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# **A Preliminary Analysis of the Competitive Effects of the Repsol-YPF Merger on the Argentine Gasoline Market**

by Germán Coloma <sup>(\*)</sup>

## **Abstract**

This paper presents alternative models of behavior of the Argentine gasoline market and applies parametric estimations to analyze the effect that the Repsol-YPF merger had on that market. Using monthly data for the different provinces of Argentina during 1999, we make an evaluation of that effect. We conclude that we cannot reject the hypothesis that the market was a Cournot oligopoly before the merger and, after that, it became one with a price leader (Repsol-YPF). This implies an efficiency loss of nearly \$60 million per month. However, these conclusions are clearly preliminary, because they are valid for a very short period of time and they could reflect an out-of-equilibrium behavior of the new firm based on wrong beliefs.

**JEL Classification Numbers:** C33, L13, L71.

**Keywords:** Gasoline market, Oligopoly behavior, Hypothesis testing.

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# **A Preliminary Analysis of the Competitive Effects of the Repsol-YPF Merger on the Argentine Gasoline Market**

by Germán Coloma

The aim of this paper is to analyze the behavior of the Argentine gasoline market and evaluate the competitive effects that the merger between Repsol and YPF, which took place in August 1999, had on that market. In doing so, we attempt to answer the following questions:

- a) Did the merger have an impact on the prices and quantities traded in that market?
- b) Which market structure does it explain the behavior of the industry better?
- c) Did that structure change as a consequence of the merger?
- d) Which are the welfare implications of that change?

In order to answer those questions, we use a data set that contains monthly price information by province for YPF during the year 1999. We also use data on quantities, market shares, oil prices, population and GDP.

The paper is organized as follows. In the first section, we describe the basic characteristics of the Argentine gasoline market for the period under study, and the basic changes that took place as a consequence of the merger. In the second, we present the theoretical model used to answer our questions. In the third, we analyze the estimation results obtained. In the fourth, we derive some welfare implications, by calculating the changes suffered by the consumer, producer and government surpluses. Finally, the fifth section summarizes the main conclusions of the paper.

## **1. Descriptive analysis**

According to the statistics of the Argentine Department of Energy, total gasoline consumption in Argentina during 1999 was equal to 5215.7 million liters. This implies an average of 11.9 liters per capita per month for the whole country. The average retail price of gasoline was equal to 38.39 cents (without including taxes), and 91.92 cents (if we include the value added tax and the specific fuel tax)<sup>1</sup>. Supply concentration in Argentina is relatively high for this market. The average Herfindahl-Hirschman Index (HHI) for 1999 was 0.3365. This is strongly influenced by the fact that the largest supplier (YPF) had a market share whose average was equal to 47.06% (see table 1).

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<sup>1</sup> Those numbers are the ones charged by YPF for the “ordinary premium gasoline” (between 92 and 97 octanes). They represent weighted averages for the whole country, and take into account the fact that there are provinces in which gasoline is exempted from specific fuel taxes. Argentine cents are equivalent to US cents, since the Argentine peso had a fixed exchange rate of 1 with the US dollar during the whole period under analysis.

The acquisition of the majority of YPF shares by the Spanish firm Repsol in August 1999 had an important effect on some of the figures mentioned in the previous paragraph. As Repsol already controlled the company Eg3, which was the fourth largest supplier with a market share of around 10%, the average HHI jumped from 0.3090 (for the period January-August) to 0.3904 (for the period September-December). This was primarily a consequence of the fact that YPF alone had an average market share of 43.91% between January and August and Repsol-YPF as a whole (that is, YPF plus Eg3) had an average market share of 53.24% between September and December.

**TABLE 1 – ARGENTINE GASOLINE MARKET – 1999**

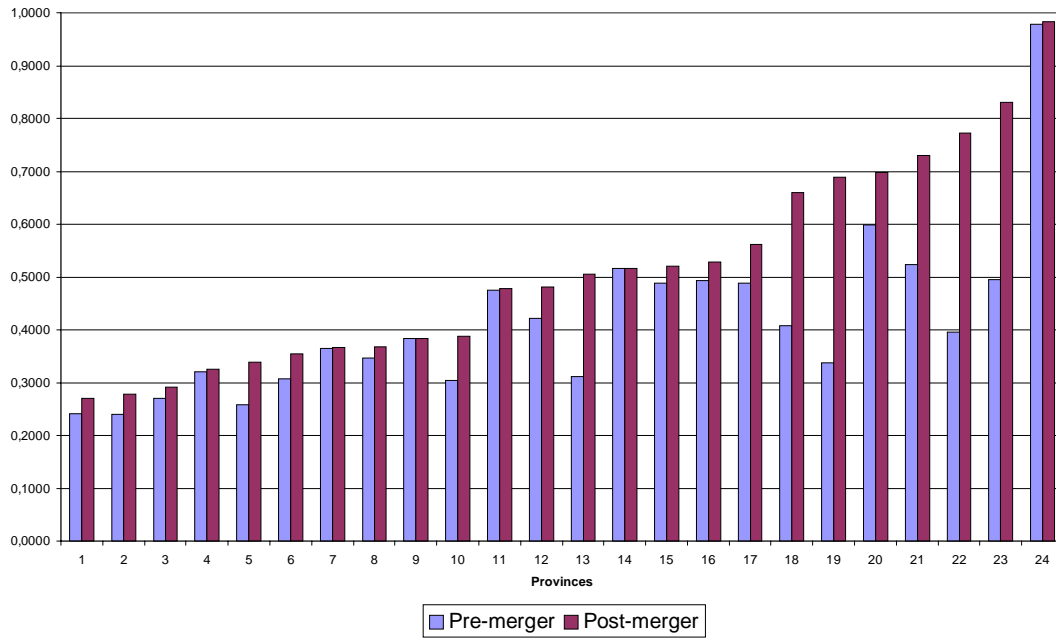
Concept	Pre-merger	Post-merger	Average
Price without taxes (\$/liter)	0,3607	0,4299	0,3839
Price with taxes (\$/liter)	0,8908	0,9754	0,9192
Price oil WTI (\$/liter)	0,1049	0,1534	0,1211
Consumption (liters/cap/month)	11,8092	12,0657	11,8947
Concentration (HHI)	0,3090	0,3904	0,3365
YPF market share	0,4391	0,5324	0,4706

