Independent Retailers and Multimarket Contact in the Chilean Gasoline Market

Fernando Coloma Ríos
Fiscalía Nacional Económica

13th May 2016

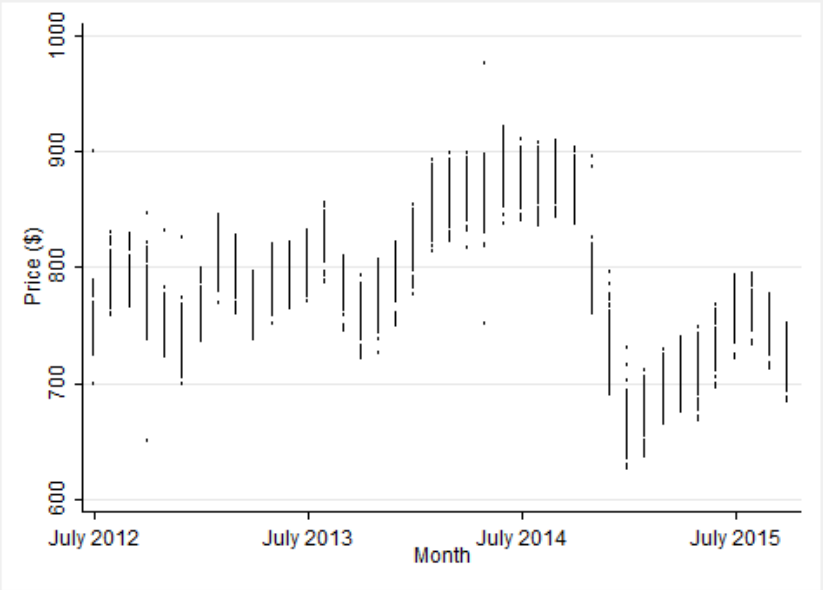
Abstract

Gasoline markets are characterized by high price differences between locations that have not been comprehensively studied by the current literature. This paper aims to provide new insights on this subject, focusing on independent gas stations with potential different incentives and differentiated observed characteristics with respect to branded stations. In order to achieve that, I perform an econometric analysis, using a rich dataset on the Chilean gasoline market, showing that independent stations have influence on the level of competition but this by itself cannot explain the huge difference in prices across local markets. At the same time, exploiting the divestiture of 61 branded stations after the requirement of the Chilean Court of Justice, the hypothesis of independent stations breaking collusive agreements in a context of extensive multimarket contact among chain owned stations is discarded. Considering these results, the analysis suggests that price differences across markets could be explained by a model of local market competition with different fixed costs between locations.

1 Introduction

As in many countries, the Chilean retail gasoline market is characterized by enormous differences in prices of local markets. This occurs even within the same city and in locations that are close to each other, where there are few reasons to think that variable costs could be considerably different, for example due to transport costs asymmetries. For instance, towards the end of October 2015, the price range for unleaded 93 octane gasoline in the capital of Chile, Santiago, varied between \$685 and \$752[1], a difference of almost 10%[2]. This is outlined in Figure 1, where prices of all gas stations in Santiago are presented for the whole of the sampled period.

Figure 1: Prices of Gasoline 93 in Santiago



Several studies have addressed this common characteristic of the gasoline market around the world, attempting to explain the phenomenon of such big price differences through product differentiation models. This paper is focused on the role played by independent unbranded gas stations with a small number of locations and their possible effect over price differences among markets. Several authors have addressed this question with results that show a positive effect of independent on the level of competition, but with a magnitude of this effect that is not clear. In this paper, by using a much richer dataset of weekly observations of all gas stations in Chile - from July 2012 to October 2015 - I aim to answer this question, providing alternative theories to account for the observed price differences.

[1] In October 30th 2015, according to the Central Bank of Chile the exchange rate from Chilean pesos to US dollars was \$690.3/USD.

[2] The mean price was equal to \$720.6 with a standard deviation of \$12.4.

The findings from the econometric analysis suggest that independent gas stations have an impact on market prices of branded retailers and especially on prices of other independents firms. Even though the effect estimated seems to be small, it can be underestimated due to a reverse causality problem explained by the fact that the entry of a new gas station should be motivated by anticipated higher prices. This can occur, for example, after an increase in income or population in a given location. This result is important because in competition analysis both kinds of stations should be considered as part of the same relevant market, even though they differ in some observable variables.

The most interesting results of this paper are derived from a quasi-experiment offered by the divestiture of 61 branded stations that were bought by independent actors after a legal requirement to mitigate possible anticompetitive effects of the acquisition of Terpel by Shell. The change from of a branded station to an independent one seems to reduce prices of near competitors in a magnitude of up to $7 for stations located in a radius of 0.5 kilometers from a divested retail station. Despite the fact that the decrease in price is higher for independent competitors, this suggests that competition authorities should be concerned by acquisitions of independent retailers by large chains with high presence in the country.

