One more lie: the 'Monday effect' in Spain's retail petrol market[1]

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Abstract

Empirical evidence drawn from the economic literature points to a low level of competition in the retail petrol market. Similar evidence can be found for the Spanish market. In fact, both Spain's antitrust authority (*Comisión Nacional de la Competencia*) and its energy regulator (*Comisión Nacional de la Energía*) have recently initiated disciplinary proceedings against the majors on the grounds of suspected price manipulation in the retail petrol market. They are accused of cutting retail prices on Mondays so as to distort the rank position of Spain in European Union statistics in a practice that has received the name of the 'Monday effect'. Here, we analyze this effect by constructing a database that includes daily retail prices for all petrol stations in Spain in the period 2009-2012, and a more detailed database for the city of Barcelona in 2013. Our estimations confirm that: *i)* in 2011 and 2012 prices fell on Mondays at retailers branded by majors; *ii)* prices were unchanged at stations in our two control groups; *iii)* prices were also seen to fall when a more detailed analysis was conducted, and this price cut was also found in 2013. In short, one more indicator of collusion in this sector and … one more lie.

Keywords: Petrol; Antitrust; Monday effect.

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

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Introduction

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).[4] 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 a new anti-competitive marker in this market. 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.[5] And yet Spain's ranking in the European Commission's *Oil Bulletin*[6] 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,[7] 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.[8]

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 (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 (section 3); and second we draw on detailed retail data for Barcelona in the month of May 2013 (section 4). Both databases are then analyzed employing an econometric approach. Our results (section 5) show that the 'Monday effect' does in fact exist and we conclude (section 6) that it has become a new indictor of no-competition in this market in Spain.

The evolution of the Spanish petrol market: an academic perspective

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[4] See CNC (2012); CNE (2013a; 2013b) and previous inquiries. For academic literature, see section 2.
[5] 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).*
[6] http://ec.europa.eu/energy/observatory/oil/bulletin_en.htm
[7] See http://ec.europa.eu/energy/observatory/oil/doc/prices/survey_oil_bulletin_data_collection.pdf
[8] See http://www.cncompetencia.es/Default.aspx?TabId=105&Contentid=622820&Pag=1

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 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, 2012).

Various studies in the literature, around the world[9] 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 CLH[10] could generate a bottleneck in this market. Several years later, Bello and Cavero (2008) 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 higher 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,

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[9] See Eckert (2013) for a survey of empirical approaches applied to this sector.
[10] CLH (*Compañía Logística de Hidrocarburos*) is Spain's only oil product transportation and storage firm. This monopoly position, coupled with the freedom to set fares, contributes to the inefficient operation of the country's petrol market.

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) demonstrate that it is inefficient to seek out petrol station discounts given the similarity of prices in a Spanish region. 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 (2012b) 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,[11] 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-

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

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.

Data

Information about retail petrol station prices in Spain is public; it is also available daily but it expires as no server stores it.[12] 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*. 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 operate in both markets, but one is not influenced by the European survey, we selected this as our first control group.

In the case of the second control group, Jiménez and Perdiguero (2012a) conclude that only independent retailers exert some competitive forces in this market. For this reason, we differentiate the petrol stations owned by supermarket chains (Carrefour, Eroski, etc.) from the rest (branded by majors in the main). 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.

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[12] See http://geoportal.mityc.es/hidrocarburos/eess/

