

ETHANOL AS A DESTABILIZING COMPONENT FOR GASOLINE PRICES IN BRAZIL

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I - Overview

Since the end of the 1990's there is no formal government interference in the production of automotive fuels and nor at their prices in Brazil. During this decade, the Brazilian government implemented several structural and legal changes in different industries, including oil and gas. Those changes were part of a comprehensive State reform and intended to change the mechanisms directing state participation in the economic life of the Brazilian society. Specifically in the oil industry, the flexibilization of the state monopoly in 1995 (allowing companies other than Petrobras to operate through concession contracts or state permissions) was followed by several small changes that culminated with the beginning of the liberalization of automotive fuel prices in 1996, the creation of a regulatory agency in 1998 and the absence of any kind of official control over fuel prices in Brazil since January 2001 (when the liberalization process was completed).

Nevertheless, given the extensive market share of Petrobras (a private company in which the Brazilian government is the majority shareholder), fossil-based automotive fuel prices have maintained considerable stability over time. This (unofficial) policy is consistent with the government's objective of price stability, but contrasts sharply with the oscillation of prices occurring in the international oil and oil-products markets. In 2011, however, consumer gasoline prices in Brazil followed an atypical pattern, due, essentially to the behavior of supply and demand for ethanol in the country due to the extensive Brazilian flex fuel fleet

In this article we argue that although the Brazilian gasoline market does not reflect international price movements, the international market for sugar and ethanol plays a significant role in the definition of prices and quantities of those products in the domestic Brazilian market. Several companies (other than Petrobras) are present in both the production and commercialization of sugar cane, sugar and ethanol in Brazil and, therefore, the Brazilian government has much less room for intervention both in the prices established by economic agents in those sectors, and the quantities they offer, when compared to the oil-derived fuel market. With the increasing share of Otto-cycle flex-fuel vehicles in the Brazilian fleet and the mandatory mix of ethanol in the gasoline sold to final consumers, we believe that ethanol will be an ever-greater complicating factor in the maintenance of internal price stability for automotive gasoline.

II - Gasoline and ethanol fuel markets in Brazil.

The Brazilian oil industry has been traditionally characterized by a strong presence (and interference) of the government on its activities. Until 1995, the Brazilian government had a constitutional monopoly in exploration, production, importation, refining and transportation of oil and its derivatives and operated directly on these sectors through the state company Petróleo Brasileiro S.A. (Petrobras). Although the distribution and retail sales of automotive fuels were not state monopolies, they also suffered from a strong state intervention, which operated through several controls on prices, sales margins and freight costs.

Fuel prices control was, until the beginning of the 1990's, an instrument used by the Brazilian government not only for energy policy purposes, but also mainly to control rising inflation rates and its impact on the economy.

As Souza e Silva (2003)¹ points out, until the 90's, the strategic management of Petrobras regarding oil products pricing, goods and services purchases policy and R&D was determined in an environment in which sectoral goals were always lined up with macroeconomic objectives. The organization of the oil industry into a state monopoly made possible attempts to maintain consistency in those goals.

In the 1990's, however, the Brazilian government implemented several structural and legal changes in different industries, including oil and gas. Those changes were part of a comprehensive State reform and intended to change the mechanisms directing state participation in the economic life of the Brazilian society. Specifically in the oil industry, the flexibilization of the state monopoly in 1995 (allowing companies other than Petrobras to operate through concession contracts or state permissions) was followed by several small changes that culminated with the beginning of the liberalization of automotive fuel prices in 1996, the creation of a regulatory agency in 1998 and the absence of any kind of official control over fuel prices in Brazil since January 2001 (when the liberalization process was completed).

The main justification for the changes was that the government had failed in effectively managing these sectors and it was necessary to change the way the Brazilian State participated in the economic life of Brazilian society. In this context, Law n. 8.884/94 was promulgated, in 1994, as part of the new Brazilian antitrust policy², and the state intervention was reduced (in 1995) so as to enable companies other than Petrobras to participate in all segments of the oil production chain. Law n. 9.478/1997 set out the basic principles governing the activities of the oil, oil products and natural gas industries³ (ANP, 2002).

This law created the National Petroleum Agency (*Agência Nacional do Petróleo - ANP*)⁴, whose main goal was to regulate, contract and monitor all the activities inherent to the oil, oil products, natural gas and biofuel industries in Brazil.⁵ Under this new regulatory scheme, automotive fuels price controls, that had begun being abolished in 1996, were definitely abandoned, a process that was concluded in January 2002. From that point onwards no government body, regulates in any way the price of automotive fuel sold on the Brazilian market, nor the quantity offered.

Until late 2001, the domestic supply of fuel in the country presented itself structured into segments that worked separated in specialized functions. For the rules in place so far, only Petrobras was authorized to import gasoline and diesel (imports of other oil products had already been released, although it required prior approval of ANP). The distributors could only acquire automotive fuels from oil refineries and/or petrochemical plants. In December 2001, ANP published several ordinances that rearranged the downstream institutional environment in Brazil, changes that were intended to promote new supply options to distributors and consumers.

One of the guiding principles of the broad legal and institutional reform implemented in the hydrocarbon industry (of which the process of liberalization of fuel prices was a part) was therefore the introduction of competition in the fuel sector. In order for this to occur in the most effective manner it was necessary to eliminate institutional barriers to entry of new players on to the market (Baran; Bicalho; et al, 2010)⁶. The introduction of competition on to the markets is not an end unto itself however. The main justification for promoting a competitive market is the fact that competition

¹ SOUZA E SILVA, CARLA MARIA DE. *Estratégia de Preços da Petrobras no Mercado de Combustíveis Brasileiro Pós-liberalização e Instrumentos de Amortecimento de Variações Internacionais*. Masters Dissertation. IE/UFRJ. Available in http://www.prh21.ie.ufrj.br/pdfs/00008_estrategias_de_precos_da_petrobras_no_mercado_de_combustiveis_brasileiro_pos_liberaacao.pdf

² In 2011, Law 8.884/94 was replaced by Law 12.529/2011, Brazilian new antitrust law.