Source: Own calculations based on data from the Argentine Department of Energy.

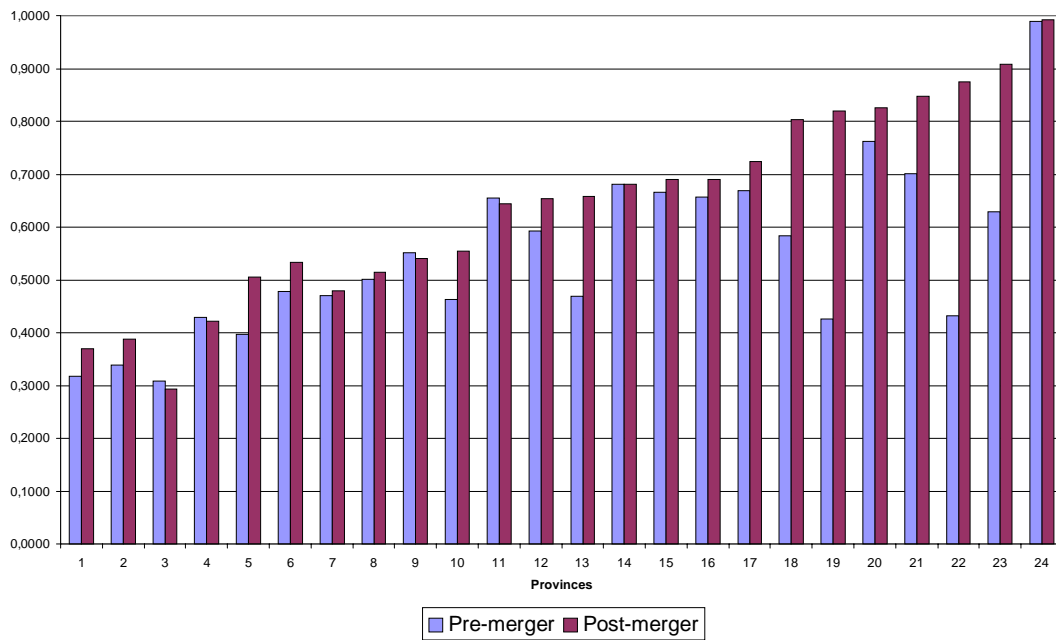
The Repsol-YPF merger may have generated a price increase in the Argentine gasoline market. If we look at the average YPF price without taxes reported in Table 1, this was equal to 36.07 cents/liter between January and August and it increased to 42.99 cents/liter for the period September/December. However, this increase is not necessarily a consequence of the merger. International oil prices also increased during the period (the WTI price averaged 10.49 cents/liter in January-August and 15.34 cents/liter in September-December), and gasoline consumption was larger, too (the average per capita consumption was 11.81 liters per capita per month in January-August and 12.07 liters per capita per month in September-December).

The effects of the Repsol-YPF merger on the gasoline market concentration differed considerably in the different Argentine provinces. In some of them YPF already possessed a large market share that did not change very much with the merger, while in others that share changed a lot. As Eg3 did not sell gasoline in every province, there are six cases (Chaco, Corrientes, Salta, Santiago del Estero, Jujuy and Tierra del Fuego) in which concentration was virtually unaffected by the merger. Conversely, there are other six provinces (San Luis, Río Negro, La Pampa, Neuquén, Chubut and Santa Cruz) in which Eg3 had a relatively large market share and therefore the merger considerably pushed the concentration indices up. This can be seen in the numbers that appear on table 2, which are also graphed in figures 1 and 2. Figure 1 shows the pre-merger and post-merger HHI concentration indices for the 24 jurisdictions in 1999, while figure 2 shows the corresponding pre-merger and post-merger YPF market shares.

