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Synthetic control method at the pump: The Petro-Canada/Suncor merger

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Abstract

We use the synthetic control method to measure the impact of the 2009 merger between Suncor and Petro-Canada on retail gasoline prices in Toronto. We find that the merger did not lead to a substantial lessening of competition, perhaps due to the divestiture process or from the remaining effective competition post-merger. Because the analysis is very economical in terms of data requirement, the synthetic control method may be useful in antitrust analysis and merger control, particularly in industries where products are relatively homogeneous.

1. Introduction

Ex post merger evaluations are important for assessing past antitrust decisions, improving future ones, and determining how methods of prospective merger analysis perform. Divestiture reviews are also important for learning their effectiveness in restoring post-merger competition and for developing guiding principles. Unfortunately, both antitrust authorities and academics have not undertaken enough work on those topics.[1]

In this paper, we seek to measure the impact of the 2009 merger between Suncor and Petro-Canada and the ensuing divestiture on retail gasoline prices in Toronto.[2] To do so, we implement the synthetic control method developed by Abadie and Gardeazabal (2003) and Abadie *et al.* (2010, 2015).

In comparative case studies, the outcome of a treated unit (i.e., the unit exposed to an intervention) is compared to the outcome of units unexposed to the intervention (i.e., the comparison units). But there can be some subjectivity in choosing comparison units.[3] Furthermore, methods like differences-in-differences implicitly assumes equal weight on each comparison unit in determining the treatment effect.[4] The synthetic control method exploits a data-driven procedure to construct an observationally comparable control group from the combination of available comparison units, which on their own may not constitute an adequate control.

We find that the Suncor/Petro-Canada merger did not lead to a substantial lessening of competition, perhaps due to the divestiture requested by the Competition Bureau or from the extent to which effective competition remained in Toronto post-merger.

The paper is structured as follows. The next section provides a description of the institutional setting. Section 3 explains briefly how the synthetic control method is implemented. Section 4

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[1] There are exceptions. For instance, Hastings (2004) studies a merger's effect in the US gasoline retail market, Ashenfelter *et al.* (2013) analyze the Maytag-Whirlpool merger, and Aguzzoni *et al.* (2016) examine a merger in the UK book market. See Ashenfelter *et al.* (2009) for a literature review on ex post merger evaluations.

[2] As far as we know, this is the first and only analysis of the merger.

[3] Hasting (2004) compares differences in price changes between gas stations involved in the merger and their close competitors (e.g., those that are less than a mile away) and gas stations that are supposed to be unaffected by the merger (e.g., those that are more than a mile away). Ashenfelter *et al.* (2013) compare the price of clothes washers, clothes dryers, dishwashers, and refrigerators (i.e., markets in which Maytag and Whirlpool had a high individual or combined market share) to prices in other appliance markets (e.g., cooktop, freezer, oven, and range) that had no or small concentration changes before and after the merger. Aguzzoni *et al.* (2016) compare the price evolution of books sold by the two merging firms in overlap areas (i.e., where both are located) to the price evolution of books sold by a merging firm in non-overlap areas (i.e., where only one is located).

[4] Hasting (2004), Ashenfelter *et al.* (2013), and Aguzzoni *et al.* (2016) all use the differences-in-differences method to measure the mergers' pricing impacts.

describes the data collected to conduct the analysis. Section 5 presents the results. The last section provides concluding remarks.

2. Institutional setting

We investigate the economic impact of the 2009 Suncor/Petro-Canada merger. This merger involved assets at multiple levels of the supply chain, including 1) petroleum and natural gas production and transportation; 2) refining; 3) transportation, terminalling, distribution, and wholesaling of refined products; and, 4) retailing of refined products (such as gasoline, diesel, lubricants, and jet fuels).

The Competition Bureau's merger analysis focused on the wholesale and retail gasoline markets in the Greater Toronto Area (we use Toronto thereafter). At the wholesale level, the transaction proposed to combine ownership of two of six refineries serving Toronto. It also involved the acquisition of much of the terminal capacity at the Toronto end of the Trans-Northern Pipelines (TNPL). At the retail level, the transaction would have created horizontal overlaps in a large number of local geographic markets in Toronto. The Competition Bureau concluded that there would be a substantial lessening of competition absent wholesale and retail remedies.