³ Law 11.909 was introduced in 2009, to deal specifically with the natural gas segment in Brazil.

⁴ From 2005 onwards, with the passing of Law 11.097/05, which deals with the introduction of biodiesel onto the Brazilian energy matrix, the ANP was re-named Petroleum, Natural Gas and Biofuel National Agency (*Agência Nacional do Petróleo, Gás Natural e Biocombustíveis*).

⁵ It is also worthy of note that Law 9.478 set out the principles and objectives of the national energy policy and set up the National Council for Energy Policy - *Conselho Nacional de Política Energética (CNPE)*.

⁶ Baran, P; Bicalho, L; Paiva, R; Pedra, D; Vilela, O. "Metodologia adotada pela Agência Nacional do Petróleo, Gás Natural e Biocombustíveis para detecção de cartéis". Rio de Janeiro: Agência Nacional do Petróleo, Gás Natural e Biocombustíveis. < Available in <http://www.anp.gov.br/?id=2586>>. Accessed in 04/28/2012.

encourages companies to be efficient and to offer a greater variety of products and services at lower prices. In a competitive market economy, price signals tend to be free of distortion and they generate incentives for companies to re-direct lower utility resources towards ends which have greater aggregate value. De-centralized decision-making by the companies promotes the efficient allocation of scarce resources, which belong to society. It also increases consumer well being in addition to accelerating progress and technical innovation (OECD, 2002)⁷. As such, the search for a greater degree of competitiveness in the oil and gas industry is, in the final analysis, aimed at maximizing the benefit to society of the result of the activities in these industries.

In automotive fuels distribution and commercialization, the regulatory changes envisioned competitive pressures through two different mechanisms: imports or local production (by other companies). In a scenario of free prices and import, it might be expected that the price of petroleum-derived automotive fuels in Brazil would follow the trends observed on the international market, given the possibility of arbitrage. Comparison of gasoline prices in Brazil and in foreign markets from 2001 onwards demonstrates significantly different trends, with prices on the internal Brazilian market being considerably stable over long periods of time, despite variations in foreign market prices (see Graph 1, below).

Broadly speaking, the reason behind this market behavior is that although the Brazilian State has eased its monopoly over the oil and oil derivative industry and has ceased to intervene in pricing by means of indexing the price of oil products, it still controls Petrobras. The Brazilian State is the major shareholder in Petrobras and is therefore able to direct that the company follow a pricing policy that is consistent with government macroeconomic aims of price stability and low inflation. Furthermore, even though the 1995 legislation permitted other companies to operate in the fields of oil refining and fuel import, these segments remain largely concentrated in the hands of Petrobras. In 2011 Petrobras held 98% of the country's refining capacity and was constructing a further 3 refineries. In terms of traded volume, Petrobras accounted for over 95% of production stage gasoline sales (refineries) between 2008 and 2011. This data demonstrates that, although automotive fuel prices are not officially set in Brazil, Petrobras does have significant market power to define the price levels of gasoline and other fossil-based automotive fuels in the country, as it practically controls the refine/import stage of gasoline production chain. It must be observed that gasoline prices behavior in 2011 were due (as will be discussed later in this paper) to fuel ethanol prices (not controlled by Petrobras). Nonetheless, Petrobras' lack of capacity to sustain a stable price trajectory can be explained (mainly) by ethanol markets structure.

One should keep in mind that gasoline and ethanol prices carry significant weight in the country's main inflation index (the National Consumer Price Index - *Índice Nacional de Preços ao Consumidor* - INPC) and that control over fuel prices in the country has historically been an instrument used by the government to control inflation and its impacts on the economy. Accordingly, it should be observed that following the liberalization of fuel prices in Brazil the government introduced a social contribution tax – the Contribution to Intervention in the Economic Domain - *Contribuição de Intervenção no Domínio Econômico* (CIDE), and amongst its goals were serving as a buffer for possible fuel price variation in the country. In recent years, increases and decreases in the production cost of gasoline have been set off in whole or in part by respective increases or decreases in the CIDE⁸ so that the impact on the final consumer of the variation in refinery prices tends to be minimal or non-existent.

In direct contrast, the production prices of ethanol have, historically, been subject to seasonal variation in line with sugarcane harvests and intercrop periods. These price trends influence prices in the subsequent stages of the productive chain (distribution and resale) and there is therefore a great variability in the resale prices for ethanol throughout the year. In this sense it should be highlighted

