Energy Economics 43 (2014) 11–21

Contents lists available at ScienceDirect

Energy Economics

journal homepage: www.elsevier.com/locate/eneco

# Symmetric transmission of prices in the retail gasoline market in Brazil

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ARTICLE INFO

*Article history:*
Received 9 October 2012
Received in revised form 4 February 2014
Accepted 6 February 2014
Available online 14 February 2014

*JEL classification:*
Q40
D40
L22
C32

*Keywords:*
Gasoline
Price asymmetry
Threshold cointegration

ABSTRACT

This study aimed to analyze the existence of asymmetric transmission of prices in the Brazilian gasoline market following a regional approach, using a disaggregated data set for the period between May 2004 and February 2011. The main result finds evidence of symmetric price transmission in retail gasoline market due to price shocks arising from the distributors. It is important to highlight that the disaggregation of the data allowed the study to show that the asymmetry is not a national problem, but specific to each city and different for each of the regions in Brazil.



## 1. Introduction

Petroleum derivatives, including gasoline, are still classified today as one of the main energy sources for a large part of the global population. In Brazil, gasoline still holds first place for light vehicle fuel, even with the possibility of using alternatives such as ethanol, mainly due to the technology of flex-fuel cars. Considering the importance of this fuel, the significant interest in analyzing the behavior of its prices in the retail market is understandable. Nevertheless, the interest in their behavior per se does not justify the study of gasoline prices. The literature suggests that it is possible to establish relationships and to provide insights into the nature of competition in this market by understanding the patterns in the transmission of price shocks and this knowledge can be useful for antitrust authorities. However, despite the relative importance of studies on asymmetric price relationships, the literature in this area is still in its early stages. There are few texts developing analyses of formal structures and concluding pointedly about their origins, since asymmetric price adjustments can be found in both concentrated and atomistics markets (see Ball and Mankiw, 1994; Benabou and Gertner, 1993; Borenstein and Shepard, 1996; Peltzman, 2000; Levy et al., 2007; Madsen and Yang, 1998; Meyer and von Cramon-Taubadel, 2004; Ray et al., 2006; Tappata, 2009; just to cite some of them).

One fact is that, among the studies that have sought to identify patterns in the dynamics of gasoline prices, a revealing number of them aimed to analyze the existence of *asymmetries* in the transmission of price shocks.[1] Such asymmetry would be the difference in response to economic alterations suffered in any step in the production chain. For the retail market, the problem of asymmetric price transmission, from now on referred to as APT, can be described as differences between positive and negative price adjustments in the retail market to input price variations (Frey and Manera, 2007).

An important empirical and theoretical controversy about asymmetric pricing is that the speed of adjustment of UK retail gasoline prices to cost changes is more rapid when costs rise than when they fall, hypothesis examined by Bacon (1991). As pointed by Bacon (op. cit.), one point of concern is the suggestion that companies can use their market power to set prices unjustifiably high relative to costs. In particular, the hypothesis is that when faced with cost increases companies rapidly adjust prices upwards, but when faced with cost decreases they adjusted prices downwards more slowly, thus permitting a temporary level of high profits. This asymmetrical pattern of adjustment was first termed 'rockets and feathers', by Bacon (1991) as indicated by Tappata (2009).

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[1] See Bacon (1991), Bachmeier and Griffin (2003), Balmaceda and Soruco (2008), Bettendorf et al. (2003), Galeotti et al. (2003), Honarvar (2009), and Radchenko (2005a, 2005b).

http://dx.doi.org/10.1016/j.eneco.2014.02.002
0140-9883/

In the gasoline market, the analysis of the dynamics of prices was already relevant in the literature even before the petroleum crisis of the 1960s, as can be seen in the works of Livingston and Levitt (1959) for the United States of America and Dixon (1964) for the United Kingdom, which depicted problems related to the gasoline retail sector. The petroleum crisis of the 1970s was accompanied by a large increase in the literature about the topic. It was also in this period that the first papers on APT appeared, promoted by the introduction of the ARIMA models by Box and Jenkins (1970), of derivations of the Wolffram (1971) model for identifying APT and of the TAR (threshold autoregressive) models by Tong (1983).

In the 1990s, with the full development of TAR models and of diverse estimation methods provided by computational advancement, there was an even larger increase in the literature about APT in the world (Hansen, 2011). Enders and Granger (1998) pointed out that, just as for the methods, the focus of the studies has changed over the years, as, instead of simply identifying whether there is asymmetry or not, a good part of them have focused on identifying the different kinds of asymmetries, revealing the evolution and refinement of the studies on the topic.

Therefore, since the associated economic theory is still developing, a general and perhaps more solid justification for undertaking a study on the transmission of shocks, i.e., over various market levels,[2] was given by Goodwin and Harper (2000). The authors highlighted that this transmission is an important descriptive characteristic of the overall operation of the market. As the price is a primary mechanism by which numerous market levels are linked, the extent of this adjustment and the speed at which shocks are transmitted between prices for producers, wholesalers and retailers are important factors that reflect the actions of the participants in those different market levels. The authors emphasized that the nature as well as the speed and extent of adjustments provide important structural information about an industry or a supply chain, and that these have important implications for the discovery of sales margins, firms' growth, and markup pricing practices.