To resolve the competitive concerns, a Consent Agreement was agreed upon between merging firms and the Competition Bureau. Under the Consent Agreement, Ultramar obtained the terminalling capacity at the Toronto end of the TNPL remedying the substantial lessening of competition that the Bureau concluded was otherwise likely in the market for wholesale gasoline in Southern Ontario and Toronto.

The Consent Agreement also requested the divestiture of 104 retail gas stations. At the conclusion of the divestiture process, 98 gasoline stations were divested to Husky, an established firm in the retail gasoline industry that only had a toehold presence in Southern Ontario prior to the merger. Five other stations were divested to retailers such as Canadian Tire and Mac's Milk. And one station was eliminated through a land expropriation.

3. Identification Strategy

We use the synthetic control method to estimate the impact of the 2009 Suncor/Petro-Canada merger (the treatment) on retail gasoline prices in Toronto. In a nutshell, the synthetic control approach identifies the treatment effect (α_t) as the difference between the outcome (e.g., retail gasoline prices) in the treatment unit (e.g., Toronto, Y_{1t}) and the optimally weighted combination of all possible J comparison (untreated) units (e.g., Montreal, Ottawa, Winnipeg, Calgary, Edmonton, and Vancouver, $\sum_{j=2}^{J+1} w_j^* Y_{jt}$) at each post-intervention period (t) covered by the data:[5]

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[5] The reader is referred to Abadie and Gardeazabal (2003) and Abadie *et al.* (2010, 2015) for a more formal and in depth presentation of the synthetic control method.

$$\alpha_t = Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt}.$$

The optimal weight $W^*=(w_2^*, \dots, w_{J+1}^*)$ is chosen to minimize the difference between the treated unit's pre-intervention characteristics (outcome and predictors) and those of the comparison units.[6]

The optimally weighted average outcome of comparison units ($\sum_{j=2}^{J+1} w_j^* Y_{jt}$), the Synthetic Toronto, provides an unbiased estimate of the counterfactual outcome had the merger not occurred in the post-intervention period.

4. Data

To determine the merger's impact and the divestiture's effectiveness in Toronto, we collected daily market-average retail gasoline prices from Gasbuddy.com for the following seven cities: Montreal, Ottawa, Toronto, Winnipeg, Calgary, Edmonton, and Vancouver.[7,8]

All prices are expressed in cents per litre (cpl) and the data cover a period spanning from January 1, 2008, to December 31, 2011. As such, we have 1461 observations for each city except for Ottawa since no report was filed to Gasbuddy.com on July 3, 2009. Table 1 presents descriptive statistics for retail gasoline prices for all cities in our sample. Figure 1 depicts those prices graphically.

Table 1
Descriptive Statistics for Retail Gasoline Prices (in cpl)
January 1, 2008 to December 31, 2011

Cities	Mean	Standard Error	Minimum	Maximum
Montreal	113.99	16.69	71.74	149.22
Ottawa	104.22	16.68	61.28	135.08
Toronto	106.94	16.00	66.48	140.09
Winnipeg	105.78	13.84	76.61	143.09
Calgary	101.21	14.51	66.90	137.94
Edmonton	98.83	14.62	66.40	137.36
Vancouver	117.70	14.93	78.18	150.93

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[6] A weight takes a value between 0 and 1 with the sum of weights being equal to 1.

[7] GasBuddy.com data are generated from price reports submitted voluntarily to the company's website by individuals.

[8] According to the 2011 National Census, those seven cities represent close to half of the Canadian population.