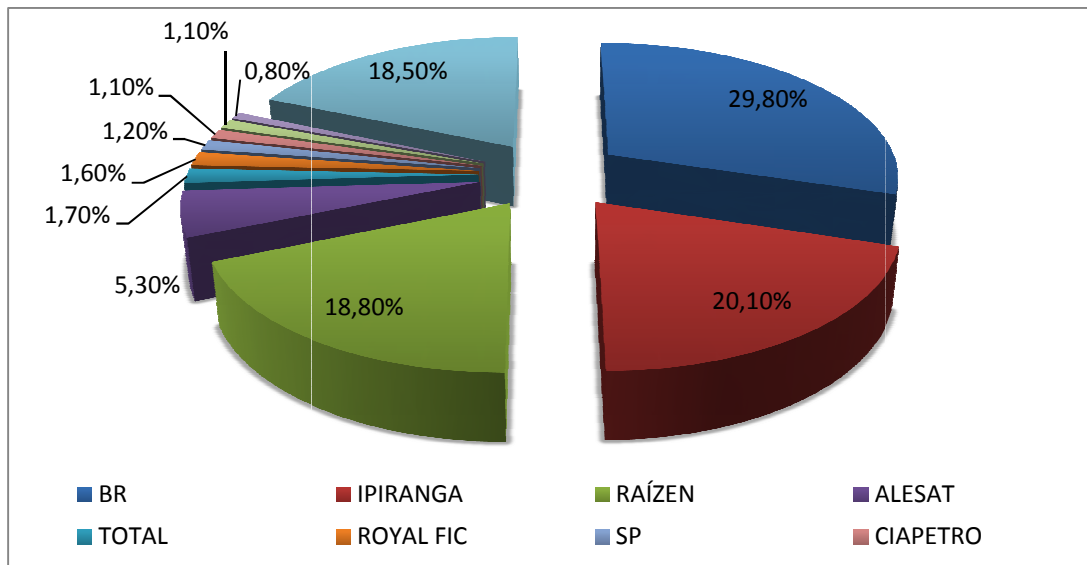
⁷ OCDE. Diretrizes para Elaboração e implementação de política de defesa da concorrência. São Paulo: Singular. 2002.

⁸ See, for example, Decree n° 7.095/2010, which reduced the rate of CIDE applicable to gasoline up to April 2010, or Decree n° 6.446/2008, which reduces the rate of CIDE applicable to gasoline. On both occasion the stated aim of the measure was to set off, for the consumer, increases in the price of gasoline at refineries.

that the market structure of the production of ethanol fuel is distinct from that of the gasoline market in Brazil. Firstly, it should be noted that the number of agents operating in each of these markets is significantly different. In the case of the market for the production of ethanol fuel, there are, in addition to Petrobras, another three petroleum refinery agents in the country. There are, on the other hand, currently over 300 ethanol-producing plants. A second important distinction relates to the level of concentration, given that, in the case of gasoline, a single company, Petrobras, holds over 95% of the market, whilst production of ethanol is much more dispersed. A notion of this is provided by the fact that applying the CR4 as a concentration index reveals that the four largest companies in the ethanol production sector hold less than 25% of the national market. Furthermore, despite since 2008 Petrobras has also operated in the ethanol production sector through a company called P BIO, its market share is about 5%, which does not permit it to define market prices.

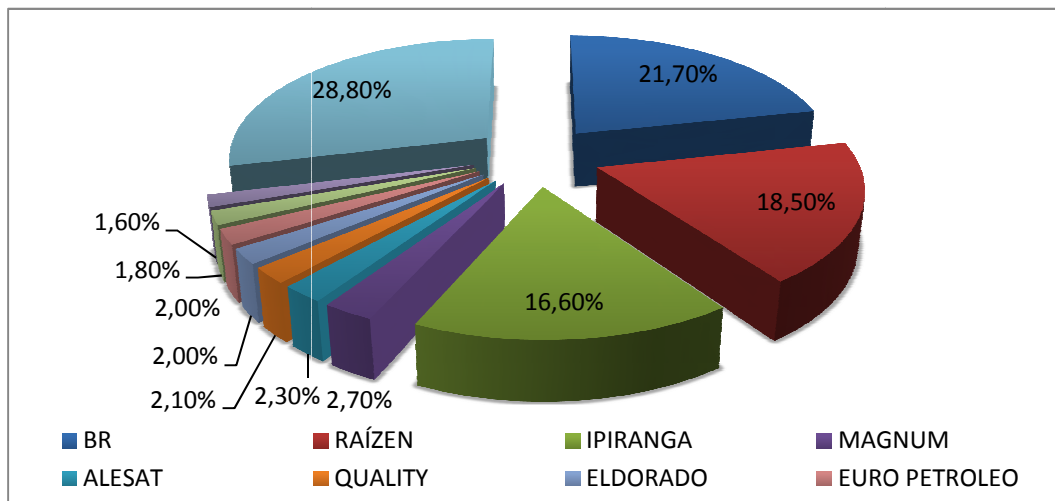
Both gasoline and ethanol distribution markets are less concentrated than the petroleum refinery segment. The CR4 of the automotive fuel market in Brazil was 74% in 2011, although concentrated it might be considered competitive both at national and regional levels. Therefore, as indicated by Figures 1 and 2, in spite of the fact that Petrobras Distribution Company (BR) is the leader company in both markets, its market share doesn't allow the company to control price level in the market following the gasoline production stage.

Figure 1: National market-Share of gasoline fuel distribution companies in 2011



Source: Boletim Abastecimento em Números, Ano 7, n. 35, Março de 2012.

Figure 2: National market-Share of ethanol fuel distribution companies in 2011



Source: Boletim Abastecimento em Números, Ano 7, n. 35, Março de 2012.

Despite the lower market concentration in the automotive fuels distribution and commercialization Brazilian markets, it could still be identified, up to 2011, a low price variability in gasoline prices, that were strongly influenced by the stability in refining prices. The second half of the 2000s, nevertheless, has witnessed a major structural change in the market for automotive fuels in Brazil: the appearance and growth of a significant flex fuel that lead the ethanol market to bear more influence into the gasoline market, a move not anticipated by the government that has undermined the ability of Petrobras to keep track of both products prices (since it is no longer enough to control gasoline production and imports to control the products prices).

