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Competition, regulation, and pricing behavior in the Spanish retail gasoline market

Abstract

The restructuring of the Spanish oil industry produced a highly concentrated oligopoly in the retail gasoline market. In June 1990 the Spanish government introduced a system of ceiling price regulation in order to ensure that "liberalization" was accompanied by adequate consumer protection. This paper examines the pricing behavior of the retail gasoline market using multivariate error correction models over the period January 1993 (abolishment of the state monopoly)-December 2004. The results suggest that gasoline retail prices respond symmetrically to increases and decreases in the spot price of gasoline. However, one the ceiling price regulation was abolished, the "collaboration" between the government and the major operators, Repsol-YPF and Cepsa-Elf in order to control the inflation rate results in a slower rate of increase (decrease) of gasoline retail prices when gasoline spot prices went up (went down) than elsewhere in the European Union. Finally, retail margins were by the end of our timing period of analysis, as in the first years after the abolishment of the state monopoly, well above the European ones.

Key words: Competition, regulation, pricing behavior, gasoline market

JEL classification: L11, L43, L51, L71

1. Introduction

Between 1927 and 1992, consumers of oil products in Spain were supplied by a state-monopoly[1] on the distribution and marketing of oil products, operated by a private concessionaire: CAMPSA. This monopoly was supplied with oil products by several public as well as private Spanish refiners. The volumes and prices were negotiated between the state, the refiners and the CAMPSA. The refiners' processing capacity and the supply of crude oil were also state-controlled.

By the end of the 1970s, Spain began to reorganize and liberalize its oil industry, to address the adverse consequences of the prevailing system of regulation, such as excess capacity, inadequate product yields and the failure to recover costs. A second reason became the foreseen entry of Spain into the EU that required a timely adjustment of the organization of the industry to comply with EU competition rules and to "prepare" the Spanish oil industry for operating in a competitive market. In the light of this latter objective, during a "transitional period" (1986-1992), the refining, distribution and retail trade segments of the industry were step-by-step opened up to new domestic and foreign operators, culminating in the dismantlement of the monopoly by 1993. The gradual dismantlement of the Spanish oil monopoly was agreed between the refiners, the Spanish Socialist Party (PSOE), in power after winning the 1982 elections, and the European Commission (Correljé 1990, 1994).

This produced a radical transformation of the industry structure and the organization of the market for oil products in Spain. The number of refining companies was reduced from 8 in the early 1970s to only 3 by the early 1990s.[2] The several public oil companies were reorganized into a "national champion", Repsol, structured similarly to international oil companies. Subsequently, Repsol was privatized tranche by tranche. The first president of Repsol was the "socialist" Oscar Fanjul. In 1996, following the victory of the right-wing People's Party (*Partido Popular*) in the March elections, Oscar Fanjul was replaced, as

[1] The state monopoly originated from the ideology of political and economic nationalism of the respective dictatorship of Primo de Rivera (1923-1927) and Franco (1936-1975). Spanish capitalism was protected by tariffs, closed markets, monopolies and other restrictions (Closa and Heywood, 2004). What liberalization there had been was largely due to external pressures (Alonso and Donoso, 1999).

[2] Meanwhile, large investments were made in refining, distribution and retail facilities in order to improve their efficiency and to adjust refinery output to the composition of demand. The industry was financially compensated through the system of regulation.

president of Repsol, by the "conservative" Alfonso Cortina, who managed the last stage of the process of privatization.[3] In 1999 Repsol took over the Argentinean company YPF, and was renamed Repsol-YPF.

In 1991, the foreign companies Elf and BP took over the two private Spanish refiners, respectively Cepsa and Petromed. In this way, the private Spanish refineries were integrated into the production systems of large international oil companies and gained access to crude supply and the international product markets

In 1992, forward integration of the Spanish refining companies was achieved by splitting up the monopoly. The retail network was divided among the refineries. The distribution activities stayed with the formerly private concessionaire of the state monopoly, CAMPSA, which thus became a transport company, the shares of which were sold to the Spanish-based refiners plus Shell (Contín *et al.*, 1999). Early 1993, CAMPSA was renamed CLH and the state monopoly was officially abolished.

In June 1990, system of administratively set prices for gasoline was replaced by a system of price ceilings. Despite the abolishment of the monopoly, the price ceilings remained in force until October 1998 (Contín *et al.*, 1999).

Against this background, the fact that the country's refining and retail sector remained highly concentrated, in combination with the deregulation of gasoline prices, fuelled a continuous discussion about the possibility of non-competitive market behavior in the retail gasoline market. In 1998 the *Banco de España* (1998*)* presented two analyzes of the impact of the liberalization on the degree of competition in the automotive fuels market. The first compared the prices actually charged for gasoline with the ceiling prices. It concluded that, except for specific periods, the differences between these two sets of prices were small. This suggested a scant degree of competition. Contín *et al.* (1999) confirmed that only between September 1996 and October 1998 prices for unleaded gasoline were set slightly below ceiling prices. As an alternative method of assessing the degree of competition, the *Banco de España* compared final pre-tax prices in Spain with the price of gasoline on intemational markets. According to the *Banco*: "this comparison shows that the pass-

[3] The conservative (PP) and the socialist (PSOE) parties shared a desire to retain the national character of the former state monopolies. Thus, deregulation and privatisation of former monopolies such as Repsol, Iberia and Telefónica went hand in hand with retaining control over the privatised companies through a "golden share", and by encouraging Spanish investors banks to buy in and form a national "hard core" of shareholders (Molina, 2001).

through of price movements on international markets was incomplete, both at times of falling, as well as rising, prices, although it tended to be more rapid when prices were rising".[4]

In addition, it was argued that there was a close collaboration between the major operators – the refiners - and the government in the formation of gasoline prices, once the ceiling price regulation was abolished, in order to "help" the government to meet its inflation rate target in periods of oil and gasoline spot price increases. Thus, the oil operators would have passed the increases in the spot price of gasoline into gasoline retail prices in Spain slower than elsewhere in Europe, in periods of gasoline spot price increases, in exchange for slowly passing of gasoline spot prices decreases into gasoline retail prices, once the spot price of gasoline started to decrease (Contín and Huerta, 2000; Expansión, 29/12/2003).

This paper deals with the price dynamics in the Spanish market for gasoline after the abolishment of the oil state monopoly. In doing so, we will seek to characterize and explain the gasoline retail price adjustments from January 1993 (abolishment of the monopoly) to December 2004. To start with, we will analyze the collaboration between the refiners and the government in setting gasoline prices in order to control the inflation rate and how this has affected pricing behavior. Thereupon, we will examine whether the abolishment of the system of ceiling price regulation, in October 1998, has resulted either in a faster or a slower adjustment of retail prices relative to gasoline spot price changes, as compared to the period of price regulation between January 1993 and October 1998. Finally, we investigate the issue of asymmetric gasoline retail price responses to gasoline wholesale spot price changes, before and after October 1998. It is worth noting that the relevant cost for gasoline retailers is the spot price of gasoline, rather than the price of crude. In fact, the gasoline spot price acts as a transfer price between the refining and the selling divisions for those refiners who operate their own service stations, as it is considered the best available measure of its marginal cost (Bacon, 1991).[5]

An understanding of the Spanish experience will be useful for countries that are currently involved in processes of sectoral deregulation and, in particular, for those

[4] However, no empirical bases were provided for supporting this statement.