### 1. Argentina: HHI Concentration Indices by Province - 1999



### 2. Argentina: YPF Market Shares by Province - 1999



**TABLE 2 – HHI CONCENTRATION INDICES AND YPF MARKET SHARES – 1999**

Province	HHI		YPF Mkt Share	
	Pre-merger	Post-merger	Pre-merger	Post-merger
1. Santa Fe	0,2412	0,2695	0,3175	0,3699
2. City of Buenos Aires	0,2397	0,2782	0,3392	0,3872
3. Tucumán	0,2709	0,2910	0,3083	0,2930
4. Chaco	0,3208	0,3249	0,4284	0,4208
5. Province of Buenos Aires	0,2577	0,3393	0,3975	0,5058
6. Córdoba	0,3063	0,3540	0,4782	0,5326
7. Corrientes	0,3652	0,3663	0,4710	0,4795
8. Catamarca	0,3464	0,3682	0,5010	0,5146
9. Salta	0,3833	0,3826	0,5518	0,5408
10. Entre Ríos	0,3045	0,3878	0,4619	0,5549
11. Santiago del Estero	0,4755	0,4783	0,6553	0,6447
12. Misiones	0,4210	0,4804	0,5923	0,6530
13. San Luis	0,3116	0,5048	0,4681	0,6577
14. Jujuy	0,5160	0,5161	0,6805	0,6812
15. Mendoza	0,4879	0,5206	0,6660	0,6895
16. Formosa	0,4930	0,5281	0,6563	0,6903
17. La Rioja	0,4886	0,5617	0,6690	0,7235
18. Río Negro	0,4077	0,6597	0,5830	0,8026
19. La Pampa	0,3379	0,6883	0,4265	0,8201
20. San Juan	0,5977	0,6972	0,7613	0,8259
21. Neuquén	0,5231	0,7303	0,7010	0,8474
22. Chubut	0,3947	0,7725	0,4323	0,8751
23. Santa Cruz	0,4953	0,8300	0,6284	0,9084
24. Tierra del Fuego	0,9790	0,9840	0,9894	0,9919
<b>Weighted Average</b>	<b>0,3090</b>	<b>0,3904</b>	<b>0,4391</b>	<b>0,5324</b>

Source: Own calculations based on data from the Argentine Department of Energy.

In order to test if the Repsol-YPF merger had an effect on gasoline prices, we made an initial set of three ordinary least square regressions using the data available. All three regressions used the YPF gasoline price as the dependent variable, and the independent variables were the 24 province dummies (the 23 Argentine provinces plus the city of Buenos Aires), a Summer dummy (for the months of December, January, February and March), a Winter dummy (for the months of June, July, August and September) and the WTI oil price. The first regression included as an additional variable the HHI index; the second used instead the YPF market share; and the third used instead a merger dummy (0 for January-August, 1 for September-December).

The total number of observations was 288 (24 provinces times 12 months). YPF gasoline prices were the retail “ordinary premium prices” (gasoline between 92 and 95 octanes) without taxes, that corresponded to the main urban area of each province. The HHI indices were calculated for each month for each province using quantity data provided by the Argentine Department of Energy, and the same data was used to calculate the YPF

market shares. For the period January-August, YPF and Eg3 were considered separate entities. For the period September-December, they were considered as a single entity in order to calculate the HHI indexes and YPF market shares.

**TABLE 3 – PRICE REGRESSION RESULTS**

<b>Concept</b>	<b>Coefficient</b>	<b>p-value</b>
<b>Regression 1</b>		
Constant City of Bs As	0,223972	0,0000
Summer Dummy	0,020364	0,0000
Winter Dummy	-0,026965	0,0000
WTI Oil Price	1,105090	0,0000
HHI Index	0,067914	0,0000
R-squared	0,970073	
Sum squared residuals	0,038785	
<b>Regression 2</b>		
Constant City of Bs As	0,216974	0,0000
Summer Dummy	0,020387	0,0000
Winter Dummy	-0,026940	0,0000
WTI Oil Price	1,117325	0,0000
YPF Market Share	0,063762	0,0000
R-squared	0,969904	
Sum squared residuals	0,039003	
<b>Regression 3</b>		
Constant City of Bs As	0,274778	0,0000
Summer Dummy	0,016071	0,0000
Winter Dummy	-0,020271	0,0000
WTI Oil Price	0,738520	0,0000
Repsol-YPF Merger Dummy	0,029782	0,0000
R-squared	0,975813	
Sum squared residuals	0,031346	

The main results of the regressions performed appear on table 3. In it we see that in all three cases the seasonal dummies are significant and that the WTI oil price has a positive and significant effect on the gasoline price. The additional variables related to HHI, YPF market share and the Repsol-YPF merger are also positive and significant in the three regressions. This implies that increases in market concentration and in the degree of preponderance of the largest supplier seem to produce increases in price, and the same result holds for the merger dummy variable.

