PROSPERA

Quebec's Economic Barometer:
The Energy Transition

2024

Propulsé par :

BCF quadrat

Préparé par :

DL CONSULTATION

Table of contents

Introduction 5

Le Quebec des 40 dernières années à vol d'oiseau 7

Résultats globaux 9

Les grands blocs qui ont contribué à la meilleure performance relative de l'économie du Quebec 11

Quelles variables affectent le plus le Baromètre ? 14

Le contexte énergétique québécois 21

Les grands messages à tirer des resultats 27

Méthodologie 30

Tableaux annexes 34

Julie Doré

Managing partner, lawyer and member of the Executive Committee at BCF

Alain Robichaud

Founding president of Quadrat Conseils

A Word from Julie Doré and Alain Robichaud

Quebec's economy and prosperity are a top of priority for all of us.

For these reasons, BCF Business Law, the go-to firm for business leaders, entrepreneurs, and growing companies, and Quadrat Conseils have joined forces to launch Prospera, The Quebec Economic Barometer. This unique barometer delves into Quebec's long-term economic performance, comparing it to Ontario's and Canada's, providing unparalleled insights for a fairer and more accurate analysis of its vitality.

This detailed document represents the structural aspects of our economy, allowing you to deepen your understanding of the forces and factors that have shaped Quebec's prosperity and economic success. The energy transition is highlighted, among other things, as a significant issue, with the province already having an undeniable advantage thanks to its hydroelectric production.

This energy transition is crucial for fostering sustainable economic growth for the province. The document emphasizes the importance of accelerating this transition to preserve Quebec's advantage and become a key player in this field.

Enjoy the read.

Introduction

In this report, we present Prospera, Quebec's Economic Barometer, an innovative index designed to analyze the significant trends that have shaped the economy in Quebec, Ontario, and Canada as a whole over the past four decades. Unlike traditional indices that focus on short-term variations in the economic cycle, the Barometer stands out by focusing on the long-term sustainability of economic performance. This approach is especially important in light of the Quebec government's aim of reducing the gap in real GDP per capita between Quebec and Ontario from 13% in 2023 to 10% by 2026[1].

The Barometer does not aim to track real-time fluctuations in economic activity or replicate economic cycles. Instead, its purpose is to forecast future economic trends over a period of 5 to 10 years, focusing on structural dynamics rather than cyclical fluctuations. This approach rounds out the Quebec government's initiatives, helping to boost Quebec's economic prosperity index, with growth estimated at between 20% and 30%, depending on the period under review. The methodology compiles 28 variables that influence economic performance, including economic growth, investment, human capital, energy, and environmental issues.

The aim of the Barometer is to inform and guide debates on the effectiveness of public policies in Quebec and Canada.

In an effort to provide a relative comparison between the jurisdictions under review rather than an absolute one, the index is set at a base value of 100 starting in 1980.

The Barometer is designed to inform and guide discussions on the effectiveness of public policy in Quebec and in Canada as a whole. The report opens with a summary background of Quebec's economy and goes on to examine the Barometer's performance over time, comparing the three jurisdictions under review and assessing the impact of specific variables. Its conclusion contains in-depth results analysis and subsequent strategic policy recommendations.

The report's 2024 edition focuses on the topic of energy, with energy demand and energy efficiency accounting for two of the Barometer's variables.

1 Government of Quebec (2024). Budget 2024-2025.

Forty-year Overview of Quebec's Economy

Forty-year Overview of Quebec's Economy

Since the 1960s, Quebec has made remarkable economic progress, leading to its population's steadily rising living standards, which eventually came to exceed Ontario's.

Until the late 1980s, living standards in Quebec rose slowly and unevenly, with hydroelectric megaprojects accounting for a significant proportion of the increase. From 1990 onward, however, Quebec's economic progression gained momentum and has since held firm. According to Fortin (2023)[2], five developments underpin this favourable development:

Quebec's sustained economic performance since the 1980s is no accident; it is the result of structural trends that are deeply rooted in the Quebec economy.

01. Educational reforms introduced in the 1960s produced tangible results 20 years later, including an especially dynamic generation of entrepreneurs.

02. Lasting social peace was achieved following intense social conflicts in the 1970s and early '80s.

03. Economic globalization began to accelerate, fostered by a new generation of educated entrepreneurs, more flexible World Trade Organization rules, and the Canada-US Free Trade Agreement.

04. Pioneering family policies, including parental leave and child care, enabled women to enter the job market, boosting their employment rate to world-leading levels.

05. In 1996, the province's debt burden began to decline significantly, mainly as a result of falling interest rates, but also due to the Quebec government's budget-consolidation efforts.

To sum up, Quebec's sustained economic performance since the 1980s owes nothing to luck; instead, it is due to structural trends that are firmly anchored in the province's economy. In the next section, we take a closer look at this economic growth, using the Barometer's results.