[5] If we related the gasoline retail price to the crude oil price, the gasoline retail price would then depend to some extend on the demand for other refined products due to joint production.

countries in which there is a discussion about the necessity to count with "national" strong player in the "strategic" sectors. Moreover, the analysis sheds light on the way in which the 'political economy' element of energy pricing, is conflicting with the efficiency driven aim of achieving a competitive market for automotive fuels in Spain. This latter aspect is not only important as an explication of the pricing strategy in Spain as such, it also underlines the need to take elements of political economy into consideration as a serious hypothesis to be tested in the analysis of energy markets in other countries. As will be shown below, this hardly ever happens, as explanatory variables normally focus on market structure and (abuse of) dominant positions.

This paper is structured as follows. The following section further explains the main issues considered and presents a short review of related literature. Section 3 describes the structure of the Spanish retail gasoline market and its system of price regulation. Section 4 describes the data and the econometric model employed. Section 5 reports our empirical results. Finally, in section 6 we discuss our findings.

2. Motivation

To the Spanish press and public opinion, it is obvious that, after the abolishment of ceiling price regulation, the Spanish gasoline prices' responses to oil crude and gasoline spot price changes were influenced by political interests. Moreover, gasoline retail prices would be adjusted more quickly to gasoline spot price increases than to declining prices, thus boosting the oil companies' profits, at the expense of the consumers and the economy in general (El Pais, 12/08/1999, 20/08/1999).

There is a sizeable literature evaluating empirical evidence in respect of such asymmetries.[6] Bacon (1991), using a quadratic adjustment model and fortnightly data from 1982 to 1989, finds evidence that the speed of adjustment of UK gasoline retail prices to cost changes is more rapid when costs rise than when they fall. Manning (1991), for the period 1973-1988, and Really and Witt (1998), for the period 1982-1995, reject the hypothesis of a symmetric short-run response by gasoline retailers to crude price

[6] See a complete overview in Grasso and Menara, (2005).

movements in the UK and to changes in the dollar/sterling exchange rate. Both studies use monthly average data and an error correction mechanism (ECM) specification.

Kirchgässner and Kübler (1992) investigate the gasoline market in Germany over the period 1972-1989 using monthly data. They distinguish two periods, before and after January 1980. They consider the response of both consumer and producer (wholesale) gasoline prices to spot price changes using an ECM. The results show that there is a considerable short-run asymmetry in the former period but not in the latter, which would indicate that the German market became more competitive over time. In contrast to other studies, it was shown that reductions in the spot prices in the 1970s were transferred faster to the German market than increases. With this behavior the oil companies, facing pressure by politicians and trade unions, wanted to avoid allegations of abusing their price setting power in a period, the seventies, of continuous price increases.

Shin (1994) relates the average wholesale price of oil products to the price of crude oil in the US market. He uses monthly data for the period 1986-1992 and his dynamic model does not find evidence of a short-run asymmetric effect. Borenstein *et al*. (1997) examine the US gasoline market using semi-monthly and weekly data over the period 1986-1990. They estimate a conventional ECM and confirm the common belief that in the short-run gasoline retail prices react more quickly to increases than to decreases in crude oil prices. They also find significant short-run asymmetries between changes in the crude prices and gasoline spot prices and also between gasoline terminal prices and retail prices.

Balke *et al*. (1998) extend the work of Borenstein *et al*. (1997) by using weekly data from the 1987 to 1997. The findings are sensitive to model specification, though the ECM fits the data the best. The asymmetry is weak in the specification in levels and moderate and persistent in the ECM. However, Bachmeier and Griffin (2003), using essentially the same data as Borestein *et al*. (1997) but in a daily rather than a semi-monthly frequency, find no evidence of asymmetry. Borenstein and Shepard (2002) find that the US terminal prices respond asymmetrically to changes in the crude oil for the period 1986-1992.

Johnson (2002) analyzes retail price responses in gasoline and diesel markets to wholesale prices changes in 15 U.S. cities covering the period 1 July 1996 to 30 June 1998. He uses weekly data and an ECM approach. Evidence for asymmetric responses is found, although asymmetric responses in the retail diesel market are short-lived. More recently,

Kaufmann and Laskowski (2005) examined the US market again. They use monthly data for the period January 1986-December 2002 and an ECM. They find that home heating oil prices respond faster to crude oil prices increases than to decreases, while there is little evidence for asymmetry in the response of retail motor gasoline prices to crude oil prices changes.

Asplund *et al.* (2000) use monthly data during 1980-1996 to explore the Swedish gasoline market. They use an ECM and find evidence that, in the short-run, gasoline prices are stickier downwards than upwards, and that prices respond more rapidly to exchange rate movements than to the spot market prices. Golby *et al.* (2000) apply a threshold error correction model to test for asymmetry pricing in the Canadian market. They use weekly data on retail prices and crude oil prices from January 1990 to December 1996. They report no evidence of price asymmetry. Eckert (2002) utilizes a standard error correction formulation and finds that weekly retail gasoline prices in Windsor, Ontario, from 1989 to 1994 respond faster to wholesale price increases than to decreases.

Galeotti *et al.* (2003) conduct an international comparison of asymmetries in the transmission of shocks to crude oil prices onto the retail price of gasoline among five European countries from January 1985 to June 2000. They estimate an ECM using monthly data. They find that in Italy, Spain, and UK asymmetries arise in the "second stage" (gasoline spot price changes to gasoline retail prices) whereas in France and Germany they appear at the "first stage" (crude price and exchange rate changes to gasoline spot prices in national currencies) and "single stage" (crude price and exchange rate changes to gasoline prices).

Finally, Bettendorf *et al.* (2003) analyze the gasoline retail price adjustments in the Dutch gasoline market to changes in the Rotterdam spot prices by estimating an asymmetric error correction model for the years 1996-2001. They construct five datasets, one for each working day, grouping retail and Rotterdam gasoline prices that are observed on the same day. The estimation results do not unambiguously point at price symmetry or asymmetry; it depends on the day for which prices are observed.

To summarise, the mixed and sometimes contradictory results in the literature on price (a)symmetry appears to be the consequence of differences in the type of data used, the models employed, and particular circumstances in the countries analyzed. This reinforces

the usefulness of carrying out this study, which, in combination with the analysis of "the political interferences" in setting gasoline prices, allows us to gain new insight in the outcome of the process of deregulation and liberalization of the Spanish automotive retail trade.

3. Oligopoly in the Spanish gasoline market

As a result of the restructuring of the Spanish oil sector since the early 1980s, a highly concentrated oligopoly emerged in the retail gasoline market. In 1993, the Spanish-based refiners controlled about 85% of the 5,983 service stations: Repsol, 54.8%, Cepsa-Elf, 23.8%, and BP, 6.3% (see table 1).[7] The low density of the Spanish retail network, as compared to other European countries and the consequent high throughput of the outlets encouraged the construction of new service stations. Since 1993, the number of service stations was increased by more than 200 outlets a year to 8,155 in 2003. Yet the rate of growth has slowed down over the most recent period (see Table 1). From the early 1990s onwards, about 30 new operators entered the market, involving Petrogal, Agip, Esso, Shell, Avanti, outlets operated by large supermarkets, independent service stations, etc. So, between 1993 and 2003, the market share of the new operators increased from 15% to 30%. The Spanish-based refiners currently control about 70% of the service stations: Repsol-YPF, 43.8%; Cepsa-Elf, 18.7% and BP, 6.9%.[8]

[7] Their market shares in term of volume were similar. Repsol-YPF currently has 4 refineries with an approximate nominal capacity of 37 MT/year (which is 57,5% of the Spanish refining capacity). Cepsa-Elf has 3 refineries (33.3%) and BP España has one refinery (9,2%). Furthermore, the Spanish-based refiners control 45% of the capital shares of CLH, the "essential facility" of the Spanish oil industry (Contín *et al.*, 2001), although the government is currently considering to cap the shareholding of any single oil operator to 5% of the total of CLH shares.