## **2. Theoretical model**

In order to analyze the behavior of the Argentine gasoline market, we will develop four models of supply and demand and try to estimate their parameters. The models will differ in the behavior that we will assume for the supply, and will correspond to four market

structures: price taking, Cournot oligopoly, price leadership and collusion<sup>2</sup>. In all four cases, the demand will have the same shape, given by the following price equation:

$$P_g + T_g = A_t + \beta_1 \cdot \text{GDPpc} + \beta_2 \cdot (\text{Qg}/\text{Pop}) \quad ;$$

where “P<sub>g</sub>” is the gasoline price without taxes, “T<sub>g</sub>” is the specific fuel tax (equal to 48.65 cents per liter in the city of Buenos Aires and 20 Argentine provinces and equal to zero in the 3 most southern provinces), “GDPpc” is an estimation of the gross domestic product per capita (which varies by month and by province), “Q<sub>g</sub>” is total gasoline consumption per province per month, and “Pop” is the population of each province. “A<sub>t</sub>”, “β<sub>1</sub>” and “β<sub>2</sub>” are the parameters to be estimated, with “t” varying from 1 to 12 (corresponding to the twelve months of the year). As we see, this function tries to capture the average demand of the Argentine person during 1999, and it implicitly assumes that such a demand has the same shape in the whole country.

The other function that we need to estimate is the marginal cost of retail gasoline, for which we will follow this specification:

$$\text{MCg} = C_i + \gamma_1 \cdot \text{WTI} + \gamma_2 \cdot \text{Oil} \quad ;$$

where “MC<sub>g</sub>” is the marginal cost of gasoline, “WTI” is the international crude oil price and “Oil” is the total quantity of oil processed in refining in Argentina during each month. “C<sub>i</sub>”, “γ<sub>1</sub>” and “γ<sub>2</sub>” are the parameters to be estimated, with “i” varying from 1 to 24 (corresponding to the 23 Argentine provinces plus the city of Buenos Aires). As we see, this function assumes that the basic determinants of the marginal cost of gasoline are the price of crude oil, the quantity of oil processed (which is directly related to capacity utilization) and a number of factors due to geographic location (summarized by a set of province dummies).

According to the market structure that we assume, supply will behave differently. This difference in behavior has to do with the definition of the marginal revenue function that firms perceive (MR<sub>g</sub>), which can be defined as follows:

$$\text{MRg} = P_g \quad (1: \text{Price taking}) ;$$

$$\text{MRg} = P_g + \beta_2 \cdot \text{HHI} \cdot (\text{Qg}/\text{Pop}) \quad (2: \text{Cournot oligopoly}) ;$$

$$\text{MRg} = P_g + \beta_2 \cdot \text{SYPF} \cdot (\text{Qg}/\text{Pop}) \quad (3: \text{Price leadership}) ;$$

$$\text{MRg} = P_g + \beta_2 \cdot (\text{Qg}/\text{Pop}) \quad (4: \text{Collusion}) ;$$

where “SYPF” is the market share of YPF (or Repsol-YPF, after the merger). Taking into account this, we can write a different supply price function for each market structure, by equating “MC<sub>g</sub>” with “MR<sub>g</sub>” and taking “P<sub>g</sub>” as the dependent variable. This implies that:

$$P_g = C_i + \gamma_1 \cdot \text{WTI} + \gamma_2 \cdot \text{Oil} \quad (1: \text{Price taking}) ;$$

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<sup>2</sup> For a more complete explanation of the characteristics of these alternative models, see Coloma (1999).

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.HHI.(Qg/Pop) \quad (2: \text{Cournot oligopoly}) ;$$

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.SYPF.(Qg/Pop) \quad (3: \text{Price leadership}) ;$$

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.(Qg/Pop) \quad (4: \text{Collusion}) .$$

As we have found that, after the Repsol-YPF merger, there has been an increase in the gasoline price that cannot be fully explained by exogenous factors, we will try to explain it applying to endogenous factors, that is, market behavior. Making use of our four models, there are at least eight different explanations for the post-merger price increase. We will classify them using two-digit codes, which correspond to the market structure assumed before and after the merger:

12: Before the merger, there was price taking; afterwards, there was Cournot oligopoly.

13: Before the merger, there was price taking; afterwards, there was price leadership.

14: Before the merger, there was price taking; afterwards, there was collusion.

22: Before and after the merger, there was Cournot oligopoly.

23: Before the merger, there was Cournot oligopoly; afterwards, there was price leadership.

24: Before the merger, there was Cournot oligopoly; afterwards, there was collusion.

33: Before and after the merger, there was price leadership.

34: Before the merger, there was price leadership; afterwards, there was collusion.

Note that two explanations (22 and 33) assume that there has been no change of market structure after the merger, but merely the fact that in a more concentrated market the Cournot equilibrium and the behavior of a price leader would lead to higher prices. The other six hypotheses imply a change in the structure of the market, that moves from a more competitive to a less competitive situation.

