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Are There Problems of Asymmetric Price Adjustment and Rent-Seeking in Spanish Retail Diesel Market?

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Abstract: This paper investigated the Spanish retail diesel market for evidence of asymmetric price adjustment and rent-seeking following changes in crude oil prices. The study used the nonlinear autoregressive distributed Lag (NARDL) modeling framework and monthly time series data for the period January 2005 to December 2015. The results indicate that Spanish diesel market is fraught with sluggish speed of adjustment, which is typical of markets witnessing uncompetitive pricing and other irregular behaviours by retail firms. The results further indicate that Spanish diesel market is bedeviled by the problem of short-run asymmetric price transmission from crude oil markets, which is consistent with the rockets and fathers effect. Further still, we find that retail firms in the Spanish automotive diesel markets may be exploiting the tax system to conceal rent-seeking behaviours. This paper therefore supports policies that will encourage continuous monitoring of the market for irregular behaviors since the observed problems have anti-trust and consumer welfare implications.
Keywords: Asymmetric Price Adjustment; Rent Seeking; NARDL model; Spain.
JEL Codes: Q43; D40; C22; N94

INTRODUCTION

Spain is a European country with limited domestic oil production. In fact, it is a typical example of an oil-deficient economy as virtually all its crude oil requirements are imported. Data from the International Energy Agency (IEA) statistics indicate that Spain's oil import dependency ratio for 2005, 2010, 2011 and 2012 were 99.8%, 99.8%, 99.8% and 99.7%, respectively. Another important feature of the Spanish retail diesel market is the high concentration of sellers. For instance, the three most important firms in the Spanish retail petroleum sector are Repsol, Cepsa-El and British Petroleum, and they control, 36.1%, 15.6% and 3.8% of the market, respectively. Altogether, these three retail firms control more than 55% of all the service stations.

The presence of few dominant firms as shown in the foregoing paragraph suggests that retail diesel prices may be responding asymmetrically to changes in oil prices. Asymmetric price adjustment is usually attributed to the presence of high retail market power or even a situation of collusive pricing behavior [1]. Under such situation, retail price rise more than the corresponding rise in crude oil costs and fall much less than the corresponding fall in crude oil costs. For instance, the UK Monopolies and Mergers Commission (MMC) investigated the gasoline market for asymmetric price transmission between 1965 – 1990 [2-4]. The MMC found that when faced with rising input costs, sellers rapidly adjust prices upwards; but when they are faced with decreasing costs, they adjust prices downwards very sluggishly. The MMC termed this pattern of asymmetric adjustment 'rockets and feathers', but failed to establish it through econometric work, but by the use of descriptive and graphical analysis of weekly company administrative records.

Asymmetric pattern of price adjustment allows retail firms to earn temporary excess profit. It is a form a market failure. It is typical of markets witnessing rent-seeking, uncompetitive pricing, collusion behavior, and other irregular behaviours that have consumer welfare and anti-trust policy implications. Apart from the oil-deficient status of Spain, the concern that the recent tumbling in oil prices is not being felt by consumers at pump further motivates this study. Specifically, it is the goal of this paper to use econometric procedure in investigating the Spanish retail diesel market for evidence of asymmetric price adjustment and the possibility that retail firms may be manipulating the tax system to conceal rent-seeking activities.

AN OVERVIEW OF THE EMPIRICAL LITERATURE

Several studies have empirically investigated the problem of asymmetric adjustment of retail energy prices following changes in crude oil costs using various methodologies. Greenwood–Nimmo and Shin [5] used the nonlinear ARDL framework to examine the UK gasoline, diesel, kerosene and gas oil markets over the period of January 1999 to March 2013. They found evidence in support of the presumed asymmetry, which is largely obscured at pump where prices include both tax and duty, suggesting the possibility of retail firms using the tax system to conceal rent-seeking behavior.