[8] Though new players have entered the market the degree of concentration is still considerable. In order to further promote competition and to reduce the degree of concentration in June 2000, the Spanish government prohibited oil operators with a retail market share of above 30% (i.e. Repsol-YPF) to increase the number of services stations over a five year period and over a 3 year period when the share is over 15% and less than 30% (Cepsa-Elf). The IEA (2001) states that because the number of outlets in Spain is increasing, this measure could have an impact of the market structure. However, the speed of growth has slowed down in the last years, which suggests that it has little effect. The probation for Cepsa-Elf finished in June 2003, whereupon it acquired Avanti's service stations network and opened new stations, counting 1,528 by the end of 2003 (see Table 1) (*Informe Anual Cepsa* 2002).

Please, insert Table 1

Virtually all (95%) of the service stations which are not owned and managed directly by the oil company are operated through exclusive selling contracts with their suppliers, which establish prices and the fees for the stations' operators (*Cinco Días*, 24/2/1997). In this respect, the Spanish gasoline market is distinctly different from that in many countries, where vertical integration is much less prevalent and where suppliers do not fully control final retail prices. As a result, a transparent wholesale market for gasoline, as that in the US (Borenstein *et al.*, 1997) or in many other countries, has not yet emerged in Spain.

Unlike other European countries, in Spain the gasoline retail prices were regulated during the 1990s by a system of price ceilings. In June 1990 the Spanish government – under pressure of the EU Commission – replaced the system of administratively fixed prices by ceiling price regulation. As only three Spanish-based refiners controlled the market at the time, this new system of price regulation had to ensure that adequate consumer protection accompanied the process of "liberalization".

Every week the Minister of Industry calculated the ceiling price (MP) for premium and unleaded gasoline 95 octane through the following formula: $MP = IQ_1 + (ERP - IQ_2) + differential + Taxes + VAT$. IQ_1 was the average of Platt's fob quotations, as a shadow price for the ex-refining value during a reference period, from Tuesday in the preceding week to Monday in the week in which the calculation is made; *ERP* was the average pre-tax gasoline retail price in Belgium, Germany, France, Italy, Holland and the United Kingdom, during a reference period that included the week in which the calculation was made and the three weeks prior to that; IQ_2 was the average of Platt's fob quotations during four weeks prior to that in which the calculation was made. The element $(ERP - IQ_2)$ was an European average mark-up above spot prices, and included "average European transport cost" and "an average European retail margin". A differential, the so-called "Spanish market adaptation margin", was set by the government at two pesetas, in order to stimulate competition and to allow for regional price differences, arising from variation in transport costs in Spain.

Between January 1993 and September 1996, the ceiling price was binding, as realized prices where at about the same level. From September 1996 onward, prices for gasoline were set two pesetas below the ceiling. As a result, Spanish pre-tax retail prices for gasoline (*SRP*) came closer to the average of the six countries included in the formula of price ceilings (see figure 1). The government abolished price regulation in October 1998 (Contín *et al.*, 1999). The Spanish government considered this average as the "competitive benchmark" for the gasoline market. Since then, however, lack of competition and political interests appear to significantly affect gasoline price formation, as will be shown in the analysis that follows below.

Please, insert Figure 1

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4. Data and methodology

The prices employed in this study are the price of crude oil *(C*), the unleaded gasoline spot price (*G*), the pre-tax gasoline retail price of unleaded gasoline (Euro 95) in Spain (*SRP*), and the average pre-tax retail price of Euro 95 in Belgium, Germany, France, Italy, Holland and the United Kingdom (*ERP*). Euro 95 is by far the most important type of gasoline in Spain (about 80% of the gasoline sales). All prices are for Monday of each week in pesetas per liter. The sample period is from January 1993 to December 2004, which accounts for 626 observations (see figure 1)

The Spanish pre-tax unleaded gasoline retail price (*SRP)* is obtained directly from the *Bulletin Petrolier* of the Directorate-General for Energy and Transport of the European Commission. The bulletin reports weekly the average Monday's pump price without taxes and duties in each member state of the European Union. The European average pre-tax unleaded gasoline retail price (*ERP*) is calculated from the Bulletin Petrolier's data. In our analysis, in the few cases where Monday's prices were missing, the average between the preceding and the following Monday's pre-tax gasoline price was used.

Prices for Brent crude oil, as an important marker crude are obtained from the U.S. Department of Energy, in dollar per barrel. This crude oil is traded in Rotterdam, the major market for crude and oil products in Europe. We obtain Monday's crude oil price in dollar per liter dividing the crude oil price per barrel by 159. In the few instances where observations on Monday's prices were missing, Friday's price was used. The spot price of gasoline in dollar per liter is the Monday's Rotterdam spot price for premium unleaded gasoline.[9]

Data on the Monday's exchange rate between the peseta and the US dollar and the peseta and the European national currencies are obtained from the *Bulletin Petrolier* for the period January 1993-December 1998. In January 1999, the Euro replaced national currencies in the Euro zone, although they continued physically existing until 2002. In 1999, the peseta/dollar exchange rate was fixed forever at 166.386 pesetas. Taking into account this fixed exchange rate and that of Euro/dollar provided by European Central Bank we calculate the exchange rate dollar/peseta on each Monday for the period January 1999-December 2004 as follows: $\text{peseta}/\text{dollar} = 166.386 \times \text{euro}/\text{dollar}$

With regard to the methodology, simple charts comparing the evolution of the pre-tax gasoline price and the retail margin in Spain with those in Europe allow us to analyze the complaints about "the political interference" in gasoline prices formation in Spain.

In order to investigate the issue of asymmetric gasoline retail price responses to gasoline spot price shocks, we distinguish two clearly separated periods, the first period –or period of price regulation – between 1993 and September 1998, and the second period –or period of "free market"-, between October 1998 and December 2004. Prior to model specification, we examine the nature of the stationarity and the cointegration relationship. First, the variables *SRP* and *G* must be tested for stationary. Using Augmented Dickey-Fuller (ADF) and Phillips-Perron tests for unit roots, we obtain that both variables are integrated of order one or I(1) without intercept and trend for both periods.

In this case, *SRP* and *G* may be co-integrated, which would mean the existence of a stable long-run economic relationship between the retail and the spot price of gasoline. In order to test for cointegration we follow the Engle-Granger two stages (EG2S). Then, we

[9] The FOB Rotterdam price for premium unleaded gasoline is the average of high and low Monday quotation (Source: Platt's, London). It is converted from US$/mt to US$/litre by the factor 8.35*159.

have first to assume that there is a stable long-run relationship between the Spanish net retail price of gasoline (*SRP*) and the gasoline spot price (*G*) as follows:

$$SRP_t = f_0 + f_1 G_t + u_t \qquad (1)$$

Spain is a small country relative to the world market in trading crude oil and gasoline. This assumption ensures that causality, if present, is only in one direction, i.e. from the world market to the local market. We specify the relationship in level rather than logs because the retail margin ($SRP_t - G_t$) has remained relatively constant over time[10]. The use of logs would imply percentage mark-ups (Johnson, 2002, Borenstein *et al.*, 1997), which is not the case as the relatively constant margin confirms.

Secondly we test the hypothesis that the residuals of equation (1) are not stationary. We have carried out the analysis separately for the first and for the second period. The hypothesis is rejected in both cases. So, the variables are cointegrated and equation (1) represents the stable long run relationship between the retail and the spot price of gasoline.