Another important distinction between the ethanol and the gasoline market relates to the regulation of their respective value chains. As already stated above, regulation of the entire gasoline chain of production has been within the competence of the ANP since 1997. The regulation of the value chain of ethanol fuel was, until the issue of Provisional Measure n° 532, on April 28, 2011, shared by the Ministry of Agriculture, Farming and Supply - *Ministério da Agricultura, Pecuária e Abastecimento* (MAPA) and the ANP. MAPA was the body with legal competence over the industry up until end of the production of ethanol fuel stage, and the ANP took over to with the beginning of the fuel distribution stage. The reasoning behind this division of competence was that ethanol was a product derived from sugarcane and not petroleum, so that it was not for the ANP to have competence over the production stage of the chain. The fact is that not all raw material at a sugarcane plant is converted into ethanol fuel, in that it can also be converted into products that are essentially foodstuffs.

The change in the regulatory regime applicable to ethanol fuel was only consolidated with the conversion of Provisional Measure n° 532 into Law 14.490 in April 2011. With the introduction of the new law, the ANP commenced a wide-ranging process of edition and revision of a series of norms, in order to align the ethanol production segment with the new legal provisions. This process has proved to be a major challenge for the regulator, given the scale of its new attributes, which include the duty to guarantee the supply of ethanol fuel throughout national territory as well as that of authorizing and monitoring a significant amount of ethanol plants. The challenge becomes even greater when we consider that this legal change occurred in a context in which the internal supply of ethanol was encountering serious difficulties and also the regulatory body was seeking to assist with the government's cost-cutting policies by reducing expenditure and freezing the hiring of new staff.

Finally, the seasonality typical to agricultural products (such as sugarcane) means that the price of ethanol fuel becomes the focus of debate on an annual basis. This is due to the combined effect of intercrop periods in sugar cane cultivation (said periods that naturally promote a seasonal increase in the price of ethanol) together with the trend of increased demand for ethanol on both internal and external markets and the realignment of prices as the result of government measures to combat tax evasion. These measures include the marking of ethanol fuel with colorants. The combined effect of these factors exerts pressure on the price of ethanol fuel for the consumer.

Thus, even though these variations in prices, common to agricultural produce, are seasonal and foreseeable, they affect the final consumer, in that consumers do not have seasonal income nor are they able to stockpile products for individual consumption. In the years prior to 2010, consumers had access to the product at low cost whilst during intercrop periods the increase in prices had the potential to restrict consumption. As we shall see below, from 2011 onwards the market conditions for the product changed in such a way as to increase ethanol prices to levels above those expected by society and which impacted significantly on the final price of gasoline C to the final consumer.

In parallel with the effect of seasonality which is typical of the sale of agricultural products and which naturally pressures ethanol fuel prices upwards during sugarcane intercrop periods, the increasing internal demand for hydrated ethanol as a result of the increase in the fleet of biofuel vehicles has introduced an additional element of pressure on fuel prices. This has major potential for generating instability in gasoline C prices in the country.

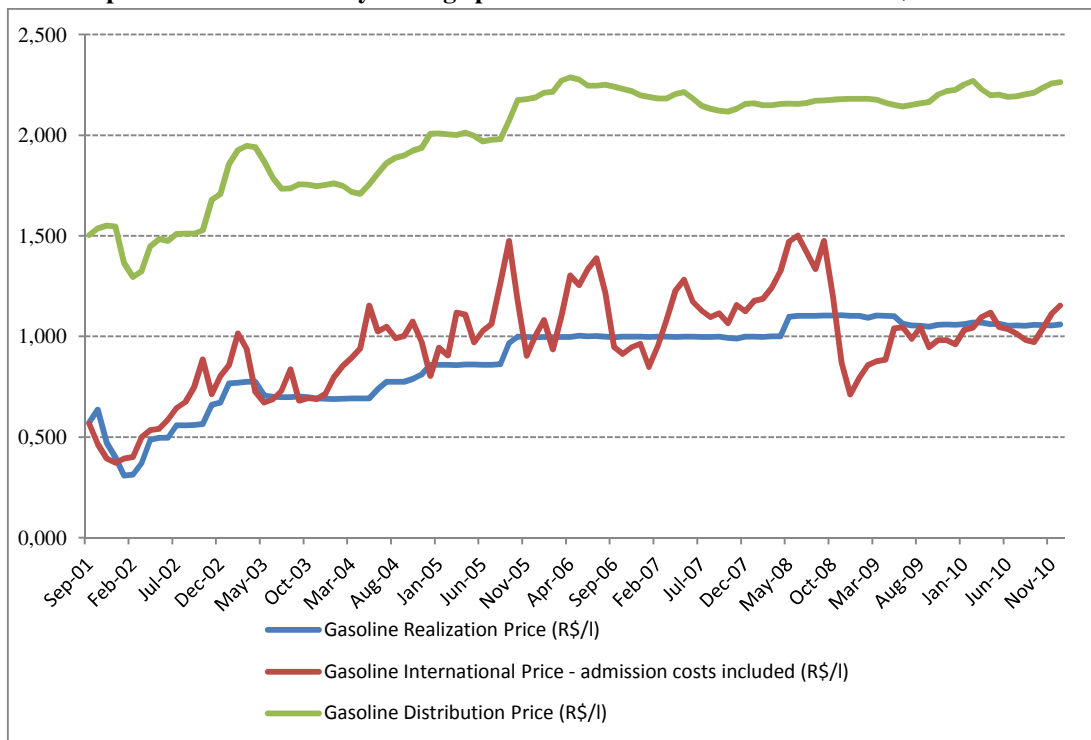
In the first quarter of 2011, gasoline prices at resale points began to increase significantly. This was not due to any alteration in the prices charged by Petrobras at the fuel production stage (refinery). It was, rather, due to factors related to the increase in the price of ethanol fuel. The increase in the price of ethanol fuel on the Brazilian market was, in turn, the consequence of the restriction in the

internal offer of the product. This restriction was a result both of the increase in the price of sugar on the international market, which led ethanol producers to direct the greater share of their sugarcane production to sugar rather than ethanol, and also of the reduction in previous years in investment in the productivity of sugar-cane fields. Both behaviors will be better discussed in the next section.