Using the same quasi-experiment, it is also shown an interesting results that can be very valuable for the current literature that aims to empirically prove the theory of multimarket contact as a collusion enhancement factor as proposed by Bernheim and Whinston (1990). In this study, the fluctuations in prices after the divestiture suggest that multimarket contact would not be an important factor for allowing higher prices in the market. This stems from the fact that in markets with no previous presence of an independent station, the effect on prices of branded stations is much lower, while in theory, if collusive price were to be sustained due to multimarket contact, prices would have suffered a sharp decrease because of the breakdown of the collusive agreement after the introduction of an actor with no contact across markets.

This paper continues as follows: in Section 2 there is a short description of independent gas stations and their possible role in the market. Section 3 briefly describes the data used. Section 4 provides an econometrical estimation of the effect on prices of the entry of independent gas stations. In Section 5, a quasi-experiment is presented, in order to evaluate econometrically the importance of independent gas stations in the market and their possible effect in a context of extended multimarket contact among branded stations. Finally the Conclusion is presented, along with several comments.

2 Independent stations and competition in the market

In this paper, independent gas stations are understood as retailers of gasoline with one or few locations in the country and low brand development. In contrast, branded stations belong to large companies with countrywide presence and a recognized brand. In the Chilean market, branded stations include Copec, Petrobras, Shell and Terpel, the latter being acquired by Shell in June 2013.

As shown in Table 1, independent gas stations have some differentiated characteristics in terms of observable, such as whether they have a convenience store, toilet, maintenance service and self-service system. This differentiation in terms that could be considered as proxies of quality of service, could signal that independent and branded stations may belong to different relevant market, each one focused on one type of customer. The question of whether there is competition between them comes to be an empirical one, and this is what this study aims, in part, to answer.

There are some previous works that have studied the relevance of independent gas stations on the price of gasoline. For instance, Slade (1986) shows that independent retailers are the price cutters in the market, while major integrated stations lead price restorations. Netz and Taylor (2002) find that as the fraction of the market supplied by independents increases, the amount of spatial differentiation increases. This fact would show that gasoline is viewed as homogeneous by consumers and for this reason a raise in the percentage of the market supplied by independents might cause an increase in price competition. In a similar fashion, Van Meerbeeck (2003) finds that in markets where branded companies compete with independent gas stations, prices are lower. Finally, Sen (2005) finds that higher market share of independent retailers is correlated with higher prices. However, the author proposes that the indirect effect due to the reduction of the market share of vertically integrated companies would dominate, and thus prices would decrease after an increase of the share of independent firms.

Even though most of the studies focusing on the effect of independent gas stations' presence in the relevant market have shown that they have a negative impact on prices, the empirical evidence regarding the size of this impact is not clear. For instance, Hasting (2004), studying the acquisition of Thrifty, an independent company, by ARCO, a branded one, found a large effect of $0.05 per gallon increase in price of gas stations within a radius of one mile from an acquired one, suggesting a high importance of independent companies in the market. However, Taylor, Kreisle, and Zimmerman (2010), using a different dataset, found a much lower and economically insignificant effect of the same acquisition.

These contradictory results could be mainly due to limitations of the available data. In contrast, this paper

has access to a much richer dataset and, similarly to Hasting (2004) and Taylor, Kreisle, and Zimmerman (2010), I too have data about an important shock in the market regarding the divestiture of 61 branded gas stations to independent companies due to antitrust concerns after the acquisition of Terpel by Shell.

Van Meerbeeck (2003) explains that, from a theoretical point of view, price differences can be explained by product differentiation, making a distinction between vertical and horizontal product differentiation. Regarding the gasoline market, he suggests that, while the differences in quality, product mix and/or service level might play a role in explaining price differences across stations, the effect of location would be more important. In the same line, Hasting (2004), proposes that her result is consistent with a model of differentiated products with consumer brand loyalty, which predicts that when independents are replaced by branded integrated stations, price competition in the market is softened, resulting in higher local market prices.

In this analysis, I explore an alternative source of price differences among markets: multimarket contact in a context of small independent firms competing only in few locations. As suggested by Bernheim and Whinston (1990), in some contexts, multimarket contact can increase the ability of firms to collude, relaxing the incentive constraints that limit the extent of collusion. As independent gas stations' owners are present in a small number of locations, they have a low level of multimarket contact. In this sense, they should have a higher incentive to compete because their punishment after price-cutting should be lower than the punishment of a branded station that would see an increase in competition in all markets after the deviation of a tacit agreement.

According to this hypothesis, after the entry of an independent player, in addition to the normal predictions of a model of product differentiation (i.e. reduction in prices due to more fierce competition), there could be an additional effect: the breakdown of price agreements between branded companies and thus, a big decrease in price. For this reason, we should see great price differences among markets depending on the firms' ability to tacitly or explicitly collude, which in turn would depend on the presence of independent stations in the relevant market.

