

One more lie: the “Monday effect” in Spanish retail petrol market¹

Juan Luis Jiménez²
Universidad de Las Palmas de
Gran Canaria

Jordi Perdiguero³
Universitat Autònoma de
Barcelona, GiM & IREA

Abstract

Academic literature worldwide support that competition is weak in retail petrol market. It is also in Spain. In fact, both Spanish antitrust authority (CNC) and the energy regulator (CNE) have recently started proceedings against majors in retail petrol market due to price manipulation. They have been accused for downward retail prices to distort the position of Spain in the statistics of prices before tax in the European Union. It has been called “the Monday effect”. For this reason, we use a own-elaborated database including retail prices for all petrol stations in Spain in the period 2009-2012 and a more detailed analysis by Barcelona in 2013. Using two control groups not affected by this effect, our estimations confirm that: *i*) prices fall on Mondays, only in 2011 and 2012 and only in retailers branded by majors. *ii*) prices fall intensively if the position in the ranking of prices was more "serious media attention" to Spain. *iii*) prices also fall also when a more detailed analysis is applied, and this fall continues in 2013. Summarizing, one more marker collusion in this sector and....one more lie.

Keywords: Petrol; Antitrust; Monday effect.

J.E.L. Codes: L13, L59, L71.

¹ Authors thanks comments by Gloria Alemán and participants at seminar in *Comisión Nacional de la Competencia* (Madrid, July 18th, 2013). Nevertheless, all errors are ours.

² Universidad de Las Palmas de Gran Canaria. Departamento de Análisis Económico Aplicado. Despacho D. 2-12. Campus de Tafira. 35017. Las Palmas. E-mail: jjimenez@daea.ulpgc.es; tlf: +34 928458191.

³ Departament d'Economia Aplicada. Universitat Autònoma de Barcelona. Grup de Recerca en Governos i Mercats (GiM). Institut de Recerca en Economia Aplicada (IREA). Edifici B. Campus de la UAB. 08193. Bellaterra, Cerdanyola del Vallès. E-mail: jordi.perdiguero@uab.cat.

1. Introduction

Historically, petrol market worldwide has shown some lacks of an effective competition. This general outcome is due to two reasons: firstly, the demand characteristics of this market, that enhances coordinated behavior (price inelasticity; low product differentiation; market shares stability; etc.);⁴ and secondly, the supply side.

Regarding the latter, since the wholesale market to final retail consumers, a lot of anticompetitive practices can be detailed. Firstly, the birth of OPEC cartel is a ‘textbook’ example of how a competitive market must not to operate. Starting from this initial stage outcome, related results have been: allegations of collusive behaviour (see Canada Competition Bureau,⁵ cases by Office of Fair Trading, 1998; Wang, 2008); asymmetric response to upstream cost shocks (see the seminal paper by Bacon, 1991; predatory pricing (see Anderson and Johnson, 1999 for an analysis about sale-below-cost laws and retail gasoline prices), etc.

Since Spain liberalized its retail petrol market, the inquiries conducted by the antitrust authorities and sector regulators, supported by the findings in the academic literature, show that effective competition levels have remained very low (Perdiguero, 2010 and 2012).⁶ However, as the 2012 report published by the *Comisión Nacional de la Competencia* (the Spanish National Antitrust Authority, henceforth the CNC) notes, this low level of competition is restricted not solely to the retail sector, but characterizes all levels in the production chain. Hence, it can be inferred that the market prices reflect the high degree of concentration that the oil companies, especially the wholesalers, enjoy.

This paper analyzes what we consider as a new anti-competitive marker in this market: the firm’s reaction to public concern. In recent years the media have reported the rising retail price of petrol in Spain, especially relative to price levels in other European Union countries, and more recently they have also noted the rise in oil firms’ profit margins, despite a fall in demand and the economic crisis.⁷ And yet Spain’s ranking in the European Commission’s *Oil Bulletin*⁸ is surprisingly low.

The explanation seems to be that the survey data used to rank retail prices in Europe (inclusive and exclusive of duties and taxes) is collected on Mondays,⁹ a fact that is allegedly exploited by majors to lower their prices on this day so that they can improve their position in the ranking. Two reports by the *Comisión Nacional de la Energía* (Spain’s energy regulator, henceforth the CNE) concur with this belief and can find no economic motive to justify these price drops. This practice is responsible for the disciplinary proceedings initiated by the CNC against Spain’s majors.¹⁰

⁴ See Ivaldi et al (2003).

⁵ <http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/00235.html>

⁶ See CNC (2012); CNE (2013a; 2013b) and previous inquiries. For academic literature, see section 2.

⁷ See Spanish newspaper “El País”, 17/05/2013. *Las petroleras aumentan en un 31% los márgenes sobre las gasolinas desde enero* [“Oil company petrol profit margins up to 31% since January” (authors’ translation)].

⁸ http://ec.europa.eu/energy/observatory/oil/bulletin_en.htm

⁹ See http://ec.europa.eu/energy/observatory/oil/doc/prices/survey_oil_bulletin_data_collection.pdf

¹⁰ See <http://www.cncompetencia.es/Default.aspx?TabId=105&ContentId=622820&Pag=1>

Meanwhile, firms did not expose any response to the criticisms raised in the press for weeks, until 4th July 2013. In a press release, the most important firm in Spain (Repsol) announced that they “reduce fuel prices on Mondays, a day that transportation professionals typically choose to fill their fuel tanks ahead of the week’s activity”.¹¹ However, as this paper tries to expose, this “marketing policy” shows some structural weakness.

Note that no other company, or association of petrol operators (Petroleum Operators Association, AOP) has issued any statement on the allegations. The Organization of Consumers and Users (OCU) published several press highlighting the report of the CNE and express the possibility that a collusive behavior explain this behavior. It is not surprising the lack of releases by the companies, with the exception of Repsol, as the reports of the CNE noted mainly Repsol as agent responsible for this pricing strategy.

While a number of studies have identified the cyclical behavior of gasoline prices in retail markets, they at least point to the existence of a certain level of retail competition (ACCC, 2007; Foros and Steen, 2011). However, to the best of our knowledge, the literature has yet to report a case similar to the one documented here, which, if confirmed, would provide further evidence of the lack of competition in the Spanish retail petrol market. Our aim therefore is to corroborate what has come to be referred to as the ‘Monday effect’.