III - Gasoline price behavior in 2011

Historically, relevant increases in the price of distribution of common gasoline observed in competitive markets could be correlated to increases in the price of gasoline A at refineries. The latter prices did not, in general, present the volatility observed in the international market, as can be seen from Graph 1.

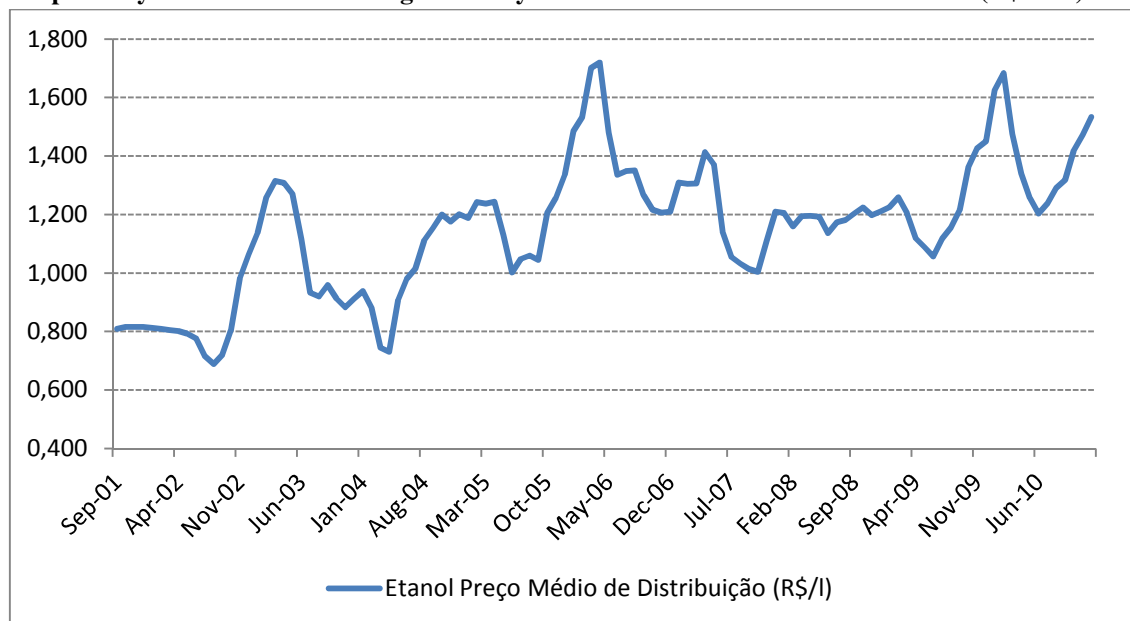
Graph 1: Gasoline monthly average price behavior from 2001 to 2010 – R\$/liter



Source: Drawn up by the author on the basis of data from CDC/ANP.

On the other hand, as it is illustrated in Graph 2, ethanol fuel prices have traditionally shown significant variance, which could almost entirely be attributed to seasonality of sugar-cane production and/or the impact of sugar price behavior in the international market.

Graph 2: Hydrated Ethanol Average Monthly Price behavior between 2001 and 2010 (R\$/liter).



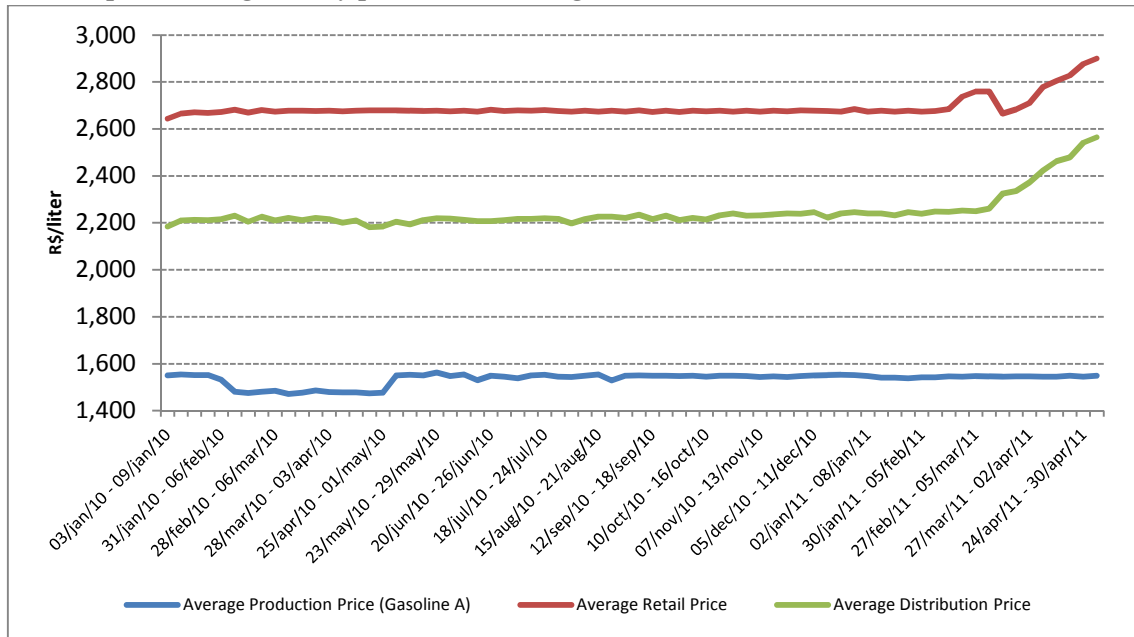
Source: Drawn up by the author on the basis of data from CDC/ANP.