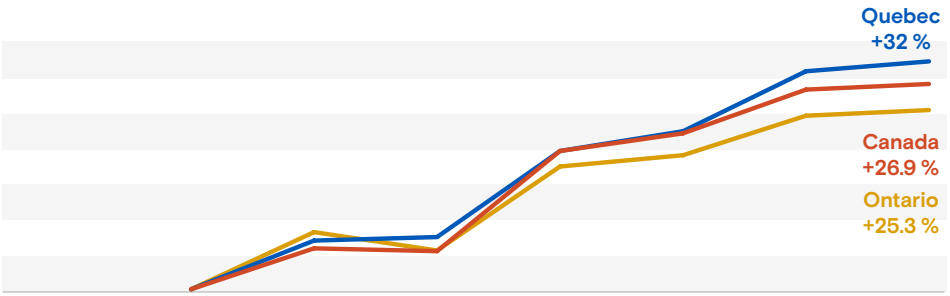
2 Fortin, Pierre (2023). *L'économie du Quebec : brève histoire et perspective* (Quebec's economy: brief history and outlook)..

Results Overview

Résultats globaux

Data from the 2022 edition of the Barometer place Quebec at the top of the ranking with an index of 132.3, surpassing both Canada as a whole (129.1) and Ontario (125.4). As these figures reveal, since 1980, Quebec's economy, as gauged by the Barometer, has improved by 32.3%, as compared with 29.1% for the country as a whole and 25.4% for Ontario. Figure 1 traces this progression for all three jurisdictions from 1980 to 2022.

Figure 1:
Economic barometer from 1980 to 2022 in Canada as a whole, Quebec, and Ontario



	1980	1989	1993	2007	2009	2021	2022
Canada	100	105.8	105.4	119.6	122.1	128.3	129.1
Quebec	100	106.9	107.4	119.6	122.4	130.9	132.3
Ontario	100	108.1	105.5	117.4	119.0	124.6	125.4

The index results show that in 2022, Quebec will lead the way at 132.3, followed by Canada at 129.1 and Ontario at 125.4.

In the 1980s, Ontario led the way with strong economic performance, only to undergo a significant downturn due to the 1989-1993 recession. From 1994 to 2007, all three jurisdictions performed well, with the country as a whole slightly outperforming the province of Ontario.

With varying impacts, the 2008-2009 recession was a challenge for all three jurisdictions, with Quebec managing to maintain good results and Ontario experiencing further decline in the midst and aftermath of the crisis.

Since 2010, all three jurisdictions have generally performed well, with Quebec holding on to its lead. It is worth noting that the COVID-19 crisis has had a relatively minor impact on the index. In fact, sluggish exports and economic growth have been offset by improved energy efficiency, the growing adoption of renewable energies, and an upturn in household finances.

Reasons for the Quebec Economy's Competitive Performance

Reasons for the Quebec Economy's Competitive Performance

How have Quebec's underlying trends enabled it to outpace the province of Ontario and the country as a whole in relative economic terms? To what specific variables does it owe its economic growth? The two sub-sections below provide answers to these questions.

Table 1 casts light on the first of the two crucial questions above. It gathers variables into six major categories and presents each category's contribution to changes in each jurisdiction's Economic Barometer. For a detailed list of the variables included in each category, see Table A.1 in the appendix.

Six categories of prosperity index variables

Human capital
Growth
Investment
Business Environment
Households

Table 1:
Each category's contribution to the Economic Barometer of Canada, Quebec, and Ontario from 1980 to 2022

		Human capital	Growth	Investment	Companies	Environment	Households
Canada	**%**	22.4	12.9	43.3	3.2	22.7	-4.5
Quebec	**%**	17.3	23.7	42.3	2.4	17.2	-3.0
Ontario	**%**	18.1	24.8	38.0	5.1	23.8	-9.8

Note : Percentages in this table may not total 100.0% due to rounding.

Table 1 presents the percentage contributions to the Barometer from 1980 to 2022. Broadly speaking, all categories contributed favourably to each of the jurisdictions, with the exception of "Households," which points to a worrying trend. Median income made a positive contribution to prosperity in all jurisdictions throughout this period; however, household debt may have hampered growth significantly, resulting in less financial leeway and systematically offsetting the positive effect of income gains.

As Table 1 clearly shows, "Investment" (at line 3) had the greatest impact on the index in each jurisdiction, accounting for 43.3% of economic prosperity in the country as a whole, 42.3% in Quebec, and 38% in Ontario.

"Environment" (line 5) generally ranked second with respect to the categories' contribution, while "Growth" (line 2) and "Human capital" (line 1) vied for third place depending on jurisdiction.

Conversely, variables relating to “Companies” (line 4), including industrial concentration, number of active owners of incorporated companies without employees, and capital intensity, contributed only slightly to index growth throughout the period.

As outlined above, due to household debt, the category of “Households” (line 6) weighed down the Barometer to varying degrees. In the next section, we take a closer look at the six categories and focus on the specific variables that contribute most significantly to the Barometer’s progression.