To do so, and following on from a review of the literature and the Spanish market (section 2), our empirical strategy draws on two sources: first we compile a daily database of petrol retail prices in Spain for the period January 2009-December 2012 and an econometric approach is implemented (section 3); and second we draw on detailed retail data for Barcelona in the month of May 2013 (section 4), which gives us better data than previous approach to estimate the potential existence of this anticompetitive behavior. Our results (section 5) show that the ‘Monday effect’ does in fact exist and we conclude (section 6) that it has become a new indicator of no-competition in this market in Spain.

2. The evolution of the Spanish petrol market: an academic perspective

The Spanish petrol market has undergone a major restructuring process having been transformed from a State monopoly run by CAMPSA (now Repsol) to a completely free market in less than two decades (see Perdiguero and Borrell, 2007; or more recently Perdiguero, 2010 and 2012). At present, all the segments that make up the industry (refining, transportation, distribution and retailing) are fully liberalized. Yet, despite this process of liberalization, the market remains extremely concentrated, both horizontally and vertically. Indeed, at the retail level many stations are vertically integrated with companies that have refining capacity in Spain (Repsol, Cepsa and BP), while the others operated under exclusive contracts, which means the long-term indirect fixing of the final price, given that these contracts include price recommendations (Jiménez and Perdiguero, 2011).

These problems have already been identified by the CNC (2009) in a report that concluded that the high vertical integration in Spain’s petrol market meant pricing decisions were being taken by a small number of agents (i.e., the major oil companies), which reduced the

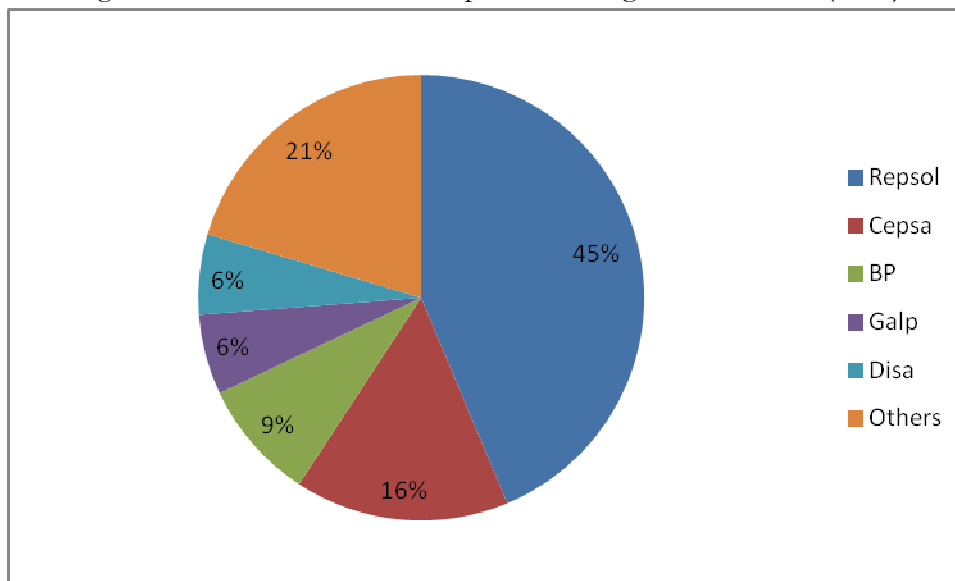
¹¹ See El País, July 4th 2013.

level of competition in the market causing price increases and price uniformity. In 2012, the Ministry of Industry requested a market report from the CNC, prompted by the growing media coverage of retail price levels in the Spanish market. This report drew a clear conclusion: there is no competition at any level in the production chain (see CNC, 2012b).

This same report noted the high concentration in the petrol market in Spain as a possible reason for this non-competitive behavior. As noted in this report Spain has a Herfindahl-Hirschman Index of 4,531 points in Spain far from the 3,661 points of France, the 1,749 points of Italy, the 1,702 points in Germany or the 1,313 of the UK.

But not only the refining segment is highly concentrated. The following graph shows the market share by sales of each of the companies operating in the Spanish market. As shown Repsol has a 45% market share and between the three companies with refining capacity in the market (Repsol, Cepsa and BP) reach 70% market share (CNC, 2012b). Therefore, we are in a highly concentrated market, which may explain the possible existence of anticompetitive behavior.

Figure 1: Market shares in the Spanish retail gasoline market (2012)



Source: CNC (2012b)

Various studies in the literature, around the world¹² as well as in Spain, have tackled the question as to whether prices reflect a competitive or a collusive outcome. In Spain, for example, Contín et al (1999) called for a lifting of barriers in order to generate effective competition in the country's recently liberalized market. In a descriptive analysis, Contín and Huerta (2001) also stated that the monopoly enjoyed by the logistics company CLH¹³ could generate a bottleneck in this market. Several years later, Bello and Cavero (2008)

¹² See Eckert (2013) for a survey of empirical approaches applied to this sector.

¹³ CLH (*Compañía Logística de Hidrocarburos*) is Spain's only oil product transportation and storage firm. This monopolistic position, coupled with the freedom to set fares, contributes to the inefficient operation of the country's petrol market.

analyzed retail data from a Spanish region (Navarra), as well as for the whole state, using an ordinary least squares (OLS) estimator, and concluded that branded retailers charged the highest prices.

The market in one of Spain's island regions, the Canaries, presents an unusual characteristic: simultaneously operating monopolistic and oligopolistic retail petrol markets. This situation has been used by Perdiguero and Jiménez (2009) to estimate the conjectural variation in a Cournot model using data from the islands. Their two-stage least squares estimations yield a price outcome close to a monopoly in the oligopolistic islands (the theoretical value of the conjectural variation parameter in monopoly is equal to 1, and 0.16 for a Cournot model with six firms in the market: their estimated parameter was 0.97).

Using a sample of petrol stations located in the Balearic Islands and on mainland Spain, Bello and Contín (2010) report an OLS analysis to show that retail competition is encouraged solely by independent retailers. They also conclude that vertically integrated brands (with capacity to refine petrol) present higher prices than other brands (i.e., the majors). Perdiguero (2010) also analyzed the dynamic retail competition in mainland Spain, concluding that strategic competition is close to collusive equilibrium.

