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The rising price of hydrocarbons
Impact on Québec's financial equilibrium**Summary**

1. The increasing price of gas at the pumps since 2004 is mainly due to the surge in the price of crude oil. It has escalated since the beginning of 2008, and is now over 137 cents a litre.
2. The demand for hydrocarbons is highly inelastic, which means that higher prices have little impact on the amount consumed. However, other factors such as economic activity can affect the consumption of hydrocarbons.
3. The government does not benefit from the rising price of oil. In 2007 a 5-cent increase in the price of hydrocarbons would have cost the Québec government \$6 million. This is because the increase in QST revenues is more than offset by the increased costs of fuel and heating oil, as well as by a reduction in revenue from the specific tax on fuel.

This document assesses the impact of increased prices for hydrocarbons¹ on the Québec government's financial framework. It starts with an overview of the hydrocarbon market in Québec, then describes the estimation methodology used and ends with the impact of price shocks on the government's revenue and expenses.

1

Hydrocarbons in Québec

In 2007 some 12 billion litres of fuel² were sold in Québec – 8.4 billion litres of gasoline and 3.5 billion litres of diesel. Individuals account for almost 90% of gasoline purchases, compared to 5% of diesel purchases; diesel is used more for commercial and industrial purposes.³ The average annual consumption of fuel remained stable between 2004 and 2007, after rising an average of 1.5% per year between 1999 and 2004. During the same period sales of heating oil and natural gas, which reached 1.4 billion litres and

5.6 billion cubic metres respectively in 2007, declined by an average of 7.2% and 1.1% respectively.

There are many factors that influence the consumption of fuel. Increased economic activity leads to a higher demand for fuel, particularly for vehicles used for commercial purposes. An increase in the number of vehicles in circulation also increases fuel sales. At the same time, demand is also influenced by the energy efficiency of vehicles. According to the Office of Energy Efficiency,⁴ the average fuel consumption of new vehicles declined slightly from 1990 to 2005, going from 8.2 to 7.5 litres per 100 km. The average consumption of light trucks also went down during that period, from 11.4 to 10.7 litres per 100 km. But the reduction was partially offset by an increase in the average power of new vehicles, due to greater demand for light trucks.⁵

¹ For the purposes of this analysis, the term "hydrocarbon" refers to gasoline, diesel, heating oil and natural gas.

² For the purposes of this analysis, the term "fuel" refers to gasoline and diesel.

³ As we shall see in section 3, a distinction has to be made between individual consumption and commercial consumption, since companies are entitled to input tax credits.

⁴ Office of Energy Efficiency: The State of Energy Efficiency in Canada – Report 2006.

⁵ *Ibid.*

TABLE 1
Hydrocarbon consumption in Québec by sector
between 2004 and 2007
(Millions of litres)

	2004	2007	% ¹
Gasoline	8,367	8,441	0.3
Individuals	7,530	7,597	0.3
Enterprises	837	844	0.3
Diesel	3,614	3,537	-0.7
Individuals	181	177	-0.7
Enterprises	3,433	3,360	-0.7
Total fuel	11,981	11,978	0.0
Heating oil	1,801	1,437	-7.2
Residential	1,079	832	-8.3
Commercial	607	522	-4.9
Industrial	115	83	-10.3
Natural gas²	5,769	5,589	-1.1
Residential	721	736	0.7
Commercial	1,961	2,006	0.8
Industrial	3,087	2,847	-2.7

1 Average annual growth between 2004 and 2007.

2 In millions of cubic metres.

Sources: Statistics Canada, ministère des Ressources naturelles et de la Faune and ministère des Finances du Québec.

The relative price of hydrocarbons also affects the rate of consumption growth. The price of hydrocarbons has shot up in the last three years, due essentially to the rising price of oil. While the cost of goods and services rose nearly 6% between 2004 and 2007, diesel and gasoline price increases were 27% and 24% respectively. During the same period the prices of heating oil and natural gas also rose by 37% and 17% respectively.