3 The data

The data used in this study is obtained from the Chilean Energy Commission, which collects and publishes online the current prices of gasoline 93, 95 and 97, diesel, kerosene and vehicular gas of every gas station in the country[3]. The original dataset contains weekly observations, however, given that some stations do not

[3] See www.bencinaenlinea.cl.

report prices every week, the dataset was modified to contain monthly observations where the price included is the last price of the month. The period of time included in the dataset begins in July 2012[4] and ends in October 2015. Only observations of unleaded 93 octane gasoline, the product most consumed in the country, are considered.

The total number of gas stations included in the dataset is 1650[5]. Table 1 presents the average of several variables, according to information gathered in October 2015, on the 1568 stations that reported their price during that month, 14.2% of which are independent. The information shown is disaggregated between branded and independent gas stations, showing in addition the difference in the average between them and if this is statistically significant.

Table 1: Comparative Statistics

Variables	Branded	Independent	Difference
Price ($)	720.6	716.7	3.8***
Convenience store	38.7%	16.6%	22.1%***
Pharmacy	2.5%	0.9%	1.6%
Toilet	31.4%	40.8%	-9.4%***
Maintenance service	25.7%	13.0%	12.7%***
Self-service	11.7%	2.7%	9.1%***
Distance nearest competitor (km.)	3.19	2.90	0.29
Distance to 2nd competitor (km.)	5.86	4.98	0.88

*** p<0.01, ** p<0.05, * p<0.1

As illustrated, at first glance, independent and chain owned gas stations are differentiated in terms of some observable, a fact that leads us to question the competitive constraint imposed by the former over the latter.

4 The effect of the number of independent stations

In order to get a first approximation of the importance of independent stations, we will proceed to carry out, in this section, an econometric estimation, so as to understand the effect that the presence of branded and unbranded stations has on price.

Table 1 indicates that the prices of independent gas stations are lower on average; however, this is only a correlation, therefore we cannot conclude that the presence of this kind of stations has a negative effect on price. It could be perfectly possible that they tend to choose locations where income is lower, and at the same time prices, for example because consumers are more price sensitive. In this case, independent gas stations should show lower price on average; this relation, however, is far from being causal.

[4] The dataset contains observations of previous periods; nevertheless, only from July 2012 every gas station is obliged to report prices, so previous observations are ignored.

[5] This does not mean that in every month there is this number of observations, because there could be an entry or exit from the market, or presumably, some gas station might not report their prices during the month.

To find the effect of an increase in the number of independent retailers, we need to use a method that solves the possible endogeneity problem that undoubtedly exists in this case. For this reason, we take advantage of the panel structure of the data to run a fixed effect regression that allows us to control for every time invariant variable, specific to the group we are introducing the fixed effects. At the same time, we can introduce time dummies to control for every variable common to the groups that vary over time. The following equation is estimated in the first place:

$$P_{ict} = \beta + \alpha_c + \gamma_t + \rho Nindependent_{ct} + X_{ct}\delta + \varepsilon_{ict} \quad (1)$$

where α_c is a county fixed effect, γ_t time effects, $Nindependent_{ct}$, the variable of interest, is the number of independent stations in the relevant market in county c in month t, X_{ct} some control variables that vary over county and time, and ε_{ict} is the error term.

The estimation of equation (1) requires the definition of the relevant market in order to calculate the number of independent gas stations per county and other control variables. To define the market, the criteria adopted by Meerbeeck (2003) and Bresnahan and Reiss (1988) are combined: the former defines the relevant market as the administrative division in which the gas station is located, and the latter select isolated markets such as rural towns and cities with surrounding areas that have few competing population centres[6]. In this paper, counties with a population lower than 40,000 habitants, as measured in 2012, are included, in order to avoid highly populated areas with many overlapping markets, such as Santiago where there are 32 counties each with population over 70,000. By selecting small counties we are reducing the sample to more isolated locations that could be reasonably considered as separated markets[7]. Table 2 presents the results of different specifications of equation (1):

[6] All counties with 1980 population under 10,000 were used to identify counties that had distinct centers of population.

[7] The adoption of 40,000 as threshold could be seen as arbitrary. For this reason, a robustness analysis is carried out below with different thresholds.

Table 2: The effect of number of independent on price

	Dependent variable: Retail price for unleaded 93					
Variables	(1)	(2)	(3)	(4)	(5)	(6)
N° Independent	-2.506**	-2.206*	-1.842	-1.547		
	(1.138)	(1.119)	(1.442)	(1.405)		
N° Branded		0.924		0.914		
		(0.711)		(0.720)		
N° Indep.*Indep.			-1.234	-1.232		
			(0.853)	(0.853)		
HHI					0.000508**	
					(0.000255)	
Independent						-4.125***
						(1.479)
Constant	794.8***	792.4***	794.8***	792.5***	790.7***	776.0***
	(0.724)	(1.763)	(0.730)	(1.769)	(1.636)	(0.380)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	County	County	County	County	County	Station
N° Cluster	203	203	203	203	203	1650
Observations	16,451	16,451	16,451	16,451	16,451	60,163
R-squared	0.982	0.982	0.982	0.982	0.982	0.984

