government debt levels and economic growth comes via monetary policy. If a national government loosens monetary conditions to make raising funds easier or to make repayment of previously incurred debt a lighter burden, inflation is the likely result. Sustained high inflation adds economic headwinds, slowing economic growth.

Fiscal, as well as monetary policy, provides a possible link between economic growth and public debt. All debt, including public debt, must be serviced. Interest payments and the work required to roll over unretired debt place demands on the public treasury. Funds used to service debt cannot be spent in other ways more conducive to economic growth. So, either spending on things that promote growth must be reduced or additional taxes must be levied to support servicing the debt. In either case, with lower useful spending or higher taxation, lower economic growth is likely to be the result.

Another possible link between public debt and economic growth must be added based on the likely behaviour of a fiscally constrained government. If legislators are unable to use fiscal policy in an effort to directly address an issue, they are more likely to turn to indirect methods such as regulation. For example, consider a legislator wishing to increase the incomes of the working poor. Two options readily present themselves, a fully refundable earned-income tax credit or an increase in the minimum wage. While an earned-income tax credit is likely to be less damaging to economic growth it has a direct deleterious impact on the treasury. As a result, a government facing already high levels of public debt may be more likely to opt for an increase in the minimum wage, which has limited direct impact on government budgets but is more likely to affect economic growth negatively (Neumark and Shirley, 2022). However, such an effect could be offset by federal programs such as equalization (see Smart, 2007 for just one example of this).

One factor that confounds the search for links between government debt and economic growth is the role institutions play in economic growth. For example, central bank independence may break the link between government debt and inflation for some countries. The strength and quality of institutions are remarkably hard to measure, and thus to control for explicitly, and would be highly correlated with any country-specific effects. Ahlborn and Schweickert (2018) resolve this by grouping countries by system. They consider "liberal" countries (the United Kingdom, the United States, and Canada, for example) as a group, the "Nordic" countries as another group, and "continental" countries (core EU member states) as a third group. Within the continental category they found a strong negative relationship between growth and public debt. Interestingly, they find little evidence of this relationship among their liberal country grouping.

The structure of the Canadian federation offers an opportunity to study the relationship between government debt and economic growth within a stable set of institutions and ensuring a reasonable grouping. Unlike many advanced economies, Canadian sub-sovereign jurisdictions (provinces) have strong spending, taxing, and borrowing authority. From the data presented above, Canadian provinces account for nearly one third of Canadian consolidated government debt. Understanding the relationship such debt loads may have on economic growth is essential to good government policy.

Given our focus on Canadian sub-national jurisdictions, prior literature examining the relationship between economic growth and public debt in monetary unions is particularly important. The comparability of the Eurozone and Canadian provinces is limited by at least two factors. First, and likely most important, true monetary union did not begin until 1999. There was a system of fixed exchange rates and other policies forming a spurious monetary union before this date, but not true uniform monetary policy. Second, there are explicit fiscal guidelines for those countries in the Eurozone contained within the Stability and Growth Pact (SGP), limiting (in theory) their ability to build up debt. No such explicit fiscal restraints are placed on Canadian provinces.

In early work focusing on the region, Baum, Checherita-Westpahl, and Rother (2013) combine both linear and non-linear dynamic threshold models with panel data to examine the relationship between government debt and growth for 12 Eurozone countries between 1990 and 2010. They report that countries with debt-to-GDP ratios below 67% see economic activity increase in response to an increase in public debt. However, this falls toward zero once the 67% threshold is reached. When countries surpass a debt-to-GDP ratio of 95%, further accumulation of public debt reduces the growth of GDP.[1] Similarly, Topal (2014) considers Eurozone countries from 1980 to 2012, again finding two thresholds: a lower threshold of 72% and an upper threshold of 80%. However, she reports a negative relationship between growth and debt once the lower threshold is crossed, but a weakening relationship once the upper threshold is breached.

Gomez-Puig and Sosvilla-Rivero (2017) take a slightly different approach to analyzing data from Eurozone countries spanning the period from 1961 to 2015. Rather than a panel approach, they consider each country as a time series. They find no common threshold. However, with the surprising exception of Belgium, they find that an increase in public debt begins to have a negative impact on economic growth well before the treaty thresholds would become binding (60% of GDP).

Abubakar and Mamman (2021) estimate both the transitory and lasting effects of debt on economic growth for countries in the Organisation for Economic Co-operation and Development (OECD) with a disaggregation for those in the Eurozone. They find some evidence of a positive transitory effect of debt on growth but strong evidence of a negative permanent effect.

Given that any reasonable allocation of federal debt combined with provincial debt puts all Canadian provinces near or above these thresholds, we now turn to examining the data on debt and the growth of provincial economies.

1 These authors (Baum, Checherita-Westphal, and Rother, 2013) report a confidence interval between 63% and 69% for the lower threshold and a wider 80% to 100% for the upper threshold.

2. Data

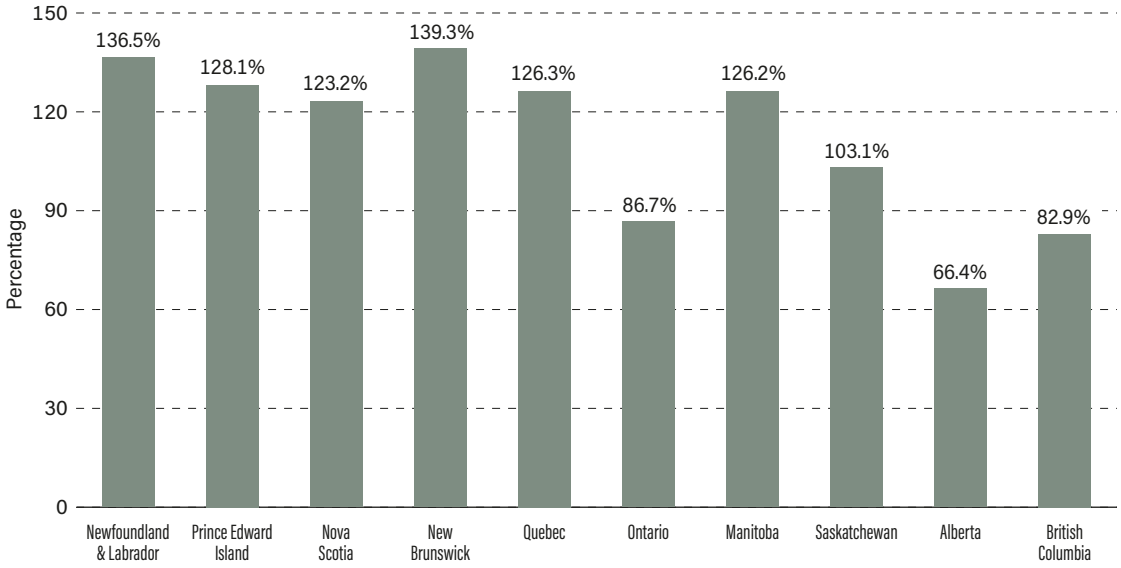
For consistency, data is drawn from Statistics Canada sources where possible. One significant problem was encountered, however. Statistics Canada changed its reporting standards in 2007 for government liabilities from the Financial Management System (FMS) to the Government Financial Statistics Framework (GFS, an International Monetary Fund standard approach). The GFS data runs from 2007 to 2022 while data compiled on the previous standard is available up to 2008. For most provinces differences in the data series are negligible when both provide data for the same year. However, British Columbia's liabilities reported under the GFS standard are effectively half those under the FMS standard. The difference is largely attributed to the inclusion of deposits in the FMS data, a relatively small item for most other provinces. These deposits consist of excess working funds, such as deposits posted by contractors against completion of contracts (Statistics Canada, 2009). While these deposits are included in the definition of liabilities in the FMS system, they do not appear in the GFS system. Therefore, we calculate total liabilities for the period 1981 to 2006 by excluding such deposit liabilities. For the two years in which the systems of account overlap, we use the midpoint between total liabilities under the GFS system and our calculated liabilities for the FMS system in our basic analysis.