Three more papers have analyzed the level of retail competition in Spain: Jiménez and Perdiguero (2011) show that it is inefficient to seek out petrol station discounts given the similarity of prices in a Spanish region (Galicia). Monopoly behavior and price rigidity were both accounted for in Jiménez and Perdiguero (2012a), a study in which it was concluded that only independent retailers generate effective competition. Finally, Jiménez and Perdiguero (forthcoming) undertook a structural analysis to show how prices remain constant after a merger owing to a previous collusion outcome.

However, to date, no study has examined cyclical price behavior in Spain. Papers conducted in line with the theory developed in Maskin and Tirole (1998) demonstrate that price cycles must provide an explanation. But, why do price cycles occur? There are various explanations, but the most important is the Edgeworth cycle theory (see Eckert, 2013, for a survey). In this price cycle equilibrium, prices are driven down to marginal cost, at which level the business is unsustainable without a price rise. Eventually, a firm will raise its price to the monopoly price level. This cycle is then repeated over time (ACCC, 2007, pp. 350). Recently it has been conjectured that this cyclical behavior is related to a collusive outcome.

Since Castanias and Johnson's (1993) seminal paper for a US city, a considerable number of empirical studies have explored the nature of Edgeworth cycles in retail gasoline markets in different geographical markets: Canada (Noel, 2007a; Noel, 2007b), United States (Doyle et al, 2008; Lewis, 2009), Australia (ACCC, 2007; Wang, 2009) and Norway (Foros and Steen, 2011).

The latter use daily prices from a sample of Norwegian retail petrol stations for the period 2003-2006 to analyze not only weekly but also intra-daily price behavior. Their empirical strategy yields two conclusions: first, that majors are able to systematically increase prices each Monday, which served as the starting point for cyclical behavior. The authors attribute this outcome to high vertical integration in this market. Second, they further show how from noon on Mondays, stations change their initial prices to the recommended maximum

prices, which is an indicator of the weak level of competition. In fact, thanks to an earlier version of this article,¹⁴ the Norwegian Competition Authority commenced proceedings against the company (see NCA, 2010).

In a recent paper, Valadkhani (2013) addresses the seasonal patterns in daily prices in the Australian retail petrol market. The author analyzes whether there are any daily idiosyncrasies in petrol prices due to the purchasing patterns of consumers and the demand for petrol. He collected average daily retail prices of unleaded petrol for 114 cities across Australia and he estimated a daily price equation. This estimation yielded two main conclusions: first, that there is a daily effect in 16 of 114 cities (Sundays or Tuesdays being the cheapest days of the week); and, second, that this effect occurs only in capital cities or major regional centers.

Although no such study has been undertaken in Spain, two public reports by the CNE have examined the market's 'suspected' cyclical price behavior: the so-called 'Monday effect' (CNE, 2013a; CNE, 2013b). These reports studied price differences for the three-day period Sunday-Monday-Tuesday using univariate analysis and drew a number of important conclusions: first, that the price of oil does not justify a systematic price drop on Mondays, especially considering that international petrol markets do not operate on weekends. Second, the price differences between Sundays and Mondays became negative and more notably so in the second semester of 2012 (around €-0.7 cents). Third, a regional analysis by brand showed that this effect was more intense in those regions where the leader in Spain's petrol market enjoyed the highest market share.

In short, if this 'Monday' effect is confirmed, it would be another anticompetitive marker in this market. So, our main aim is to implement a multivariate analysis that supports the earlier descriptive findings of the CNE.

3. Data

Information about retail petrol station prices in Spain is public and it is also available daily. But it expires as no server stores it.¹⁵ We therefore downloaded all daily prices from the Ministry of Energy, Tourism and Trade's website from 1 January 2009 to present (May 2013). Our final database contains prices for petrol 95 octane from Monday to Friday and holds more than six million observations. The website also facilitates the geographical coordinates of the stations and their brands.

Our empirical strategy involves two control groups: petrol stations on the Canary Islands (a region of Spain) and those that are unbranded or operated by independent retailers. These control groups were not chosen *ad hoc*. Regarding the former, the European Commission's *Oil Bulletin* explains in its research methodology that petrol stations located in this archipelago are not included in their statistical information because of the different tax systems applied in mainland Spain and this region. Therefore, as the same companies

¹⁴ Foros, O and Steen, F. 2008. Gasoline prices jump on Mondays: an outcome of aggressive competition?, CEPR DP6783.

¹⁵ See <http://geoportal.mityc.es/hidrocarburos/eess/>

operate in both markets, but one is not influenced by the European survey, we selected this as a control group.

Regarding the latter (our main control group), this second control group is supported by academic literature, as Jiménez and Perdiguero (2012a) who conclude that only independent retailers exert some competitive forces in this market.¹⁶ For this reason, we differentiate the petrol stations owned by supermarket chains (Carrefour, Eroski, etc.) from the rest (branded by majors in the mainland). Our hypothesis is that the independent retailers should follow a different pattern in their cyclical price behavior.

Table 1 shows the descriptive statistics for our database.

Table 1: Average prices (all petrol stations, in €)

	2009	2010	2011	2012
Prices on Tuesdays to Fridays	1.0001 (0.0947)	1.1520 (0.0768)	1.3013 (0.0816)	1.4146 (0.0967)
Prices on Mondays	1.0015 (0.0920)	1.1482 (0.0778)	1.2986 (0.0810)	1.4048 (0.0955)
Price difference (Mondays minus the rest)	0.0014	-0.0038	-0.0027	-0.0098
t-test (H ₀ : price difference equal to 0)	7.0054*** (0.0000)	25.3825*** (0.0000)	15.7582*** (0.0000)	43.0026*** (0.0000)

Standard deviation in brackets. (*) t-test shows statistical significance.

As Table 1 shows, Monday prices were only *higher* than those charged on the other days of the working week in 2009. The main price differential was recorded in 2012, when it almost reached €1 cent. As can be seen, the *t* statistic indicates that the price difference between Monday and the other working days is significant: in 2009 the price was significantly higher on Mondays, while for the years 2010, 2011 and 2012 the prices charged were significantly lower on Mondays than those charged on the other week days. This difference was particularly marked in the case of 2012, with the statistical *t* value rising to over 43.