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As shown in column (1) and (2)[8] an increase of the number of independent stations seems to reduce the market price in a magnitude above $2. In column (2) the regression is controlled by the number of branded stations that seems to have no effect on the market price. Annex I Table A1 presents a robustness test, showing the results of regression (2) with different threshold for the population of the county. In general, the results are similar, showing a higher effect of independent stations. In columns (3) and (4) an interaction between the number of independent stations and a dummy variable equals to one when the station is independent, is introduced. The result shown in these columns is quite interesting and important to the analysis. Being an independent gas station does not increase the effect of a raise in the number of non-branded retailers in a statistically significant magnitude. This result shows that every kind of station would be affected in the same way and thus, branded stations would compete with independent ones despite being different in some observable, as shown in Table 1. Column (5) shows that an increase of concentration in the market measured by Herfindahl-Hirschman Index (HHI)[9] raises prices in a low magnitude, and column (6) shows that independent gas stations are associated with lower prices with a difference of $4 on average.

Despite the fact that the results seem to suggest that independent gas stations have an effect on the

[8] In regressions (1) to (5) fixed effects are included at the level of county and the standard errors are clustered at the same level. In column (6) fixed effects are included at the level of gas station and the standard errors are clustered at the same level. The number of clusters is high (203 in regressions (1)-(5) and 1650 in regression (6)) and robust standard errors are included too. Therefore, we can be confident about the proper estimation of the errors, in order to solve serial correlation or heteroskedasticity problems

[9] As the dataset does not include quantities sold, I calculate market shares using the number of stations of each brand in each county.

market price which is higher than the effect of branded stations[10], according to the regressions results, the magnitude seems to be small. However, we should take into account that the result is possibly downward biased. The entry of new participants is more profitable when the price of the market is growing, for example due to an income or population growth shock. For this reason, we should see more entry in a market where price is increasing and thus we would have a bias in our estimation. In the estimation, it is problematic when there are shocks over time specific to a local market, something that is very probable in this case. Our fixed effect regression cannot control for this, so probably the effect of the entry of a new independent participant is higher.

5 The divestiture of 61 branded stations

After the requirement of the Chilean Court to avoid anticompetitive effects of the acquisition of Terpel by Shell, two branded companies, on the 4th of September 2013, 61 stations[11] were auctioned to independent gas stations' operators. Of these stations, 49 were finally acquired before the 16th of October 2013, while the rest were transferred in subsequent months. This event provides a very useful quasi-experiment for testing the role of non-branded players in the market.

Hasting (2004) and Taylor, Kreisle, and Zimmerman (2010) estimate the effect of the presence of independent gas stations in the market evaluating the acquisition of Thrifty, an independent company, by ARCO, a branded company. Even though both studies conclude that independent stations reduce prices, the magnitude of this effect is very different in each estimation. In this section, we evaluate the effect of the conversion of these 61 branded stations to independent stations, using a difference in difference approach, as done by Hasting (2004) and Taylor, Kreisle, and Zimmerman (2010).

Taking advantage of the structure of the data, in this estimation we are able to estimate not only the impact of the divestiture, but we can also disentangle, to some extent, the channels through which independent stations influence prices. Therefore, this enables us to evaluate the theory of the special role that is played by these types of retailers in breaking tacit collusion, in a context of huge multimarket contact among branded chains.

[10] Nevertheless, it is important to bear in mind that when branded stations have previous presence in the market, the concentration will not necessarily decrease after the addition of a new branch. So, theoretically, the sign of the effect for the entry of these kind of actors is not clear.

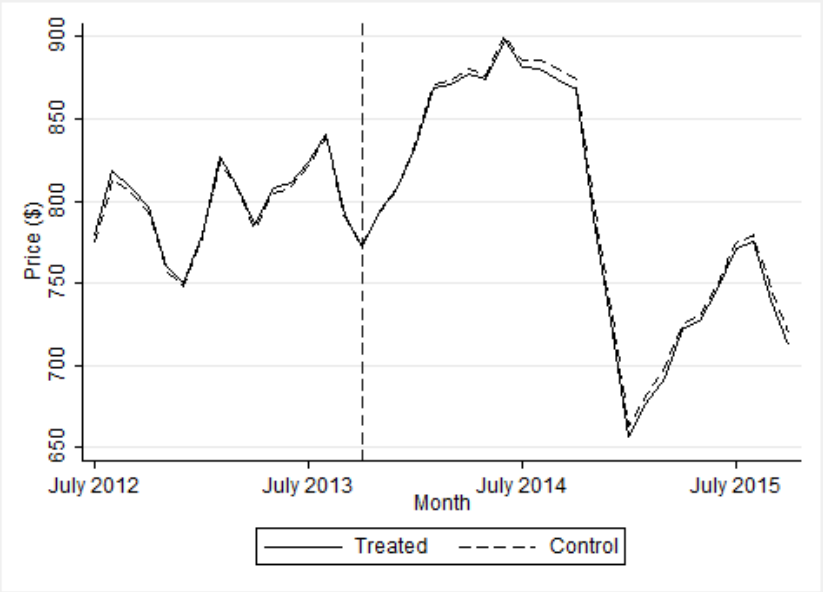
[11] Two of them were finally sold after a new auction on the 23th of October, 2013.