Both federal and provincial debt are ultimately backed by the same taxpayers. There are multiple ways one could allocate federal debt among the provinces. If we are concerned with the future cost of servicing that debt from general tax revenue, federal debt could be allocated on the basis of federal tax burden by province. If we are concerned with the impact of prior deficit spending, we could allocate debt on the basis of net federal spending by province. However, we opt for the more commonly used expedient of allocating debt on a per-capita basis, as was done by Fuss and Munro (2024).

Figure 1 shows the average total ratio of debt to nominal GDP for each province, covering the span from 1981 to 2022. There is remarkable variation in the average among provinces. New Brunswick along with Newfoundland & Labrador top the chart with average debt ratios of 139.3% and 136.5%. Prince Edward Island (128.1%), Nova Scotia (123.2%), Quebec (126.3%), and Manitoba (126.2%) all have similar debt loads. At the other end of the spectrum are Alberta (66.4%), British Columbia (82.9%), and Ontario (86.7%).

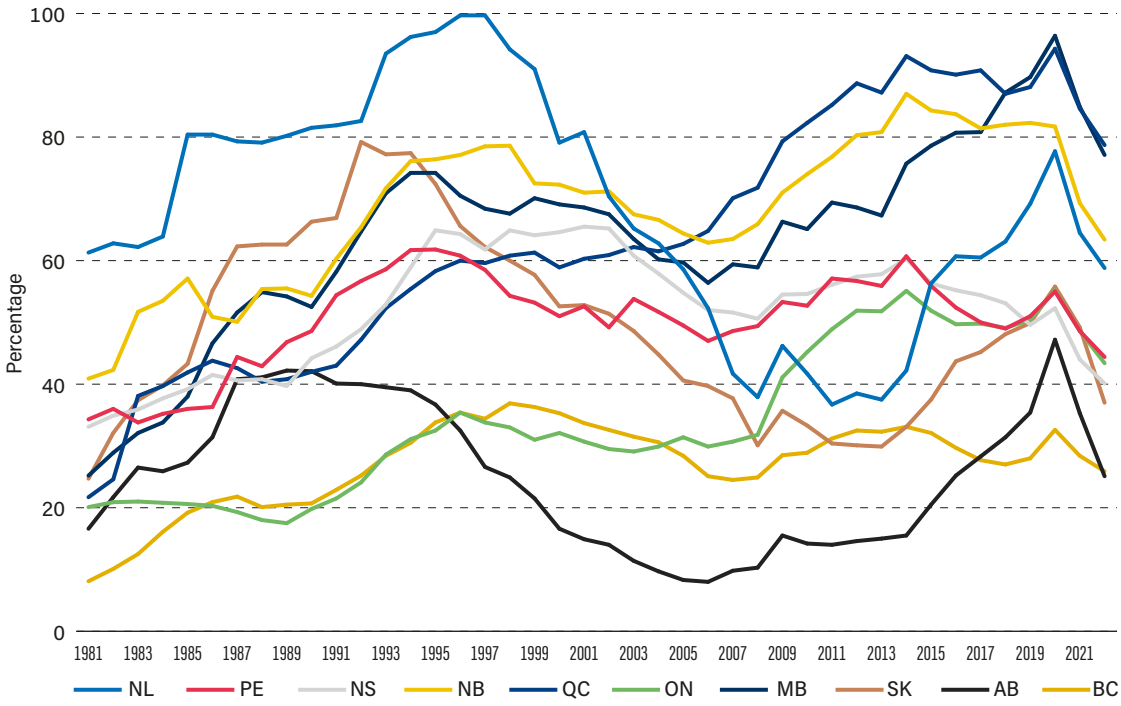
The average debt load of provinces disguises a lot of variation over time. Saskatchewan, for example, dramatically reduced its liability-to-GDP ratio in the early 1990s. For this reason, **figure 2** shows the evolution of each province's ratio of combined debt to nominal GDP over the

Figure 1: Average ratio of debt to nominal GDP, by province, 1981–2022



Sources: Statistics Canada, 2009, 2024a, 2024d; author's calculations.

Figure 2: Total ratio of debt to GDP, by province, by year, 1981–2022

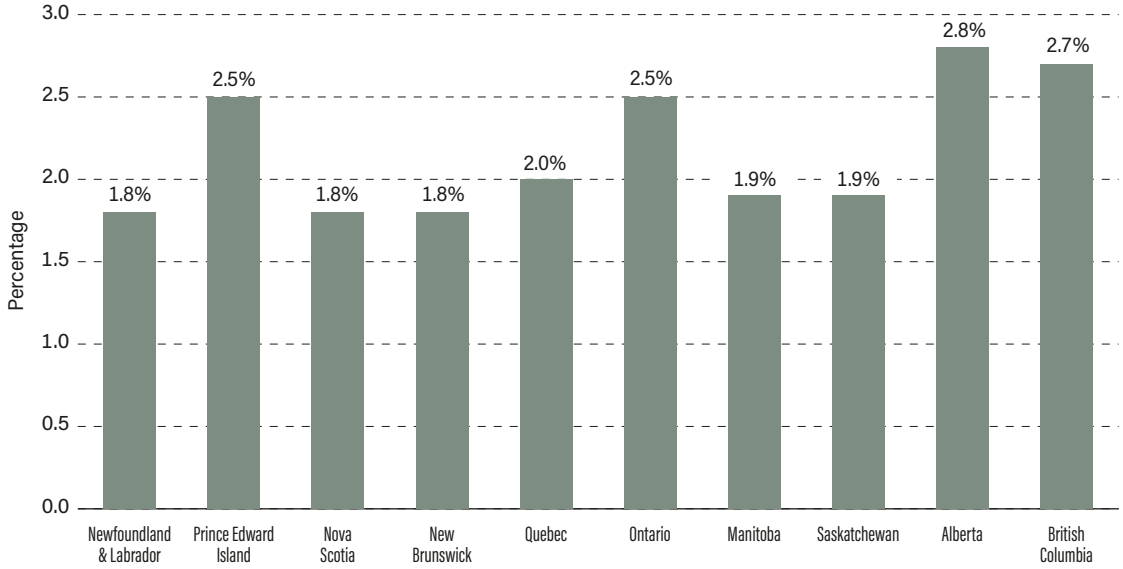


Sources: Statistics Canada, 2009, 2024a, 2024d; author's calculations.