Figure 1
Retail Gasoline Prices (in cpl)
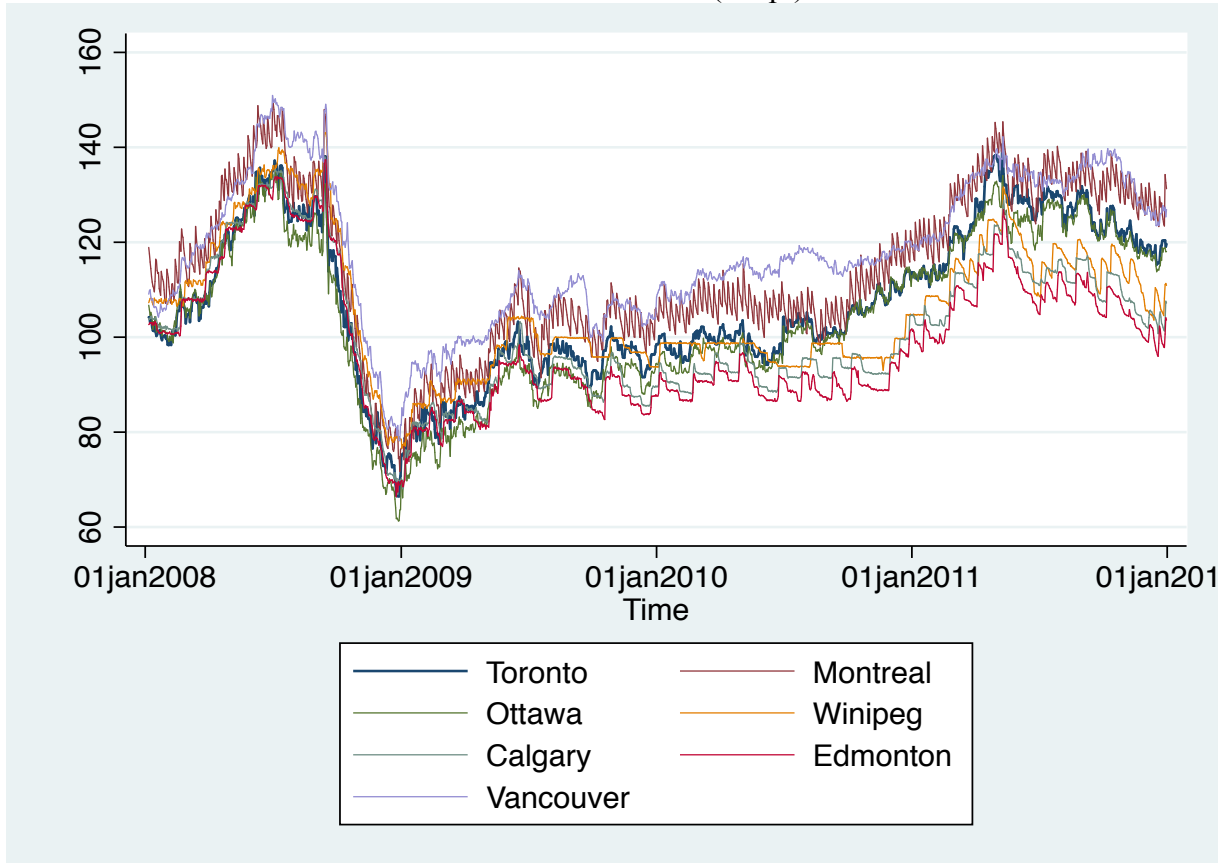
5. Results

Our objective is to measure the merger's effect on retail gasoline prices in Toronto. As such, we attempt to determine how prices would have evolved in Toronto after 2010 but-for the merger. This is done by constructing the Synthetic Toronto and comparing the outcome therein to the observed one. Recall that the Synthetic Toronto is constructed by using potential comparison cities so that predictors of retail gasoline price most closely resemble those in Toronto pre-merger.

Table 2
Pre-Merger Means of Retail Gasoline Prices Predictors

Variables	Toronto	Synthetic Toronto
$Retail_{t-1}$	101.0768	101.0747
$Retail_{t-2}$	101.1499	101.1497
$Retail_{t-3}$	101.2415	101.2365
$Retail_{t-4}$	101.2930	101.2873
$Retail_{t-5}$	101.3259	101.3295

We use lagged values of retail gasoline prices as predictors. Table 2 compares pre-treatment predictors of Toronto with those of the Synthetic Toronto. The average of cities in which the merger unlikely prevented or lessened competition substantially (according to the Competition Bureau) seems to provide a suitable control group for Toronto. Indeed, the Synthetic Toronto reproduces accurately Toronto's predictors pre-merger.

Table 3 shows the weight of each comparison city in Synthetic Toronto. Pre-merger retail predictors in Toronto are best reproduced by a combination of two cities: Montreal and Ottawa.