Chou, Chang and Hu [6] established retail price adjustments in the gasoline and diesel markets of Taiwan, Japan, South Korea, and Singapore using monthly data between January 2004 and June 2012. The study employed an asymmetric error correction model (ECM). The results indicate that asymmetric adjustments in retail gasoline and diesel prices are common, and that the adjustment, which quickly and obviously responded to cost reductions, is a type of politico-economic asymmetry. Chen, Huang and Ma [7] used an asymmetric error-correction model and monthly data on wholesale prices of gasoline and diesel product in China as well as international crude oil prices from February 2006 to October 2013 to examine whether China's gasoline and diesel prices adjust asymmetrically to international crude oil price changes. The empirical results suggest that increases and decreases in international oil prices have asymmetric effects on both wholesale prices of gasoline and diesel fuel in China, and that both increases and decreases in international oil prices have a greater effect on diesel prices than on gasoline prices in China.

Chattopodhyay and Mitra [8] explored the potential asymmetries in the pricing of oil products in India where prices are not only affected by the crude oil price changes in the international markets but are also subject to government interventions. The study analyzed the impact of crude oil price on domestic oil prices by applying non-linear autoregressive distributed lag (NARDL) and Growing Hierarchical self-organizing Map (GHSOM) approaches for the period of April 2005 to July 2014. The results indicate that the prices of products left to be determined by the market exhibit a strong asymmetry. However, pricing of the products that are monitored and controlled by the government do not exhibit any such asymmetry. Pattanakocha and Pornchaiwisetgul [9] examined asymmetric price transmission (APT) of gasoline price and diesel price and their causes in Thailand. The study used the monthly data of Western Texas Instrument crude oil price, unleaded gasoline (ULG) price and high speed diesel (HSD) price, the oil fund, the stock of ULG, and HSD inventories. The results show that APT exists for ULG but not for HSD.

Venditti [10] investigated the petrol and diesel prices in the US and the four largest Euro area countries (Gemany, France, Italy and Spain). The study noted that in the past decade, changes in oil prices have played a significant role in shaping inflation dynamics in the US and the euro area, largely through their direct effect on fuel prices, thereby reviving the controversy over whether the prices of petroleum products respond more promptly to positive than to negative oil price shocks. The result shows that fuel prices respond very promptly to oil price shocks, with some heterogeneity across countries, and that no systematic evidence of asymmetries emerges.

Honarvar [11] used Crouching ECM approach to investigate the US retail gasoline market. The results are consistent with Bachmieier and Griffen [12], which found that there is no evidence of rockets and feathers effect in the U.S gasoline market.

DATA AND METHODOLOGY

The data for this study consists of monthly time series observations for the period January 2005 to December 2015, a total of 132 observations. The variables of interest are the retail prices of diesel and the costs of imported crude oil in Spain. The retail prices are available not only at pump (i.e inclusive of tax and duty) but also exclusive of tax and duty (i.e ex-tax prices). The data were sourced from the International Energy Agency (IEA) monthly oil price statistics. To effectively track the asymmetry in the response of the retail price of diesel to change in the cost of crude oil, this study used the crude oil cost for Spain measured in dollars per barrel. However, the retail price of diesel that is measured in the national currency of Spain was converted to U.S dollars using the exchange rate data obtained from OECD statistics (Monthly Monetary and Financial Statistics, MEI). The entire data is indexed to base year 2010 (i.e. Year 2010 = 100), and logged before estimation. Figure 1 presents a time series plot of the data using its indexed representation.

The graphs in Figure-1 show that the data track themselves quite closely. Our empirical methods will therefore include cointegration tests based on the bounds testing approach of Pesaran, Smith and Shin [13] (henceforth PSS) and the t_{BDM} statistic of Banerjee *et al*., [14]. Notice also that the graphs aptly capture the fall in prices during the 2008-2009 Global Financial Crisis.