In order to estimate the supply price functions for these alternative hypotheses, we need to mix the original price functions and to make use of the Repsol-YPF merger dummy (Merge). This gives us the following relationships:

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.Merge.HHI.(Qg/Pop) \quad (12) ;$$

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.Merge.SYPF.(Qg/Pop) \quad (13) ;$$

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.Merge.(Qg/Pop) \quad (14) ;$$

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.HHI.(Qg/Pop) \quad (22) ;$$

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.[(1-Merge).HHI+Merge.SYPF].(Qg/Pop) \quad (23) ;$$

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.[(1-Merge).HHI+Merge].(Qg/Pop) \quad (24) ;$$

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.SYPF.(Qg/Pop) \quad (33) ;$$

$$P_g = C_i + \gamma_1.WTI + \gamma_2.Oil - \beta_2.[(1-Merge).SYPF+Merge].(Qg/Pop) \quad (34) .$$

### 3. Estimation results

The eight alternative hypotheses defined in the previous section generate eight different sets of regressions, each of them with the same demand price function and a different supply price function. All of them were estimated using three-stage least squares, taking into account the possible correlation between the two equations and the fact that, in a model of demand and supply, prices and quantities can be considered as endogenous variables. We therefore used the following exogenous variables as instruments for our regressions: a constant, eleven monthly dummies, twenty-three province dummies and GDP per capita<sup>3</sup>. The total number of observations is 288 (one per month per province) and the main results of the regressions are the ones summarized on table 4.

In order to compare these results, we can use different strategies. If we look at the goodness-of-fit of the regressions, the models that have a higher R-squared coefficient are 22, 23, 33 and 34 for the demand price function, and 24 and 34 for the supply price function. Using the total sum of the squared residuals as an overall measure for the eight systems, it is clear that 12, 13 and 14 present the largest values (and therefore the poorest results) while the other five hypotheses have the smallest values (and are therefore better).

All the demand price regressions are relatively good in the sense that most of their variables are significant and have the expected signs. This is particularly true for the coefficient of consumption per capita (i.e., for the slope of the demand curve), which is always negative and significantly different from zero. The coefficient for the GDP per capita, conversely, is not significantly different from zero in models 22, 23 and 33, and in most regressions it is negative (which would imply that gasoline is an “inferior good”, at least in the short run).

In the supply price regressions the situation is different. Several models capture negative effects for the WTI oil price, which is theoretically wrong and counter-intuitive. The only models that display the right sign for this variable are 22, 23 and 33, and the coefficients estimated by those models are in all cases significantly different from zero. The coefficients for oil quantity are also ambiguous. In models 12, 13, 14 and 24 the sign is positive and not significantly different from zero; in models 23 and 34 it is negative and insignificant; while in models 22 and 33 it is negative and significant.

At first glance, therefore, models 22, 23 and 33 seem to be the only ones that pass a triple test of consistency: they all have a relatively high goodness-of-fit and a relatively low total sum of squared residuals, they display the right sign for the demand slope (and this coefficient is significant), and they also display the right sign for the effect of the oil price in the supply price function (and this coefficient is also significant). Ranked by their total sum of squared residuals alone, however, 24 is the best model (although it predicts a wrong sign for the oil price).

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<sup>3</sup> Although exogenous, we did not use WTI oil price as an instrumental variable, since in a series of only one year it is linearly dependent of the monthly dummy variables.

**TABLE 4 – MARKET REGRESSION RESULTS**

Concept / Hypothesis	12	13	14	22	23	24	33	34	
<b>Demand price function</b>									
<b>Constant April</b>	<b>Coefficient</b>	0,984812	0,980852	0,967508	1,008377	1,003622	0,985998	1,007639	0,991533
	<b>P-value</b>	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
<b>GDP per capita</b>	<b>Coefficient</b>	-0,000006	-0,000007	-0,000009	-0,000001	-0,000002	-0,000006	0,000001	-0,000005
	<b>P-value</b>	0,0001	0,0000	0,0000	0,3935	0,1264	0,0001	0,3439	0,0011
<b>Cons per capita</b>	<b>Coefficient</b>	-0,012411	-0,011648	-0,009082	-0,017040	-0,016028	-0,012510	-0,016898	-0,013580
	<b>P-value</b>	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
	<b>R-squared regression</b>	0,610652	0,604336	0,573174	0,619801	0,622062	0,611199	0,620203	0,617479
	<b>Sum squared residuals</b>	3,401607	3,456784	3,729044	3,321673	3,301927	3,396831	3,318167	3,341965
<b>Supply price function</b>									
<b>Constant CBAs</b>	<b>Coefficient</b>	0,339962	0,330923	0,301230	0,348661	0,334680	0,289151	0,323797	0,274182
	<b>P-value</b>	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
<b>WTI oil price</b>	<b>Coefficient</b>	-0,323337	-0,482537	-0,640562	0,523414	0,222160	-0,269895	0,556377	-0,073580
	<b>P-value</b>	0,0284	0,0025	0,0002	0,0000	0,0106	0,0190	0,0000	0,4640
<b>Oil quantity</b>	<b>Coefficient</b>	0,000019	0,000027	0,000035	-0,000043	-0,000026	0,000004	-0,000046	-0,000009
	<b>P-value</b>	0,5047	0,3539	0,2145	0,0088	0,1490	0,8604	0,0063	0,6232
	<b>R-squared regression</b>	0,487705	0,486382	0,653407	0,738012	0,711138	0,754129	0,722377	0,757477
	<b>Sum squared residuals</b>	0,663915	0,665630	0,449172	0,339527	0,374354	0,318639	0,359789	0,314301
<b>Total sum squared residuals</b>		4,065522	4,122414	4,178216	3,661200	3,676281	3,715470	3,677956	3,656266