Given the existence of a cointegrating or long-run equilibrium relationship, it is always possible to formulate an error correction model (ECM) (Engle and Granger, 1987) to analyze the response of gasoline retail prices to gasoline spot price changes.

Let EC_{t-1} be the error correction term defined as the one period lagged residual from equation (1), that is $EC_{t-1} = SRP_{t-1} - \left(\hat{f}_0 - \hat{f}_1 G_{t-1}\right)$, $\Delta G_t^+ = \max\{\Delta G, 0\}$, $\Delta G_t^- = \min\{\Delta G, 0\}$, $\Delta SRP_t^+ = \max\{\Delta SRP, 0\}$, $\Delta SRP_t^- = \min\{\Delta SRP, 0\}$ and Δ refers to changes in the levels in *G* and *SRP*

Then, the specification for the error correction model used here is:

$$\Delta SRP_t = \sum_{i=0}^{m} (b_i^+ \Delta G_{t-i}^+ + b_i^- \Delta G_{t-i}^-) + q\ EC_{t-1} + \sum_{i=1}^{n} (g_i^+ \Delta SRP_{t-i}^+ + g_i^- \Delta SRP_{t-i}^-) + e_t \qquad (2)$$

[10] The average retail margin was 17.92 ptas/litre for the whole period; 18.29 for the first period and 17.58 for the second period.

Our ECM provides us with a dynamic specification that captures the effect to current retail price adjustment of current and lagged changes in gasoline spot prices and of previous retail price movements, together with an error correction term. Furthermore, it differs between gasoline spot price increases and decreases and lagged gasoline retail price increases and decreases, allowing for asymmetric short-run responses. The number of lagged variables m and n are determined by minimizing the Schwarz Information Criterion, which is a consistent lag selection criterion. The lag length captures complete adjustment and ensures white noise residuals. The coefficient q is the rate of adjustment toward the long-run equilibrium.

If we decompose the residuals from equation (1) based on changes in the gasoline spot prices (Bachmeier and Griffin (2003)), the specification for the error correction model is:

$$\Delta SRP_t = \sum_{i=0}^{m} (b_i^{+}\Delta G_{t-i}^{+} + b_i^{-}\Delta G_{t-i}^{-}) + q^{+} EC_{t-1} + q^{-} EC_{t-1} + \sum_{i=1}^{n} (g_i^{+}\Delta SRP_{t-i}^{+} + g_i^{-}\Delta SRP_{t-i}^{-}) + e_t \quad (3)$$

The coefficient q^{+} corresponds to situations where $\Delta G > 0$ and q^{-} corresponds to situations where $\Delta G \leq 0$.[11]

The differences in the coefficients b_i^{+}, b_i^{-} and g_i^{+}, g_i^{-} allow an asymmetric response of retail gasoline prices to changes in the spot price of gasoline and in lagged retail prices, respectively. Likewise, the difference in the coefficients q^{+} and q^{-} allows an asymmetric response of the rate of adjustment toward the long run equilibrium. The resulting estimates of the coefficients will also be used in a cumulative adjustment function that will show the cumulative response of the retail price of gasoline to a one peseta increase or decrease in the spot price of a liter of gasoline. We compare the two resulting cumulative response paths through time, which enables us to investigate the existence of price asymmetry in the Spanish retail gasoline market.

[11] Decomposing the residual from the OLS estimate of equation (1) based on changes in the spot prices of gasoline is consistent with the asymmetry described by consumer complaints (Kaufmann and Laskowski, 2005)

The cumulative response D of retail gasoline prices to one-time change in crude oil prices after k periods is computed as follows:

$$D_K^O = D_{K-1}^O + b_K^O + q^O\left(D_{K-1}^O - f_1\right) + \sum_{i=1}^{k}\left[g_i^O \max\left\{0, \left(D_{k-i}^O - D_{k-i-1}^O\right)\right\} + g_i^* \min\left\{0, \left(D_{k-i}^O - D_{k-i-1}^O\right)\right\}\right] \quad (4)$$

where ^{O} is accordingly replaced by either $^+$ or $^-$ representing the adjustment of interest (Borenstein *et al.*, 1997; Johnson, 2002). q^O is equal to q in case of not distinguishing an asymmetric response of the rate of adjustment, and g_i^* is g_i^- if ^{O} is $^+$ and g_i^* is g_i^+ if ^{O} is $^-$.

5. Empirical results

As stated, in October 1998 the ceiling price regulation was abolished. Between October and December 1998 the spot price of gasoline and crude oil went down (Adelman, 2002; figure 1), and the unleaded gasoline retail price before taxes in Spain (SPR) decreased more rapidly than elsewhere in Europe (ERP). In January 1999 oil and gasoline spot price trend changed. The spot price of gasoline increased and the gasoline retail price went up more rapidly in Spain than in the European Union up to July 1999 (Contín and Huerta, 2000, figure 1).[12]

However, in August 1999 the government called for oil operators' "collaboration" in order to control the rate of inflation. Between 1996 and 1998 the conservative government successfully controlled the Consumer Price Index (CPI). The stated objective in 1999 was an increase of 1.8%. In the first quarter, though, half the annual objective had already been reached and this gave rise to concern (Banco de España, 1999). Firstly, Repsol-YPF -whose president at that time was the "conservative" Cortina- and subsequently Cepsa-Elf and BP España, accepted not to pass all the increases of the spot price of oil and gasoline into gasoline prices. The rest of the operators followed them. This clearly damaged retail margin

[12] The major oil operators had argued that the ceiling price regulation hindered them to quickly adjust gasoline prices to changes in the spot price of gasoline. The abolishment of the price regulation would have allowed them to rapidly pass the crude oil prices changes into gasoline prices.

(figure 3). The "compensation" would result from slower rate of decrease of gasoline retail prices when the crude oil and gasoline spot prices started to go down, as compared to that in the European market (Contín and Huerta, 2000).

Figure 2 clearly shows how in 1999 and 2000, when the crude oil and gasoline spot price increased (Adelman, 2002, figure 1), the annual average gasoline price before taxes increased less in Spain than in the European Union, whereas between 2001 and 2003, a period of oil and gasoline spot prices decreases, the Spanish annual average gasoline retail price fell at a slower rate than that in Europe.

Please, insert Figure 2

As a result, the Spanish retail margin per liter of gasoline sold was clearly below that in Europe in 2000, whereas in the years 2001, 2002 and 2003 it was clearly above (figure 3). In fact, Repsol-YPF estimated that if in 2000 it had passed all the increases of the crude oil price into gasoline prices, it would have earned 750 millions of euros more (El Pais, 16/02/2001). The smaller operators also pointed out that over the period 1999-2000 they only could follow the refiners' pricing strategy, given their clearly dominant position. They suffered enormous economic difficulties, as they could not compensate the tiny retail margin with benefits from refining activities (see refining margin in figure 3) or the production of crude oil (Oilgas, febrero, 2001).

In addition, in 2000 the European Commission showed its "surprise" for the small gasoline price differences between service stations and regions in Spain (the smallest in Europe)[13] (El Pais, 23/05/2000). The oil operators responded that that was due to the effort of the companies for not passing all gasoline spot price increases into gasoline retail prices. Finally, Perdiguero (2005) shows how since the abolishment of the state monopoly oil operators "moderate" the gasoline retail margin just before the general elections, increasing it significantly after the elections has taken place. All these facts demonstrate that the major

[13] In 1999, the difference between the Euro 95 retail gasoline price of the most expensive Spanish region and the cheapest one was 3.2 ptas/litre whereas in 2000 it was only 0.6 ptas/litre (Oilgas, febrero 2001).

operators and the government collaborated in setting price once the regulation of prices was abolished, to suggest overall price stability as a main element of "general interest". This results in a pricing behavior which is quite different from that in the European markets. It was made possible because of the structure resulting from the process of "liberalization" of the Spanish oil industry, and, in particular, the market dominance of Repsol-YPF and because of the relations between these firms and the Spanish political elite.