5.1 Graphical analysis

A first approximation for the evaluation of the transaction is shown in Figure 2, where the mean price of treatment and control group is presented over time. The treatment group was defined as those gas stations with a divested station[12] inside a radius of d kilometers from the latter, where d is defined according to the different specifications of the regressions. The vertical line represents the date of the approximated divestiture (October 2013)[13].

Figure 2: Treatment and control whole sample

Figure 2a: 0.5 km



[12] Considering that some divested stations did not continue operating or operated for a short period, only those divested stations with 10 or more observations after October 2013 (over a total of 24) were considered. This reduces the number of divested stations to 46.

[13] It is important to keep in mind that this is not an exact date and that a gas station could also take some time to start functioning normally with the new owner. Thus, the result could be distorted and the effect of the divestiture underestimated by this measurement error.

Figure 2b: 1.5 km.

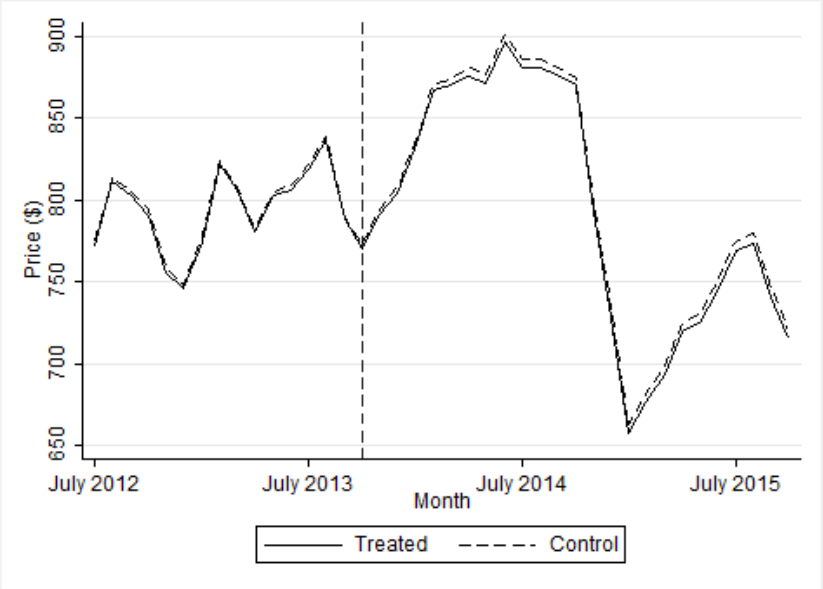


Figure 2a considers as treatment group those stations with a divested retailer at a distance less than 0.5 kilometers, while Figure 2b considers a distance smaller than 1.5 kilometers. It is worth noting that, according to the data shown in all the graphics of this section, the parallel trend assumption inherent to a difference in difference estimation seems to hold. As seen in the graphs, at first glance, after the transaction, the treatment group seems to have suffered a small reduction in price compared with the control group.

In order to better understand the different aspects of the results presented in the previous graphs, I have included Figure 3, with four new graphics in which the treatment group is defined as those gas stations with a divested station at less than 0.5 kilometers distant.