To perform a deeper analysis of which model is better, it is necessary to contrast their power of prediction against each other. One way to do this is to perform tests of non-nested hypotheses. The simplest and most intuitive of those tests is probably the one proposed by McKinnon, White and Davidson (1983), which consists of running additional regressions that incorporate the results of one model as dependent variables of another model. In particular, the variation of this test that we will use implies running regressions of the following form:

$$Pg + Tg = A_t + \beta_1.GDPpc + \beta_2.(Qg/Pop) + \delta_1.[(\overline{Pg + Tg})_1 - (\overline{Pg + Tg})_0] \quad ;$$

$$Pg = C_1 + \gamma_1.WTI + \gamma_2.Oil - \beta_2.X_0 + \delta_2.[\overline{Pg}_1 - \overline{Pg}_0] \quad ;$$

where “0” is the model that we want to test (null hypothesis) and “1” is the model that plays the role of alternative hypothesis. In this context, “ $(\overline{Pg + Tg})_0$ ” is the series of demand prices estimated by model 0, while “ $(\overline{Pg + Tg})_1$ ” is the series of demand prices estimated by model 1. Similarly, “ $\overline{Pg}_0$ ” and “ $\overline{Pg}_1$ ” are the series of supply prices estimated by those models, while “ $X_0$ ” is the series of variables that model 0 incorporates to the supply equation (which is different for each model). Under this specification, what we test is the joint hypothesis that “ $\delta_1 = \delta_2 = 0$ ”, that is, the idea that adding the values estimated by model 1 to the regression does not improve the explanatory power of model 0. In order to do this we perform a Wald test, whose coefficient has a certain probability value between 0 and 1. If this probability is high, then we cannot reject the hypothesis that “ $\delta_1 = \delta_2 = 0$ ” and therefore model 0 cannot be “beaten” by model 1. If it is low, then we can reject the hypothesis that “ $\delta_1 = \delta_2 = 0$ ” and therefore we can conclude that model 1 has enough explanatory power to improve the explanation given by model 0.

**TABLE 5 – HYPOTHESIS TESTING: WALD COEFFICIENTS AND P-VALUES**

Model 0 / Model 1		22	23	24	33
<b>Cournot-Cournot (22)</b>	<b>Coeff</b>	---	13,1906	22,0503	6,1298
	<b>P-value</b>	---	0,0014	0,0000	0,0467
<b>Cournot-Leadership (23)</b>	<b>Coeff</b>	0,8002	---	4,4983	0,1472
	<b>P-value</b>	0,6703	---	0,1055	0,9290
<b>Cournot-Collusion (24)</b>	<b>Coeff</b>	38,2977	40,5344	---	34,5320
	<b>P-value</b>	0,0000	0,0000	---	0,0000
<b>Leadership-Leadership (33)</b>	<b>Coeff</b>	3,6368	4,4854	10,3449	---
	<b>P-value</b>	0,1623	0,1062	0,0057	---

In table 5 we can see the main results of our tests, given by the corresponding Wald coefficients and p-values obtained when we contrast against each other the four hypotheses that we have considered most probable in our preliminary observation<sup>4</sup>. These results show

<sup>4</sup> We also performed tests that incorporated the other hypotheses, but their results do not alter the conclusions presented here.

a clear preference for model 23 (i.e., the one that assumes that the market was as a Cournot oligopoly before the Repsol-YPF merger and after that it became a market with a price leader). This is the only one that, when playing the role of model 0, produces Wald coefficients that are low enough so that the hypothesis that “ $\delta_1 = \delta_2 = 0$ ” cannot be rejected in any case at any reasonable level of significance (10% or below). Conversely, models 22 and 24 produce very high Wald coefficients when they play the role of model 0, and for them we can always reject the hypothesis that “ $\delta_1 = \delta_2 = 0$ ”. Finally, model 33 performs well against models 22 and 23, but when it is contrasted with model 24 we cannot reject the hypothesis that “ $\delta_1 = \delta_2 = 0$ ”.

#### 4. Welfare implications

The models presented in section 2 and the estimations performed in section 3 can be used to derive some welfare implications of our analysis. We have estimated certain demand, marginal cost and marginal revenue functions, and we have concluded that we cannot reject the hypothesis that the Argentine gasoline market behaved like a Cournot oligopoly before the Repsol-YPF merger and became a market with a price leader after that merger. This allows us to compare the post-merger market equilibrium with the equilibrium that could have taken place if the merger had not happened. Those equilibria generate different consumer and producer surpluses and different tax revenues, and we can therefore calculate which is the efficiency change that occurred as a consequence of the merger.