For the Brazilian case, the study of the existence of asymmetry in gasoline prices' transmissions in the country can be useful given the history of collusion in the industry, assuming that such asymmetries may be caused by the exercise of market power. On the other hand, a study of the existence of asymmetry in gasoline prices can help to create a list of methods able to provide empirical evidence on the existence of anticompetitive conduct in the industry.

Thus, to understand a specific angle of the dynamics of market prices for gasoline in Brazil, the present study performs a vertical analysis of APT, relating distribution and gas stations. The aim is to describe the process of APT in the country, seeking, as far as possible, to draw a profile of APT in Brazilian municipalities to relate the patterns of the results and their characteristics, both wholesale and retail.

In contrast with works that analyze APT in an aggregate manner, this study makes use of regional data to avoid errors of data aggregation. In addition, the data used in the vertical analysis relate to the distributor prices as an input factor, instead of the petroleum price in the international market, because if there is asymmetry between the international petroleum market and the gas station price, it is not clear at which level of the sector the asymmetry occurred. It should be further noted that, in the case of Brazil, the transmission of petroleum price shocks to the retail gasoline price can be even more conflicting due to the presence of Petrobrás – a leading company in the Brazilian petroleum sector – and of ethanol in the composition of regular fuel. Petrobrás, as a state-controlled company, is subject to policy actions that impede the free dynamic of prices between the internal and the external market. Likewise, ethanol, as part of the composition of regular fuel, can smooth the petroleum price variations in the international market, a factor that can generate erroneous results between internal and external analysis.

[2] Given the dynamics of prices of the same market for different levels of the production chain.

Given these considerations, this paper is organized as follows. Section 2 provides a brief characterization of the Brazilian gasoline market; Sections 3 and 4 present the theoretical aspects and the empirical literature on APT; and Section 5 describes the specification of the model, the method, and the data used. Section 6 presents and analyses the main results. Finally, Section 7 concludes the paper.

## 2. The Brazilian retail gasoline market

The fuel market in Brazil has undergone great transformations since the 1990s, with the privatization of several companies in the sector, the end of Petrobrás's monopoly in activities of prospecting and distributing oil, the creation of a regulatory agency (ANP — Petroleum National Agency), and the complete price liberalization in 2001 at all stages of the productive chain. There has also been an increase in the share of gas stations called “white flags” (i.e., ones that work without a permanent contractual bond with distributors). However, along with these changes, which would suggest that the sector displays a more competitive structure, instances of gasoline adulteration, tax evasion, and anticompetitive actions arose.

In the upstream fuel chain segment, there had been an easing of entrance since 1993. However, this ease, in spite of inducing a significant increase in the number of distributors, did not affect the market share concentration. For example, five distributors controlled 68.4% of the retail gasoline market in 2000, increasing to 73% in 2010. Such an increase was mainly due to the greater share of BR-brand distributors in gasoline sales, from 20% in 2000 to almost 30% in 2010 (ANP, 2011). In sum, even with the opening of the market to the activities of new distributors, the result in the past years has been an increase in the sales share of large companies.

On the other hand, the Brazilian gasoline retail market is a sector characterized as highly fragmented, with more than 35 thousand registered gas stations in 2008. The most economically important states in the country possess a large number of the total stations: more than 8000 associates are concentrated in the State of São Paulo, followed by Minas Gerais, with nearly 4000 stations, and Rio Grande do Sul, Paraná, and Rio de Janeiro, with 2811, 2620, and 2051 stations, respectively (Fig. 1).

However, despite the atomization of the retail market, the associations of gas station owners are commonly investigated by the Antitrust Authority of Brazil, because of the frequent evidence of cartel formation. Until August 2010, nearly 22% of the lawsuits regarding cartels investigated in Brazil related to fuel resale. Since then, the proportion of lawsuits related to gas stations has remained relatively high, approximately 15% (Secretaria de Direito Economico, SDE, 2011).

Regarding the structure of prices in the retail and wholesale gasoline market in the country, it is important to note aspects of price construction and regional differences that make aggregate analysis less effective for understanding the behavior of agents in the formation of prices. Among the factors that differentiate the pricing, or the dynamics of prices in different regions, can be cited: the different fuel taxation practices undertaken by states; the feasibility of using ethanol instead of gasoline in every region; and the transportation costs of fuel.

Alcohol has different impacts on gasoline prices in different states of the country. Regions producing sugar cane have higher relative viability for alcohol use than other regions due to the lower transportation costs. In São Paulo, for example, the major producer of sugar cane in Brazil, the use of ethanol as fuel is more competitive than in other states. Therefore, regional differences regarding alcohol participation in price formation can significantly affect the dynamics of the prices in each region.[3]

[3] In an interesting study Wall et al. (2011) in an disaggregate analysis of how the increased production of ethanol has affected the US market of motor fuels. In the empirical analysis how ethanol and gasoline prices affect ethanol usage, the authors show that relative ethanol and petroleum gasoline prices, along with transport costs of these fuels, are important determinants of blending decisions.