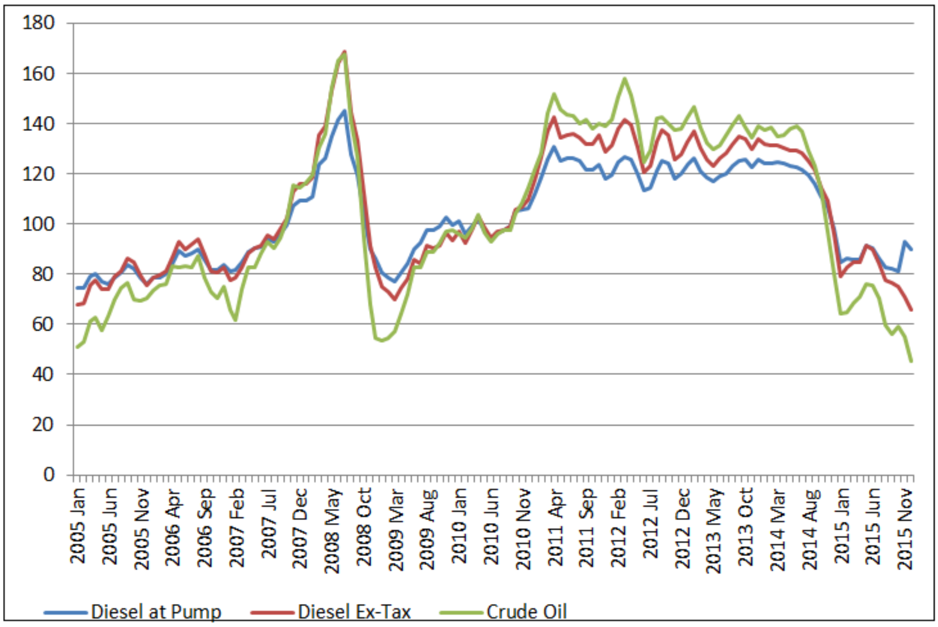

Fig-1: Time series plot of the data

Source: Authors' plot

Notes: Diesel at pump captures the diesel prices at pump (i.e. inclusive of tax and duty) while diesel ex-tax captures the ex-tax prices of diesel. All the prices are indexed to 2010 base year (i.e. year 2010 = 100).

The econometric framework advanced by Shin, Yu and Greenwood-Nimmo [15] for modeling asymmetric cointegration and dynamic multipliers in a non-linear autoregressive distributed lag (NARDL) framework was adopted. Under this framework, short-run and long-run non-linearities are introduced through positive and negative partial sum decompositions of the explanatory variables. Greenwood Nimmo and Shin [5] applied this framework in modeling the asymmetric price transmission in the UK retail energy sector.

The framework is built around the asymmetric cointegrating relationship of the form:

$$Y_t = \theta^{+1} X_t^{+} + \theta^{-1} X_t^{+} + u_t \qquad (1)$$

Where y_t is an I(1) variable; and the explanatory variable is decomposed as follows:

$$X_t = X_0 + X_t^{+} + X_t^{-} \qquad (2)$$

Where $X_t^{+} = \sum_{j=1}^{t} \max(\Delta X_j, 0)$ and $X_t^{-} = \sum_{j=1}^{t} \min(\Delta X_j, 0)$ are partial sum processes of positive and negative changes in X_t, while X_o is an initial threshold value that is assume to be zero following Shin, Yu and Greenwood-Nimmo (2013). Δ is the first difference operator while θ^{+} and θ^{-} are the associated asymmetric long-run parameters. The NARDL (p, q) model associated with equation (1) can be written in its level form as follows

$$Y_t = \sum_{j=1}^{P} \phi_j Yt - j + \sum_{j=O}^{q} (\theta_j^{+1} X_{t-j}^{+} + \theta_j^{-} X_{t-j}^{-}) + \varepsilon_t \qquad (3)$$