In order to perform our exercise, we will use the results of the regression under model 23, which is the one that ranked better according to the Wald tests of non-nested hypotheses. That regression gave us the following results:

$$P_g + T_g = 1.07069 - 0.000002 \cdot \text{GDPpc} - 0.016028 \cdot (\text{Qg/Pop}) \quad (\text{Demand price}) ;$$

$$\text{MCg} = 0.33619 + 0.22216 \cdot \text{WTI} - 0.000026 \cdot \text{Oil} \quad (\text{Marginal cost}) ;$$

where the constants are averages for the period September-December and for the 24 jurisdictions under analysis. The corresponding marginal revenue functions can be derived from the demand price function, taking into account that the average fuel tax is \$0.4604 per liter. This gives us the following expressions for the pre-merger and post-merger situations:

$$\text{MRg} = 0.61031 - 0.000002 \cdot \text{GDPpc} - 0.016028 \cdot (1 + \text{HHI}) \cdot (\text{Qg/Pop}) \quad (\text{Pre-merger}) ;$$

$$\text{MRg} = 0.61031 - 0.000002 \cdot \text{GDPpc} - 0.016028 \cdot (1 + \text{SYPF}) \cdot (\text{Qg/Pop}) \quad (\text{Post-merger}) .$$

From the descriptive analysis performed in section 1, we know that the average post-merger values of “Pg”, “WTI”, “SYPF” and “Qg/Pop” are 0.4299 (\$/lt), 0.1534 (\$/lt), 0.5324 and 12.0657 (lt/cap/month). If we calculate the average post-merger values for “GDPpc” and “Oil”, these are 7819.98 (\$/year) and 2646.41 (thousands of cubic meters). We also know that the average pre-merger value for “HHI” is 0.3090.

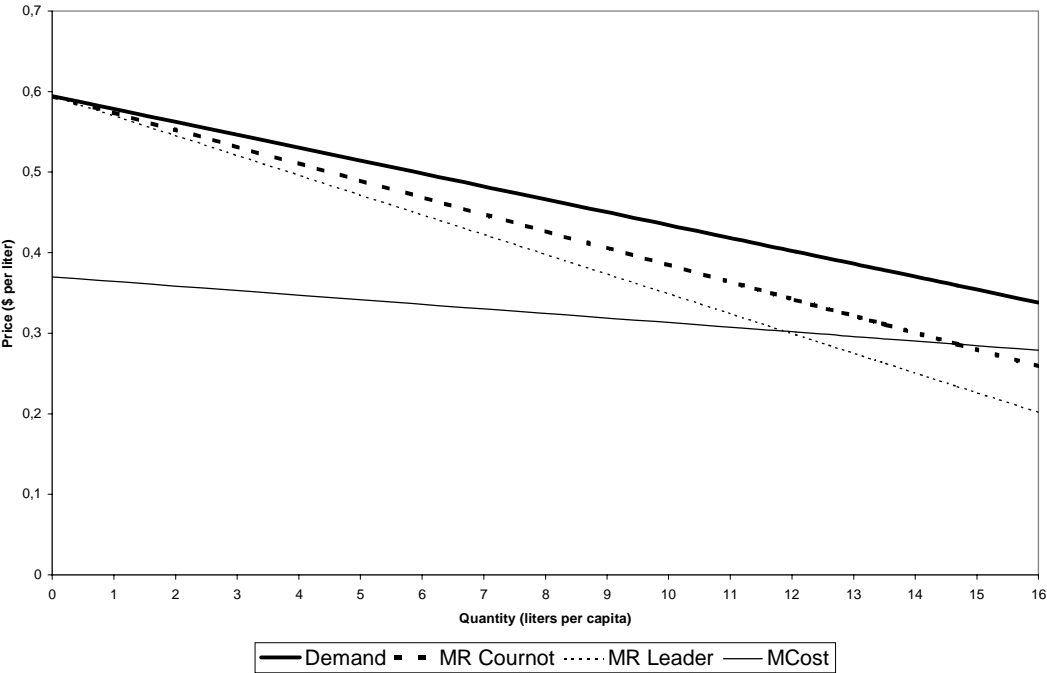
Under the assumption that, in the short run, “Oil” and “Qg/Pop” keep a fixed proportion, we can calculate a conversion factor between the two magnitudes that is equal

to 219.3333. Therefore we can re-write the marginal cost function in the following way:

$$MC_g = 0.33619 + 0.22216 \cdot WTI - 0.005703 \cdot (Q_g/Pop) \quad ;$$

and equate it with the pre-merger marginal revenue function. When we substitute “GDPpc” and “WTI” for their corresponding post-merger values while keeping “HHI” in its pre-merger level, we can find an estimate of what the average “Qg/Pop” would have been in the period September-December if the merger had not taken place. This number is equal to 14.6882 liters per capita per month. Substituting it into the demand price function, this gives a price of \$0.3592 per liter (net of taxes), which becomes equal to \$0.8951 per liter when we add the value added tax and the fuel tax. Besides, when we substitute into the marginal cost function, we find that this concept is equal to \$0.3015 per liter for the actual post-merger quantity, but it would have been equal to \$0.2865 for the larger quantity estimated if the merger had not occurred.