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_o: 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 1 shows Spain's weekly rank position in the *Oil Bulletin*. This shows how up to 2011 it alternated positions 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 1: Spain's rank position in the *Oil Bulletin*
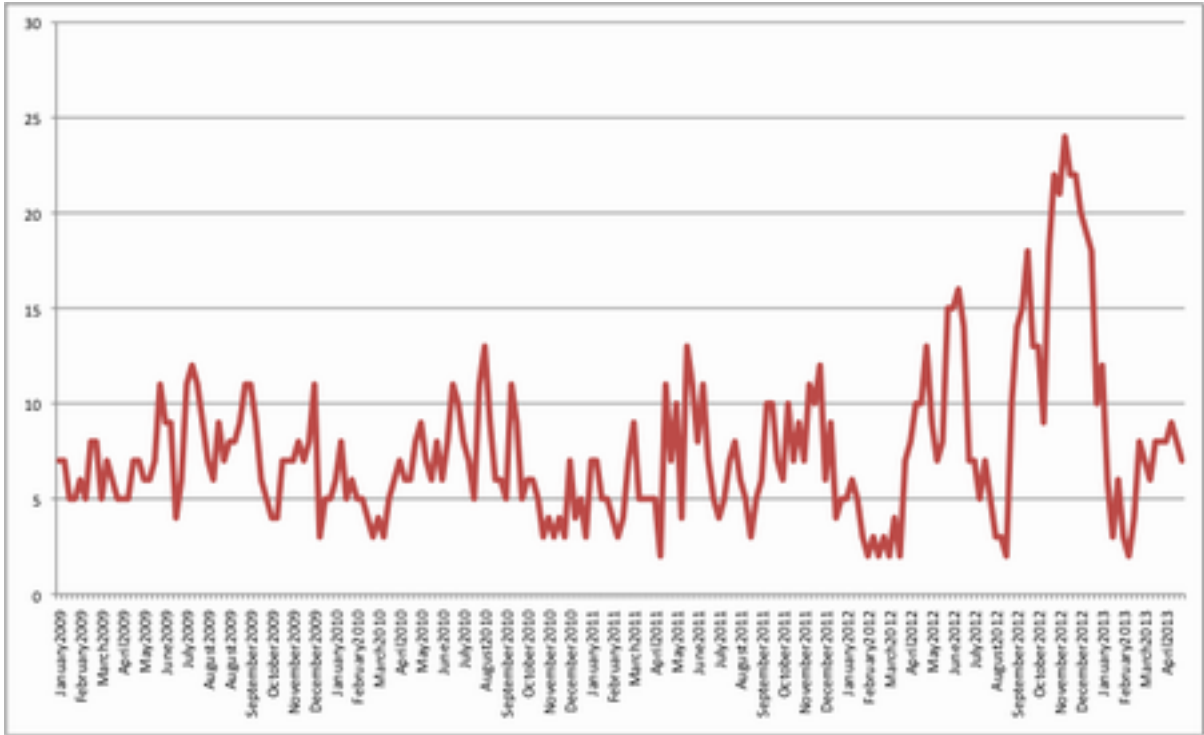
Source: Oil Bulletin.

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.

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):

$$[1]$$

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),[13] 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). These estimations are then repeated for each of the four years studied (2009-2012, inclusive), as we wish to see whether the behavior is homogeneous over time, or limited to certain years.

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.

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'.

Both approaches are estimated by ordinary least squares, robust to potential problems of heteroskedasticity. We also include fixed effects by petrol stations and temporal effects by day. These variables enable us to control for any specific effect attributable to any petrol station or given day.

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. Tables 1.1 to 1.5 show the results.[14]

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[13] 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 supports this idea.

[14] 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 1.1. Monday effect compared to average of the other working days

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. sup.
Constant	1.2069***	1.2215***	0.9190***	1.2224***	1..1943***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Monday	**-0.0001**	**-0.0001**	**-0.0003**	**-0.0001**	**0.0033*** **
	(0.806)	**(0.885)**	**(0.595)**	**(0.442(**	**(0.001)**
Nº obs.	5828074	5546916	281158	5383056	163860
F Test	0.06	0.02	0.28	0.59	11.51***
	(0.8064)	(0.8850)	(0.5947)	(0.4416)	(0.0007)