Table 3
City Weight in the Synthetic Toronto

City	Synthetic Toronto
Montreal	0.312
Ottawa	0.688
Winnipeg	0
Calgary	0
Edmonton	0
Vancouver	0

Figure 2
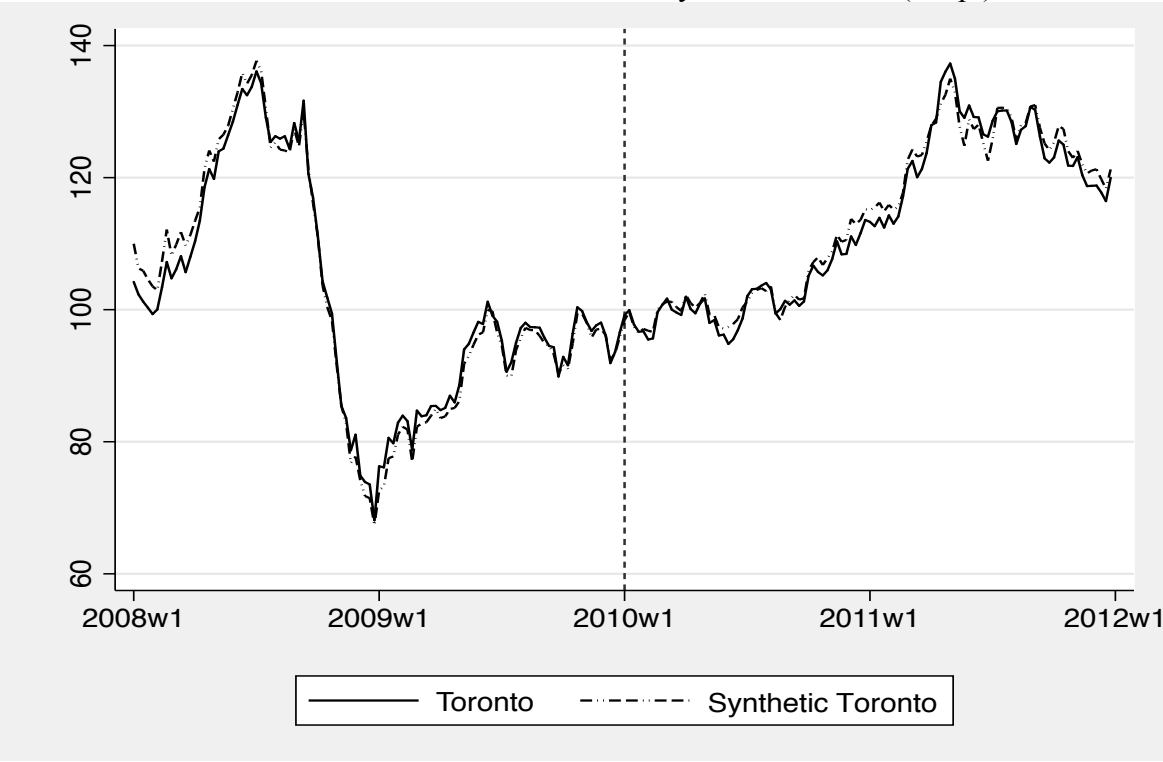Retail Gasoline Prices in Toronto and Synthetic Toronto (in cpl)

Figure 2 depicts retail gasoline prices for Toronto and Synthetic Toronto, respectively, for the period spanning from January 1, 2009 to December 31, 2011. Retail gasoline prices in Synthetic Toronto closely follow the trajectory of retail gasoline prices in Toronto both before and after the merger.

The predictors' high accuracy in replicating Toronto pre-merger (Table 2) in combination with the very close relationship between pre-merger retail gasoline prices in Toronto and its synthetic counterpart (Figure 2) suggest that Synthetic Toronto provides a good approximation as to what would have been the evolution of retail gasoline prices in Toronto had the merger not happened.