Following Shin, Yu and Greenwood-Nimmo [15], the underlying model in this study is derived from equation (3) and specified in its error correction form as follows:

$$\Delta Y_t = \rho Y_{t-1} + \theta^{+} X_{t-1}^{+} + \theta^{-1} X_{t-1}^{-} + \sum_{j=1}^{P-1} \phi_j \Delta Y_{t-1} + \sum_{j=O}^{q-1} (Л_j^{+1} \Delta X_{t=1}^{-} + Л_j^{+1} \Delta X_{t-1}^{-}) + \varepsilon_t \qquad (4)$$

Where ρ is the speed of adjustment while $\beta^{+} = -\frac{\theta^{+}}{P}$ and $\beta^{-} = -\frac{\theta^{-}}{P}$ are the asymmetric long-run parameters.

Here, Y_t is used to capture the retail price of diesel while X_t is used to capture the crude oil costs for Spain. The ADF unit root tests were used to ascertain the orders of integration of the variables in this study to ensure that they are consistent with the underlying requirements of the NARDL framework. The results of cointegration tests based on the PSS bounds testing approach and the t_{BDM} statistic of Banerjee *et al*., [14] are also reported in this study. For more background information on the NARDL framework, we refer the reader to recent studies that have successfully used this approach in modeling asymmetric adjustment of retail prices to changes in crude oil costs, such as Ogbuabor, Orji and Anthony-Orji [16], Greenwood–Nimmo and Shin [5], Ogbuabor, Orji, Aneke and Manasseh [17], Ogbuabor, Eigbiremolen, Manasseh and Mba [18], and the references therein.

EMPIRICAL RESULTS AND DISCUSSION

This empirical analysis began by examining the time series properties of the data. The results of the ADF unit root tests are presented in Table-1 as follows:

Table-1: ADF unit root test results

Variables	Test 5% Critical Values	Level ADF Test Stat	1st Difference ADF Test Stat	Order of Integration
Diesel at Pump	-3.445	-2.205	-7.529*	I(1)
Diesel Ex-Tax	-3.445	-1.668	-7.105*	I(1)
Crude Oil	-3.445	-1.693	-5.984*	I(1)

Notes: The notation for the variables is as follows: Diesel at pump denotes the retail prices (i.e. inclusive of tax and duty) of diesel; while Diesel Ex-Tax denotes the ex-tax prices of diesel, respectively. * denotes significance at 5% level.

The ADF unit root test results in Table-1 indicate that all the variables are integrated of order one, I(1), which is consistent with the assumptions of the NARDL model in equation (4). These results also indicate that there may be an equilibrium relationship between the variable. Accordingly, we report the results of our cointegration tests as part of our empirical results based on the PSS bounds tests and the $t\text{-}_{BDM}$ statistic of Banajee *et al*., [14]. The NARDL estimation results for this study based on equation (4) are reported in Table-2, which shows the response of diesel prices at pump and ex-tax diesel prices to changes in crude oil cost.

We find that the speed of adjustment is quite sluggish as it shows the values of 15% and 27% per month at pump and for ex-tax price, respectively. Greenwood–Nimmo and Shin [5] also found similar pattern of sluggish speed of adjustment in the UK retail petroleum products markets. Our results indicate that the speed of adjustment is even more sluggish at pump compared to ex-tax prices. This means that the irregular behaviours associated with such sluggish speed of adjustment such as weak competition and prolonged periods of mispricing are more pronounced at pump. This finding raises serious anti-trust and consumer welfare issues that should not be ignored by policy makers in this economy. These results are also consistent with the dynamics of the Spanish retail diesel market which shows the dominance of three retailers as well as the status of Spain as an oil-deficient economy.