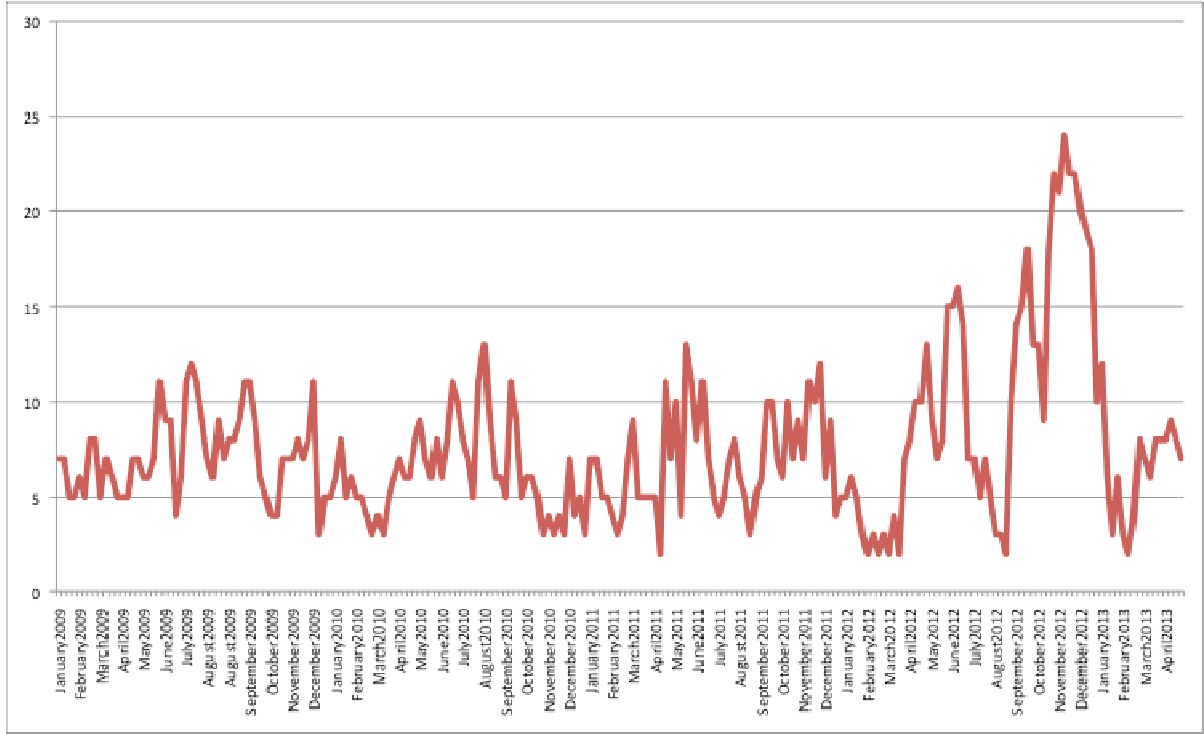
Other variables included in our database are the binary variables for the two controls: 4.8 per cent of our database comprises prices from petrol stations in the Canary Islands; and 2.8 per cent are from supermarkets or independent retailers. As such, 92.4 per cent of the petrol stations make up our treatment group. Finally, we also take Spain's rank position in the *Oil Bulletin* into account. The average position in the period was 7th, while it varied from 2nd to 18th.

As for the institutional question that triggers the 'Monday effect', Figure 2 shows Spain's weekly rank position in the *Oil Bulletin*. This shows how up to 2011 it alternated positions

¹⁶ This outcome was also obtained by Zimmerman (2012) for US market.

between the third and thirteenth interval, while the variation became much more marked in 2012, where in the first quarter it was the second highest price of 27, before falling dramatically to 24th in the second week of November.

Figure 2: Spain's rank position in the *Oil Bulletin*



Source: Oil Bulletin.

To identify a more robust relationship an econometric approach is required. To this end, in the following section we estimate different econometric specifications showing the relationship between the different days of the week and the price of gasoline charged by petrol stations.

4. Estimations and results

Our main empirical strategy is to determine whether prices differ depending on the day of the week. In order to test this effect on the price of petrol 95 octane, we adopt the following general model (as used recently in Valadkhani, 2013):

$$p_{it} = \beta_0 + \beta_1 Mo_i + \beta_2 Tu_i + \beta_3 We_i + \beta_4 Th_i + \beta_5 Fr_i + \varepsilon_{it} \quad [1]$$

where p_{it} is the retail price of petrol 95 (euros per liter) at petrol station i on day t . Mo_i , Tu_i , We_i , Th_i and Fr_i are binary variables that represent the day of the week, taking the value of

one on the respective day and zero otherwise. ε_{it} is the error term. As we include data for Monday to Friday (note, no data are available for weekend retail prices),¹⁷ our estimations exclude one day as a benchmark or reference day.

As mentioned in the introduction, we use two databases: one for the whole of Spain and a more detailed database for one of the country's main cities, Barcelona. All estimations are then made using five different samples: *i*) the whole of Spain; *ii*) petrol stations located in mainland Spain; *iii*) petrol stations located in the Canary Islands (one of the two control groups); *iv*) petrol stations located in mainland Spain, excluding those branded by supermarkets (our treatment group); *v*) petrol stations located in mainland Spain branded by supermarkets (the second control group).

Our empirical strategy is based on consecutive estimations, as follows:

1. First approach: Monday as the sole explanatory variable We estimate the price of each petrol station using just this binary variable. Our aim is to determine whether Monday prices are significantly lower than the average for the rest of the week. We introduce the variable "Monday" multiplied by the dummy variable for each year to see whether the behavior is homogeneous over time, or limited to certain years.
2. Second approach: considering all days of the week (i.e., equation [1]). Using Mondays as a benchmark, we estimate whether Monday is the cheapest day of the week compared with each of the remaining days. This fits with the pricing strategy of the 'Monday effect'.¹⁸

Both approaches are estimated by ordinary least squares. Given the possible existence of autocorrelation we have implemented the test proposed by Wooldridge (2002) and programmed for Stata software by Drukker (2003). Results show the presence of autocorrelation, so the estimates were performed taking into account the residual autocorrelation. Thus the estimates presented robust standard errors to the presence of heteroskedasticity and autocorrelation. We also include fixed effects by petrol stations and temporal effects by day.¹⁹ These variables enable us to control for any specific effect attributable to any petrol station or given day.