Bearing in mind the correlation and the stability in the prices charged by producers of gasoline A, the significant increase in the price of gasoline C as from the second bimester of 2011 took society by surprise.

Graph 3, below, sets out the evolution of the average price of gasoline on the Brazilian market between January 2010 and May 2011, on the basis of the prices charged by the producers of gasoline A and on the prices of gasoline C in the stages of distribution and resale⁹. On the basis of this observation we can perceive major stability in average prices in the country between January 2010 and January 2011. From mid-February 2011 onwards there was a sharp increase in the price of fuel in the distribution and resale stages. This was not a consequence of the behavior of average gasoline A prices at the production/import stages, in that these prices remained stable throughout the period set out in the graph.

⁹ Gasoline A is the oil product that comes directly from the oil refinery. Gasoline C is the product that is sold to final consumers, and it consists in a mix of Gasoline A and anhydrous ethanol.

Graph 3: Average weekly price behavior for gasoline in Brazil (R\$/l)



Source: Drawn up by the author on the basis of data from CDC/ANP.

Between February and April 2011, average resale prices in Brazil increased around 11%, whilst average distribution prices grew by approximately 9%. As can be seen in Graph 3, from mid-March 2011 onwards, the prices of resale and distribution of common gasoline in the country followed a pattern of increase which cannot be explained by the conduct of the prices of gasoline A in Brazil.

Bearing in mind that, in addition to gasoline A, the two major elements that influence the composition of the prices of common gasoline are the taxes levied and the price of anhydrous ethanol¹⁰, and that there was no variation in the tax payable on the distribution and resale of common gasoline, it is necessary to analyze the behavior of the price of anhydrous ethanol fuel (added to gasoline A in the proportion of 25% in order to make up gasoline C) as well as the price of hydrated ethanol, the principal substitute for gasoline C on the automotive fuel resale markets. We need to do this in order to identify the factors that led to the significant increase in the prices of gasoline C from mid-March 2011 onwards.

Some clarifications are called for prior to the analysis of the factors that explain the behavior presented by the price of gasoline C in the first quarter of 2011. Firstly, the characteristics of price volatility associated with agricultural seasonality are inherent to the ethanol fuel market: given that this product is derived from sugarcane, its price is substantially influenced by harvest and intercrop periods in the producing regions¹¹.

Given that Brazilian ethanol fuel is a product derived from sugarcane, its raw material is subject to the seasonal factors inherent to agricultural production. As can be seen in Graph 2, historically, the price of ethanol has risen in the sugarcane intercrop period (between November and May) as a normal consequence of market behavior and independently of any diversion towards the production of sugar

¹⁰ See the structure of price formation for common gasoline at:

<http://www.anp.gov.br/?pg=41230&m=&t1=&t2=&t3=&t4=&ar=&ps=&cachebust=1306433624856>

¹¹ To this effect it is worth noting that the production of ethanol is distributed between two major regions in Brazil: the Center-South region, represented basically by the state of São Paulo, and the North-North-Eastern regions represented by the states of Alagoas and Pernambuco. The first region, in the last harvest, accounted for 89% of the area harvested for sugarcane (according to data from CONAB, available in www.conab.gov.br). The harvest and intercrop periods are however different in both regions. In the Center-South region the sugar cane harvests begin in April/May and end in November/December. In the North-North-Eastern region, however, the harvest period commences in September/October and ends in February/March. Bearing in mind the significant share in national production of the Center-South region, this study, in referring to ethanol harvest and intercrop periods refers to those corresponding to the Center-South region.

inherent albeit that this shift in price may be accentuated in years of price hikes for sugar on the international market, with producers opting to expand their production of sugar.

Ethanol prices may be influenced not only by the variations in offer arising out of seasonal factors in the production of sugarcane but also by the prices of products which are alternatives to it (in terms of offer, sugar and alcohol directed to other purposes than fuel; in terms of demand, gasoline).

Whilst both the production and prices of ethanol have seasonal behavior in line with sugarcane harvests there is no proportional response in demand for the product. In fact demand may, during some months, respond in a contra - cyclical manner (with demand increasing in intercrop periods) which sometimes intensifies the trend of price increases already present during intercrops.

Before the introduction of biofuel (*flex fuel*) cars onto the Brazilian market, the only response open to consumers in the face of hikes in the prices of hydrated ethanol was to reduce the use of automotive vehicles. In fact, it can be reasonably presumed that the consumers would, at least partially, maintain their pattern of demand for ethanol, in line with established habits, rather than opting to use other forms of transport. Consumers therefore ended up incorporating the increase in prices into their budgets.

With the advent of biofuel cars (*flex fuel*) the possibility afforded to drivers of cars with this technology to switch between gasoline C and hydrated ethanol fuel became an option exercised at the time of filling the tank and based on the individual preferences of each consumer and the relation between the prices of both fuels¹². As the share of *flex* cars in the national passenger car fleet increased, a greater degree of interrelationship was observed between the markets for both fuels in other words, the variation of prices in one market began to have more direct and immediate repercussions in demand of the other.

The comprehension of the factors which led to the behavior observed in the markets for common gasoline in the first semester of 2011 requires analysis not only of the evolution of the price of said common gasoline in Brazil during this period but also of the scale of the broadening of interdependence between the markets of gasoline and ethanol, as well as of the impacts of the variations in the ethanol market of the prices charged on the markets for distribution and resale of gasoline C and the conditions production and offer of ethanol in the scenario of growing demand.