41-year span of the data. The data show that total debt in each province peaked in the mid-1990s. This is the result not only of the federal government addressing its budgetary challenges, but of many provinces tackling their own debt and deficit issues around the same time. Key among these provinces were Saskatchewan, Alberta Newfoundland & Labrador, and Quebec. The 2000s were generally a period of falling debt loads as the federal government maintained balanced budgets, as did many of their provincial counterparts (or at least their debt grew slower than their economy). This period has been dubbed the Chrétien Consensus (Clemens, Lau, Palacios, and Veldhuis, 2017). This downward trend reversed in 2008/09 in the aftermath of the global financial crisis. While debt-to-GDP levels were roughly stable following the recovery, we see a dramatic increase in debt ratios during 2020 as the COVID pandemic and the associated public health measures increased spending and suppressed economic activity.

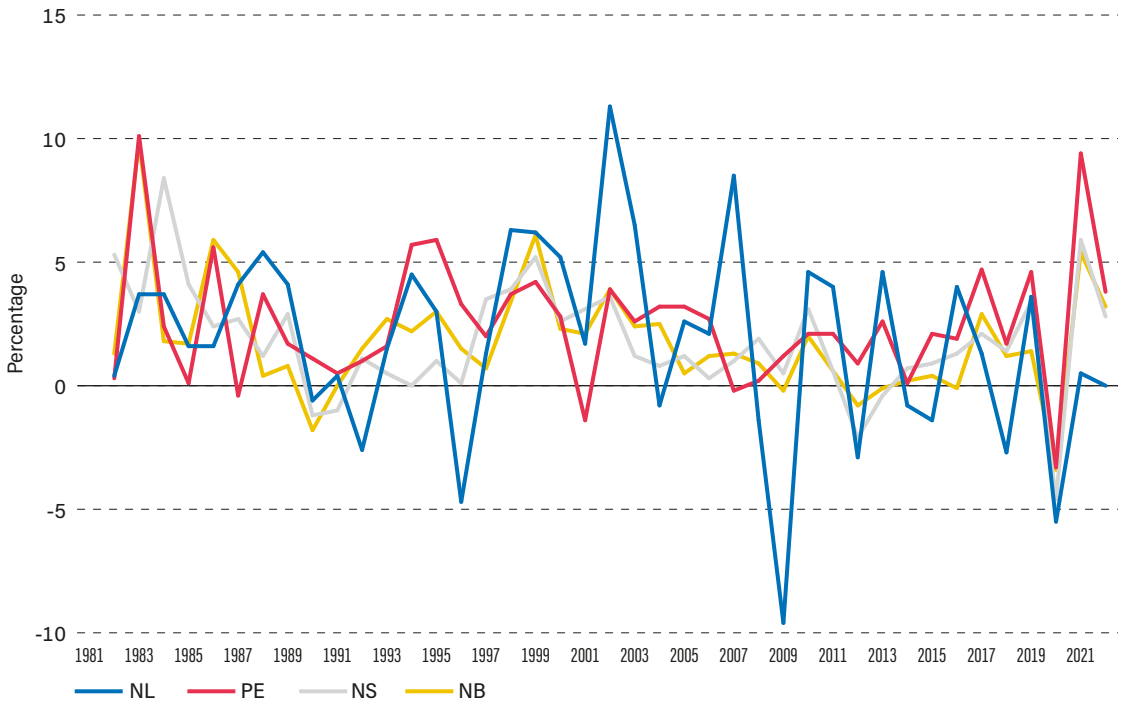
Despite talk of the Canadian economy as a cohesive whole, it is actually made up of very different economies, roughly centered around provinces. This can easily be seen by considering the growth rates of the individual provinces; **figure 3** shows the average growth rate of real GDP for each province. It is fairly easy to divide Canada into two groups, those with average growth rates of 2.0% or more (Prince Edward Island, Quebec, Ontario, Alberta, and British Columbia) and those growing more slowly. As with debt ratios, these averages hide a lot of variation over time. To make the chart of growth rates over time easier to read, we split the data into regions. **Figure 4A** shows growth rates of the four Atlantic Provinces, **figure 4B** shows the central provinces of Quebec, Ontario and Manitoba, and **figure 4C** shows the growth rates of the three westernmost provinces.

Figure 3: Average annual growth of real GDP, by province, 1981–2022



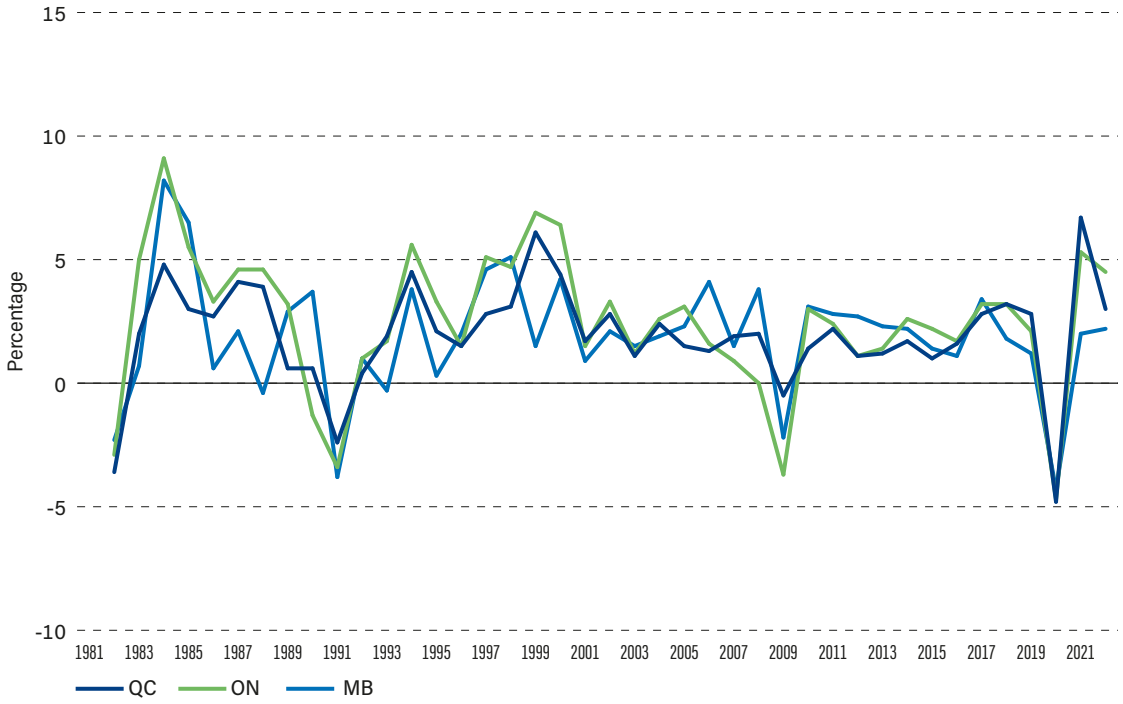
Sources: Statistics Canada, 2024d; author's calculations.