Variables with the Greatest Impact on the Barometer

Variables with the Greatest Impact on the Barometer

A variable's contribution to the index depends on its growth over time and weight.

Any given variable's contribution to the index depends both on its growth over time and its weighting.

Weighting has an inverse correlation to variance, that is, variables that are more stable over time, hence presumably more reliable and more predictive of performance, are awarded greater weighting.

Table 2 below provides a ranking of the variables that contributed most and least to index growth from 1980 to 2022 in the three jurisdictions.

Tables 3 and 4 present the same information, but for shorter periods. In seeking to isolate the factors that contribute to improved Barometer performance, our findings show that the variables presented in these tables strongly support economic prosperity.

The first observation is that there is relatively little movement at the top and bottom of the rankings over time. Very positive or very negative variables tend to remain so. This indicates that the same factors recur either as catalysts for or hindrances to prosperity in Quebec and the other jurisdictions under review.

Table 2 :
The variables with the most and least positive impact in each jurisdiction, 1980-2022

	Canada		Quebec		Ontario	
Rank	Variable	%	Variable	%	Variable	%
1	R&D expenditure	17.9	GDP / Pop 15-64	21.1	GDP / Pop 15-64	20.8
2	Post-secondary graduation rate	17.3	Post-secondary graduation rate	15.0	R&D expenditure	16.8
3	GDP / Pop 15-64	16.0	Capital stock / Pop	14.6	Post-secondary graduation rate	16.6
26	Population of working age	-3.8	Household debt / disposable income	-4.6	Net debt / GDP	-5.2
27	Household debt / disposable income	-6.7	Population of working age	-8.4	Household debt / disposable income	-12.1
28	Imports	-12.0	Imports	-10.2		-13.5

Note : The relative contribution of each variable is shown in the right-hand column for each jurisdiction.

First, looking at the 1980-2022 period for Quebec, we note the strong contribution of per capita economic growth (measured by the ratio of GDP to the population aged 15 to 64), which crowns the trio of the most positive factors (exerting the greatest influence on the Barometer), followed by the per capita post-secondary graduation rate and the per capita stock of fixed capital.

It is also worth noting that the post-secondary graduation rate, which has been a major growth factor in Quebec since the 1990s, does not appear in the 1980-1988 results. In all likelihood, the increase in human capital was also significant in the 1980s; unfortunately, yearly graduation-rate data prior to 1990 are not available. As a result, this variable is absent from the 1980-1988 ranking.

These findings point to an important general conclusion, namely, that in addition to sustained per capita growth, investment in physical and human capital are crucial and ongoing drivers of economic prosperity in Quebec.

Sustained per capita growth and investment in physical and human capital **are crucial and lasting drivers of Québec's economic prosperity.**

According to economic theory, infrastructure has always been the cornerstone of long-term growth. In turn, education, with its multiple direct and ancillary impacts, has become an increasingly important factor in accounting for today's economically healthy ecosystems.

Together, these variables account for half the rise in the index in Quebec over the past 40 years.

As for Ontario and Canada as a whole, GDP per working-age population and the proportion of post-secondary graduates are also among the three main factors driving improvements in their respective indices. Unlike the situation in Quebec, however, R&D investment is a key economic growth factor for Ontario and the country as a whole.

In addition, the index in all three jurisdictions is negatively affected by certain variables, such as imports, the ratio of household debt to disposable income, and the proportion of the population aged 15 to 64. The preponderance of imports is due to the Quebec economy's openness and international trade growth – it is not particularly worrisome inasmuch as exports are also on the rise. In addition, the negative impact of private debt and population ageing is worth noting.

To extend our assessment, we examined the impact of individual variables over five shorter periods: 1980-88, 1989-93, 1994-2007, 2008-09 and 2010-2022. This breakdown is designed to separate recession intervals from growth periods. The first three rows of tables 3 and 4 present the three variables with the largest positive impacts by jurisdiction and period. The last three rows in these tables show the three most negative variables.

We conclude that these three jurisdictions were stimulated by strong investment between 1980 and 1988, both in R&D and fixed capital. Economic growth in the 1980s also helped maintain good performance.

By contrast, real median after-tax income fell in all three jurisdictions. Ontario recorded a lesser decline during this sub-period and outperformed Quebec and the country as a whole.

In 1989, Ontario attained an index value of 108.3, but was hit harder by the recession than Quebec and the country as a whole. This was due in large part to a decrease in the employment rate, a decrease in median household income, and an increase in household and public debt.

In addition to its more diversified economic structure, Quebec's long-term outlook – including focusing on bolstering performance with regard to post-secondary education and fixed capital investment – enabled it to stave off a downturn during this sub-period.