Please, insert Figure 3

We now examine whether (and how) the abolishment of the system of ceiling price regulation has affected the gasoline retail price adjustments in relation to changes in the spot price of gasoline. In doing so, we model the first and the second period separately.

Model for the first period

As a first step we estimate the long run relationship between the Spanish gasoline retail price before taxes in Spain *(SRP)* and the gasoline spot price (*G*), on the one hand, and between the European average gasoline retail price before taxes (*ERP*) and the gasoline spot price on the other. The estimated relationships are (standard errors are in parenthesis):

$$SPR = \underset{(0.49)}{22.75} + \underset{(0.026)}{0.755}*G + u \qquad (5)$$

$$D\text{-}W = 0.45 \quad \text{adj. } R^2 = 0.727$$

$$ERP = \underset{(0.54)}{14.66} + \underset{(0.029)}{1.049}*G + u \qquad (6)$$

$$D\text{-}W = 0.39 \quad \text{adj. } R^2 = 0.819$$

In the lung-run, the estimated coefficient of *G* is much smaller in Spain than in Europe. This suggests that, in the long run, a one peseta change in the spot price of a liter of gasoline induces a smaller retail price change in Spain than in Europe. As a result, the difference between the retail price before taxes in Spain and in Europe that was very significant at the beginning of the first period almost disappeared by the end of the period (figure 1). Consequently, the Spanish retail margin converged toward that of Europe over the first period (figure 3).

Table 2 reports the results of estimating equations (2) and (3) by OLS. The Schwarz Criterion suggested not to include the lagged gasoline retail price in the model. In column (3) we first test the null hypothesis $q^+ = q^-$ using a Wald test. The symmetric specification cannot be rejected (F = 2.497, p-value = 0.115), which means that we have not found evidence of an asymmetric response of the rate of adjustment toward the long run equilibrium. The coefficient of the error correction term in column (2), which is significant and negative as required, indicates that about 0.101 of the misadjusted price from the previous week is corrected in this week.

Please, insert Table 2

Moreover, there is not statistically significant effect of an increase or decrease in *G* of one unit on the retail price change. Increases and decreases in the spot price of gasoline of two weeks earlier lead to similar retail price increases and decreases. So, oil operators apparently were right when they argued that although the ceiling price regulation allows them to translate the spot price changes into shifts in the gasoline retail price, this occurs with a delay of fifteen days (Contín and Huerta, 2000). A Wald test applies to the hypothesis that the coefficient of the variables referring to increases and decreases of the spot price of gasoline are equal is not rejected (F = 0.304, p-value = 0.882 for the model of column (2); F = 0.754, p-value = 0.521 for the model of column (3)), which means that we have not found evidence of asymmetric response of the retail price of gasoline to changes in the spot price of gasoline.

We analyze the adjustment path in more detail by examining the cumulative adjustment function. Figure 4 presents the cumulative response paths to positive and negative gasoline spot price changes, which measure the estimated cumulative response to a spot price increase or decrease for each week after the spot price change.[14]

The results say that a one peseta increase in the price of a liter of gasoline in Rotterdam leads to 0.018 pesetas increase in the retail price of a liter of gasoline in the first week and to 0.48 pesetas increase in the second week and so on. At the same time, a one peseta decrease in the spot price of a liter of gasoline leads to 0.043 pesetas increase in retail gasoline price in the first week and to 0.40 pesetas decrease in the second week and so on. In addition, approximately seven weeks after a one-peseta increase or decrease in the gasoline spot price, 95% of the long run equilibrium price is reached.

Please, insert Figure 4

Figure 4 also presents the difference between the cumulative response of gasoline retail prices to increases and decreases in the gasoline spot price. The 95% confident interval[15] of the difference contains the value zero which clearly shows that there is no difference in the response of gasoline retail prices to gasoline spot price increases and decreases in the first period.

Model for the second period

The estimated long run equilibrium relationship for the second period in Spain and Europe are:

$$SPR = \underset{(0.33)}{18.23} + \underset{(0.012)}{0.983} * G + u \qquad (7)$$

$$D\text{-}W = 0.49 \quad \text{adj. } R^2 = 0.89$$

[14] As there is a symmetric response of the rate of adjustment to the long equilibrium, we only present here the cumulative adjustment function of the asymmetric ECM (column 2). The results do not change for the model which allows asymmetry in the adjustment to equilibrium (column 3).

[15] The standard errors are calculated using the Delta method.

$$ERP = 17.92 + 0.975*G + u \qquad (8)$$
$$\quad (0.25) \quad (0.009)$$

$$D\text{-}W = 0.85 \quad \text{adj. } R^2 = 0.93$$

Unlike the first period, data in the second period exhibit heteroskedasticity both in Spain and in Europe. The variability of the gasoline retail price increases when the gasoline spot price increases. Thus, equations (7) and (8) have been estimated by generalized least squares (GLS).

As compared to the first period, the estimated coefficients of *G* are quite similar in Spain and in Europe with a near one-to-one relationship between the retail and the spot price of gasoline. This suggests that, in the long run, a one peseta change in the spot price of gasoline is fully passed-trough into the retail price of gasoline both in Spain and in Europe.

Table 3 reports the results of estimating equations (2) and (3) by OLS for the second period. As in the first period, no lagged gasoline retail prices are included in the models followings the Schwarz criterion. The standard errors of the parameters estimates are calculated using White's heteroskedasticity consistent covariances. Again, the null hypothesis $q^+ = q^-$ cannot be rejected (F = 0.850, p-value = 0.375). This means that there is a symmetric response of the rate of adjustment toward the long run equilibrium in the second period, although that rate is smaller than in the first period.

Please, insert Table 3

Furthermore, an increase of one peseta in the spot price of a liter of gasoline results in a contemporaneous price increase in the retail price of about 0.19 pesetas. A decrease of one peseta, however, results in a contemporaneous price decrease of about 0.08 pesetas/liter. Decreases and increases in the gasoline spot price in the previous two weeks yield rather similar changes in the gasoline retail price. Eventually, only an increase (decrease) in the

gasoline spot price of the previous third (fourth) week yields a statistically significant effect on the gasoline retail price change. Simultaneously testing the equality of all parameters of the same lags does not reject the null hypothesis (?) of equality (F = 1.463, p-value = 0.202 for the model of column (2); F = 1.360, p-value = 0.239 for the model of column (3)).

Figure 5 presents the cumulative adjustment function of the symmetric ECM (table 3) for the second period. As in the first period, the value zero is in the 95% confident interval of the difference between the cumulative response of gasoline retail prices to increases and decreases in the gasoline spot price. However, the difference in the response of the first and fourth week is "almost" significant.[16] So, our results suggest that there is no difference in the response of gasoline retail prices to gasoline spot price increases and decreases in the second period; yet the evidence is not as clear as in the first one. To reach the 95% long run equilibrium price takes much more time (about twenty weeks) than in the first period.

Please, insert Figure 5

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6. Discussion

In this paper we have analyzed pricing behavior in the Spanish gasoline market. In doing so, we have distinguished two separated periods: the first involving price regulation, and the second, as a "free market".

With respect to the first period, ceiling price regulation "forced" the convergence of the Spanish gasoline retail price, that was well above that in Europe by the beginning of the period, towards an European average price, which was considered by the Spanish government as the "competitive benchmark". Also, the Spanish retail margin converged toward the European one. Moreover, retail prices reacted symmetrically to increases and decreases of the spot price of gasoline.