Figure 4A: Annual real GDP growth rates, Atlantic region, 1981–2022



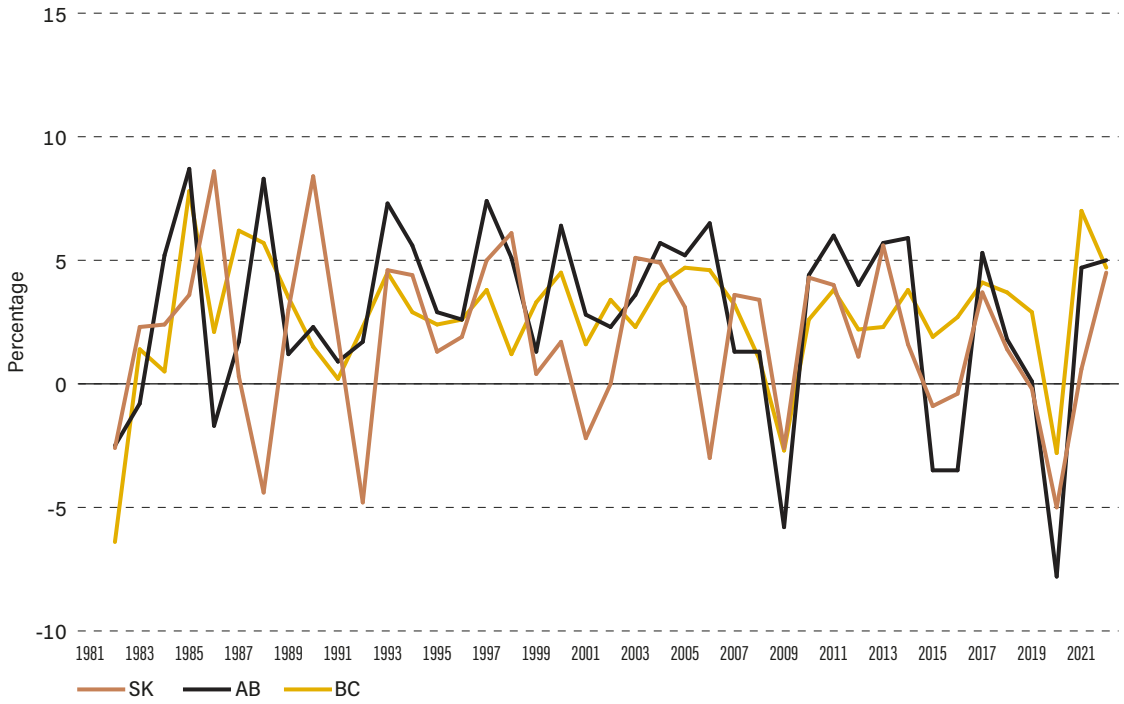
Sources: Statistics Canada, 2024d; author's calculations.

Figure 4B: Annual real GDP growth rates, Central region, 1981–2022



Sources: Statistics Canada, 2024d; author's calculations.

Figure 4C: Annual real GDP growth rates, Western region, 1981–2022



Sources: Statistics Canada, 2024d; author's calculations.

Clearly, those provinces that depend heavily on resource extraction, particularly oil extraction (Newfoundland & Labrador after 1987, Saskatchewan, and Alberta), are subject to substantial volatility in the level and value of economic activity. These provinces all see sharp swings in the rate of real GDP growth over time. While those in the central region show fewer periods of negative economic growth, those periods of shrinkage they have experienced match almost perfectly with recessions in the United States.

We now turn to a simple analysis of the relationship between provincial growth rates and provincial government liabilities.

3. Simple analysis

Reinhart and Rogoff (2010) use a remarkably large data set covering a wide variety of countries to perform their rather basic initial analysis. Most relevant to our purposes in this publication, they show average annual growth rates of GDP in advanced economies by level of debt in four ranges, under 30%, from 30% to 60%, from 60% to 90%, and over 90%. Correspondingly, we break down the experiences of Canadian provinces in using the same thresholds (**table 1**).

Table 1: Mean and median annual real GDP growth, by province and debt ratio using Reinhart and Rogoff categories, 1981–2022

	Below 30%		30%–60%		60%–90%		Above 90%	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Newfoundland & Labrador					2.4	4.05	1.83	1.67
Prince Edward Island							2.53	2.15
Nova Scotia					5.29	5.29	1.73	1.28
New Brunswick							1.84	1.51
Quebec					–0.77	–0.77	2.1	1.97
Ontario			–2.89	–2.89	2.96	3.14	2.31	2.5
Manitoba					2.19	0.65	1.89	2.07
Saskatchewan					1.74	2.33	1.95	1.86
Alberta			2.83	4	3	3.24	2.5	2.43
British Columbia			–2.5	–2.5	3.2	3.23	2.47	2.72
Overall mean	N/A		2.09		2.67		2.04	
Overall median	N/A		3.2		3.01		2.01	
Count	0		22		90		294	

Note: Means and Medians are calculated and reported for each province. The overall means and medians are the means and medians for all observations for the threshold.
Source: Author's calculations.

Blank cells in the chart indicate that the province in question never had a ratio of debt to nominal GDP in that range during the period from 1981 to 2022. The overwhelming bulk of the data falls into the over 90% debt-ratio category. No province in this period had a ration of debt to nominal GDP below 30% while every province experienced a ratio of combined debt to nominal

GDP over 90% during this period. Even the 30%-to-60% debt range is sparsely populated, with just 22 of 410 observations (5.4%) and all but three of these coming from Alberta. For this category, the average growth rate was 2.09% and the median 3.20%. The median growth rate was the highest of any category. The 60%-to-90% range offers much richer data, accounting for 90 observations (22%). Average and median growth rates equalled 2.67% and 3.01%, respectively. When the debt ratio exceeds 90%, the average growth rate was 2.04% while the median was a comparatively low 2.01%

This data is broadly consistent with Reinhart and Rogoff's (2010) finding of a slowdown in economic growth once the 90% debt-to-GDP ratio is breached. While growth does not fall off a cliff, there is a full percentage-point difference in the median growth rates and a 0.62 percentage-point difference in the average between provinces with debt loads in the 60%-to-90% range and those above 90%. If this difference is in fact tied to the debt-to-GDP ratio, reducing debt below the 90% threshold will add up to more than 6% extra economic activity over just 10 years.

Given there are no observations in the under 30% debt-ratio category and the bulk of observations exist in the over 90% category, **table 2** ignores cases in which debt rates are below 60% and breaks down observations in the more than 90% category into more refined groups. Read generally, table 2 suggests a decline in growth as debt increases, but this decline stabilizes after gross liabilities to GDP reach 120%. Again, it is important to stress that growth does not fall to zero once liabilities exceed 120% of GDP, but does appear to slow significantly. Moreover, elements of Canadian fiscal federalism, such as equalization and other federal transfers, may be masking the impact of excessive public debt on growth.

Taken together, tables 1 and 2 indicate that provinces carrying higher gross debt loads experience lower rates of economic growth. There are some interesting anomalies that suggest additional factors are at work. For example, Saskatchewan experienced a median economic growth rate of 4.36% while having a combined federal and provincial debt load in excess of 150% of GDP. This remarkable feat is the result of three consecutive years. Growth was –4.8% in 1992, 4.6% in 1993, and 4.4% in 1994. Though this occurred as Saskatchewan was taking steps to deal with its debt and deficits, it also reflects commodity prices, weather, and other factors not related to the province's debt load. Something similar can be seen with the experience of Newfoundland & Labrador, which twice experienced 4 consecutive years of growth rates over 4% when debt to GDP exceeded 150% (1987–1989 and 1998–2000). While the second can be explained by the start of oil production in the Hibernia field in 1997, we have no ready explanation for the first.