### 3. Argentina: Post-merger Equilibrium



The numbers calculated in the previous paragraphs are represented in figure 3, where we have depicted the average post-merger equilibrium for the Argentine gasoline market. The demand price function was graphed without taxes (Demand), and we see that the post-merger marginal revenue function (MR Leader) is lower than the pre-merger marginal revenue function (MR Cournot). As the negative slope of the marginal cost

function (MCost) is smaller than the slopes of the marginal revenue functions, this implies that the actual post-merger equilibrium (MR Leader = MCost) determines a higher price and a smaller quantity than the theoretical equilibrium that would have taken place if the merger had not occurred (MR Cournot = Mcost).

In order to calculate the welfare effects of the Repsol-YPF merger, we could use the information obtained to estimate the changes in the consumer and producer surpluses and in the tax revenue collected by the state. Expressed in Argentine pesos per capita per month, these changes are the following:

$$\Delta CS = -(0.9754-0.8951) \cdot 12.0657 - (0.9754-0.8951) \cdot (14.6882-12.0657)/2 = -1.07417 ;$$

$$\Delta PS = (0.4299-0.3592) \cdot 12.0657 - (0.3592-0.3015) \cdot (14.6882-12.0657) - (0.3015-0.2865) \cdot (14.6882-12.0657)/2 = 0.68206 ;$$

$$\Delta Tax = 0.21 \cdot [(0.4299-0.3592) \cdot 12.0657 - 0.3592 \cdot (14.6882-12.0657)] - 0.4604 \cdot (14.6882-12.0657) = -1.22608 .$$

Adding up all these figures, we obtain a net efficiency loss equal to \$1.61819 (per capita per month), which is equal to a total of \$59,130,320 per month when we multiply it by the number of inhabitants of Argentina (which is approximately equal to 36.541 million people). Note that the economic agent that suffers the highest loss is in this case the state, since the reduction in consumption induced by the price increase has a large negative effect on tax collection.

The efficiency loss estimated in the previous paragraph can be decomposed into two figures: one due to the merger itself and the other due to the structural market change (from Cournot oligopoly to price leadership). In order to do this, we have to calculate the post-merger equilibrium that would have taken place if the market had gone on behaving as a Cournot oligopoly. In order to do this we can equate “MCg” with the pre-merger “MRg” function evaluated at the post-merger level of market concentration (i.e., “HHI = 0.3904”). This implies an average “Qg/Pop” equal to 13.5325 liters per capita per month, a net price of \$0.3778 per liter (\$0.9175 per liter when we add taxes) and a marginal cost of \$0.2931 per liter.

When we move from the pre-merger equilibrium to this new alternative, the change in consumer surplus is -0.28670 (\$/cap/month), the change in producer surplus is 0.12263 (\$/cap/month) and the change in tax revenues is -0.73883 (\$/cap/month). The net efficiency loss is therefore equal to \$0.90290 per capita per month, which amounts to a total of \$32,992,997 per month when we multiply it by the number of inhabitants. This would be the net effect of the merger under the assumption of Cournot oligopoly, while the effect of the structural change (from Cournot oligopoly to price leadership) would be equal to \$26,137,323 per month.

## 5. Concluding remarks

The conclusions of this study can be expressed as answers to the four questions

asked in the introduction. From our descriptive analysis we can conclude that the Repsol-YPF merger did have an impact on the prices and quantities traded in the Argentine gasoline market, and that impact might have to do with the idea that in a more concentrated market prices increase and there is a greater possibility to exercise market power.

When trying to answer which market structure explains the behavior of the industry better, we can conclude that it is probable that before the Repsol-YPF merger the market behaved like a Cournot oligopoly, in which each firm had a certain market power related to its relative size. This conclusion is similar to the one obtained both by Serebrisky (2000) and by Perussia (2000) when studying the Argentine gasoline market in the last years of the decade of 1990, although it differs from the conclusion obtained by us in a previous study (Coloma, 1998), in which we found that the market tended to behave in a more competitive fashion<sup>5</sup>.

We also have to answer affirmatively to the question about the possibility of a structural change as a consequence of the merger, since we have found that the model that explains the data better is the one that assumes that the pre-merger Cournot oligopoly changed into a post-merger situation in which Repsol-YPF began to behave as a price leader. The welfare implications of this change are an increase in the producer surplus, which is smaller than the decreases experienced by the consumer and government surpluses. Therefore, we can conclude that there was an efficiency loss. Using the coefficients obtained in our regressions, we estimate that this loss is a bit more than \$59 million per month, of which \$33 million are due to the merger itself and \$26 million are due to the structural change.

These conclusions, however, are clearly preliminary, since we only have data that allows us to analyze a post-merger period of four months. It is possible, therefore, that the estimated structural change be an out-of-equilibrium behavior that Repsol-YPF tried immediately after the merger based on wrong beliefs. In that case, we would expect a revision of this behavior in the following months with a return to the previous market structure or a change to a different one.

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<sup>5</sup> That study was based on aggregate national data, which generated only time-series information. That made impossible for us to detect any regional changes in behavior as responses to different local market concentrations. That is probably why we found that price taking was a better explanation than Cournot oligopoly, while Serebrisky and Perussia found otherwise.

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