



**Government
of Canada**

**Gouvernement
du Canada**

**Update of Four Elements of the
January 2001 Conference Board study:**

**‘The Final Fifteen Feet of Hose : The Canadian
Gasoline Industry in the Year 2000’**

Competition Bureau

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Canada



1. Introduction

In 2000, Industry Canada and Natural Resources Canada sponsored an independent study of Canadian gasoline markets by the Conference Board of Canada.

In its report, ‘The Final Fifteen Feet of Hose: The Canadian Gasoline Industry in the Year 2000’, released in February 2001, the Conference Board pointed out that Canadians enjoy some of the lowest gasoline prices in the world. The Conference Board also concluded that the response of the retail price of gasoline to both increases and decreases in crude oil prices was the same.

Are the conclusions reached by the Conference Board still valid two years later? To find out, the Competition Bureau, in preparation for the Commissioner’s appearance in front of the Standing Committee on Industry Science and Technology, updated four questions addressed by the Conference Board in its study. The four questions are:

1. What is the relationship between wholesale prices and crude oil prices?
2. What is the relationship between retail prices and wholesale prices?
3. Do retail prices change asymmetrically with wholesale price increases or decreases?
4. Is there cross-subsidization between the wholesaling sector of the industry and the retailing sector of the industry?

In the next section, we will describe the econometric tests that were conducted. These tests were based on the Conference Board methodology. We will also present the results obtained. The results we found are consistent with those of the Conference Board.

2. Methodology and Results

The empirical tests were conducted for eleven cities across Canada: St. John’s, Saint John, Halifax, Quebec City, Montréal, Ottawa, Toronto, Winnipeg, Regina, Calgary, and Vancouver. For each of these cities, we have obtained monthly wholesale and retail prices for unleaded regular gasoline from

MJ Ervin. The price of crude oil was also obtained from MJ Ervin.¹ All prices are expressed in cents per litre (cpl) and do not include taxes. All price series are from January 1991 to March 2003. As such, we have added two years, or 24 months, worth of data to the database used by the Conference Board.

2.1 What is the relationship between wholesale prices and crude oil prices?

To determine the relationship between wholesale prices and crude oil prices, we have estimated, on a city-by-city basis, the following equation by ordinary least square (OLS):

$$\Delta W_t = \beta_t(\Delta CRUDE_t) + \delta_t(\Delta CRUDE_{t-1}) + \varepsilon_t$$

where ΔW_t is the change in the price of wholesale in a city at time t over a one month period, $\Delta CRUDE_t$ is the change in the price of crude oil at time t over a one month period, $\Delta CRUDE_{t-1}$ is the change in the price of crude oil at time $t-1$ over a one month period, and ε_t is an error term. A lag on the price of crude oil was included to account for the possibility that changes in crude oil prices in the previous month have an influence on changes of wholesale prices in the current month.² The results are shown in Table 1 where t-statistics are in parenthesis below the estimated coefficients.

The results show that there exists a strong positive relationship between wholesale prices and crude oil prices. The coefficients of current crude oil are highly significant for all cities whereas the lagged coefficients of crude oil are highly significant for cities in the West only and are not significant for cities in Quebec and Ontario. For all cities, the sum of the significant coefficients are all above one.

¹ We used NYMEX, an international price of crude oil.

²The Conference Board, instead of looking directly at the relationship between Canadian wholesale prices and crude oil prices, proceeded in two steps. First, it focused on the relationship between wholesale prices in the United States (US) and crude oil prices. Second, it analyzed the relationship between American wholesale prices and Canadian wholesale prices. However, the Conference Board recognized that the relationship between Canadian wholesale prices and crude oil prices could have been estimated directly as Canada is a price taker in international markets. Moreover, given the high correlation between American wholesale prices and crude oil prices and between Canadian wholesale prices and American wholesale prices, the direct approach gives very similar results as those obtained through the indirect approach.

This implies that a one cpl increase (decrease) in the price of crude oil will result in an increase (decrease) of more than one cpl in wholesale prices. However, the impact may vary from one region to another. Indeed, while a one cpl increase (decrease) in the price of crude oil will result in an increase (decrease) of around 1.4 cpl in wholesale prices in western Canada, the variation is around 1.16 cpl for cities in Quebec and Ontario and close to 1.3 cpl in Atlantic Canada.