Table 3 :
The variables with the most and least positive impact on the Barometer, 1980-1988, 1989-1993 and 1994-2007

	1980-1988[3]					
	Canada		**Quebec**		**Ontario**	
Rank	Variable	%	Variable	%	Variable	%
1	R&D expenditure	32.1	GDP / Pop 15-64	30.1	R&D expenditure	23.9
2	GDP / Pop 15-64	22.4	R&D expenditure	27.4	GDP / Pop 15-64	23.4
3	Fixed capital stock per capita	12.8	Gross fixed capital formation	16.7	Gross fixed capital formation	14.9
14	Long-term unemployment rate	-3.6	Long-term unemployment rate	-3.5	Median after-tax income	-0.8
15	Median after-tax income	-4.6	Median after-tax income	-5.5	Private foreign investment in Canada	-2.1
16	Imports	-12.6	Imports	-10.6	Imports	-11.0
	1989-1993[4]					
1	Post-secondary graduation rate	42.1	Post-secondary graduation rate	55.5	Post-secondary graduation rate	19.1
2	R&D expenditure	37.7	Fixed capital stock per capita	51.9	R&D expenditure	18.4
3	Overall workforce participation 45-64	21.4	R&D expenditure	51.0	Exports	15.4
20	Long-term unemployment rate	-21.2	Population of working age	-23.9	Population of working age	-27.3
21	Household debt to disposable income ratio	-21.5	Net debt / GDP	-24.1	Long-term unemployment rate	-27.8
22	Median after-tax income	-25.1	Median after-tax income	-28.1	Net debt / GDP	-40.3
	1994-2007[5]					
1	Post-secondary graduation rate	18.5	Post-secondary graduation rate	20.9	Post-secondary graduation rate	20.9
2	R&D expenditure	12.5	GDP / Pop 15-64	17.4	GDP / Pop 15-64	13.9
3	Energy efficiency (GDP divided by energy consumption)	11.9	Fixed capital stock per capita	12.3	Gross fixed capital formation	11.6
25	Private foreign investment in Canada	-3.9	Private foreign investment in Canada	-5.0	Private foreign investment in Canada	-5.1
26	Household debt to disposable income ratio	-7.7	Household debt to disposable income ratio	-8.6	Imports	-10.6
27	Imports	-9.9	Imports	-10.6	Household debt to disposable income ratio	-10.8

Note : The figures are a percentage of the total increase/decrease in a given jurisdiction over each period.

3 There are no data for some variables during this sub-period. Though initially selected, the "Professional occupations" variable was omitted from the rankings, as it contributed to the index in only one year over the course of the sub-period.

4 There are no data for some variables during this sub-period. Ontario rankings contain an additional variable, as the "Business value sold abroad / GDP" variable was available for this province during the 1988-1993 sub-period. The "HHI net exports - industry" variable was omitted from the ranking, as it contributed to the index in only one year in this sub-period.

5 The variable "Electricity capacity from renewable sources" was excluded as it was available only for two years in this sub-period.

From 1994 to 2007, all three jurisdictions recorded sustained improvements in their economic prosperity, due mainly to an upsurge in post-secondary education and growth in GDP output by the working-age population. Fixed capital investment, exports, and energy efficiency also rose in this sub-period, as did household debt levels.

The 2008-2009 recession hit Ontario harder, once again, than Quebec or the country as a whole. Rising long-term unemployment, falling employment rates, and declining diversity in net exports all contributed to Ontario's more severe downturn. Improved environmental performance helped boost the index in Quebec in 2008-2009.

Starting in 2010, all three jurisdictions posted sustained improvements, with comparable increases in Ontario and Canada as a whole, and a slightly larger rise in Quebec. Sustained economic growth, increased energy efficiency, greater renewable energy potential, and greater post-secondary education rates were the leading factors behind this improvement. Meanwhile, a drop in the proportion of the population of working age dragged the indices down.

Table 4 :
The variables with the most and least positive impact on the Barometer in each jurisdiction, 2008-2009 and 2010-2022

	2008-2009					
	Canada		**Quebec**		**Ontario**	
Rank	Variable	%	Variable	%	Variable	%
1	Private foreign investment in Canada	30.0	Private foreign investment in Canada	28.7	Household debt to disposable income ratio	25.1
2	Capital intensity/	17.5	HHI - Net exports	12.4	Exports	20.0
3	GHG emissions per capita	15.1	Fixed capital stock per capita	11.8	Venture capital	13.6
26	Exports	-7.3	Exports	-5.0	EHI industrial concentration	-21.1
27	Venture capital	-8.4	Venture capital	-8.4	GHG emissions per capita	-34.1
28	Household debt to disposable income ratio	-14.4	Household debt to disposable income ratio	-11.9	Private foreign investment in Canada	-49.4
	2010-2022					
1	Electricity capacity from renewable sources	29.1	GDP / Pop 15-64	23.7	GDP / Pop 15-64	25.9
2	Post-secondary graduation rate	24.3	Fixed capital stock per capita	15.8	Electricity capacity from renewable sources	24.8
3	Energy efficiency (GDP divided by energy consumption)	24.1	Post-secondary graduation rate	15.3	Energy efficiency (GDP divided by energy consumption)	21.5
26	Net debt / GDP	-8.3	Entrepreneurs / employees	-7.2	Household debt to disposable income ratio	-17.1
27	Imports	-17.3	Imports	-11.3	Imports	-18.8
28	Population of working age	-28.7	Population of working age	-29.2	Population of working age	-24.8

Note : The figures are a percentage of the total increase/decrease in a given jurisdiction over each period.