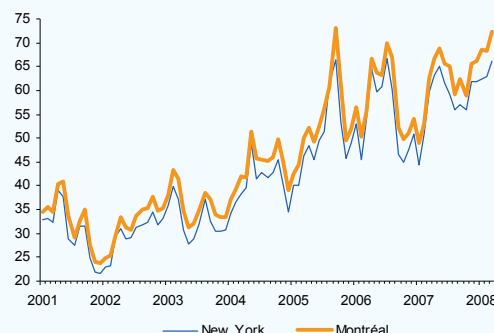
What makes up the cost of fuel

The retail price of a litre of gasoline or diesel consists of: the cost of crude oil, the refiner's margin, transportation, the retail sales margin, federal excise tax, Québec's specific tax, the goods and services tax (GST) and the Québec sales tax (QST).

The cost of crude oil depends on the price per barrel of crude oil and the value of the Canadian dollar compared to the U.S. dollar. The price per barrel is determined at the international level by changes in supply and demand. Furthermore, any rise in the Canadian dollar compared with the U.S. dollar reduces the cost of crude oil.

The refiner's margin is the difference between the rack price and the cost of crude oil, the refiner's profit to cover operating costs. As Chart 1 shows, the rack price at the port of New York strongly influences the rack price in Québec. Since there is free trade in petroleum products between Canada and the United States, American refineries compete with those of Québec.

CHART 1
Rack price of regular gasoline in Montréal and New York
(Cents per litre)



Sources: Energy Information Administration and Régie de l'énergie.

The retail sales margin covers the costs of administration, operations and marketing. It is closely linked to local market conditions, especially population density and the average output of service stations.

The Québec government currently levies a general tax of 15.2 cents per litre on gasoline and 16.2 cents per litre on diesel.⁶ In the Montréal region an additional tax of 1.5 cents per litre of gasoline has been applied to fund the Agence métropolitaine de transports (AMT) since January 1, 1996.

The federal government levies excise taxes of 10 cents per litre on gasoline and 4 cents per litre on diesel. The specific taxes levied by both governments have not been increased since 1996 for gasoline and 1997 for diesel.

GST and QST are levied on gasoline and diesel as they are on heating oil and natural gas. The amount of GST and QST per litre depends on the price of these hydrocarbons before taxes. QST on gasoline and diesel is calculated on the total cost, which includes the before-tax price, federal excise tax, specific provincial tax and GST.

⁶ Border regions enjoy lower taxes on gasoline because the taxes are lower in the United States and Ontario. The government also grants tax rebates in "peripheral" and "specific" regions in order to offset the price of fuel, which is usually higher in regions distant from the large urban centres.

Why the price of gasoline goes up

Table 2 breaks down the rise in the price of gasoline in Montréal⁷ between 2004 and 2007 in relation to the factors that affect the price at the pump. During that time the price of gas rose from 85.5 cents per litre to 106.3 cents per litre, an increase of close to 21 cents.

TABLE 2
Breakdown of the average price of regular gasoline in Montréal
(Cents per litre)

	2004	2007	Change	April 2008
Cost of crude oil	31.3	48.6	17.3	70.3
Refiner's margin	12.7	13.3	0.6	10.4
Rack price	44.0	61.9	17.9	80.7
Transportation	0.3	0.3	0.0	0.3
Retail sales margin	3.3	4.4	1.1	5.7
Price before taxes	47.6	66.6	19.0	86.7
Federal excise tax	10.0	10.0	0.0	10.0
Québec specific tax	15.2	15.2	0.0	15.2
AMT tax	1.5	1.5	0.0	1.5
GST ¹	5.2	5.6	0.4	5.7
QST	6.0	7.4	1.4	8.9
Total taxes	37.9	39.7	1.8	41.3
Price at the pump	85.5	106.3	20.8	128.0