Table 1 : Results of the Wholesale Regressions

City	$\Delta CRUDE_t$	$\Delta CRUDE_{t-1}$	Sum ^a	Adjusted R ²
St. John's	1.133 (12.501) ^{***}	0.170 (1.869) [*]	1.303	0.53
Saint John	1.140 (12.497) ^{***}	0.172 (1.882) [*]	1.157	0.53
Halifax	1.126 (12.422) ^{***}	0.183 (2.012) ^{**}	1.309	0.528
Quebec City	1.159 (13.676) ^{***}	0.089 (1.052)	1.159	0.568
Montreal	1.159 (13.744) ^{***}	0.087 (1.033)	1.159	0.57
Ottawa	1.150 (13.390) ^{***}	0.117 (1.365)	1.15	0.559
Toronto	1.155 (12.777) ^{***}	0.150 (1.651)	1.155	0.538
Winnipeg	0.954 (8.198) ^{***}	0.503 (4.311) ^{***}	1.457	0.384
Regina	0.957 (8.318) ^{***}	0.502 (4.354) ^{***}	1.459	0.39
Calgary	0.957 (8.292) ^{***}	0.496 (4.285) ^{***}	1.453	0.387
Vancouver	0.727 (6.304) ^{***}	0.714 (6.175) ^{***}	1.441	0.363

^a Sum of significant coefficients only.

^{*} Indicates significance at the 10 % level.

^{**} Indicates significance at the 5 % level.

^{***} Indicates significance at the 1 % level.

2.2 What is the relationship between retail prices and wholesale prices?

In determining the relationship between retail prices and wholesale prices, we estimated the same equation as the Conference Board:

$$\Delta R_t = \beta_1(\Delta W_t) + \beta_2(\Delta W_{t-1}) + \beta_3(\Delta W_{t-2}) + \beta_4[(R_{t-1} - W_{t-1}) - (R - W)^*] + \varepsilon_t$$

where ΔR_t is the change in the retail price over a one-month period in a city, ΔW_t is the change in the wholesale price over a one-month period in a city (note that the variable is also lagged for one and two periods), $[(R_{t-1} - W_{t-1}) - (R - W)^*]$ is an error-correction term (that will be explained below), and ε_t is an error term.

The intuition behind this equation is that changes in retail prices should be influenced by both changes in wholesale prices and by retail margins. Indeed, if retailers are operating with low margins, the change in retail price in reaction to a change in wholesale price may differ when compared to situations where retail margins are high.³ For instance, if retail margins are high (low) and wholesale prices increase by one cpl, then retailers may adjust retail prices by less (more) than one cpl.

To capture this potential effect, the error-correction term was included in the estimations. It represents the difference between the one-period lag of the retail margin and what is referred to as the market outcome margin. The market outcome margin is a measure of average margins over periods where retail margins generally moved in the same direction (i.e., increased, decreased or remained constant). Given the intuition outlined above, the sign of the error-correction term should be negative. For example, if retail margins were high (when compared to their average over a given period of time) in the previous month, then an increase in wholesale prices should result in a small increase in current retail prices when compared to a situation where retail margins were low in the previous month.

³ For instance, high (low) retail margins could correspond to situation where a high (low) degree of market power is being exercised.

Table 2 : Results of the Retail Regressions

City	ΔW_t	ΔW_{t-1}	ΔW_{t-2}	Sum ^a	Error-correctio n term	Adjusted R ²
St. John's	0.464 (9.707) ^{***}	0.345 (6.215) ^{***}	0.039 (0.804)	0.809	-0.223 (-4.128) ^{***}	0.609
Saint John	0.571 (12.882) ^{***}	0.278 (5.682) ^{***}	0.025 (0.560)	0.849	-0.373 (-6.437) ^{***}	0.688
Halifax	0.575 (11.140) ^{***}	0.312 (5.642) ^{***}	0.014 (0.271)	0.887	-0.187 (-3.369) ^{***}	0.587
Quebec City	0.756 (12.863) ^{***}	0.291 (4.818) ^{***}	0.083 (1.416)	1.047	-0.394 (-5.782) ^{***}	0.651
Montreal	0.838 (15.566) ^{***}	0.258 (4.783) ^{***}	-0.056 (-1.035)	1.096	-0.455 (-6.305) ^{***}	0.723
Ottawa	0.867 (19.876) ^{***}	0.165 (3.866) ^{***}	0.021 (0.486)	1.032	-0.269 (-4.324) ^{***}	0.759
Toronto	0.982 (26.154) ^{***}	0.068 (1.907) [*]	0.018 (0.482)	1.05	-0.535 (-7.089) ^{***}	0.849
Winnipeg	0.746 (12.912) ^{***}	0.283 (5.011) ^{***}	-0.029 (-0.484)	1.029	-0.342 (-5.519) ^{***}	0.647
Regina	0.759 (12.277) ^{***}	0.123 (2.038) ^{**}	-0.032 (-0.512)	0.882	-0.512 (-7.288) ^{***}	0.618
Calgary	0.736 (14.622) ^{***}	0.250 (4.938) ^{***}	-0.109 (-1.968) [*]	0.986	-0.472 (-6.884) ^{***}	0.73
Vancouver	0.767 (11.467) ^{***}	0.146 (2.190) ^{**}	0.054 (0.806)	0.913	-0.395 (-6.525) ^{***}	0.568