Figure 3: Treatment and control groups with particular samples

Figure 3a: Only independent

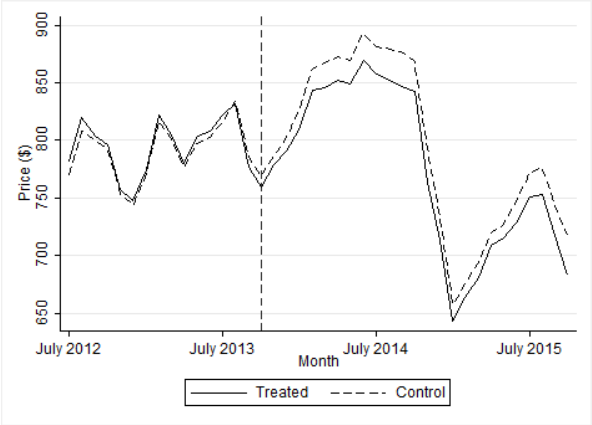


Figure 3 b: Only branded

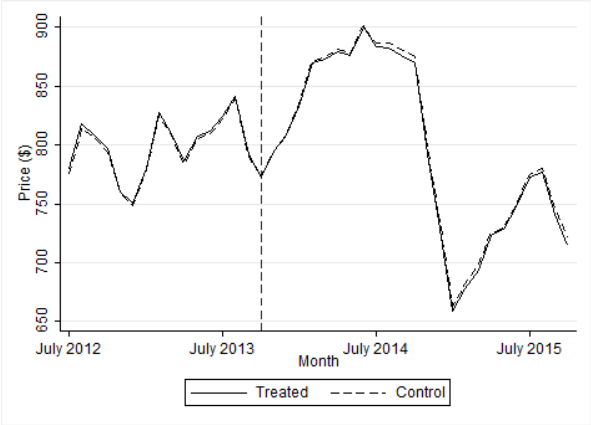


Figure 3c: Previous presence of independent

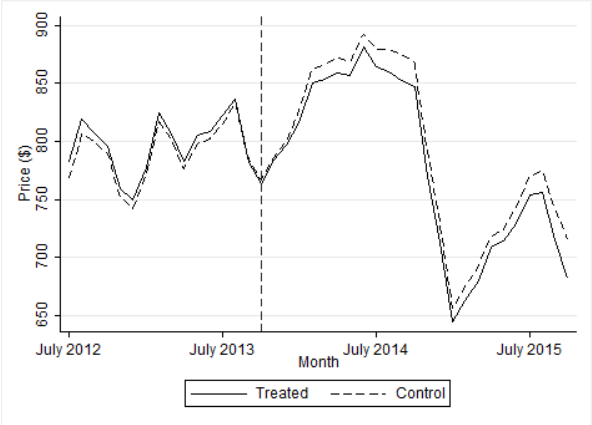
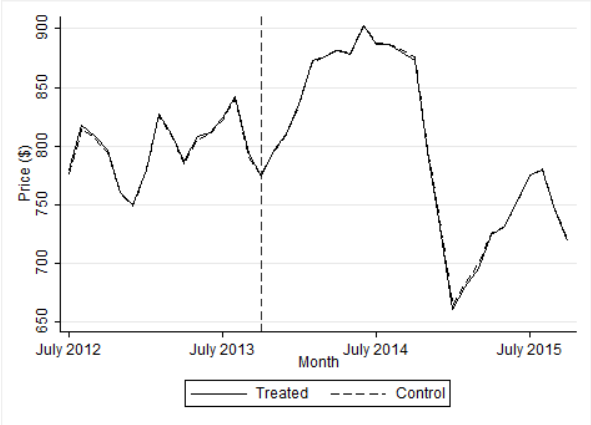


Figure 3d: No previous presence of independent



We can see a clearer pattern emerging here, regarding the effects of the divestiture. Figure 3a shows that apparently, after the threshold of October 2013, prices decreased in the treatment group with respect to the control group when we restrict the sample only to independent stations. As illustrated in Figure 3c, the same happens when we take a subsample of all gas stations, which, previous to the divestiture had an independent station inside a radius of 0.5 kilometers. On the other hand, the divestiture seems to have had a lower effect on branded stations and in markets with no previous presence of independent stations.

5.2 Difference in Difference estimation

Continuing with the analysis, we will proceed at this point with a difference in difference estimation as done by Taylor, Kreisle, and Zimmerman (2010). The regression to be run is the following:

$$P_{it} = \beta + \alpha_i + \gamma_t + \rho Treatment_{it}^{d} + \varepsilon_{it} \tag{2}$$

where P_{it} equals the price of station i in month t, α_i is a station fixed effect, γ_t is a time effect, $Treatment_{it}^d$ is a dummy variable equal to one for stations with a divested station[14] in a radius of d kilometers and the observation is after the 16th of October 2013[15][16], and ε_{it} is the error term. Table 3 presents the results of this regression using four different distances from a divested station, in order to define the treatment group[17].

Table 3: Effect of divestiture

	Dependent variable: Retail price for unleaded 93			
Variables	(1)	(2)	(3)	(4)
Treatment	-6.993***	-3.741***	-2.727***	-1.186
	(1.647)	(1.058)	(0.814)	(0.751)
Constant	775.5***	775.5***	775.5***	775.5***
	(0.351)	(0.352)	(0.352)	(0.352)
Km. to divested	0.5	1	1.5	2
Time effects	Yes	Yes	Yes	Yes
Fixed effects	Station	Station	Station	Station
N° Cluster	1,592	1,592	1,592	1,592
Observations	58,253	58,253	58,253	58,253
R-squared	0.985	0.985	0.984	0.984

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As expected, the sign of the treatment variable is negative, which shows that the substitution of a branded station by an independent one has a negative effect on price. For stations located at a distance less than 0.5 kilometers from a divested station, the average effect was almost $7 which is around 1% of the average price in October 2015. In addition, it is worth noting that the estimated effect decreases with the distance from a divested station used to define the treatment variable, result which is in accordance to economic intuition.

This result is consistent with a model of vertical product differentiation, where independent stations have a lower level of perceived quality, therefore to compete in the market they must charge at a lower price, increasing the competitive pressure over other actors.

In order to gather more information about the channel by which an independent station affects prices on the market, we ran some new regressions. Table 4 presents the same estimations with Table 3, but including an interaction term between the treatment variable and a dummy variable equal to one when the station is independent. With these regressions we will be able to estimate if there was a differentiated effect by kind

[14] Divested stations were discarded from the sample.