[16] In fact, the 90% confident interval does not contain the value zero for the first and the fourth week, which would suggest a week asymmetry in those weeks.

Once the price regulation was abolished, major operator's pricing behavior became driven by a close collaboration with the government in name of the "general interest" to control the inflation rate. The rest of operators followed. As a result, prices and retail margins followed a pattern very different from that in European markets. However, gasoline spot prices changes were fully passed on in the long run to retail prices, both in Spain and in Europe. Spanish retail gasoline prices, thus, appear to have responded symmetrically to increases and decreases in the spot price of gasoline, although here the evidence is less clear than in the previous period. The cumulative adjustment functions show that the adjustment process toward the long-run equilibrium price was much faster in the period of regulation that in the second period. This suggests that Spanish oil operators adjusted retail prices more slowly in the situation of international price increases and high volatility over the second period, than in the situation of international price stability and low volatility over the first period.

Figure 3 also shows how at the end of the period of analysis the Spanish retail margin was, as in the first years after the abolishment of the monopoly, well above that in Europe.[17] Moreover, figure 3 suggests that only during the last years of the price regulation period and the first year after its abolishment, Spanish retail margins have evolved similarly to those in liberalized markets.

The highly concentrated oligopoly in the Spanish retail market and the role of Repsol-YPF, as the "national champion"[18], explain why traditional practices and commitments between the major operators and the government prevailed after the liberalization. In this sense, Balbe and Padros (2001) state that "Mediterranean liberalization" (including Spain, France, Italy and Portugal), although formally impressive, has only slightly transformed the "national firms", sometimes simply converting them from public to private monopolies.

The liberalization of the Spanish gasoline market shows how difficult is to achieve markets driven by competitive forces when liberalization processes promote the creation of

[17] Again, concerns about lack of competition in the Spanish gasoline market arise. In this sense, the Banco de España (1999) points out that though the Spanish average pre-tax gasoline price has converged to the European average price, there is still margin for further reduction if we take as the reference the pre-tax prices of some countries (for example, France)

[18] Correljé (1994) and Etchemendy (2002) point out that the first step towards liberalisation of the Spanish oil sector entailed the transformation of a public monopoly controlled by the Ministry of Hacienda and the banks to a monopoly owned by the public and private refiners. As stated, this monopoly was allowed function until 1993 which resulted in a crucial advantage for the empowerment of traditional actors for the future competition in an open market.

"national champions" in "strategic sectors"; in particular in countries with traditionally strong links between the "national industry" and the state.[19] We agree with Balbe and Prados (2001) that a more "active approach" is needed to create competitive markets in many formally liberalized markets in Mediterranean countries. They make a case for an active role of the competition authorities in detecting and correcting the anticompetitive impact of deregulation. However, the Spanish government has an extensive power to control competition authorities. The traditional strong links between the "national champions" and the Spanish government and the dependence of the competition authorities on the government facilitate industry capture of regulation and market supervision. In the Spanish case, independent regulatory[20] and competition agencies should deal mainly with the high degree of horizontal and vertical concentration in the Spanish downstream oil industry. Furthermore, the IEA (2005) points out that in Spain margins for dealers are high compared to some other countries in Europe. It states that one reason for this could be that Spain has a relatively low density of filling stations. It finally recommends to the Spanish government to promote competition further by encouraging new entrants, such as hypermarkets, and by removing planning obstacles.

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[19] In March 2004, the socialist party (PSOE) won general elections, resulting in the replacement of the "conservative" president of Repsol-YPF, Alfonso Cortina, by Antoni Brufau, a member of La Caixa' board. The bank La Caixa is among Respol's Spanish main shareholders and the Spanish largest savings bank. By October 2005 the Spanish government called again oil operators' collaboration in order to control the inflation rate. It asked oil operators to translate oil and gasoline spot decreases into retail prices more rapidly than increases (negative asymmetries) (Expansión, 26/09/2005).

[20] The powers of the regulatory body for the energy sectors, *La Comisión Nacional de la Energía (CNE*), are only consultation and inspection.

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Figure 1: Time series of gasoline and crude prices