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

Table 1.2. Monday effect compared to average of the other working days. 2009

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. sup.
Constant	1.0002***	1.0124***	0.7423***	1.0134***	0.9767***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Monday	**0.0012*** **	**0.0011*** **	**0.0027*** **	**0.0010*** **	**0.0038*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Nº obs.	1359402	1297992	61410	1260444	37548
F Test	64.09***	52.69***	26.70***	44.08***	17.22***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

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

Table 1.3. Monday effect compared to average of the other working days. 2010

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. sup.
Constant	1.1520***	1.1666***	0.8669***	1.1675***	1.1368***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Monday	-0.0035***	-0.0035***	-0.0030***	-0.0035***	-0.0019***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Nº obs.	1811531	1723127	88404	1672014	51113
F Test	2512.21***	2384.03***	133.21***	2389.79***	18.06***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

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

Table 1.4. Monday effect compared to average of the other working days. 2011

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. sup.
Constant	1.3013***	1.3171***	0.9939***	1.3178***	1.2921***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Monday	-0.0026***	-0.0023***	-0.0078***	-0.0024***	**0.0017*** **
	(0.000)	(0.000)	(0.000)	(0.000)	**(0.000)**
Nº obs.	1421214	1351814	69400	1311679	40135
F Test	1267.08***	1181.11***	125.50***	1272.31***	16.99***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

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

Table 1.5. Monday effect compared to average of the other working days. 2012

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. sup.
Constant	1.4099***	1.4269***	1.0873***	1.4276***	1.4029***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Monday	-0.0100***	-0.0104***	-0.0043***	-0.0105***	-0.0048***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N° obs.	1235927	1173983	61944	1138919	35064
F Test	7241.06***	7244.98***	77.36***	7277.44***	43.66***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(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 0.1 cents cheaper than the average price, in the case of the supermarkets the Monday price is 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 2 summarizes the response to this question for all the geographical and yearly markets considered.

Table 2: Are prices on Mondays lower than the average prices charged on other days? Summary of estimations

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

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'. The main results of this second approach can be seen in Table 2.1.

Table 2.1. 'Monday effect' with regard to each of the other working days

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. supers
Constant	1.2039***	1.2185***	0.9160***	1.2192***	1.1946***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tuesday	0.0057***	0.0054***	0.0107***	0.0055***	0.0035***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)
Wednesday	0.0060***	0.0060***	0.0056***	0.0061***	0.0028**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.021)
Thursday	0.0100***	0.0102***	0.0073***	0.0103***	0.0063***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Friday	**-0.0090*****	**-0.0089*****	**-0.0123*****	**-0.0087*****	**-0.0137*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Nº obs.	5828074	5546916	281158	5383056	163860
F Test	2506.19***	2330.06***	228.97***	2265.45***	69.59***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

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

The econometric results show that in the case of the overall base (all of Spain or the Mainland), we can rule out any 'Monday effect' for the whole period considered. In all cases, Fridays present a price that is between €0.89 and €1.37 cents cheaper than the Monday price. However, given the temporal amplitude of the database, this does not mean that the strategy has been adopted by market players during specific periods of time.

To test whether this average effect is different for each of the four years included in the sample, we repeat this same estimation for each year. The results are presented in Tables 2.2 to 2.5.

Table 2.2. 'Monday effect' with regard to each of the other working days. 2009

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. supers
Constant	1.0014***	1.0135***	0.7451***	1.0145***	0.9804***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tuesday	0.0012***	0.0013***	**0.0004**	0.0014***	**-0.0002**
	(0.000)	(0.000)	**(0.524)**	(0.000)	**(0.854)**
Wednesday	**-0.0007***	**-0.0006***	**-0.0027***	**-0.0005***	**-0.0031***
	(0.000)	**(0.001)**	**(0.000)**	**(0.005)**	**(0.006)**
Thursday	**-0.0037***	**-0.0037***	**-0.0036***	**-0.0036***	**-0.0068***
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Friday	**-0.0017***	**-0.0015***	**-0.0047***	**-0.0014***	**-0.0053***
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Nº obs.	1359402	1297992	61410	1260444	37548
F Test	194.94***	186.01***	16.63***	175.66***	13.31***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