[15] This is considered as the divestment date because initially it was the deadline for the transfer of the 59 stations auctioned on the 4th of September 2013. As it is not the exact date of transfer, our results may suffer some attenuation bias due to this measurement error.

[16] Robust standard errors are estimated and clustered by station to allow autocorrelation between observations of the same station. As in Section IV, the number of clusters is high enough to get a reasonable estimation of standard errors.

[17] Columns (1), (2), (3) and (4) present the results using, respectively, 0.5, 1, 1.5 and 2 kilometers from a divested gas station to define the treatment group.

of station and thus if independent stations are closer competitors among them. Though not conclusive, the results seem to show that there was a higher effect of the divestiture over independent stations. This effect turns out to be statistically insignificant when we define the treatment variable using a larger radius. Still, it is clear that prices of branded stations near divested ones have decreased. Thus, there is evidence that both kinds of retailers are competitors and should be considered as part of the same relevant market.

Table 4: Effect of divestiture by kind of station

	Dependent variable: Retail price for unleaded 93			
Variables	(1)	(2)	(3)	(4)
Treatment	-6.049***	-3.287***	-2.590***	-0.942
	(1.572)	(1.055)	(0.829)	(0.771)
Treatment*Independent	-17.82**	-9.106	-2.249	-3.593
	(7.669)	(5.788)	(3.764)	(2.955)
Constant	775.5***	775.5***	775.5***	775.5***
	(0.351)	(0.352)	(0.352)	(0.352)
Km. to divested	0.5	1	1.5	2
Time effects	Yes	Yes	Yes	Yes
Fixed effects	Station	Station	Station	Station
N° Cluster	1,592	1,592	1,592	1,592
Observations	58,253	58,253	58,253	58,253
R-squared	0.985	0.985	0.984	0.984

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As mentioned above, one possible effect of independent stations in the market is their influence on breaking down tacit collusion among branded stations. In fact, branded stations are characterized by a large contact across markets in multiple locations along the country, while independent ones are not. This means that independent stations should have a larger incentive to cut prices and thus trigger a competitive behavior among retailers in the market.

Bernheim and Whinston (1990) examine, theoretically, the effect of multimarket contact on the degree of cooperation that firms can sustain, and conclude that multimarket contact can have real effects relaxing the incentive compatibility constraints that limit the extent of collusion. Here, we have the chance to test this theory empirically, taking advantage of the quasi-experiment offered by the previously mentioned divestiture of branded retailers. The hypothesis to be tested relies on the idea that if multimarket contact is important for sustaining collusion, the entry of an independent station should have a greater effect when it is the first gas station of this kind to be present in the local market.

In practice, this is reached by introducing to equation (2) two new variables. First, a dummy variable equals to one if the station is branded and part of the treatment group, and, second, a dummy variable equals to one if a station is part of the treatment group, is a branded station and previous to the divestiture

had no independent competitor in a radius of 0.5, 1, 1.5 or 2 kilometers, depending of the specification. The prediction is that, if multimarket contact is important, the coefficient of the last dummy variable should be negative, that is, prices of branded stations should have decreased more in markets with no previous presence of an independent.

Since the coefficient of interest is positive and statistically significant in each specification, the results shown in Table 5 do not support the hypothesis of multimarket contact as an important factor for sustaining collusion. In fact, branded stations suffered a much lower effect in locations with no previous presence of independent retailers, a result that suggests that the introduction of an independent retailer does not cause a cessation of an eventual tacit or explicit agreement.

Table 5: Divestiture and multimarket contact effect

	Dependent variable: Retail price for unleaded 93			
Variables	(1)	(2)	(3)	(4)
Treatment	-23.87***	-12.39**	-4.839	-4.535
	(7.513)	(5.701)	(3.687)	(2.873)
Treatment*Branded	3.706	3.139	-0.646	1.389
	(8.459)	(6.513)	(4.002)	(3.162)
Treat.*Branded*No independent	16.73***	7.580**	4.875***	4.043***
	(4.082)	(3.286)	(1.731)	(1.510)
Constant	775.5***	775.5***	775.5***	775.5***
	(0.350)	(0.351)	(0.352)	(0.352)
Km. to divested	0.5	1	1.5	2
Time effects	Yes	Yes	Yes	Yes
Fixed effects	Station	Station	Station	Station
N° Cluster	1,592	1,592	1,592	1,592
Observations	58,253	58,253	58,253	58,253
R-squared	0.985	0.985	0.985	0.985

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

It is worth noting that a possible drawback of the estimations presented in this section is related to the fact that the divested stations were selected by the seller, Shell[18], and thus the selection process was undoubtedly strategic and not random. For instance, before the divestiture, among the gas stations owned by Shell, 22.8% of the divested ones had convenience stores, compared with 31.8% of the others stations of the company. It is possible that the selected stations had a low competitive potential, and therefore our estimations would not reflect the effect of the switch to independent of an average station. This means that our results might be an underestimation of the true effect over the market of an average station. In addition, our results could be underestimated because some divested stations were not fully competitive during the whole sampled period since they did not function permanently.