¹⁷ ACCC (2007) confirms that no weekend effect exists in this market, although this report uses data from the Australian market. However, section 4 of this paper solve this lack of information and it also supports this idea.

¹⁸ In this case we had to limit the database for the years 2010, 2011 and 2012. The reason is that the computer was not enough memory to estimate the autoregressive model. In any case, the results of Table 2 shows that if "Monday effect" exists in 2009, this effect is very low, so that the exclusion of this year would not affect our results.

¹⁹ To check if we have to use fixed or random effects we performed the Hausman test. In all cases the test shows that there are systematic differences between the two estimates, suggesting the use of fixed effects

First approach: Monday as the sole explanatory variable

The first empirical approach, as indicated, simply involves setting the price charged by each of the petrol stations on each of the days against a binary variable that takes a value of 1 if the day of the week is Monday and 0 in other case. Table 2 shows the results.²⁰

Table 2. Monday effect compared to average of the other working days

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. sup.
Constant	1.3245*** (6.34e-06)	1.5112*** (4.29e-06)	0.7449*** (0.000)	1.5114*** (4.35e-06)	1.5167*** (0.000)
Year2010	0.0079*** (0.000)	0.0076*** (0.000)	0.1239*** (0.001)	0.0077*** (0.000)	0.0014* (0.001)
Year2011	0.0094*** (0.000)	0.0071*** (0.000)	0.2527*** (0.001)	0.0074*** (0.000)	-0.0018* (0.001)
Year2012	0.0187*** (0.000)	0.0157*** (0.000)	0.3399*** (0.001)	0.0163*** (0.000)	-0.0011 (0.001)
Monday*Year2009	-0.0008*** (0.000)	-0.0009*** (0.000)	0.0008** (0.000)	-0.0009*** (0.000)	0.0009*** (0.000)
Monday*Year2010	-0.0009*** (0.000)	-0.0009*** (0.000)	-0.0017*** (0.000)	-0.0009*** (0.000)	0.0004*** (0.000)
Monday*Year2011	-0.0021*** (0.000)	-0.0016*** (0.000)	-0.0108*** (0.000)	-0.0017*** (0.000)	0.0024*** (0.000)
Monday*Year2012	-0.0042*** (0.000)	-0.0044*** (0.000)	-0.0009*** (0.000)	-0.0046*** (0.000)	0.0006*** (0.000)
No. obs.	5674256	5400796	273460	5241213	159583
No. Petrol Stations	8425	8050	375	7831	219
F Test	7614.91*** (0.0000)	15939.15*** (0.0000)	50209.06*** (0.0000)	16836.24*** (0.0000)	150.28*** (0.0000)

P-values in brackets. *** (1%), ** (5%), * (10%)

The main finding from this first approach is that in 2010, 2011 and 2012 the price of petrol sold on Mondays is cheaper than the average weekday price, except in the case of petrol sold at stations owned by supermarkets. While petrol sold at stations owned by the majors in mainland Spain is between 0.1 and 0.5 cents cheaper than the average price, in the case of the supermarkets the Monday price is between 0.04 and 0.2 cents more expensive.

As such, it does not seem that supermarket petrol stations employ a pricing strategy influenced by the ‘Monday effect’. However, this approach fails to show definitively whether this effect exists for other stations, since Monday prices are compared to the average of the other working days, yet it is possible that the price charged on another working day is the same or cheaper than that charged on Mondays. Table 3 summarizes the response to this question for all the geographical and yearly markets considered.

²⁰ All tables include five estimations as explained in the text: *i)* **Spain**- whole of Spain; *ii)* **Mainland**- petrol stations located in mainland Spain; *iii)* **Canary Islands**- petrol stations located in Canary Islands; *iv)* **Mainl. NO sup.**- petrol stations located in mainland Spain, excluding those branded by supermarkets; *v)* **Mainl. sup.**- petrol stations located in mainland Spain branded by supermarkets.

Table 3: Are prices on Mondays lower than the average prices charged on other days? Summary of estimations

	Geographical market	2009	2010	2011	2012
	Spain	Yes	Yes	Yes	Yes
	Mainland	Yes	Yes	Yes	Yes
Treatment group	Mainland NO supermarkets	Yes	Yes	Yes	Yes
Control groups	Canary Islands	No	Yes	Yes	Yes
	Mainland supermarkets	No	No	No	No

Note: No sig.- No statistical significance

Second approach: considering all days of the week (with Mondays as reference)

In order to conduct a more robust analysis, we implemented this second approach, in line, for example, with Valadkhani (2013). We estimate equation [1], where the prices set by each of the petrol stations, depends on four binary variables that take the value of 1 if the day of the week is Tuesday, Wednesday, Thursday and Friday respectively, and zero otherwise. The interpretation of the coefficients of these dummy variables has to be made with reference to the binary variable used as a benchmark, in our case Mondays. Therefore, what the coefficients of these variables indicates is whether petrol prices on each of the days of the working week are cheaper or more expensive than the Monday price.

If the ‘Monday effect’ exists then the prices charged during the rest of the week should be higher than the Monday price; however, if the price charged on just one working day is equal to or less than Monday’s price we can discard the existence of the ‘Monday effect’. Results of this second approach can be seen in Table 4.

The econometric results show that in the case of the overall base (all of Spain or the Mainland), we confirm the ‘Monday effect’ for the whole period considered. For all periods, the rest of the weekdays have a higher prices than Mondays, between 0.04 and 0.7 cents. However, we can see in the table 4 that “Monday effect” increase with the past of the years. While prices for 2010 are only between 0.04 and 0.1 cents more expensive than Mondays, this difference increases reaching between 0.1 to 0.3 cents for 2011, and shows the maximum in 2012 where prices are between 0.3 and 0.7 cents more expensive than Mondays. However, the two groups of stations where we hope not find "Monday effect" (petrol stations in the Canary Islands and located on the mainland owned by supermarkets) show a behavior that does not fit with “Monday effect”. In the case of the Canary Islands, with the exception of 2010 show days with prices equal or lower than the price fixed on Mondays. In the case of gas stations owned by supermarkets, in all the years are weekdays with prices lower than fixed on Mondays.