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

Table 2.3. 'Monday effect' with regard to each of the other working days. 2010

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. supers
Constant	1.1495***	1.1641***	0.8648***	1.1650***	1.1360***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tuesday	0.0021***	0.0021***	0.0022***	0.0021***	**0.0017***
	(0.000)	(0.000)	(0.000)	(0.000)	**(0.001)**
Wednesday	0.0016***	0.0015***	0.0034***	0.0015***	**0.0004**
	(0.000)	(0.000)	(0.000)	(0.000)	**(0.437)**
Thursday	0.0025***	0.0025***	0.0014***	0.0026***	**0.0003**
	(0.000)	(0.000)	(0.000)	(0.000)	**(0.607)**
Friday	0.0032***	0.0033***	0.0007**	0.0034***	**-0.0003**
	(0.000)	(0.000)	(0.022)	(0.000)	**(0.554)**
Nº obs.	1811531	1723127	88404	1672014	51113
F Test	409.75***	413.27***	34.52***	427.66***	4.17***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0022)

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

Table 2.4. 'Monday effect' with regard to each of the other working days. 2011

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. supers
Constant	1.2987***	1.3147***	0.9860***	1.3154***	1.2938***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tuesday	0.0032***	0.0020***	0.0257***	0.0021***	**-0.0007**
	(0.000)	(0.000)	(0.000)	(0.000)	**(0.185)**
Wednesday	0.0021***	0.0021***	0.0020**	0.0022***	**-0.0011****
	(0.000)	(0.000)	(0.022)	(0.000)	**(0.033)**
Thursday	0.0035***	0.0036***	0.0028***	0.0037***	**-0.0013****
	(0.000)	(0.000)	(0.002)	(0.000)	**(0.011)**
Friday	0.0014***	0.0015***	**-0.0011**	0.0017***	**-0.0038****
	(0.000)	(0.000)	**(0.241)**	(0.000)	**(0.000)**
Nº obs.	1421214	1351814	69400	1311679	40135
F Test	473.60***	441.64***	324.19***	463.27***	14.98***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

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

Table 2.5. 'Monday effect' with regard to each of the other working days. 2012

	Spain	Mainland	Canary Islands	Mainl. NO sup.	Mainl. supers
Constant	1.3999***	1.4166***	1.0831***	1.4171***	1.3981***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tuesday	0.0042***	0.0042***	0.0048***	0.0043***	**-0.0001**
	(0.000)	(0.000)	(0.000)	(0.000)	**(0.900)**
Wednesday	0.0060***	0.0062***	0.0038***	0.0064***	**-0.0003**
	(0.000)	(0.000)	(0.000)	(0.000)	**(0.699)**
Thursday	0.0187***	0.0193***	0.0079***	0.0195***	0.0126***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Friday	0.0112***	0.0120***	**-0.0032****	0.0121***	0.0081***
	(0.000)	(0.000)	**(0.000)**	(0.000)	(0.000)
Nº obs.	1235927	1173983	61944	1138919	35064
F Test	4958.28***	5034.53***	80.66***	4971.63***	87.50***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

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

Table 2.2. identifies no pattern compatible with the 'Monday effect', which allows us to rule out this kind of behavior in 2009. This represents a further demonstration that this behavior does not respond to any economic issue, or question related to cost structure or similar, since we have temporarily verified its absence.

However, the results for the other three years show behavior that is consistent with the existence of the 'Monday effect'. For the year 2010 (Table 2.3.), petrol stations located in the Mainland and not operated by the supermarkets 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 €0.2 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 (see Table 2.4.).

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 at least €0.6 cents for each day, in the case of our treatment group. This result is in line with reported by the CNE (2013a).