[18] However, the counties where a divestiture was required were defined by the Court.

6 Conclusion

In this paper I have provided an analysis that offers new insights regarding the importance of independent retailers in gasoline markets. Econometric estimations show that this kind of station produces a decrease in prices of independent and branded retailers, suggesting that both kinds of participants should be considered as part of the same relevant market. This implies that competition authorities should be concerned about acquisitions of independent stations by large chains. Even though an increase in quality of service could take place, it is also true that prices should tend to increase after a transaction of this type.

Regarding price dispersion in nearby locations, the hypothesis that independent gas stations cause the breakdown of collusive pricing because their higher incentive to compete due to their low level of multimarket contact, is not backed by empirical evidence. By econometrically exploiting the sale of 61 branded stations in many local markets, we got the following results: the prices of branded gas stations had a lower decrease in locations with no previous presence of independent companies. This means that the introduction of the first independent competitor in the market would not have triggered very high competition through the interruption of an eventual collusive agreement.

These results leave the question of the high price differences between locations unanswered. Even though independent stations are associated with a price $4 lower on average, this is far from explaining the whole price variation across markets. A possible explanation for this fact could be found in an economics model of entry with different fixed costs between local markets. In fact, the cost of land has an enormous variation in markets within the same city. In this context, the equilibrium condition of entry should imply different prices in markets with different fixed costs.

In each market, firms should enter until the present value of the gross profit is equal to the present value of fixed costs[19]. This means that in equilibrium, the next firm to enter should have negative net profits. In this context, a firm in a relevant market with high fixed costs should face in equilibrium higher prices in order to cover these costs and get net profits equal or greater than zero. Therefore, in this kind of markets, the marginal firm would enter at a higher price and the next firm would not enter at all, because the depression in price that would follow would make entry unprofitable.

Entry would only occur after an increase in demand, allowing for an additional firm to cover its fixed costs. This theory is consistent with the results presented in Section 4 which show that an increase in the number of competitors affects prices in a small amount. New stations should only enter when demand

[19] These include the fixed cost of entry.

increases and there is an upward pressure on prices. In this setting, it is perfectly possible to observe entry with no or small relation with price because of this reverse causality problem which cannot be solved by a fixed effect estimation given that shocks vary over time and are location-specific.

References

[1] Bernheim, D. and M. Whinston (1990). “Multimarket Contact and Collusive Behaviour”. RAND Journal of Economics, 21, pp. 37-57.

[2] Bresnahan, Timothy F., and Reiss, Peter C. (1988). "Do Entry Conditions Vary across Markets?" Brookings Papers Econ. Activity, no. 3 (1988), pp. 833-82.

[3] Hastings, Justine S. (2004). "Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Evidence from Contract Changes in Southern California." American Economic Review, 94(1): 317-328.

[4] Netz, Janet S. and Beck A. Taylor (2002). “Maximum or Minimum Differentiation? Location Patterns of Retail Outlets”. Review of Economics and Statistics, February 2002, 84(1), pp. 162–75.

[5] Sen, Anindya (2005). “Does Increasing the Market Share of Smaller Firms Result in Lower Prices? Empirical Evidence from the Canadian Retail Gasoline Industry”. Review of Industrial Organization, 2005, Vol.26(4), pp.371-389.

[6] Slade, Margaret E. (1986). “Conjectures, Firm Characteristics, and Market Structure: An Empirical Assessment.” International Journal of Industrial Organization, December 1986, 4(4), pp. 347–69.

[7] Taylor, Christopher T., Nicholas M. Kreisle, and Paul R. Zimmerman. 2010. "Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Evidence from Contract Changes in Southern California: Comment." American Economic Review, 100(3): 1269-76.

[8] Van Meerbeeck, Wim (2003). “Competition and Local Market Conditions on the Belgian Retail Gasoline Market”. De Economist, 2003, Vol.151(4), pp.369-388.

A Annex 1

Table A1: Robustness test

	Dependent variable				
	Retail price for unleaded 93				
Variables	(1)	(2)	(3)	(4)	(5)
N° Independent	-9.221***	-2.519	-1.890*	-1.462	-3.235***
	(3.208)	(1.797)	(0.971)	(0.993)	(1.136)
N° Branded	-2.685	-0.0405	0.484	0.182	-1.529***
	(4.205)	(1.251)	(0.493)	(0.432)	(0.357)
Constant	812.7***	796.3***	791.2***	790.9***	795.8***
	(4.808)	(2.056)	(1.513)	(1.405)	(4.580)
Time effects	Yes	Yes	Yes	Yes	Yes
Fixed effects	County	County	County	County	County
N° Cluster	55	143	226	229	303
Population<	10,000	20,000	60,000	70,000	∞
Observations	2,485	8,770	21,212	22,154	60,163
R-squared	0.968	0.978	0.984	0.983	0.978

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1