Quebec's Energy Status

Quebec's Energy Status

Energy is a central issue in this edition of the Economic Barometer. Energy demand in Canada has been growing since 1995, despite a few dips, notably during the COVID-19 pandemic. As Figure 2 shows, energy demand in Quebec, which represents one of the Barometer's 28 variables, has remained relatively stable over time, and is still lower than in Ontario. The relative stability of Quebec's energy demand may be attributed to a number of factors, including the province's demographics and economic make-up.

It should be noted that Quebec has a population of slightly more than half that of Ontario, but proportionally fewer energy-intensive industries. Ontario ranks second in Canada for total energy demand and ninth for per capita consumption, while Quebec ranks third for total energy demand and eighth for per capita consumption[6].

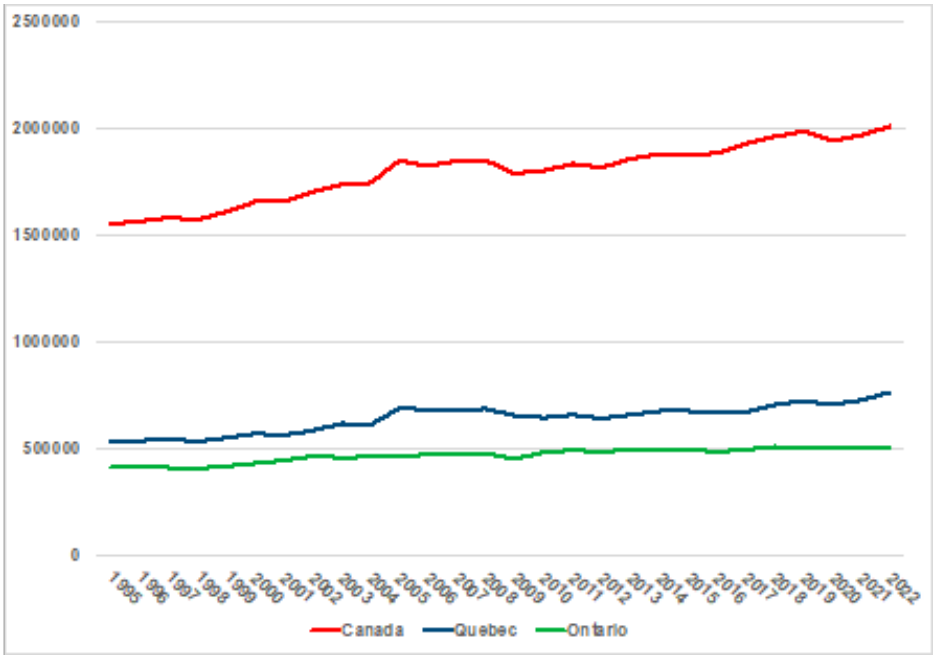
Total energy demand in Quebec is due in part to industrial consumption of hydroelectricity, whose abundance has drawn energy-intensive industries to the province. It is also attributable to higher energy consumption by the transportation and building (residential and commercial) sectors than in European countries with comparable or higher standards of living[7] [8].

6 Canadian Energy Regulator (2024). *Provincial and territorial energy profiles - Quebec*

7 *Chaire de gestion du secteur de l'énergie* HEC Montréal (2024). *État de l'énergie au Quebec*.

8 Canadian Energy Board (2024). *Provincial and Territorial Energy Profiles - Ontario*

Figure 2. Total energy demand for Canada, Quebec, and Ontario (in terajoules)



Source : Statistics Canada, table 25-10-0029-01 [9]

While Quebec's energy demand is lower than Ontario's, its per capita consumption is actually greater. These facts raise serious questions about Quebec energy efficiency. Despite its lower total energy demand, Quebec's per capita energy consumption is higher, suggesting less efficient use of energy.

QUEBEC'S ABILITY TO SUPPLY ELECTRICITY

Crucially, to meet demand for electricity, Quebec's capacity to supply this essential resource must be assessed. One of the key variables used to create the Barometer is the proportion of energy consumed in a jurisdiction that is generated from renewable sources, which reflects, in part, its renewable energy production capacity and consumption, including electricity. According to Statistics Canada forecasts, electrical power-generation capacity should be sufficient to meet short-term energy demand[10].

9 Statistics Canada (2023). *Availability and demand of primary and secondary energy, in terajoules, annual*.

10 Canadian Energy Regulator (2024). *Provincial and territorial energy profiles - Quebec.*

In 2019, Quebec produced about one-third of the country's total electrical output, that is, 212.9 terawatt-hours (TWh), and had a generating capacity of 46,380 megawatts (MW), making it the country's leading producer of electrical power[11].