These observations concerning Saskatchewan and Newfoundland & Labrador do bring another possible link between economic growth and provincial debt to the fore. It is possible that a highly indebted jurisdiction will be more willing to accept the costs of new resource development or other projects than a jurisdiction without the pressure of high debt service.

Table 2: Mean and median annual real GDP growth, by province and debt ratio using adjusted categories, 1981–2022

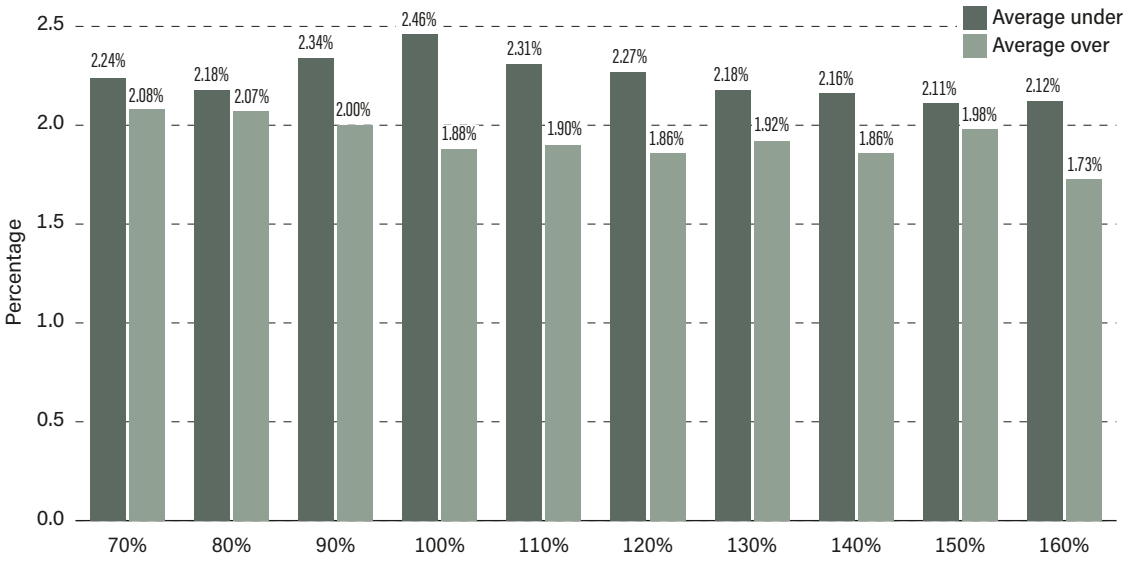
	60%–90%		90%–120%		120%–150%		Above 150%	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Newfoundland & Labrador	2.4	4.05	–0.09	0.62	2.95	3.67	2.3	1.7
Prince Edward Island			3.16	2.92	1.81	1.9	3.33	3.33
Nova Scotia	5.29	5.29	2.26	2.14	1.23	1	1.71	0.98
New Brunswick			1.25	3.1	1.62	1.28	1.8	1.87
Quebec	–0.77	–0.77	1.96	1.96	2.44	2.44	1.3	1.63
Ontario	2.96	3.14	3.09	2.68	–4.74	–4.74		
Manitoba	2.19	0.65	3.98	2.63	1.73	1.96	1.15	1.98
Saskatchewan	1.74	2.33	1.8	1.69	2.37	1.88	1.38	4.36
Alberta	3	3.24	2.11	2.5				
British Columbia	3.2	3.23	2.54	2.47				
Overall mean	2.67		2.27		1.83		1.98	
Overall median	3.08		2.34		1.76		1.98	
Count	90		121		122		55	

Note: Means and Medians are calculated and reported for each province. The overall means and medians are the means and medians for all observations for the threshold.
Source: Author's calculations.

To further consider the possibility of a threshold level for government liabilities as proposed by Reinhart and Rogoff (2010), we consider the mean (**figure 5**) and median (**figure 6**) growth rates of provinces above and below a variety of thresholds below. In these figures, we treat an observation as a province-year. For example, when the threshold is 70% we take either the simple average or the simple median of growth rates of one year (observations) from Quebec, eight years (observations) from Ontario, three years (observations) from Saskatchewan, 24 years (observations) from Alberta, and six years (observations) from British Columbia to calculate the rate of economic growth below the threshold. From figures 5 and 6, it appears there may be a threshold around or below 70%, but there are very few observations at that level (47 out of 410). There is a rise in economic growth rates as we move from the 80% threshold to the 100% threshold, which may suggest a debt threshold in that range. From this simple analysis we find some evidence of a threshold for a province's debt to GDP above which growth is slowed.

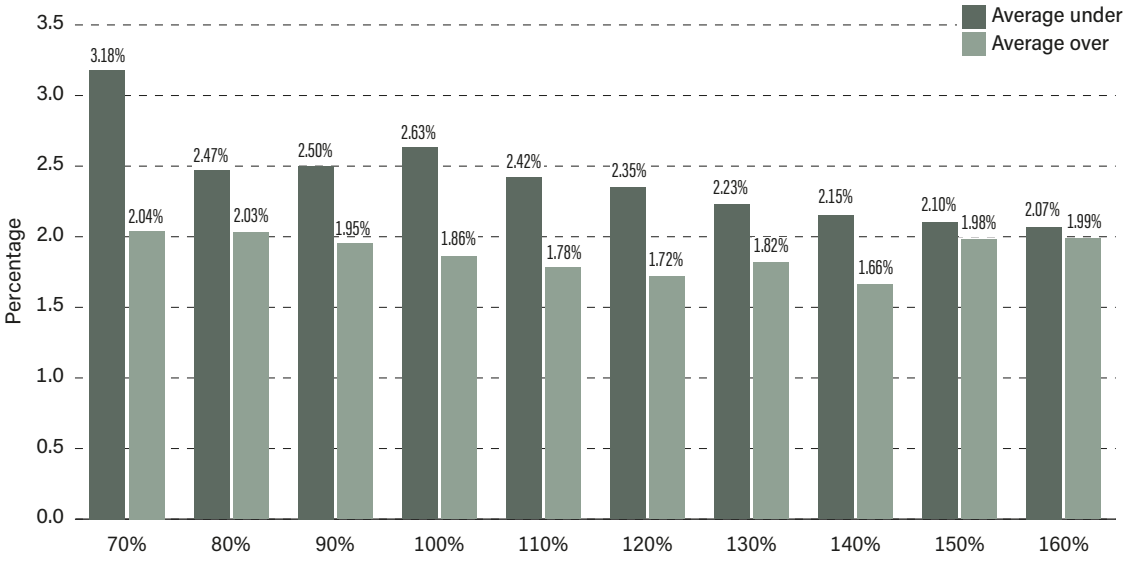
This analysis does not control any of the other factors that influence a region's rate of economic growth nor the possibility that slow economic growth causes a run-up of a region's debt-to-GDP

Figure 5: Mean economic (real GDP) growth, by debt threshold



Sources: Statistics Canada, 2009, 2024a, 2024d; author's calculations.