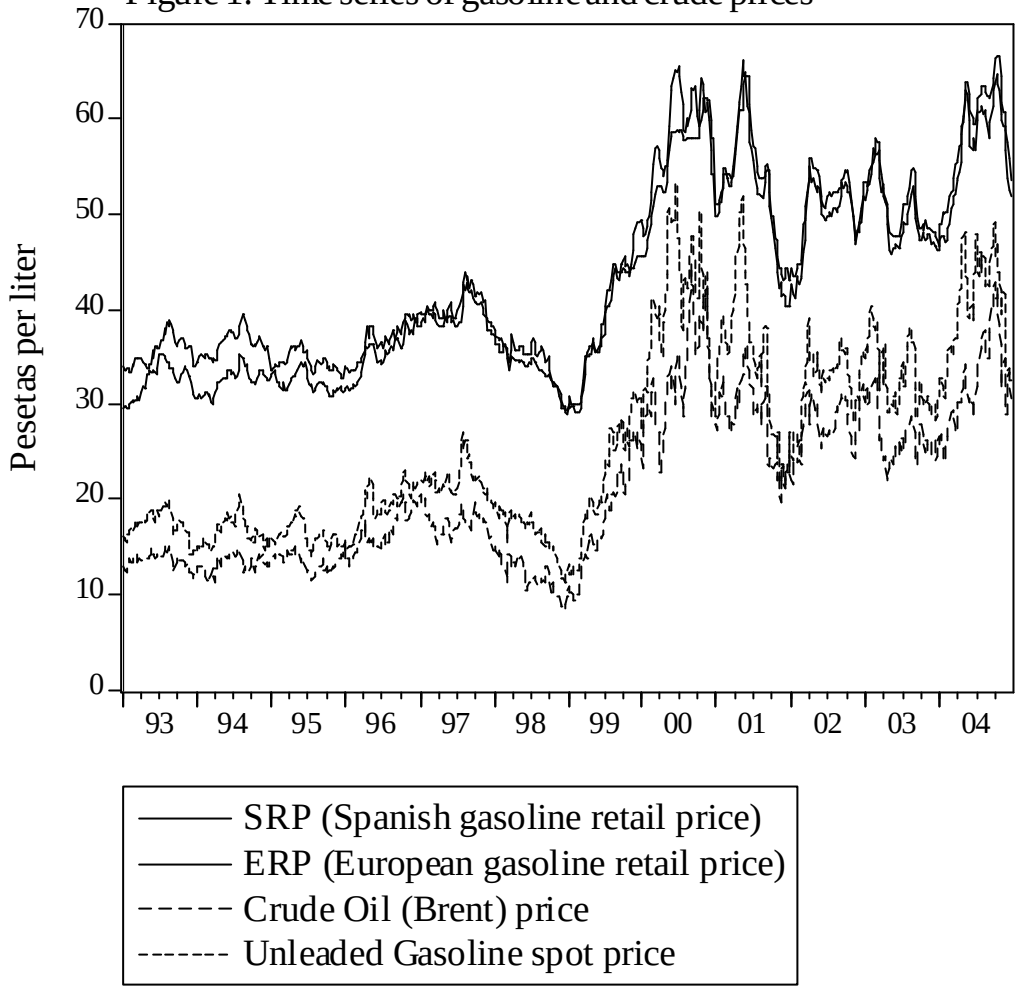

Figure 2: Annual average gasoline and crude oil prices

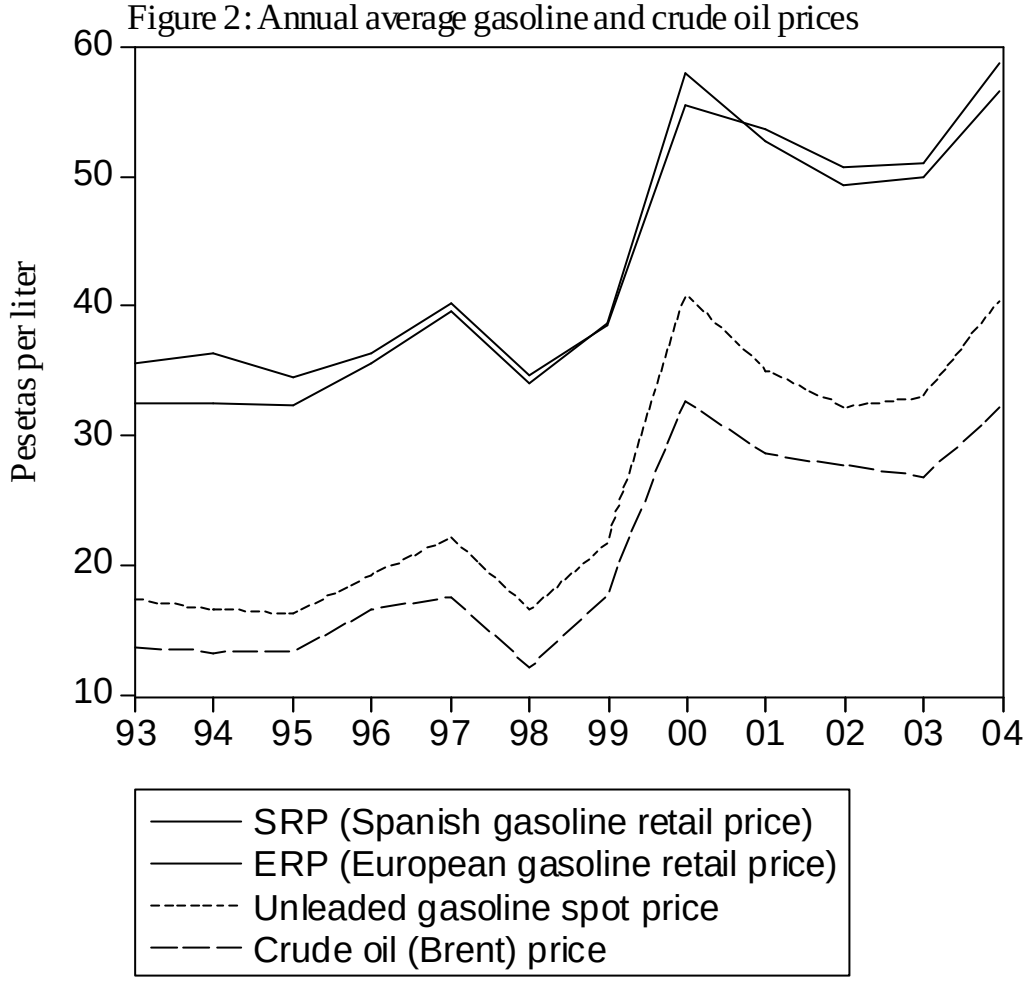

Figure 3: Annual average margins

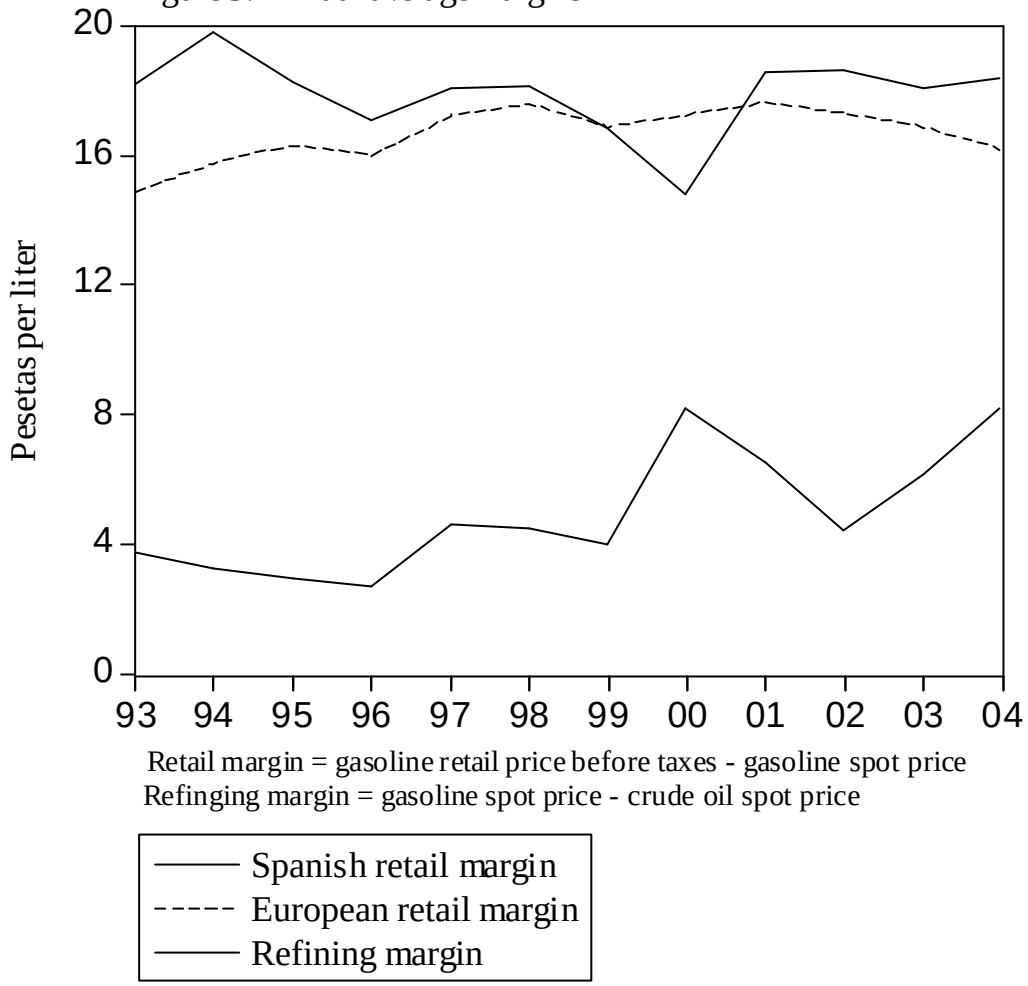

FIGURE 4: Cumulative adjustment function for the first period

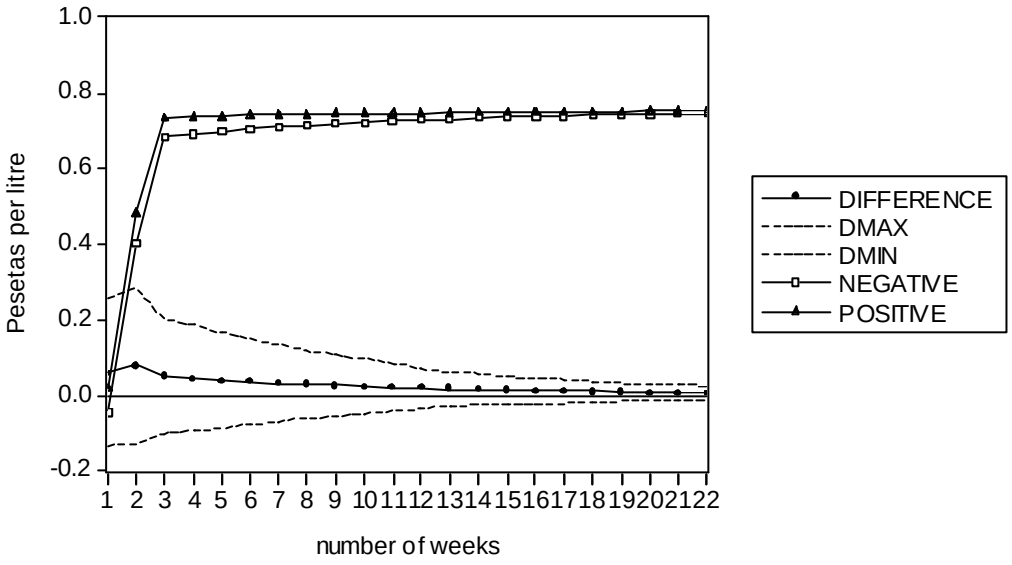

FIGURE 5: Cumulative adjustment function for the second period

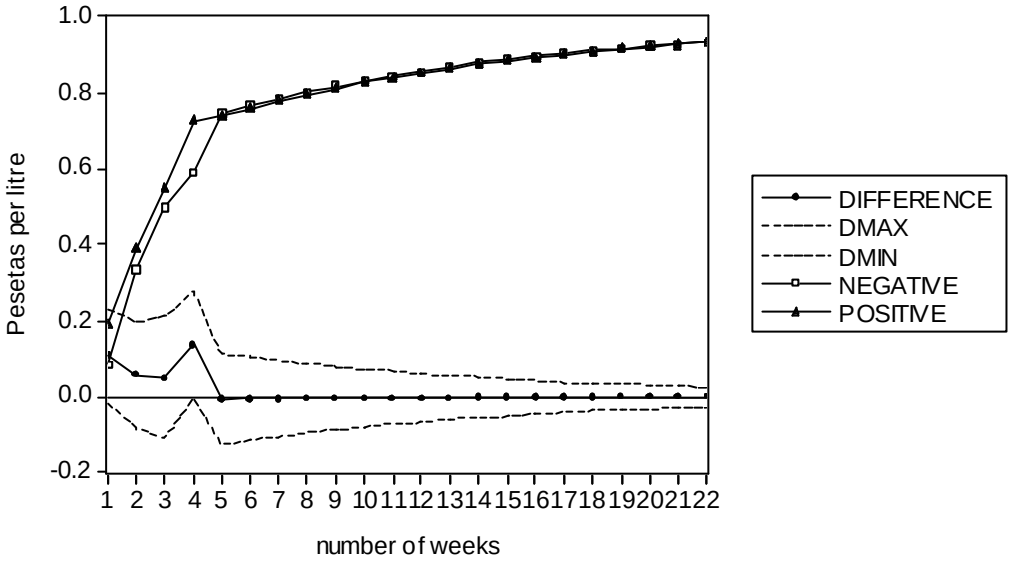

Table 1: Spanish retail outlets by supplier 1993-2003

Suppliers	1993	%	1995	%	1997	%	1999	%	2001	%	2003	%
Repsol-YPF	3,232	54.8	3,348	54.4	3,400	52.2	3,408	47.4	3,664	47.6	3,570	43.8
Cepsa-Elf	1,400	23.8	1,477	24.0	1,691	26.0	1,505	20.9	1,437	18.7	1,528	18.7
BP	371	6.3	382	6.2	454	7.0	469	6.5	523	6.8	566	6.9
Petrogal	102	1.7	128	2.1	150	2.3	186	2.6	69	0.9	233	2.9
Total	100	1.7	110	1.8	125	1.9	197	2.7	187	2.4	39	0.5
AGIP	60	1.0	84	1.4	96	1.5	120	1.7	127	1.7	297	3.6
Shell[1]	113	1.9	125	2.0	150	2.3	213	3.0	209	2.7	245	3.0
Continental	2	-		-		-	126	1.8		-		-
Avanti	35	0.6		-		-	72	1.0	61	0.8		-
Esso	25	0.4	60	1.0		-	56	0.8	67	0.9	75	0.9
Esergui	30	0.5		-		-	56	0.8	65	0.8	73	0.9
Tamoil	10	0.2		-		-	43	0.6	43	0.6	46	0.6
Meroil		-		-		-	175	2.4	184	2.4	198	2.4
Saras	3	0.1		-		-		_	140	1.8		-
Petrocat	41	0.7	97	1.6	97	1.5	69	1.0	69	0.9	67	0.8
Other	369	6.3	342	5.6	350	5.4	498	6.9	849	11.0	1,218	14.9
TOTAL	**5,893**	100.0	**6,153**	100.0	**6,513**	100.0	**7,193**	100.0	**7,694**	100.0	**8,155**	100.0

[1]In 2004 Shell sold all its service stations to the independent company Disa
Source: Enciclopedia Nacional del Petróleo, Petroquímica y Gas, 1994-2004.