Almost 94% of this power was generated by hydroelectric plants, with an installed capacity of 40,850 MW. The Robert-Bourassa generating station is the country's largest, with a capacity of 5,616 MW[12].

In 2019, wind-generated electricity accounted for about 5% of Quebec's total electrical output, with a capacity of 4,300 MW. Several wind-farm building projects have been launched in recent years, including the Apuiat facility (200 MW), whose construction began in 2022 and which will be operational in December 2024[13].

Hydro-Quebec generates most of the province's electricity from 62 hydroelectric-generating stations. In addition to hydro and wind power, Quebec generates electrical power from sources such as solar, natural gas, diesel, and biomass[14].

INCREASING ENERGY REQUIREMENTS IN THE YEARS AHEAD

While current infrastructure is able to meet current needs, multiple factors suggest a significant increase in demand for renewable energy in Quebec in the years ahead.

First, Quebec's commitment to becoming carbon neutral by 2050 will strongly stimulate demand for renewable energies, at the expense of fossil fuels. Likewise, the ambitious target of 85% of all vehicles on the road being electric by 2030 will also boost demand for electricity, bearing in mind that in 2023 there were fewer than 200,000 electric vehicles on Quebec's roads[15].

Another factor that drives up energy requirements is the growing number of vehicles on the road and the expansion of surface areas requiring heating in the residential, commercial, and institutional sectors[16].

These projects, which will significantly increase demand for electricity, are sparking major debates in the province. While the vast majority of Quebec's energy is produced from renewable sources, the province

11 *Ibid.*

12 *Ibid.*

13 *Ibid.*

14 *Ibid.*

15 Gouvernment of Quebec (2023). *Norme véhicules zéro émission – Le gouvernement veut augmenter l'offre de véhicules électriques au Quebec*.

16 Shields, A. (2021). *Imaginer le Quebec, au-delà de la voiture*. *Le Devoir*, April 17, 2021

remains a major consumer of fossil fuels, which represent 55% of final energy consumption[17]. Hence, achieving the aforementioned objectives will require considerable investment to bolster Quebec's available electrical power supply.

Increasing demand for electricity is synonymous, for many, with an increase in electrical output. Recently, the Quebec government raised the prospect of boosting electrical output by building new hydroelectric dams[18]. Likewise, discussions have also taken place concerning the rehabilitation of the Gentilly nuclear power plant in response to growing energy demand[19].

Building new power plants raises environmental and social concerns, even as it highlights the challenges that Quebec must face to meet its growing energy demand and its commitments to fighting climate change and becoming carbon neutral by 2050.

QUEBEC'S LACK OF ENERGY EFFICIENCY

Solutions that prioritize generating more electricity fail to address a crucial issue in Quebec: energy inefficiency. Since this issue is a Barometer variable, Quebec must interpret and include it as a part of its energy situation. According to L'état de l'énergie au Quebec, in 2021, nearly half of all energy in Quebec was wasted and added no value to the economy[20]. In other words, for every unit of energy that consumers could use, almost one unit was lost to the system.

The transportation sector is responsible for 34% of these losses, compared with 23% for industry and 15% for construction (residential, commercial, and institutional)[21]. In the case of transportation, 75% of energy is lost upon consumption, compared with 34% and 24%, respectively, for industry and construction[22].

These results indicate that the transportation sector is considerably less efficient than other sectors. Hence, greater efforts should be focused on this sector as a priority for reducing waste. There are many ways of reducing such waste, including stricter standards and tax measures to cut fuel consumption and discourage the purchase of fuel-inefficient vehicles. Furthermore, the government can introduce incentives for car-pooling, public transit, and active transportation to reduce energy requirements using a bottom-up approach.

17 Quebec circulaire (n.d.). *Secteurs et ressources – Énergie.*

18 Nadeau, J.-B. (2023). *Où seront les prochains barrages d'Hydro-Quebec ?* *L'Actualité*, April 5, 2023.

19 Gerbet, T. (2024). *Hydro-Quebec: « Aucune barrière majeure au redémarrage de Gentilly-2 ».* *Radio-Canada Info*, January 30, 2024.

20 *Chaire de gestion du secteur de l'énergie* HEC Montréal (2024). *État de l'énergie au Quebec.*

21 *Ibid.*

22 *Ibid.*

It is worth noting that yet more can be done to improve Quebec's energy efficiency. Assessments of the technical and economic potential (TEP) of reductions in annual consumption were carried out by Hydro-Quebec, Énergir, and Bureau de la transition climatique et énergétique at ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP). TEP is a technically and economically feasible quantitative estimate of cuts in annual energy consumption that can be achieved without significant reduction in service levels.

An annual energy-saving potential of almost 14% for electricity and 25% for natural gas compared with consumption in 2021 and 2022 was calculated, based on the technology and economic conditions prevailing during that period[23]. As for petroleum products for use in transportation, up to 24% of demand in 2017 could have been averted[24].

23 *Ibid.*

24 *Ibid.*

Key Takeaways

Key Takeaways

A fundamental finding of this exercise is that GDP growth in the working-age population has played a crucial role in Quebec's economic prosperity.