Table 3 provides a summary of all the estimations included in Tables 2.1 to 2.5. 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 3: Are prices on Mondays lower than each of the other working days? Summary of estimations

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

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 4 summarizes the characteristics of the petrol stations by brand in this database.

Table 4: 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, 2012a and 2012b).

As in the previous section, we undertook an OLS estimation to analyze whether prices fall on Mondays. Table 5.1 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).

Tables 5.2 and 5.3. report the outcomes of the second approach as implemented in the previous section, but now including the characteristics of the petrol stations. Both tables lead to the same conclusion: Repsol fixes its prices on Mondays at a rate that is lower than that on each of the other days, by €0.3 to 10 cents. These results also take into consideration the characteristics of the petrol stations, which might have a differential impact on prices. However, no other brand sells petrol at a lower price on Mondays.

Table 5.1.: First approach to Barcelona database

	All brands	Repsol	Cepsa	BP	Galp	Petrocat	Meroil	Shell	Others
Constant	1.4369***	1.4566***	1.4625***	1.4554***	1.4536***	1.4417***	1.4573***	1.4560***	1.3551***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Monday	-0.0101***	-0.0211***	-0.0137***	-0.0113**	**0.0005**	**-0.0018**	**-0.0060**	**-0.0003**	**0.0011**
	(0.000)	(0.000)	(0.000)	(0.012)	**(0.874)**	**(0.757)**	**(0.155)**	**(0.948)**	**(0.591)**
Nº obs.	2541	868	372	155	279	62	186	124	495
F Test	76.52***	96.90***	19.10***	6.48**	0.03	0.10	2.04	0.00	0.29
	(0.0000)	(0.0000)	(0.0000)	(0.0119)	(0.8740)	(0.7567)	(0.1547)	(0.9482)	(0.5906)

Table 5.2: Second approach to Barcelona database

	All brands	Repsol	Cepsa	BP	Galp	Petrocat	Meroil	Shell	Others
Constant	1.4268***	1.4355***	1.4487***	1.4441***	1.4541***	1.4399***	1.4513***	1.4556***	1.3563***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tuesday	0.0029*	0.0166***	**0.0055**	**0.0040**	**-0.0155*****	**-0.0026**	**-0.0020**	**-0.0069**	**-0.0082*****
	(0.056)	(0.000)	**(0.178)**	**(0.495)**	**(0.000)**	**(0.745)**	**(0.721)**	**(0.291)**	**(0.003)**
Wednesday	0.0094***	0.0221***	0.0112***	0.0101*	**-0.0016**	**0.0023**	**0.0029**	**-0.0006**	**-0.0022**
	(0.000)	(0.000)	(0.004)	(0.068)	**(0.693)**	**(0.761)**	**(0.578)**	**(0.926)**	**(0.395)**
Thursday	0.0133***	0.0238***	0.0201***	0.0151***	**0.0017**	**0.0043**	**0.0108****	**0.0009**	**0.0006**
	(0.000)	(0.000)	(0.000)	(0.007)	**(0.681)**	**(0.572)**	**(0.040)**	**(0.881)**	**(0.807)**
Friday	0.0156***	0.0271***	0.0192***	0.0188***	**0.0059**	**0.0043**	**0.0112****	**0.0069**	**0.0026**
	(0.000)	(0.000)	(0.000)	(0.001)	**(0.148)**	**(0.572)**	**(0.033)**	**(0.266)**	**(0.325)**
Saturday	0.1042***	0.0208***	0.0143***	0.0097*	**0.0022**	**0.0013**	**0.0059**	**5.51e-18**	**-0.0003**
	(0.000)	(0.000)	(0.001)	(0.095)	**(0.603)**	**(0.877)**	**(0.285)**	**(1.000)**	**(0.919)**
Sunday	0.0071***	0.0136***	0.0099**	**0.0078**	**0.0022**	**-3.76e-18**	**0.0055**	**6.02e-18**	**-0.0005**
	(0.000)	(0.000)	(0.016)	**(0.179)**	**(0.603)**	**(1.000)**	**(0.314)**	**(1.000)**	**(0.866)**
Nº obs.	2541	868	372	155	279	62	186	124	495
F Test	29.97***	22.41***	6.97***	2.70**	5.46***	0.22	1.88*	0.85	3.24***
	(0.0000)	(0.0000)	(0.0000)	(0.0163)	(0.0000)	(0.9689)	(0.0874)	(0.5330)	(0.0039)