1 The GST fell from 7% to 5% during this period.

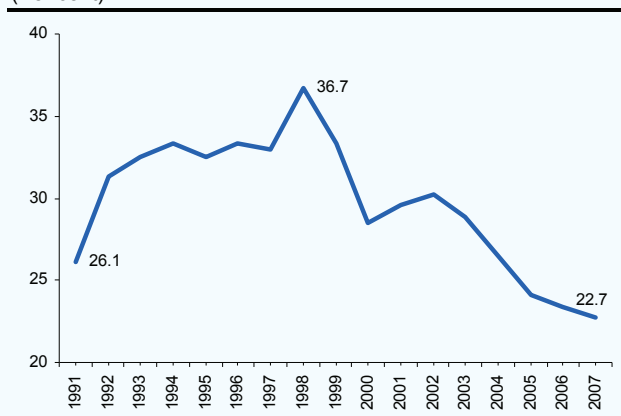
Sources: Ministère des Finances du Québec and Régie de l'énergie.

Higher prices at the pump are mainly due to increased rack prices. Over 80% of this increase can be attributed to the surging price of crude oil, which in turn is the result of strong demand, especially from Asian countries, low oil reserves in the United States, geopolitical instability (especially in Venezuela and Nigeria) and a market that is less flexible than before.

Barely 9% of the price increase at the pump can be attributed to the increased tax revenues collected by both governments through their respective sales taxes. Even though the amount of QST charged on each litre has gone up slightly in recent years, the Québec taxes (specific tax, AMT tax and QST) account for a declining share of the price at the pump. Between 1998 and 2007, these taxes went from 36.7% of the cost of gas to 22.7%, the lowest level since 1991. That is due to the fact that, unlike the other components, the specific tax and AMT tax do not change with the price.

In April 2008 the average price at the pump was 128.0 cents per litre, up 21.7 cents from 2007. This higher price is mainly due to the rise in the cost of crude oil of almost US\$38 a barrel.

CHART 2
Proportion of Québec taxes in the price of gas at the pump from 1991 to 2007
(Per cent)



Source: Ministère des Finances du Québec.

2

Price elasticity of demand

Price elasticity measures how an increase in price affects the quantity of product consumed. Usually the elasticity value is negative: if the price goes up the amount consumed goes down. A good or service is said to be inelastic if a 1% price increase leads to a demand decrease of less than 1%.

The ministère des Finances du Québec (MFQ) has developed a model for forecasting demand for fuel that can estimate the price elasticity of gasoline and diesel. The model is based on the behaviour of a representative consumer, and estimates how much of the consumer's budget is allocated to purchasing various goods and services, particularly gasoline. The estimates in the model can also identify the volume of gasoline and estimate a price elasticity that varies with the price, comparing it with the elasticity of other non-durable and semi-durable goods, such as food and clothing. In the model there are many factors that affect fuel consumption: the prices of fuel and other goods and services, economic activity, the number of vehicles and their average energy consumption.

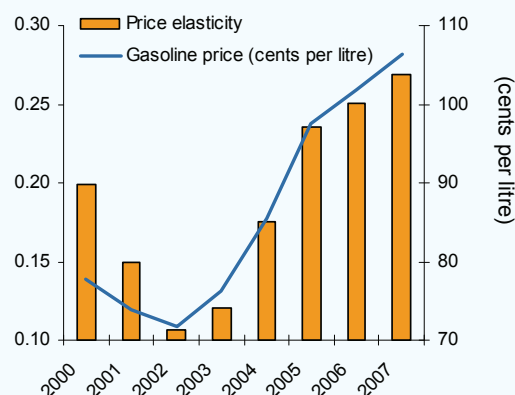
For the period between 2004 and 2007, the model shows that a 10% increase in the price of gasoline would lead to an average 2.4% drop in consumption, while a 10% increase in the price of diesel would lead to a 0.8% drop in consumption. The price elasticity of diesel is lower than that of gasoline because diesel is mainly used for commercial purposes, so it would be harder to reduce consumption. In addition, as Chart 3

⁷ The Montréal prices were studied, due to the significant size of the market.

shows, price elasticity varies according to the price level, since consumers are more affected by price fluctuations when the price of gas is high. But the results are still inelastic.