Figure 6: Median economic (real GDP) growth, by debt threshold



Sources: Statistics Canada, 2009, 2024a, 2024d; author's calculations.

ratio. This second possibility is clearly demonstrated by the increases in provincial debt during the pandemic. However, this argument can be overplayed as it is unlikely that a single year of slow economic growth will cause a province's debt ratio to move across any given threshold. To address these issues, we undertake a more rigorous econometric analysis.

4. Econometric analysis

A number of econometric approaches have been used by different researchers trying to understand the relationship between public debt and economic growth. Our approach to the data is informed by the techniques employed by Baum, Checherita-Westphal, and Rother (2013), who focus on data from countries of the European Monetary Union—later Eurozone. Baum, Checherita-Westphal, and Rother, like Reinhardt and Rogoff (2010) take real GDP growth as the dependent variable.

This work and others focused on countries in a monetary union (like Bokemeier and Greiner, 2015) are based, to some degree, on the Solow growth model or one of its variants. This means controlling for population growth and investment. As an extension to previous work, we break gross capital formation into two elements based on the economic agent undertaking the investment: we consider private-sector investment and government investment as separate elements.

In addition, Canada is a trading economy, with significant exposure to the US and world markets. To this end, we include a measure of trade openness for each province, calculated as the sum of exports and imports divided by GDP. In addition, we include a dummy variable for years in which the American economy was in recession as the United States is Canada's major trading partner.

As a final control variable we include the Bank of Canada's commodity price index. We also include a lag of the growth rate to generate a simple dynamic model for completeness. A list of the variables and their sources is included as **Appendix 1**.

We use Wang's (2015) method of estimating a fixed-effect panel threshold model. The resulting equation to be estimated is:

$$y_{i,t} = \alpha_i + \beta X_{i,t-1} + \gamma_1 d_{i,t-1} I(z_{i,t-1} \leq z^*) + \gamma_2 d_{i,t-1} I(z_{i,t-1} > z^*) + u_{i,t}$$

where $X_{i,t-1}$ is an array of independent explanatory variables (which includes openness, investment, population growth and the like), $d_{i,t-1}$ is the variable subject to a threshold—in this case the debt-to-GDP ratio, and I is an indicator function, taking a value of 1 if the condition in brackets is satisfied. The rate of real GDP growth is $y_{i,t}$. Note that the debt-to-GDP ratio ($d_{i,t-1}$) is lagged one period. This is done to reduce the likelihood of endogeneity between growth rates and debt levels.

We also considered a simple dynamic version of the model by including a lagged value of the dependent variable. In the complete model, we include a dummy variable for years in which debt reporting was based solely on the Financial Management System (FMS).

We begin with a benchmark model based on Baum, Checherita-Westphal, and Rother (2013).

$$y_{i,t} = \alpha_i + \beta_1 y_{i,t-1} + \beta_2 Openness_{i,t-1} + \beta_3 Investment_{i,t-1} + \gamma_1 d_{i,t-1} I(z_{i,t-1} \leq z^*) + \gamma_2 d_{i,t-1} I(z_{i,t-1} > z^*) + u_{i,t}$$

where $z_{i,t-1}$ is each province's total debt-to-GDP ratio.

Before turning to the results of the econometric model, it is important to understand what is being estimated. The structure of the model means that we are considering short-run growth rather than long-run growth, as the growth rate is only from one year to the next. There are two reasons for doing so. First, this approach preserves data allowing for a more robust approach to estimating a threshold model. Considering five-year growth rates, as is sometimes done, would reduce our data from 40 time periods to just 10. Second, the short-run approach sets the standard in favour of a positive effect of public debt. Any finding of no effect, or a negative effect, of debt on growth in this environment is much more meaningful than would otherwise be the case.

Table 3 shows the result of the static and dynamic benchmark single-threshold models. First entry in a cell is the coefficient, with the standard deviation in parentheses below. While the static model strongly suggests the existence of a threshold,[2] the dynamic model does not. In the static model, the impact of taking on additional government debt is much lower once the threshold of 104.66% of GDP has been reached. This finding is broadly in keeping with threshold findings in other research. However, it is highly likely that impact of the COVID-19 pandemic and the associated public health measures are skewing the estimates.[3] To assess this, in **table 4** we truncate the data at 2019.[4]

When data covering the COVID-19 years is excluded from the analysis, both the static and dynamic model support the existence of a threshold in the relationship between public debt and economic growth. In both models, the threshold is estimated to be between 104% and 105%. Once this threshold is crossed, the estimated positive impact of additional debt cut practically in half. In all remaining analysis, we truncate the data at 2019.

2 We did consider the possibility of multiple thresholds, but they were consistently without support.

3 While the pandemic clearly had a dramatic impact on the economy, the actions taken by both provincial and federal governments were not economic policy. The dramatic increase in debt ratios as a result of reduced economic activity as well as a massive increase in debt are likely to confound the underlying relationship between variables. This is particularly true as the recovery that took place in 2021 hardly fits the usual definition of economic growth, but does match the expected return of economic activity once public-health restrictions were relaxed. Thus, the data since 2019 captures the effect of public-health orders more than it captures economic relationships.

4 We alternately included a COVID-19 dummy variable for 2020 through 2022, which was negative and statistically significant at the 5% level. However, to properly control for the effects of COVID on the data, each variable included with the model would have to be interacted with this dummy, which would be overly cumbersome.

Table 3: Benchmark threshold panel regression model estimates, 1982–2022

Variable	Static Panel	Dynamic Panel
$y_{(t-1)}$		0.0454
		(–0.048)
Openness (t–1)	–0.0123	–0.0182
	(–0.0131)	(–0.0131)
Investment (t–1)	–0.0238	–0.0395
	(–0.046)	(–0.0456)
$d_{(t-1)}$ if $d \leq$ threshold	0.0468***	0.0344***
	(–0.0112)	(–0.0112)
$d_{(t-1)}$ if $d \geq$ threshold	0.0275***	0.0180**
	(–0.0074)	(–0.0076)
Threshold estimate	104.66***	104.97
Bootstrap p value (of threshold)	0.004	0.1187
Threshold Confidence Interval	100.80–104.97	100.37–105.09

Note: First entry in a cell is the coefficient, with the standard deviation in parentheses below. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Estimates of **Bootsrap p value** all use 1,500 replications.
Source: Author's calculations.

Table 4: Benchmark threshold panel regression model estimates, 1982–2019

Variable	Static Panel	Dynamic Panel
$y_{(t-1)}$		0.0924*
		(–0.0491)
Openness (t–1)	0.0025	–0.0077
	(–0.0125)	(–0.0124)
Investment (t–1)	–0.0611	–0.0605
	(–0.0436)	(–0.0437)
$d_{(t-1)}$ if $d \leq$ threshold	0.0483***	0.0338***
	(–0.0104)	(–0.0108)
$d_{(t-1)}$ if $d \geq$ threshold	0.0264***	0.0154**
	(–0.007)	(–0.0071)
Threshold estimate	104.97***	104.06*
Bootstrap p value (of threshold)	0.002	0.0547
Threshold Confidence Interval	101.01–105.09	100.57–104.38

Note: First entry in a cell is the coefficient, with the standard deviation in parentheses below. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Estimates of **Bootsrap p value** all use 1,500 replications.
Source: Author's calculations.