The estimated impact of the merger corresponds to the difference between retail gasoline prices in Toronto and in Synthetic Toronto. Figure 3 shows that this difference is very small post-merger. The discrepancy between the lines suggests that the merger did not result in a substantial lessening or prevention of competition, which might be explained by the divestiture process and/or effective remaining competition.[9]

Figure 3
Difference Between Retail Gasoline Prices in Toronto and Synthetic Toronto (in cpl)

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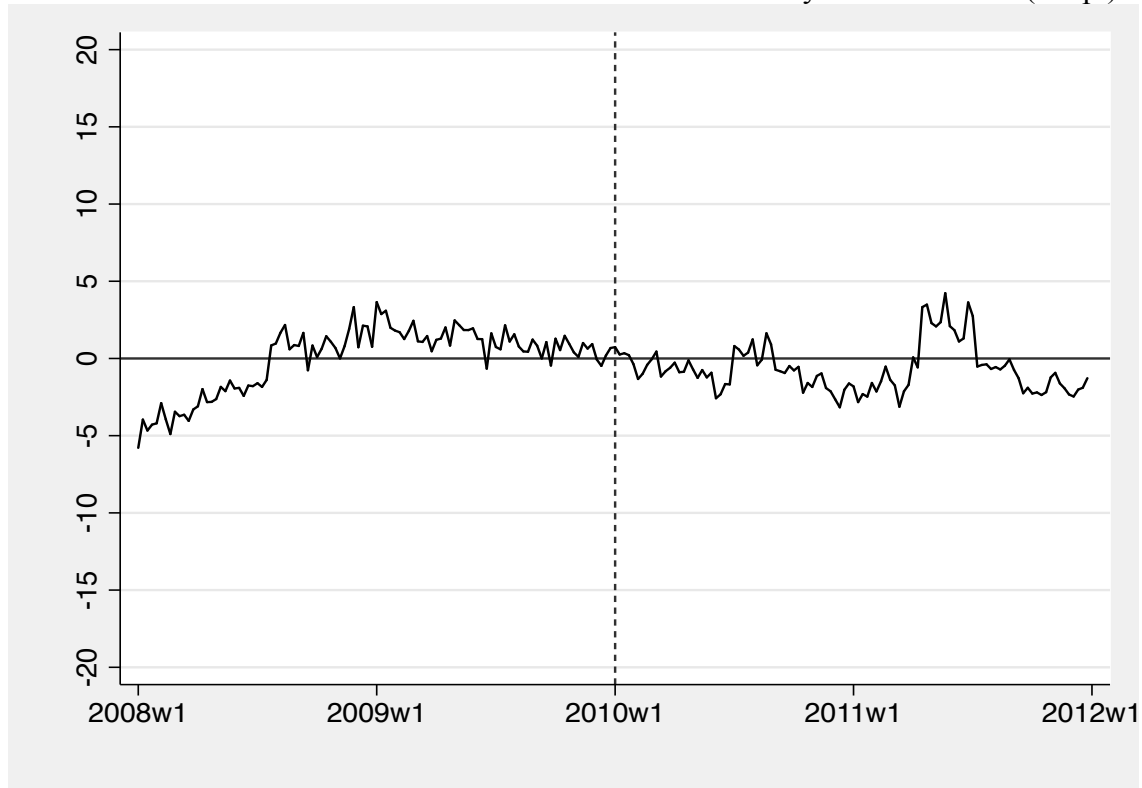
[9] The addition of socio-economic variables (monthly unemployment, monthly population, and yearly median income) to the set of predictors does not change results.

6. Conclusion

We look at a merger in the Canadian retail gasoline industry and assess its impact on prices in Toronto, the only relevant geographic market where the Competition Bureau had competitive concerns. Using the synthetic control method, we find that the merger did not trigger a retail gasoline price increase in Toronto. We cannot, however, determine whether this result comes from the divestiture requested by the Competition Bureau to alleviate the competitive concerns or from the extent to which effective competition remained in Toronto post-merger.

From a policy perspective, the analysis conducted herein suggests that the synthetic control method can be useful in antitrust analysis and merger control, particularly in industries where products are relatively homogeneous (e.g., electricity, cement, and commodity and energy markets in general).[10] Indeed, we only used retail gasoline prices (current and lagged) implying that cost and demand shifters, which might be more difficult and costly to obtain and are required when conducting a traditional econometric analysis, might not be necessary for antitrust authority to gather at least in a first and quick merger assessment. As such, antitrust authorities facing resource constraints and tight deadlines to conclude their merger reviews should consider including the synthetic control method in their toolkit.

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[10] Although retail gasoline should be considered a differentiated product at the local level it can be regarded as a relatively homogeneous good once aggregated at the city level, as is the case here.

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