Table 5.3.: Second approach to Barcelona database

	All brands	Repsol	Cepsa	BP	Galp	Petrocat	Meroil	Shell	Others
Constant	1.2945***	1.4377***	1.4525***	1.4742***	1.4322***	1.4297***	1.4399***	1.4552***	1.3346***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Tuesday	0.0038**	0.0176***	0.0052	0.0040	-0.0149***	-0.0026	0.0025	-0.0069	-0.0077**
	(0.019)	(0.000)	(0.219)	(0.493)	(0.001)	(0.743)	(0.719)	(0.287)	(0.014)
Wednesday	0.0100***	0.0231***	0.0109***	0.0101*	-0.0019	0.0023	0.0040	-0.0006	-0.0024
	(0.000)	(0.000)	(0.007)	(0.065)	(0.660)	(0.760)	(0.543)	(0.925)	(0.430)
Thursday	0.0135***	0.0246***	0.0198***	0.0151***	0.0016	0.0043	0.0102	0.0009	0.0004
	(0.000)	(0.000)	(0.000)	(0.006)	(0.704)	(0.570)	(0.124)	(0.880)	(0.906)
Friday	0.0161***	0.0276***	0.0189***	0.0188***	0.0061	0.0043	0.0112*	0.0069	0.0025
	(0.000)	(0.000)	(0.000)	(0.001)	(0.161)	(0.570)	(0.091)	(0.262)	(0.395)
Saturday	0.0109***	0.0213***	0.0141***	0.0097*	0.0025	0.0013	0.0065	2.01e-15	-0.0004
	(0.000)	(0.000)	(0.001)	(0.092)	(0.584)	(0.876)	(0.350)	(1.000)	(0.903)
Sunday	0.0074***	0.0140***	0.0098**	0.0078	0.0025	1.76e-15	0.0075	2.01e-15	-0.0006
	(0.000)	(0.000)	(0.021)	(0.176)	(0.584)	(1.000)	(0.281)	(1.000)	(0.855)
Fidelity card	0.1576**								0.4168
	(0.012)								(0.338)
Shop	-0.0125**	0.0014	-0.0118	0.0114**					-0.4920
	(0.041)	(0.677)	(0.250)	(0.023)					(0.156)
24 hours	0.0517	-0.0044*	0.0050	0.0005	-0.0147				0.1358
	(0.303)	(0.081)	(0.511)	(0.890)	(0.627)				(0.710)
Car wash	-0.0069	0.0055*	-0.0114*		-0.0088				0.6220
	(0.904)	(0.099)	(0.094)		(0.692)				(0.346)
Self-service	0.0673	-0.0013			0.0383				0.4264
	(0.125)	(0.575)			(0.311)				(0.170)
Garage	0.0774	-0.0044							
	(0.408)	(0.271)							
Gas	-0.0531	-0.0051							
	(0.768)	(0.381)							

Bread	0.0355	-0.0000	-0.0008		0.0478*				-0.1317
	(0.495)	(0.988)	(0.915)		(0.091)				(0.852)
Bar	0.0121	0.0048	-0.0036		0.0216				
	(0.869)	(0.213)	(0.680)		(0.232)				
N° Pumps	0.0011	-0.0004	0.0008	-0.0047**	-0.0039	0.0019**	0.0019	0.0001	-0.0285
	(0.911)	(0.560)	(0.460)	(0.018)	(0.0086)	(0.023)	(0.312)	(0.937)	(0.776)
N° obs.	2200	806	341	155	248	62	93	124	402
F Test	169.51***	144.88***	46.59***	22.86***	35.52***	6.49	5.57	5.15	17.26
	(0.0000)	(0.0000)	(0.0000)	(0.0065)	(0.0004)	(0.4842)	(0.5910)	(0.6414)	(0.1876)

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 2).