It should also be noted that the interdependence between the gasoline and ethanol markets is more easily perceived in those markets in which, during harvest periods, the competitiveness of ethanol in relation to gasoline tends to be very high, given both the proximity of the centers of production. Bearing in mind, therefore, that the Center-South region is the main producing region of ethanol and that the state of São Paulo is not only the major producer but also the main center of consumption of ethanol (hydrous and anhydrous)¹³, the behavior observed in this unit of the federation may be considered a representative example with which to explain the oscillation in prices and demand for fuels. We shall thus turn to an examination of these variables in the state of São Paulo.

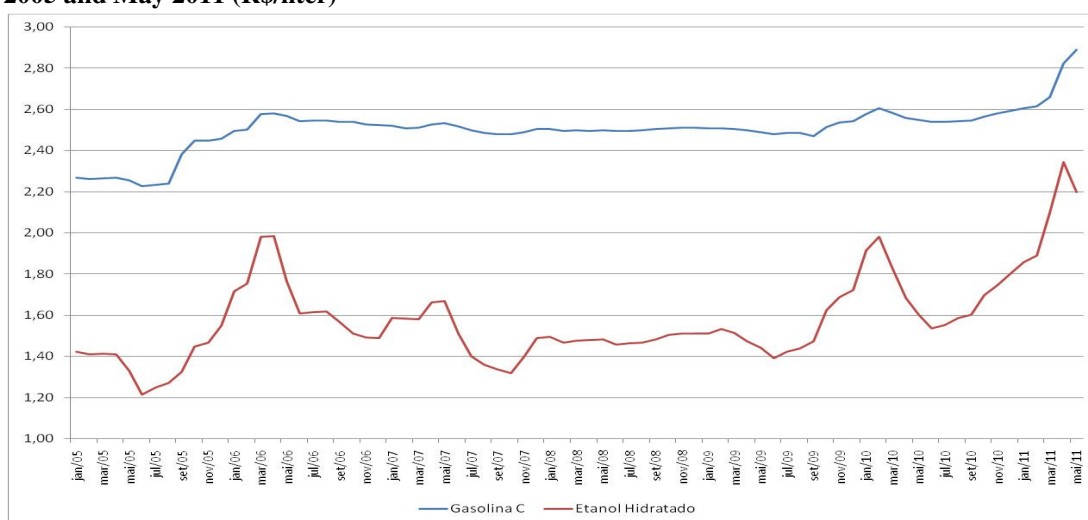
IV - Main causes of increases in the prices of gasoline C observed in the first semester of 2011

Having set out the above considerations we now turn to an examination of the evolution of the prices of resale and distribution of gasoline C and hydrated ethanol in the country:

¹² The fuels, despite being good substitutes for each other, have distinct characteristics. One of these characteristics in particular determines the economic advantage for the consumer of substitution of the fuels: hydrated ethanol has lower calorific power compared to gasoline. It is only economically advantageous to the consumer to fill up with EHC when it is priced at 70% or less than the price of gasoline. The difference between the calorific power of both types of fuel is directly reflected in the per kilometer yield of both.

¹³ The state of São Paulo, in 2010, accounted for 58% of the sugarcane harvested in Brazil and 57% of the total production of ethanol (according to data from CONAB) and for 25% of the total sales of gasoline C and 56% of the total sales of hydrated ethanol in the country, according to sales data from the ANP.

Graph 4: Average Monthly Price of Resale – Hydrate ethanol vs. Gasoline C between January 2005 and May 2011 (R\$/liter)



Source: Drawn up by the author on the basis of data from CDC/ANP.

As can be seen from Graph 4, up until January 2006, a gasoline C and hydrated ethanol followed trajectories of increases in average resale prices. From May 2006 onwards, the average prices of gasoline C presented reasonably stable behavior, whilst those of ethanol oscillated throughout the year, principally in line with the offer available during sugarcane harvest and intercrop periods. Note the ethanol price hikes which occurred in March 2006 and February 2010, when average prices reached a level of almost R\$2.00/l.

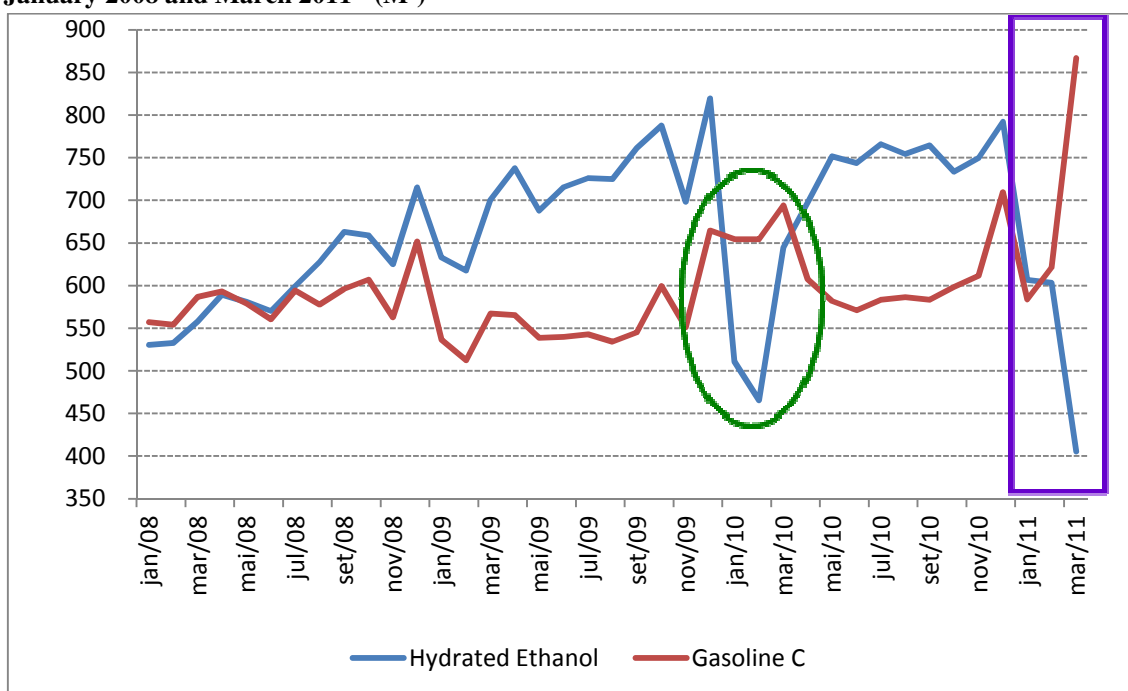
In 2011, price dynamics changed and the trend that had been noted in early 2010, with a small increase in gasoline C prices (2.56% between December 2009 and February 2010) in response to the increase of 15.09% in the prices of hydrated ethanol, came back with greater intensity in 2011.