As Fortin (2018) rightly pointed out[25], this was due primarily to the surge in employment rates over the past twenty years. He argued that work-life balance measures, such as reduced-rate child care and extended parental leave, encouraged young women in Quebec to enter the job market, raising their employment rate to among the highest in the world.

Furthermore, Quebec's economy was, in relative terms, sheltered from the 2009 recession, due in part to the provincial government's 2007 infrastructure plan. These findings clearly confirm that the foundations of Quebec's economy are solid and that the province's economic prosperity is improving. This analysis also uncovered a number of levers that can be used to sustain this trend.

The analysis revealed that pursuing robust growth is vital to improving Quebec's economic prosperity. Crucially, we must continue to boost the employment rate, in particular by encouraging people aged 55 to 74 to remain active. This analysis also highlights the vital importance of education in consolidating the structural foundations of Quebec's economy. Hence, curbing school drop-out rates by helping students stay in school until they have completed their post-secondary education or vocational training is an essential undertaking.

In addition, the environmental sector is expected to become an increasingly powerful driving force in Quebec's economy as it harnesses renewable energy sources to support the province's ecological transition. Nevertheless, Quebec must make improvements in energy efficiency to enable better uses of the province's energy resources. This may require deploying energy-efficiency programs in the residential, commercial, and industrial sectors and promoting more energy-efficient technologies.

Residential and non-residential investment are viewed as crucial in stimulating productivity growth, where Quebec's performance has been weaker than either Ontario's or the US's over the past ten years.

25 Fortin Pierre (2018), « 50 ans de performance économique au Quebec », *L'Actualité*, April 6, 2018.

This analysis has recognized the Quebec economic ecosystem's improving health and the need to adopt or consolidate public policies to support this favourable trend. Overall, these results show that Quebec, Ontario, and the country as a whole have experienced enhanced economic prosperity since 1980, with Quebec showing the sharpest improvement. Population ageing and high household debt levels, however, represent challenges that may stunt this growth. Also, factoring environmental sustainability into the Economic Barometer highlights the fact that future economic performance is uncertain if measures are not promptly adopted to promote renewable energy sources and reduce greenhouse gas emissions. Against this backdrop, energy efficiency and a leaner economy based on clean energy are likely to be key factors in Quebec's future economic prosperity.

Given its renewable energy assets, Quebec is particularly well-positioned to tackle the challenges it faces.

Methodology

Methodology

In this appendix, we describe the methodology that was used to build the economic prosperity index. In general, we adhere to the methodology used by organizations such as the Conference Board of Canada to build composite indices. The process involves the following steps:

01. Select the variables to be included in the index

To begin with, we selected 28 variables identified by expert economists as being predictive of long-term economic growth.

We chose variables that reflect environmental sustainability and households' economic status. These factors also promote long-term economic prosperity. The Barometer includes five environmental variables and two household-related variables.

02. Collect data on each variable for as many years as possible from 1980 to 2022 for each jurisdiction

The data for most of the index variables came from Statistics Canada's public tables. The rest were sourced from other government agencies and international organizations. Most variables were available for each jurisdiction from 1980 or 1981 to 2022.

In cases where certain variables were not available until subsequent years, we managed the problem by adjusting the index accordingly. As regards the years in which these variables were available, no such problem arose. For the years for which data were absent, however, we took the view that these variables had no effect on the index.

For some variables, including the percentage of GDP derived from the depletion of natural resources and the ratio of household debt to disposable income, data were available for a longer period for the country as a whole than for Quebec or Ontario. In such cases, we assumed that the observation ratio of Quebec and Ontario in Canada remained consistent with the first value during the years when the Canadian values were observed, which was not the case for the Quebec and Ontario values.

03. Calculate the annual growth rate of each variable and the standard deviation of the growth rate in each jurisdiction

To calculate the annual growth rate of each variable (X), we use the symmetrical percentage change (SPC) formula:

$$SPC(X_{it}) = 200 \times \frac{X_{it} - X_{it-1}}{X_{it} + X_{it-1}}$$

Here, i indicates the jurisdiction and t, the year. The standard deviation (SD) of each variable is then calculated as:

$$SD(X_i) = \sqrt{\frac{\sum_t^T (X_{it} - \mu_i)^2}{T-1}}$$

Where T is the number of years with data and μ_i is the mean of X_i.

04. Assign each variable a higher weighting for variables with less annual variation

Calculate the sum of the inverse of the standard deviation of each variable in each jurisdiction. The weighting (W) of each variable is equal to its share of the sum of the inverse standard deviations in its jurisdiction:

$$W(X_i) = \frac{\frac{1}{SD_i(X_i)}}{\sum_i^n \frac{1}{SD_i(X_i)}}$$

Where n is the number of variables.