However, the benchmark model is remarkably simple, excluding several potentially important explanatory variables. It is also unsettling to see that investment appears not to have a significant relationship with growth. To this end, we extend the benchmark to disaggregate investment spending and to include additional explanatory variables. In the extended model (**table 5**), we also include a dummy variable for years in which the FMS was the sole basis for reporting government liabilities.

Table 5: Threshold panel regression model, 1982–2019, including addition control variables

Variable	Static Panel	Dynamic Panel
$y_{(t-1)}$		0.0684
		(–0.0475)
Openness (t–1)	–0.0031	–0.0039
	(–0.0138)	(–0.0138)
Private investment (t–1)	0.022	0.0156
	(–0.0476)	(–0.0478)
Government investment (t–1)	–0.4235**	–0.3840**
	(–0.183)	(–0.1848)
Population growth	–0.3155	–0.314
	(–0.2466)	(–0.2462)
US recession (dummy)	–0.0168***	–0.0171***
	(–0.0041)	(–0.0041)
Change in commodity index	0.0001***	0.0001***
	(0)	(0)
Financial Management System dummy	0.0048	0.004
	(–0.0041)	(–0.0042)
$d_{(t-1)}$ if $d \leq$ threshold	0.0291***	0.0278***
	(–0.0103)	(–0.0104)
$d_{(t-1)}$ if $d \geq$ threshold	0.0112	0.0106
	(–0.0069)	(–0.0069)
Threshold estimate	101.63*	101.63*
Bootstrap p value (of threshold)	0.0553	0.0653
Threshold Confidence Interval	98.49–102.03	98.48–102.03

Note: First entry in a cell is the coefficient, with the standard deviation in parentheses below. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Estimates of **Bootsrap p value** all use 1,500 replications.
Source: Author's calculations.

Comfortingly, there are no qualitative differences between the static and simple dynamic models. Both yield threshold estimates of 101.63%. Both find that additional debt accrued below the threshold adds to the following year's economic growth. However, once the threshold is breached, additional debt offers no benefit to economic growth.

Among the other variables included in the model, the disaggregation of investment is perhaps the most startling. Last year's private investment is not found to have a significant relationship with this year's economic growth. Last year's government investment is found to have a *negative* relationship with this year's economic growth. Several possible explanations for this phenomenon come to mind as deserving exploration in future work. It is possible that the time horizon considered here is too short for either private or government investment to pay dividends in achieving economic growth. It is possible the decline in economic activity after a project is completed overwhelms the positive impact of the project itself. It may be that the region is better off for having the project completed than not having it at all, but in any given year the benefits of building the fixed capital outweigh the benefits of the completed project.

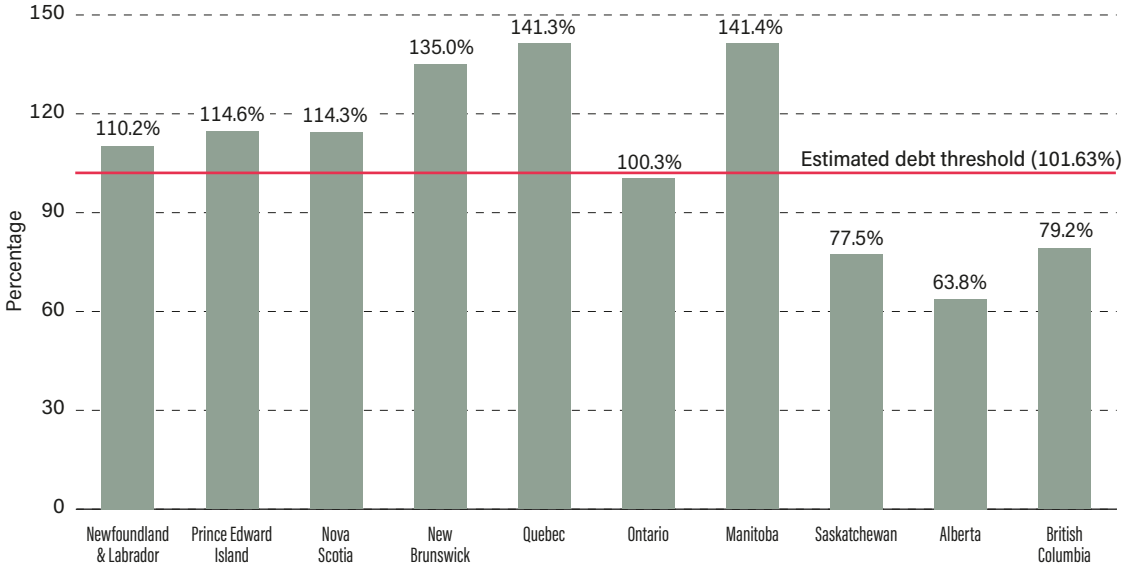
It may also be that the crowding-out effects of government investment render the costs of most projects undertaken larger than the benefits of the projects themselves, resulting in a negative relationship between economic growth and government investment spending. This would be wholly consistent with government projects undertaken for non-economic reasons. If this is the case, the cost to economic growth should still enter debate over the desirability of the project.

The finding that a recession in the United States has a significant and negative effect on economic growth in Canadian provinces should surprise exactly no one. The United States has been Canada's largest trading partner for decades, despite some attempts to diversify our trading portfolio. As a result, we are likely to remain strongly influenced by the performance of the US economy.

Canada has long had a reputation—sometimes embraced, sometimes scorned—as hewers of wood and drawers of water. The finding that there is a significant relationship between the Bank of Canada's commodity price index and provincial economic growth is entirely consistent with a resource-based economy.

If the thresholds estimated in the more rigorous analysis reflect conditions facing all Canadian provinces, only three provinces (Saskatchewan, Alberta, and British Columbia) are likely to see any short-run benefit from an expansion of debt-financed government spending. The remaining seven are likely to see no benefit or even see economic growth slowed when their debt ratios increase. If thresholds derived from studies of international data are more accurate, only Alberta has any room to expand its debt faster than economic growth. **Figure 7** shows each province's ratio of combined federal and provincial liabilities to GDP as of 2022 as well as the estimated threshold (101.63%) from table 5.

Figure 7: Current combined federal and provincial debt loads as a percentage of GDP, by province, 2022; and estimated debt threshold



Sources: Statistics Canada, 2024a, 2024d; author's calculations.

5. Conclusions

Canada, like most developed countries, has recently seen a dramatic increase in public debt. The Canadian debt story is complicated by the fact that Canadian provincial governments as well as the Canadian federal government can and do carry significant public debt.

There are a multitude of direct and indirect reasons to be wary of rising government debt. The simple mechanics of debt service mean that higher debt levels lead to a redistribution of wealth from taxpayers in general to those financially comfortable enough to lend to government. Similarly, higher debt service reduces the funds available for other government funding priorities at a given tax rate. In addition to these direct reasons, there is a growing body of evidence that suggests high levels of government debt impedes economic growth.

Economic growth is fundamental to improving living standards and improving the provision of public services. However, the causes of economic growth are imperfectly understood at best. Canada is expected to struggle in the coming decades to maintain the same rates of economic growth as its peers and may not even keep pace with its projected population growth. Given this outlook, it is essential that Canadian policy makers consider all possible avenues to support economic growth, including taking steps to reduce debt at all levels of government.