^a Sum of significant coefficients only.

* Indicates significance at the 10 % level.

** Indicates significance at the 5 % level.

*** Indicates significance at the 1 % level.

The results of the estimations (done using OLS on a city-by-city basis) are illustrated in Table 2 where t-statistics are in parenthesis below the estimated coefficients. We find that current and lagged (of one period) wholesale prices as well as the error-correction term are highly significant. As expected, wholesale prices have a strong positive impact on retail prices whereas the error-correction term coefficients are all negative.

Starting with wholesale prices, we see that the sum of the significant coefficients are close to one for most cities. As such, a one cpl increase (decrease) in wholesale prices will result in an increase (decrease) of one cpl in retail prices. However, the sum of significant coefficients for St. John's, Saint John, Halifax and Regina is lower than 0.90.

Turning to the findings associated with the error-correction term, we see that adjustments in retail prices following a change in wholesale prices are different whether retail margins are high or low. For instance, if retail margins are above the market outcome margin, an increase in wholesale prices may not be completely reflected in the retail prices. Conversely, if retail margins are below the market outcome margin, an increase in wholesale prices will trigger a larger increase in retail prices.⁴

Our results are consistent to those obtained by the Conference Board.

2.3 Do retail prices change asymmetrically with wholesale price increases and decreases?

Price asymmetry in retail gasoline pricing refers to the phenomenon of retail prices responding more strongly to increases in wholesale prices (or crude oil prices) than to decreases. This could be explained by a number of reasons including, but not limited to, the existence of market power, supply adjustment costs and long-term agreements.

To test for the presence of asymmetry, we estimated, for each city, the following equation by OLS:

$$\Delta R_t = \beta_1(\Delta W_t) + \beta_2(\Delta W_t \times D) + \varepsilon_t$$

⁴ Alternatively, if retail margins are above (below) the market outcome margin and if wholesale prices are decreasing, then retail prices will be lowered by more (less) than the fall in wholesale prices.

where ΔR_t is the change in the retail price over a one-month period in a city, ΔW_t is the change in the wholesale price over a one-month period in a city, D is a dummy variable that is equal to one if the variation in wholesale prices is positive and to zero if it is not, and ε_t is an error term.

The dummy variable is included to isolate the impact of wholesale price increases. Hence, if there is some sort of asymmetry, i.e., if retail prices vary differently following an increase or a decrease in wholesale prices, then the coefficient associated with the variable including the dummy, D , should be statistically significant.

The results of the estimations (done using OLS on a city-by-city basis) are illustrated in Table 3 where the t-statistics are in parenthesis below the estimated coefficients.

The results we obtained indicate that there is no evidence of price asymmetry. Indeed, no coefficients for the dummy variable are statistically significant which means that the asymmetry hypothesis is rejected for all cities. In other words, retail prices adjust in the same manner following a decrease or an increase in wholesale prices. The same results were found by the Conference Board.

2.4 Is there cross-subsidization between the wholesaling sector of the industry and the retailing sector of the industry?

The objective is to test the claim that integrated refiners use profits from their wholesale operations to subsidize prices of their branded retailers.

To test for cross-subsidization, two sets of regressions were conducted. The first equation estimated is

$$MR_t = \alpha + \beta_1 MR_{t-1} + \beta_2 MW_t + \varepsilon_t$$

Table 3 : Results of the Asymmetry Regressions

City	ΔW_t	$\Delta W_t \times D$	Adjusted R ²
St. John's	0.474 (5.607) ^{***}	0.018 (0.146)	0.288
Saint John	0.537 (6.447) ^{***}	0.099 (0.817)	0.39
Halifax	0.577 (6.945) ^{***}	0.027 (0.220)	0.394
Quebec City	0.716 (7.375) ^{***}	0.096 (0.685)	0.449
Montreal	0.845 (9.433) ^{***}	0.070 (0.543)	0.561
Ottawa	0.810 (12.607) ^{***}	0.109 (1.172)	0.704
Toronto	0.926 (15.960) ^{***}	0.114 (1.384)	0.795
Winnipeg	0.757 (8.244) ^{***}	0.062 (0.466)	0.489
Regina	0.804 (8.121) ^{***}	-0.035 (-0.243)	0.451
Calgary	0.913 (9.480) ^{***}	-0.137 (-0.982)	0.504
Vancouver	0.754 (6.713) ^{***}	0.092 (0.599)	0.426

* Indicates significance at the 10 % level.