The results in Table-2 also indicate that there is a significant evidence of long-run asymmetry at pump at the 1% level. This finding further underlines the presence of irregular behaviours by retail firms in this market. Again, the long-run coefficients are smaller at pump, suggesting that in the long term, consumers are prone to the ups and downs of the international oil market. The results become more interesting when we consider the short-run dynamics. We find that there is strong evidence of short run additive asymmetry in the ex-tax prices at the 5% level. The results indicate that crude oil price increases are passed through more strongly and rapidly than price decreases in the periods immediately following the shocks. This is because the sum of the estimated positive short-run parameter (which is 0.73) is higher than the corresponding sum of the negative short-run parameters (which is 0.52). Indeed these results provide clear evidence of the prevalence of the rockets and feather effect in the Spanish retail automotive diesel market. More interestingly, the results indicate that the short-run additive asymmetry observed in the ex-tax diesel market disappeared at pump. In other words, the observed short-run additive asymmetry is obscured at pump so that consumers observing only the pump price are not able to notice this asymmetry. This raises the possibly that firms in this market may be manipulating the tax system to conceal rent-seeking behaviors. These findings further buttress our earlier points on the prevalence of irregular behaviours in this market. The diagnostic checks in Table-2 did not show any problem of autocorrelation or heteroskedasticity at the 5% level. The dynamics of the crude oil market explained substantially the variations in the retail diesel market as shown by the $\bar{\mathcal{R}}^2$ values of 67% and 81%.

Table-2: NARDL estimation results

Dependent Variables	**Diesel Ex-Tax**	**Diesel at Pump**
Estimated Coefficients		
ρ	-0.27***	-0.15**
β^+	0.76***	0.44*
β^-	0.75***	0.38*
$\sum_{j=1}^{q-1} \pi_j^+$	0.73***	0.65***
$\sum_{j=1}^{q-1} \pi_j^-$	0.52***	0.49***
Symmetry Tests		
$\mathcal{H}_0: \beta^+ = \beta^-$	0.07	7.40***
$\mathcal{H}_0: \sum_{j=1}^{q-1} \pi_j^+ = \sum_{j=1}^{q-1} \pi_j^-$	3.76**	1.82
Diagnostics		
F_{PSS}	7.88***	3.88
t_{BDM}	-4.77***	-2.37
BG Test (NR^2)	20.06*	18.52
ARCH Test	12.15	13.32
$\bar{\mathcal{R}}^2$	0.81	0.67

Notes: Diesel at pump denotes the retail prices (i.e. inclusive of tax and duty) while Diesel Ex-Tax denotes the ex-tax prices. The notation for the estimated coefficients relates to the NARDL model of equation (4). The reported symmetry tests are standard Wald tests. The BG Test is the Breusch–Godfrey serial correlation test, while the ARCH Test is the standard Heteroskedasticity Test. The BG Test and the ARCH Test were conducted at lag 12, since the dataset comprises monthly series. The relevant k = 1 critical values reported by PSS for the t_{BDM} statistic are −2.91, −3.22, and −3.82 at the 10%, 5% and 1% levels. The equivalent critical values for the F_{PSS} statistic are 4.78, 5.73 and 7.84.

* denotes Significance at the 10% level;

** denotes Significance at the 5% level;

*** denotes Significance at the 1% level.

CONCLUSION AND POLICY IMPLICATIONS

This paper investigated the Spanish retail diesel market for evidence of asymmetric price adjustment and rent-seeking following changes in crude oil prices. The study used the nonlinear autoregressive distributed Lag (NARDL) modeling framework and monthly time series data for the period January 2005 to December 2015. The results indicate that Spanish diesel market is fraught with sluggish speed of adjustment, which is typical of markets witnessing uncompetitive pricing and other irregular behaviours by retail firms. The results further indicate that Spanish diesel market is bedeviled by the problem of short-run asymmetric price transmission from crude oil markets, which is consistent with the rockets and fathers effect. Further still, we find that retail firms in the Spanish automotive diesel markets may be exploiting the tax system to conceal rent-seeking behaviours. This paper, therefore, supports policies that will encourage continuous monitoring of the market for irregular behaviors, since the observed problems of asymmetric price adjustment, rockets and feathers effect, and rent-seeking have anti-trust and consumer welfare implications.

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