We add to the literature concerning the relationship between public debt and economic growth by analyzing the relationship in Canadian provinces using three approaches. The first approach mirrors that used by Reinhart and Rogoff (2010) by aggregating all provinces by their debt-to-GDP ratios and computing the simple average of economic growth rates. When using the same categories, we find provinces with debt loads below 60% have the highest median growth rate and that growth rates fall as debt ratios pass thresholds of 60% and 90%. This approach clearly suggests that higher provincial debt-to-GDP ratios correspond to slower economic growth. A refinement of the categories to reflect the reality of debt for Canadian provinces further supports a decline in growth rates as debt levels rise.

We then considered a wide array of narrow thresholds for debt ratios and calculated separate average growth rates for those provinces above the threshold and those provinces below the threshold. No matter the threshold, provinces below the threshold grew faster than those above the threshold. However, we did see an increase in the average growth below the threshold as the threshold moved from 70% of GDP to 100% of GDP. This suggests that there may be a debt threshold in the neighbourhood of 100% of GDP.

Finally, we used a fixed-effects threshold panel-data procedure to estimate a threshold value for debt in the relationship between debt and growth. This approach allows each province to differ systematically from the others, while preserving the notion of a common debt threshold. We find that short-term benefits of increasing the government debt-to-GDP ratio decrease dramatically once the debt-to-GDP ratio exceeds 100%. Thus, increasing debt beyond this threshold offers little or no return in economic growth. In other words, governments in Canada cannot spend themselves into prosperity. Equivalently, expanding debt today in the expectation that future growth will make the burden of additional debt manageable is unlikely to prove a fruitful strategy. Our estimates also show that government investment is not only unconducive to economic growth, but may actually reduce economic activity.

The panel-data approach focused solely on short-term economic growth rather than the long term in an effort to preserve as much data for analysis as possible. This approach effectively "stacks the deck" in favour of a positive relationship between increased debt-to-GDP ratios and economic growth. As can be seen in figure 2, debt-to-GDP ratios increase dramatically during contractions of GDP. There are no truly multi-year recessions in the data set, meaning that an increase in a province's debt-to-GDP ratio in a recession is immediately followed by the increased economic activity of a recovery.

As we have used three relatively simple approaches to a merged data set our results should be taken as demonstrative, not definitive. It is still possible that these findings do not exactly describe the potential outcomes for any individual province when increasing or decreasing its debt. However, taken in conjunction with the growing body of literature, there is ample reason for policy makers to exercise caution when thinking of expanding government debt. It is also likely that fiscal federalism as practiced in Canada masks some of the negative relationship between economic growth and public debt. Programs like equalization raise additional taxes (through progressive income taxes) in faster growing regions and redistribute the revenue to regions with weaker economic performance.

Finally, given the relationships between public debt and economic growth found in this study, the additional debt accrued by the federal government over the past five years is more likely to slow than enhance economic growth, particularly in those regions already lagging behind others. The resulting slower growth makes debt more onerous for both provincial and federal governments and hinders our ability to provide the services Canadians demand.

Appendix

Variable	Data Source	Vector
Provincial Liabilities 1981-2008 Note: Financial Management System Basis Pliab	Statistics Canada table 10-10-0052-01	NL: v151598, PE:v151621, NS: v151643, NB: 151663, QC: v151685, ON: v1511708, MB: v151731, SK: v151754, AB: v151776, BC: v151798 Less Vectors (Deposits) NL: v151607, PE: v151629, NS: v151650, NB: v151671, QC: v151694, ON: v151717, MB: v151740, SK: v151763, AB: v151785, BC: v151807
Provincial Liabilities 2007 to 2022 Note: Canadian Government Finance Statistics Basis Pliab	Statistics Canada table 10-10-0017-01	NL: v91575056, PE: v91575318, NS: v91575580, NB: v91575842, QC: v91576104, ON: v91576366, MB: v91576628, SK: v91576890, AB: v91577152, BC: v91577414
NGDP	Statistics Canada table 36-10-0222-01	NL: v62787417, PE: v62787534, NS: v62787651, NBv62787768, QC: v62787885, ON: v62788002, MB: v62788119, SK: v62788236, AB: v62788353, BC: v62788470
RGDP (Constant 2017 Prices)	Statistics Canada table 36-10-0222-1	NL: v62790166, PE: v6790205, NS: v62790244, NB: 62790283, QC: v62790322, ON: v62790361, MB: v62790400, SK: v62790439, AB: v62790478, BC: v62790517
Population Pop	Statistics Canada table 17-10-0005-01	NL: v466983, PE: v467298, NS: v467613, NB: v467928, QC: v468243, ON: v468558, MB: v468873, SK: v469188, AB: v469503, BC: v469818, Canada: v466668
Gross Fixed Capital Formation (Constant 2017 Prices) Invest	Statistics Caada table 36-10-0222-01	NL: v62790138, PE: v62790177, NS: 62790216, NB: v62790255, QC: v62790294, ON: v62790333, MB: v62790372, SK: v62790411, AB: v62790450, BC: v62790489
Working Age Population	Statistics Canada table 17-10-0005-01	NL: v467286, PE: v467601, NS: v467916. NS: v467916, NB: v468231, QC: v468546, ON: v468861, MB: v469176, SK: v469491, AB: 469806, BC: v470121, Canada: v466971

Variable	Data Source	Vector
Gov't Gross Fixed Captial Formation (Constant 2017 Prices) Ginvest	Statistics Canada table 36-10-0222-01	NL: v62790146, PE: v62790185, NS: v62790244, NB: v62790263, QC: v62790302, ON: v62790341, MB: v62790380, SK: v62790419, AB: v62790458, BC: v62790497
Exports (Constant 2017 Prices) rExports	Statistics Canada table 36-10-0222-01	NL: v62790151, PE: v62790190, NS: v62790229, NB: v62790268, QC: v62790307, ON: v62790346, MB: v62790385, SK: v62790424, AB: v62790463, BC: v62790502
Imports (Constant 2017 Prices) rImports	Statistics Canada table 36-10-0222-01	NL: v62790158, PE: v62790197, NS: v62790236, NB: v62790275, QC: v62790314, ON: v62790353, MB: v62790392, SK: v62790431, AB: 62790470, BC: v62790509
General Government Final Consumption expenditure Govt	Statistics Canada table 36-10-0222-01	NL: v62790137, PE: v62790176, NS: v62790215, NB: v62790254, QC: v62790293, ON: v62790332, MB: v62790371, SK: v62790410, AB: v6790449, BC: v62790488
Consumer Price Index CPI	Statistics Canada table 18-10-0005-01; author's calculations	NL: v41693542, PE: v41693677, NS: 41693811, NB: v41693946, QC: v41694081, ON: v41694217, MB: v41694353, SK: v41694489, AB: v41694625, BC: v41694760
Federal Government Liabilities 1981 to 2008 Note Financial Management System Basis Fliab	Statistics Canada table 10-10-0052-03	V151555
Federal Government Liabilities 2007 to 2022 Note: Canadian Government Finance Statistics Basis Fliab	Statistics Canada table 10-10-0016-01	V91574709
Bank of Canada Commodity Price Index (Total) Pitot	Commodity price index—Bank of Canada	

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