CHART 3

Price elasticity of gasoline and the average price of regular gasoline in Québec from 2000 to 2007



Sources: Ministère des Finances du Québec, Statistics Canada and Régie de l'énergie.

Natural Resources Canada has estimated the price elasticity of heating oil and natural gas. According to their figures, a 10% increase in the price of heating oil would lead to a consumption drop ranging from 1.8% in the commercial and industrial sector to 2% in the residential sector; for natural gas a 10% increase in the price would lead to a 1% drop in consumption.

Impact of other factors on amounts consumed

In reality, factors other than price can affect amounts consumed. For example, from 2004 to 2007, an analysis based solely on price elasticity shows that the 24% increase in the price of gasoline should have led to a reduction in the volume of gasoline consumed of close to 6%; in reality there was an increase of 0.9%, because the steep price increase was more than offset by a growth in economic activity and an increase in the number of vehicles.

With regard to diesel, the 27% price increase from 2004 to 2007 should have led to a 2.2% reduction in volume, and in fact the drop was 2.1%. In this case, although strong economic activity and the increase in the number of automobiles should have offset the price increase, that was mitigated by reduced activity in some manufacturing sectors that use a lot of diesel.

3

Impact on the government's financial framework

This section measures the impact of increased hydrocarbon prices on the Québec government's financial framework. The method used was to measure the impact of increased hydrocarbon prices -- compared to a reference scenario -- on amounts consumed based on price elasticity.

Table 3 shows the reference price scenario for 2007. The reference prices for gasoline (106.3 cents per litre), diesel (104.8 cents per litre) and heating oil (74.1 cents per litre) correspond to the average prices in the Montréal region in 2007, according to the Régie de l'énergie. The MFQ estimated the 2007 price for natural gas based on data from Gaz Métro, the ministère des Ressources Naturelles et de la Faune (MRNF) and Statistics Canada.

TABLE 3
Price of fuel by sector in Québec
(Cents per litre)

	Price elasticity	2007 reference price	Proposed change Cents per litre	%
Gasoline	-0.24	106.3	5.0	4.7
Diesel	-0.08	104.8	5.0	4.8
Heating oil	-0.18	74.1	5.0	6.8
Natural gas¹				
Residential	-0.10	59.3	5.0	8.4
Commercial	-0.10	50.2	5.0	10.0
Industrial	-0.10	43.4	5.0	11.5

¹ Cents per cubic metre.

Sources: Régie de l'énergie, Statistics Canada, ministère des Finances du Québec and Gaz Métro.

Price elasticity of demand can be used to quantify the decline in volume attributable, for example to a 5-cent increase in the price of hydrocarbons. Such an increase in the price of gasoline – a 4.7% increase compared to the reference price – would have led to a drop in gasoline consumption of almost 93 million litres (-1.1%) in relation to the level originally expected. Similarly, the diesel price increase (+4.8%) would have led to a 13 million-litre reduction in amounts consumed (-0.4%). Lastly, the increased prices of heating oil and natural gas would have reduced consumption by amounts of 19 million litres (-1.3%) and 59 million cubic metres (-1.1%) respectively.

Decreased revenue from the specific tax

Increases in the prices of gasoline and diesel slow sales of these fuels and thereby reduce the revenue from the specific tax. According to calculations by the ministère des Finances, a 5-cent rise in the price of diesel and gasoline would have reduced consumption by some 106 million litres in 2007 (both gasoline and diesel). Revenue from the fuel tax would thus have fallen by an amount equal to the decline in volume multiplied by the specific tax rate (15.2 cents per litre for gasoline and 16.2 cents per litre for diesel).⁸

A 5-cent increase in the prices of gasoline and diesel would thus have reduced revenue from the specific tax on fuel by \$15 million in 2007.