** Indicates significance at the 5 % level.

*** Indicates significance at the 1 % level.

and the second equation estimated is

$$MR_t = \alpha + \beta_1 MR_{t-1} + \beta_2 CRUDE_t + \varepsilon_t$$

where α is a constant, MR_t is the monthly retail margin (defined as the retail price minus the wholesale price) in a city at time t , MW_t is the monthly wholesale margin (defined as the wholesale price minus the retail price) in a city at time t , $CRUDE_t$ is the monthly price of crude oil at time t , and ε_t is an error term.

In the first equation, retail margins are explained by past retail margins and current wholesale margins. If there is cross-subsidization, then there should be a negative relationship between wholesale and retail margins indicating that the majors use their revenues from high wholesale margins to squeeze retail margins.

In the second equation, retail margins are explained by past retail margins and current crude oil prices. If there is cross-subsidization, then there should be a negative relationship between crude oil prices and retail margins.⁵

The Conference Board, in doing its analysis, did not estimate these two equations on a city-by-city basis but rather pooled all cities together. We replicated that methodology. Table 4 presents the results where t-statistics are in parenthesis below the estimated coefficients.

In the first equation, the wholesale margin coefficient is negative but not significant. This suggests that no cross-subsidization is occurring between the wholesaling and retailing sectors.

In the second equation, the crude oil coefficient is negative and significant at the 10% level which

⁵ While there can be an economic rationale behind the first relationship tested, it seems weak for the second relationship.

support the cross-subsidization hypothesis.⁶ However, the coefficient is relatively small indicating that cross-subsidization is minimal. Indeed, a one cpl increase in crude price would lead to a 0.015 cpl decrease in retail margins.

Both results are consistent with those of the Conference Board. The only difference is the size of their crude oil coefficient in the second equation which is smaller (-0.004) in the Conference Board study.

Table 4 : Results of the Cross-Subsidization Analysis

Variable	Estimated coefficient
<i>First equation</i>	
Constant (α)	1.399 (8.801) ^{***}
Wholesale margin (MW)	-0.011 (-0.655)
Retail margin ($MR(-1)$)	0.767 (48.049) ^{***}
Adjusted R ²	0.589
Durbin-Watson	2.195
<i>Second equation</i>	
Constant (α)	1.642 (8.007) ^{***}
Crude Oil ($CRUDE$)	-0.015 (-1.80) [*]
Retail margin ($MR(-1)$)	0.763 (47.205) ^{***}
Adjusted R ²	0.590
Durbin-Watson	2.189

* Indicates significance at the 10 % level.

** Indicates significance at the 5 % level.

*** Indicates significance at the 1 % level.

⁶Note that cross-subsidization is not considered an anti-competitive act.

3. Conclusion

In preparation for the Commissioner's appearance in front of the Standing Committee on Industry Science and Technology, the Competition Bureau has updated four questions addressed by the Conference Board in its study 'The Final Fifteen Feet of Hose: The Canadian Gasoline Industry in the Year 2000':

1. What is the relationship between wholesale prices and crude oil prices?
2. What is the relationship between retail prices and wholesale prices?
3. Do retail prices change asymmetrically with wholesale price increases and decreases?
4. Is there cross-subsidization between the wholesaling sector of the industry and the retailing sector of the industry?

While we replicated the Conference Board methodology in conducting the econometric analysis, we added two years of data. Assuming that the Conference Board's assumptions are correct with respect to the various relationships tested, we find the following:

1. There is a very strong positive relationship between wholesale prices and crude oil prices;
2. There is a very strong positive relationship between retail prices and wholesale prices;
3. There is no asymmetry in retail prices, i.e., they decrease in the same manner as they increase following a decrease, respectively an increase, in wholesale prices;
4. There is very weak evidence of cross-subsidization, but not of a magnitude to affect competition.

These findings correspond to those of the Conference Board.