Table 4. ‘Monday effect’ with regard to each of the other working days.

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. Supers
Constant	1.3063*** (8.04e-06)	1.4049*** (5.00e-06)	0.8661*** (0.000)	1.4049*** (5.07e-06)	1.4152*** (0.000)
Year2011	0.0037*** (0.000)	-0.0002* (0.000)	0.1256*** (0.000)	-0.0002 (0.000)	-0.0020*** (0.001)
Year2012	0.0147*** (0.000)	0.0077*** (0.000)	0.2178*** (0.000)	0.0080*** (0.000)	-0.0028*** (0.001)
Tuesday*Year2010	0.0004*** (0.000)	0.0003*** (0.000)	0.0031*** (0.000)	0.0003*** (0.000)	0.0002** (0.000)
Wednesday*Year2010	0.0005*** (0.000)	0.0005*** (0.000)	0.0026*** (0.001)	0.0005*** (0.000)	-0.0004*** (0.000)
Thursday*Year2010	0.0011*** (0.000)	0.0011*** (0.000)	0.0018*** (0.001)	0.0012*** (0.000)	-0.0006*** (0.000)
Friday*Year2010	0.0014*** (0.000)	0.0015*** (0.000)	0.0014*** (0.000)	0.0016*** (0.000)	-0.0013*** (0.000)
Tuesday*Year2011	0.0016*** (0.000)	0.0002*** (0.000)	0.0254*** (0.000)	0.0003*** (0.000)	-0.0023*** (0.000)
Wednesday*Year2011	0.0015*** (0.000)	0.0011*** (0.000)	0.0046*** (0.000)	0.0012*** (0.000)	-0.0025*** (0.000)
Thursday*Year2011	0.0011*** (0.000)	0.0017*** (0.000)	-0.0097*** (0.000)	0.0018*** (0.000)	-0.0031*** (0.000)
Friday*Year2011	0.0030*** (0.000)	0.0033*** (0.000)	-0.0040*** (0.000)	0.0035*** (0.000)	-0.0023*** (0.000)
Tuesday*Year2012	0.0023*** (0.000)	0.0024*** (0.000)	0.0020*** (0.001)	0.0025*** (0.000)	-0.0023*** (0.000)
Wednesday*Year2012	0.0052*** (0.000)	0.0055*** (0.000)	0.0018*** (0.001)	0.0057*** (0.000)	-0.0008*** (0.000)
Thursday*Year2012	0.0068*** (0.000)	0.0072*** (0.000)	0.0025*** (0.001)	0.0074*** (0.000)	0.0012*** (0.000)
Friday*Year2012	0.0046*** (0.000)	0.0049*** (0.000)	-0.0009 (0.001)	0.0051*** (0.000)	0.0009*** (0.000)
No. obs.	4315612	4103553	212059	3981509	122044
No. Petrol Stations	7668	7301	367	7091	210
F Test	4929.28*** (0.0000)	13104.86*** (0.0000)	15388.15*** (0.0000)	13552.84*** (0.0000)	153.31*** (0.0000)

P-values in brackets. *** (1%), ** (5%), * (10%)

For the petrol stations located in the mainland and not owned by supermarkets, the results for the three years show behavior that is consistent with the existence of the ‘Monday effect’. For the year 2010 this petrol stations set a price for the other days of the week that was significantly higher than that charged on Mondays. Yet, this price difference is very small, about €0.1 cents, so although in 2010 the pattern of prices for petrol stations in the Mainland not operated by supermarkets supports the ‘Monday effect’, the size of the difference means it was very limited. The price behavior in 2011 is quite similar to that in

2010. The estimates show a pattern that is consistent with the ‘Monday effect’, but again it is quite limited.

In 2012, however, the difference is more marked. The price pattern in this year is not only compatible with the ‘Monday effect’, but the magnitude of the price increase is between 0.3 and 0.7 cents for each day, in the case of our treatment group. This result is in line with reported by the CNE (2013a).

Table 5 provides a summary of the estimations included in Table 4. The main issues is that while prices set on Mondays by petrol stations in our treatment group fall, those set by our two control groups remain unchanged.

**Table 5: Are prices on Mondays lower than each of the other working days?
Summary of estimations**

	Geographical market	2010	2011	2012
	Spain	Yes	Yes	Yes
	Mainland	Yes	Yes	Yes
Treatment group	Mainland NO supermarkets	Yes	Yes	Yes
Control groups	Canary Islands	Yes	No	No
	Mainland supermarkets	No	No	No

Note that we also reject the existence of the Edgeworth cycle described in section 2. For such a cycle to exist, with Monday as the cheapest day, Tuesday should be the most expensive day, while Wednesday, Thursday and Friday should provide increasingly lower prices but higher than Monday’s price. However, the ratios observed in the tables do not fit with this pattern.

5. Is the ‘Monday effect’ still apparent in 2013? The Barcelona case

The analysis up to this point has been based on data for the five working days but has not been able to examine weekend prices or the characteristics of the retailers. The purpose of this section, therefore, is twofold: first, to improve the quality of the earlier data so as to check for any potential bias in these previous estimates that might have an impact on retail prices; and, second, to analyze whether the ‘Monday effect’ is still apparent in 2013.

To do so we collected data for all petrol stations located in the second most populous city in Spain, Barcelona, during May 2013. Table 6 summarizes the characteristics of the petrol stations by brand in this database.