Table 2. Estimates of price adjustment equation for the first period[a]

Variables	(2) Asymmetric ECM	(3) Asymmetry in the adjustment to Equilibrium
EC_{t-1}	-0.101 (0.025)**	
EC^{+}_{t-1}		-0.063 (0.035)+
EC^{-}_{t-1}		-0.140 (0.035)**
ΔG^{+}_{t}	0.018 (0.062)	0.012 (0.061)
ΔG^{-}_{t}	-0.043 (0.058)	-0.037 (0.058)
ΔG^{+}_{t-1}	0.388 (0.068)**	0.418 (0.070)**
ΔG^{-}_{t-1}	0.364 (0.064)**	0.327 (0.068)**
ΔG^{+}_{t-2}	0.225 (0.062)**	0.232 (0.062)**
ΔG^{-}_{t-2}	0.246 (0.059)**	0.249 (0.059)**
D.W.	2.172	2.174
Adj. R^2	0.443	0.459
Obs.	297	297

[a]Standard errors are in parentheses
Coefficients are statistically different from zero at the: **1%, *5%, +10%

Table 3. Estimates of price adjustment equation for the second period[a]
Heteroskedasticity consistent standar errors.

Variables	(2) Asymmetric ECM	(3) Asymmetry in the adjustment to Equilibrium
EC_{t-1}	-0.085 (0.026)**	
EC^{+}_{t-1}		-0.058 (0.030)+
EC^{-}_{t-1}		-0.104 (0.039)*
ΔG^{+}_{t}	0.190 (0.038)**	0.192 (0.038)**
ΔG^{-}_{t}	0.084 (0.035)**	0.085 (0.035)*
ΔG^{+}_{t-1}	0.131 (0.040)**	0.153 (0.045)**
ΔG^{-}_{t-1}	0.172 (0.037)**	0.157 (0.042)**
ΔG^{+}_{t-2}	0.105 (0.039)*	0.108 (0.040)*
ΔG^{-}_{t-2}	0.107 (0.041)*	0.110 (0.040)*
ΔG^{+}_{t-3}	0.142 (0.043)*	0.133 (0.046)*
ΔG^{-}_{t-3}	0.051 (0.045)	0.057 (0.049)
ΔG^{+}_{t-4}	-0.011 (0.037)	-0.004 (0.035)
ΔG^{-}_{t-4}	0.119 (0.052)*	0.113 (0.048)*
D.W.	1.80	1.83
Adj. R^2	0.51	0.51
Obs.	321	321

[a]Standard errors are in parentheses
Coefficients are statistically different from zero at the: **1%, *5%, +10%