Figure 2: Average daily prices at Repsol petrol stations in Barcelona and at the petrol stations owned by a supermarket (Makro)
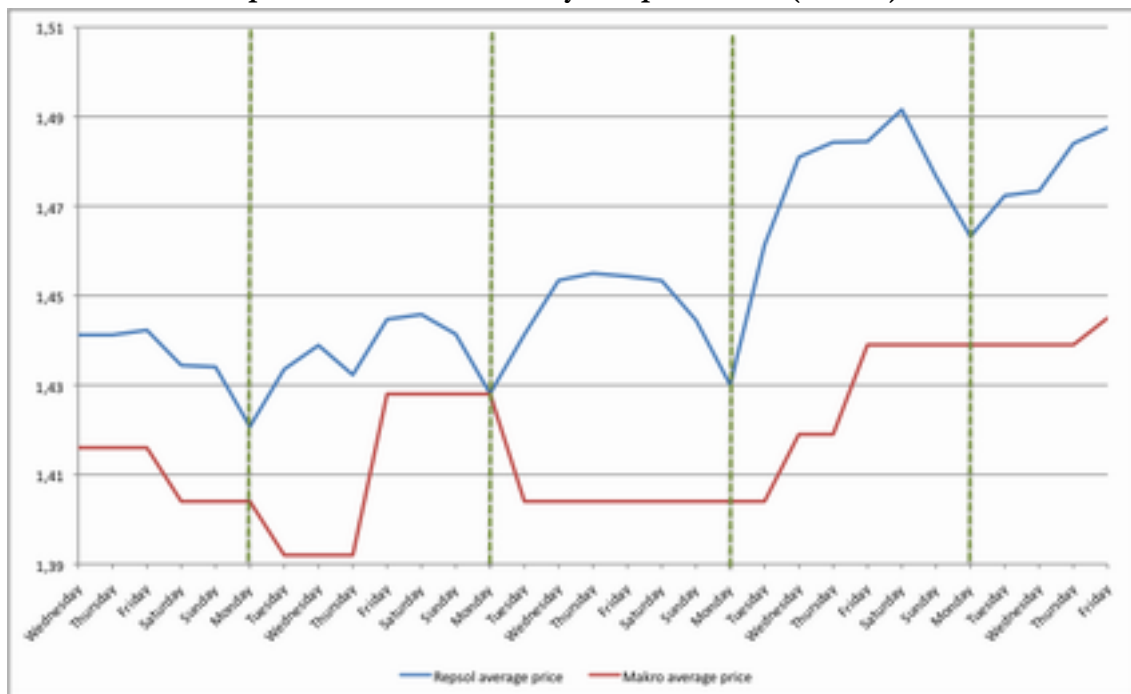
Source: Own elaboration.

These results have in fact been confirmed by Repsol. In a recent press release the firm 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"[15]. However, this claim 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? Why did it not implement the strategy in 2009? 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.

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[15] See El Pais, July 4th 2013.

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. To support this, we used two control groups: petrol stations in the Canary Islands (which were not included in the *Oil Bulletin's* statistics) and those owned by supermarkets and independent retailers (which are the only firms that exert real competition in this market).

We have reached a number of 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. In fact, we found no evidence of the 'Monday effect' in 2009. Third, our two control groups do not suffer the 'Monday effect'.

Thus, we have demonstrated the existence of a new anti-competitive marker in this market that has previously been identified in other studies. Moreover, 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.[16]

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[16] See footnote 5.

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