Table 6: Petrol stations and the services offered (%). May 2013

	Petrol stations	Market share	Loyalty card	Shop	24 hours	Car wash	Self-service	Garage	Gas	Bread	Bar	Number of pumps
Repsol	28	34.2	100	71.4	60.7	32.1	67.8	7.1	7.1	39.2	14.3	5.4
Cepsa	12	14.6	100	75	66.7	25	16.7	0	0	58.3	16.7	7.3
GALP	9	11.0	100	100	66.7	55.6	55.6	0	0	66.7	55.6	7.8
Meroil	6	7.3	100	100	66.7	50	50	50	0	50	0	6.3
BP	5	6.1	100	80	80	0	20	0	0	0	0	8.4
Shell	4	4.9	100	50	50	0	50	0	0	0	0	3
Petrocat	2	2.4	100	100	50	50	50	0	0	100	0	5.5
Others	16	19.5	30	63.3	46.7	6.7	43.3	13.3	0	6.7	13.3	3.4
TOTAL	82	-	92.2	75.3	55.0	24.8	43.4	11.2	0.9	36.2	11.3	5.6

Note: All data are in percentages, except the number of petrol stations and pumps.

The average characteristics of the retailers are fairly similar. In the case of concentration, Repsol has the highest market share (34.2%) in the retail petrol market by number of petrol stations (as it does throughout Spain). In fact, the C_3 index is 59.8% and the HHI index is 2,004. Despite these high concentration values, it is not among Spain's most concentrated markets (see Perdiguero and Jiménez, 2009, and Jiménez and Perdiguero, 2012 and forthcoming).

As in the previous section, we undertook an OLS estimation to analyze whether prices fall on Mondays. Table 7 reports the outcomes of the first approach as implemented in the previous section. We estimate one equation per brand in order to detect any potentially different patterns. As the results show, the Monday prices of three firms are lower than the average prices charged for the rest of the week - Repsol, Cepsa and BP, who account for 51.2 per cent of the market share. Moreover, this preliminary outcome is higher in Repsol petrol (€2.1 cents) than it is in the other two (€1.3 and 1.1 cents, respectively).

Table 8. report the outcomes of the second approach as implemented in the previous section. We can lead to the same conclusion: Repsol fixes its prices on Mondays at a rate that is lower than week average by 2 cents. Other firms that present the same pattern are Cepsa (with Monday's prices 1.2 cents lowers than average of the week), BP (1 cents lower) and Meroil (0.6 cents). No other brand sells petrol at a significant lower price on Mondays.

Table 7: First approach to Barcelona database

Constant	1.444*** (0.000)
Monday	0.004*** (0.001)
Monday*Repsol	-0.020*** (0.001)
Monday*Cepsa	-0.012*** (0.002)
Monday*BP	-0.010*** (0.002)
Monday*Galp	0.002 (0.002)
Monday*Petrocat	-0.003 (0.003)
Monday*Meroil	-0.006*** (0.002)
Monday*Shell	-0.001 (0.002)
No. obs.	2459
No. Petrol Stations	82
F Test	63.15*** (0.0000)

P-values in brackets. *** (1%), ** (5%), * (10%)

As in the analysis for Spain, Table 7 shows that some firms set prices on Monday compatible with the strategy of "Monday effect", but does not confirm the existence of this effect. To verify its existence is necessary to check whether the prices set the other days of the week are greater than the prices set on Monday. The econometric results can be seen in Table 8.

Table 8: Second approach to Barcelona database

	All
Constant	1.435*** (0.000)
Tuesday	-0.009*** (0.001)
Wednesday	-0.002 (0.002)
Thursday	-0.00004 (0.002)
Friday	0.001 (0.002)
Saturday	0.002 (0.001)
Sunday	0.001 (0.001)

Tuesday*Repsol	0.024*** (0.002)
Wednesday*Repsol	0.026*** (0.002)
Thursday*Repsol	0.024*** (0.002)
Friday*Repsol	0.025*** (0.002)
Saturday*Repsol	0.022*** (0.000)
Sunday*Repsol	0.015*** (0.000)
Tuesday*Cepsa	0.014*** (0.002)
Wednesday*Cepsa	0.014*** (0.002)
Thursday*Cepsa	0.020*** (0.002)
Friday*Cepsa	0.017*** (0.003)
Saturday*Cepsa	0.014*** (0.002)
Sunday*Cepsa	0.010*** (0.002)
Tuesday*BP	0.012*** (0.002)
Wednesday*BP	0.012*** (0.003)
Thursday*BP	0.014*** (0.003)
Friday*BP	0.016*** (0.003)
Saturday*BP	0.010*** (0.003)
Sunday*BP	0.008*** (0.002)
Tuesday*Galp	-0.008*** (0.002)
Wednesday*Galp	0.001 (0.003)
Thursday*Galp	0.001 (0.003)
Friday*Galp	0.003 (0.003)
Saturday*Galp	0.003 (0.003)
Sunday*Galp	0.003 (0.002)
Tuesday*Petrocat	0.006* (0.004)
Wednesday*Petrocat	0.005