05. Calculate the variable's contribution to the index in a given year, by multiplying its weighting by its annual growth rate

The contribution (C_i) of each variable in each jurisdiction is calculated as follows each year:

$$C_{it}(X_{it}) = W(X_i) \times SPC(X_{it})$$

We then take the sum of these contributions to find the total percentage change (P) in the index for that year.

$$P_{it} = \sum_{j}^{n} C_{it}(X_{itj})$$

06. Calculate the index

To calculate the index, we adjust the symmetrical percentage change formula, where the annual percentage change is the sum of the contributions calculated in step 5, with the index set at 100 in 1980:

$$EHI_{it} = EH_{it-1} \times \frac{200 + P_{it}}{200 - P_{it}}$$

Appendix Tables

Table A.1 :
Variables included in the Economic Barometer by category

Categories	Human capital	Growth	Investment	Company	Environment/ Energy	Households
Variables	• Overall workforce participation 45-64 • Population of working age • Employment rate • Long-term unemployment rate • Post-secondary graduation rate	• Exports • Venture capital • Private foreign investment in Canada • Foreign investment outside Canada • Imports • GDP per working-age population • HHI net exports - products • HHI net exports - industries	• Gross fixed capital formation • Fixed capital stock per capita • Public debt / GDP • R&D expenditure • ICT investment / GDP	• Industrial concentration • Entrepreneurs / employees • Capital intensity	• GHG emissions per capita • % of GDP from natural-resource extraction • Proportion of energy from renewable sources • Energy efficiency • Electricity capacity from renewable sources	• Median after-tax income • Household debt to disposable income ratio

Table A.2.
Contribution of each variable to the index by jurisdiction, 1980-2022

	Canada		Quebec		Ontario	
Rank	Variable	%	Variable	%	Variable	%
1	R&D expenditure	17.9	GDP per working-age population	21.1	GDP per working-age population	20.8
2	Post-secondary graduation rate	17.3	Post-secondary graduation rate	15.0	R&D expenditure	16.8
3	GDP per working-age population	16.0	Fixed capital stock per capita	14.6	Post-secondary graduation rate	16.6
4	Energy efficiency	11.6	R&D expenditure	14.4	Gross fixed capital formation	13.6
5	Fixed capital stock per capita	11.3	Gross fixed capital formation	11.7	Exports	13.3
6	Gross fixed capital formation	11.2	Exports	10.5	Energy efficiency	8.9
7	Exports	10.2	Overall workforce participation 45-64	7.6	Fixed capital stock per capita	8.9
8	Overall workforce participation 45-64	8.2	Energy efficiency	6.3	Electricity capacity from renewable sources	6.9
9	Electricity capacity from renewable sources	7.7	Electricity capacity from renewable sources	5.6	GHG emissions per capita	5.8
10	ICT investment / GDP	3.0	ICT investment / GDP	3.3	Overall workforce participation 45-64	5.4
11	GHG emissions per capita	2.5	GHG emissions per capita	3.0	ICT investment / GDP	4.0
12	Median after-tax income	2.2	Industrial concentration	2.8	Industrial concentration	2.5
13	Venture capital	1.6	Employment rate	1.7	Median after-tax income	2.3
14	Capital intensity	1.6	Proportion of energy from renewable sources	1.6	Private foreign investment in Canada	1.9
15	Private foreign investment in Canada	1.5	Median after-tax income	1.6	HHI net exports - products	1.7
16	Industrial concentration	1.1	Private foreign investment in Canada	1.5	Entrepreneurs / employees	1.7
17	% of GDP from natural-resource extraction	0.8	Venture capital	1.4	Venture capital	1.7
18	Employment rate	0.7	Long-term unemployment rate	1.3	Proportion of energy from renewable sources	1.3
19	Entrepreneurs / employees	0.6	HHI net exports - industries	0.8	% of GDP from natural-resource extraction	0.9
20	Proportion of energy from renewable sources	0.1	% of GDP from natural-resource extraction	0.7	Capital intensity	0.8
21	Long-term unemployment rate	-0.1	Entrepreneurs / employees	-0.2	HHI net exports - industries	0.1
22	Public debt / GDP	-0.2	Capital intensity	-0.2	Employment rate	-0.1
23	Foreign investment outside Canada	-1.0	HHI net exports - products	-0.3	Long-term unemployment rate	-0.3
24	HHI net exports - industries	-1.4	Foreign investment outside Canada	-0.9	Foreign investment outside Canada	-1.2
25	HHI net exports - products	-2.1	Public debt / GDP	-1.7	Population of working age	-3.6
26	Population of working age	-3.8	Household debt to disposable income ratio	-4.6	Public debt / GDP	-5.2
27	Household debt to disposable income ratio	-6.7	Population of working age	-8.4	Household debt to disposable income ratio	-12.1
28	Imports	-12.0	Imports	-10.2	Imports	-13.5
Total		**100**		**100**		**100**

Notes :
Figures are a percentage of the total increase/decrease in a given jurisdiction over each period.
Percentages in this table may not total 100.0% due to rounding.

PROSPERA

Quebec's Economic Barometer:
The Energy Transition