Increased revenue from the QST

Conversely, an increase in the price of hydrocarbons increases QST revenue for the Québec government. The impact of such price increases can be broken down into three aspects: volume, price and combined. Since November 1996, enterprises have been entitled to input tax rebates for their expenditures on hydrocarbons.

The volume aspect shows the QST revenue loss attributable to the reduction in volume, compared to the QST base amount collected on each litre (or cubic metre) originally sold. According to the ministère des Finances, the volume aspect would have resulted in an \$8-million loss of QST for the Québec government in 2007.

The price aspect shows the impact of the price increase on the amount of QST collected on each litre (or cubic metre) originally sold. The price aspect would have resulted in a maximum gain of \$41 million in QST in 2007.

Lastly, the combined aspect measures the joint impact of the amount of QST collected on each litre (or cubic metre) and of the reduction in volume on QST revenue. In this case, the combined aspect would have resulted in a loss of approximately \$400,000 for the Québec government in 2007.

Putting these three aspects together shows that a permanent 5-cent increase in the price of hydrocarbons would have raised QST revenue by close to \$33 million in 2007. Subtracting from that the \$15-million reduction in fuel tax revenue, a permanent increase of 5 cents would have raised government revenues by \$17 million in 2007.

TABLE 4
Impact of a 5-cent increase in the price of hydrocarbons on the Québec government's revenue
(Millions of dollars)

	Specific tax	QST	Total
Volume aspect	- 15.3	- 8.0	- 23.3
Price aspect		41.1	41.1
Combined aspect		- 0.4	- 0.4
Overall impact	- 15.3	32.7	1.4

Source: Ministère des Finances du Québec.

Increased government expenditures

An increase in the price of hydrocarbons would also affect the Québec government's expenditures. Such expenditures would correspond mainly to the cost of heating government buildings and supplying fuel for the fleet of government vehicles (public safety, ambulance services, service vehicles, etc.). The Secrétariat du Conseil du trésor estimated these expenditures at \$314 million in 2007-2008. Over 75% of these expenditures were for heating hospitals, schools and other government buildings.

In the short term, for the purposes of this analysis, it is assumed that an increase in the price of hydrocarbons will not affect the Québec government's consumption, since it has to continue serving the public. As a result, a 1% increase in the price of hydrocarbons would increase hydrocarbon expenditures by 1%.

⁸ The figures are adjusted to take into account volumes for which regional rebates are applied.

A 5-cent increase in the price of hydrocarbons would have increased government expenditures by some \$24 million in 2007. Adding in the supplementary revenue derived mainly from the QST, the Québec government would have had a net loss of \$6 million in 2007.

TABLE 5

Impact of a 5-cent increase in the price of hydrocarbons on the government's financial framework

(Millions of dollars)

Impact on revenue	17.4
- Specific tax	- 15.3
- QST	32.7
Impact on expenditures	- 23.5
Overall impact	- 6.1

Source: Ministère des Finances du Québec and Secrétariat du Conseil du trésor.

4

Conclusion

Contrary to popular belief, the government does not benefit from the increased price of hydrocarbons. Increased QST revenue is more than offset by higher expenditures on fuel and heating, and by a decline in revenue from the fuel tax due to reduced consumption. In 2007 the government would have had a net loss of \$6 million for every 5-cent increase in the price of hydrocarbons. In addition, the high cost of hydrocarbons would have affected the spending power of households and the profits of enterprises, which in turn might have reduced the Québec government's other sources of revenue.

Produced by the Direction de l'analyse et de la prévision des revenus autonomes with contributions from Jean-Sébastien Dupont and Stéphane Girard.

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