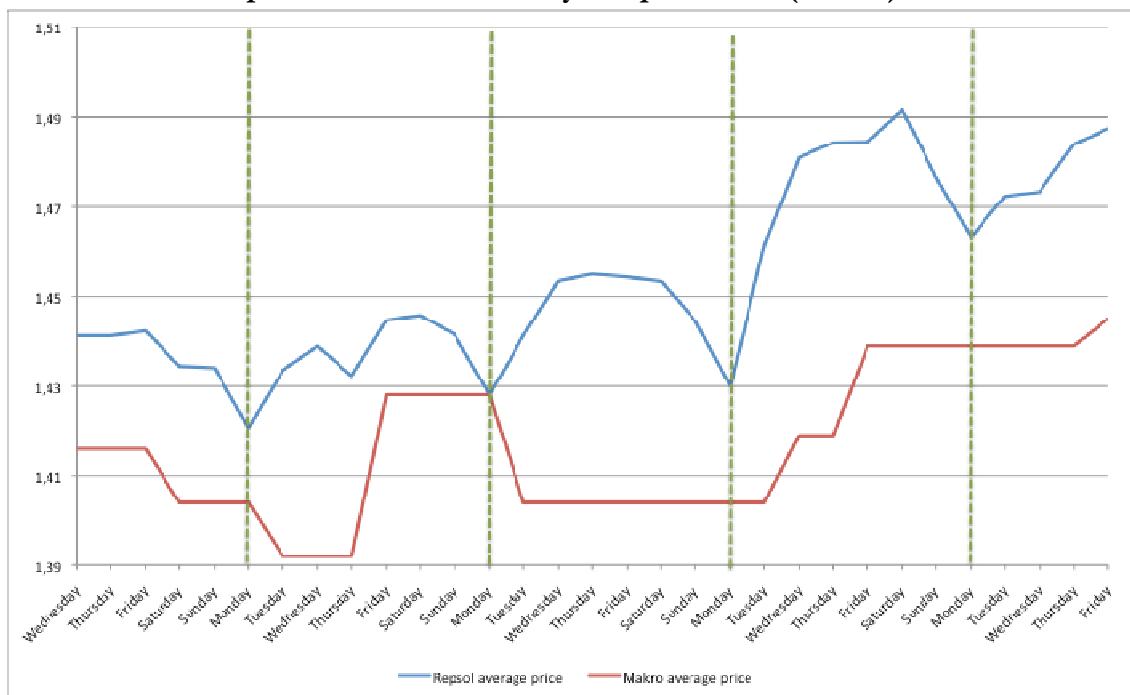
	(0.005)
Thursday*Petrocat	0.004
	(0.005)
Friday*Petrocat	0.002
	(0.005)
Saturday*Petrocat	0.001
	(0.005)
Sunday*Petrocat	0.0001
	(0.004)
Tuesday*Meroil	0.006***
	(0.002)
Wednesday*Meroil	0.005*
	(0.003)
Thursday*Meroil	0.010***
	(0.003)
Friday*Meroil	0.008***
	(0.003)
Saturday*Meroil	0.006**
	(0.003)
Sunday*Meroil	0.006***
	(0.002)
Tuesday*Shell	0.001
	(0.003)
Wednesday*Shell	0.001
	(0.003)
Thursday*Shell	-0.0001
	(0.004)
Friday*Shell	0.004
	(0.004)
Saturday*Shell	0.0005
	(0.003)
Sunday*Shell	0.0006
	(0.003)
<hr/>	
No. obs.	2459
No. Petrol Stations	82
F Test	25.22***
	(0.0000)

P-values in brackets. *** (1%), ** (5%), * (10%)

Results in Table 8 show as firms Repsol, Cepsa, BP and Meroil set prices significantly higher during the week than Monday, and therefore have a pricing strategy according to the "Monday effect". Moreover, the difference between the prices of other days of the week and Monday is greater with increasing market share of the companies. While Repsol fixed prices between 1.5 and 2.6 cents more expensive than Monday rest of the week, Cepsa makes between 1 and 2 cents, BP between 0.8 and 1.6 cents, and finally Meroil (the company with the lowest market share among which fit with the "Monday effect" strategy) only between 0.6 and 1 cent. Therefore, it seems that the higher the market power of a firms higher is the magnitude of the pricing strategy according to the "Monday effect".

To support these results, we plot two graphs: in the first, the average daily price of petrol at Repsol stations in Barcelona and, in the second, the average daily price of petrol at stations owned by an operator in the control group (the supermarket Makro). The vertical green lines highlight Monday prices. This clearly indicates how the average prices charged by Repsol in Barcelona fall on Mondays while the prices do not follow this pattern at the Makro stations (Figure 3).

Figure 3: Average daily prices at Repsol petrol stations in Barcelona and at the petrol stations owned by a supermarket (Makro)



Source: Own elaboration.

As we have noted in the introduction, these results have in fact been confirmed by Repsol in a recent press release. However, reasons claimed by Repsol raises a number of questions: Why had the firm not previously advertised this commercial strategy to its consumers? Since when did professional carriers start using petrol 95 instead of diesel? Why does Repsol not implement the ‘Monday effect’ in the Canary Islands? Does Repsol enjoy higher profits on the other days of the week or does it sell below cost value on Mondays? The evidence is quite resounding in response to these questions, we are faced by one more lie.

6. Conclusions

Despite the liberalization of Spain's petrol market, both the empirical literature and recent reports published by the country's antitrust authorities and sector regulators identify not only serious problems in the level of competition at the retail level, but also at every point in the production chain.

At the retail level, the European Commission's *Oil Bulletin* upholds this idea: Spain is one of the countries charging the highest prices before tax. This outcome received broad media coverage in 2011 and 2012, raising questions about a supposed 'Monday effect'. Given that the European Commission collects its data on final prices on the Monday of each week, there are indications that the retail price is manipulated on that day (there being no obvious economic justification for the fluctuation) so as to modify European statistics and reduce the impact of press coverage.

Drawing on a database, created specifically for this study, which includes daily prices for all petrol stations in Spain, from 2009 to 2012, we sought to estimate whether Monday prices are lower than those charged the rest of the week where no economic reason sustain this potential outcome. To support this, we used two control groups: the main one are those owned by supermarkets (which are firms that exert real competition in this market, as previous literature show); and petrol stations in the Canary Islands (which were not included in the *Oil Bulletin's* statistics despite being a Spanish region).

We have reached the following conclusions: first, prices on Mondays are lower than those charged the rest of the week at petrol stations located in mainland Spain and not owned by supermarkets (i.e. more than 90 per cent of all of Spain's petrol stations). Second, this behavior was more pronounced in 2012 than in previous years. Third, our two control groups do not suffer this 'Monday effect'.

Similarly, analyzing the behavior of the stations located in the city of Barcelona during of May 2013 we can see how this behaves remains in this year. Furthermore, we observed that there is also a positive relationship between market share and the price difference between Monday and the other days of the week. Therefore, it seems that greater market power higher is the probability to set prices according to the 'Monday effect' and with greater intensity.

All these outcomes support the idea that lower prices on Mondays are not affected by economic reasons, demand or cost fluctuations. Thus, our estimations show the existence of a new anti-competitive marker in this market, that has previously been identified in only two previous studies (for Norwegian and Australian markets). In fact, it has generated not only an important public concern in Spain but also an opened case in the Spanish antitrust authority.

Summarizing: this paper follows the main outcome of academic literature for this market that clearly made a direct relationship between high concentration at all levels of the market and reduced levels of competition. A final data to take into account: despite the impact of the economic crisis on the sector in Spain, the oil companies managed to increase their

profit margin by 30 per cent in the first quarter of 2013.²¹ So, one more lie in the Spanish petrol market.

²¹ See footnote 4.

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