Economic theory teaches us that in free markets, the main forces for price increases generally arise out of pressure from demand or pressure from costs¹⁴. Pressures from demand are, in general characterized by an excess of demand in relation to offer, in a given period of time. This may occur for a variety of reasons (increase in disposable income, public policies stimulating demand, change in consumption patterns of the population, etc). Pressure on costs, on the other hand, is characterized principally by increases in the costs of raw materials and other business costs (increase in interest rates, currency devaluation, increase in labor costs etc.) As indicated in Graph 3, any pressure related to the price of the principal raw material (gasoline A at the production units) can be discarded as a determining factor in the price of Gasoline C. It is however necessary to examine the other possible root causes of increase in the price of common gasoline so as then to determine the reasons for the atypical behavior encountered in the first quarter of 2011.

In relation to the pressures of demand, the consumption of common gasoline in São Paulo decreased progressively from 2008 onwards, as can be seen from Graph 5, below, whilst the prices of hydrated ethanol presented consecutive increases. Even with the increases in the prices of hydrated ethanol in the early months of each year, the trend continued to be one of increase in the demand for ethanol and retraction of the demand for common gasoline.

¹⁴ There is also an inertia component, associated, in general, with economic indexation mechanisms and the expectations of private agents – but it is not relevant for the persente analysis.

Graph 5: Consumption of EHC vs. Consumption of gasoline C in the state of São Paulo between January 2008 and March 2011 - (M³)



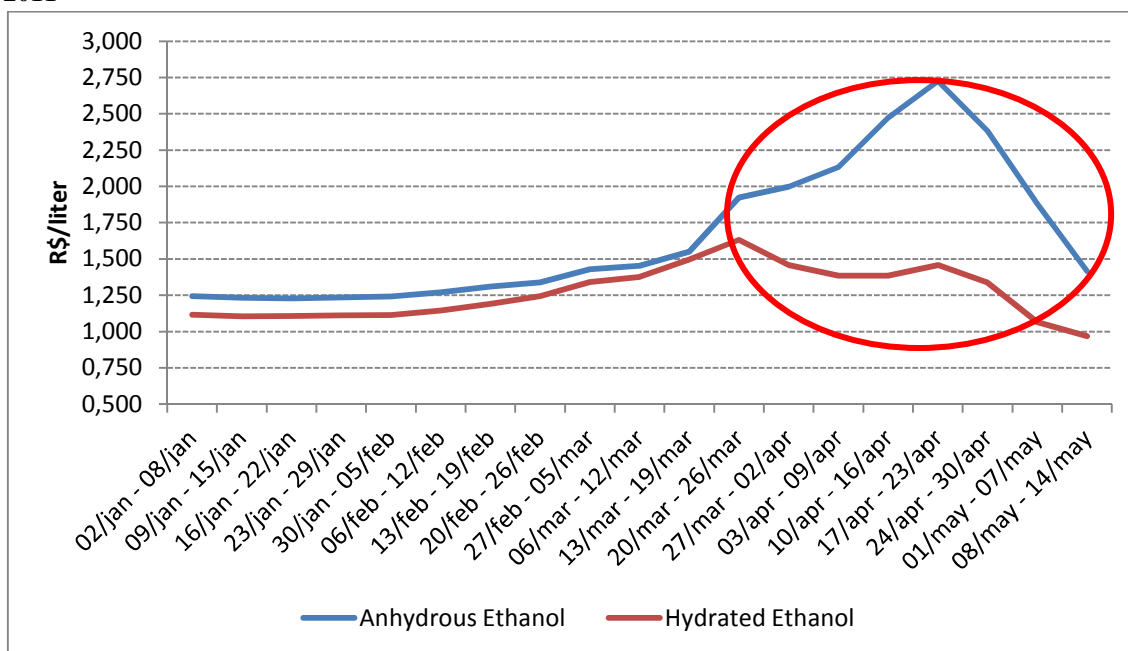
Source: Drawn up by the author on the basis of data from CDC/ANP.

In the first quarter of 2010, faced with an increase considered to be atypical in the average prices of hydrated ethanol, demand for the product fell by 29.7% in relation to the last quarter of 2009 in the state of São Paulo, so that the immediate response in the consumption of common gasoline was perceptible, with an increase of 10.33% in the same period (identified by the green ellipsis in the graph). The movement observed in 2010 had, up until that time, been the strongest response in terms of the demand for ethanol in relation to price increases and was already a reflection of the high degree of participation of flex-fuel vehicles in the national fleet. From March 2010 onwards however, the demand for hydrated ethanol recovered and by May of the same year had already returned to late 2009 levels, with consequent reduction in the level; of demand for gasoline (which decreased 12.08% in the second quarter of 2010, in relation to the first three months of the same year).

In the first quarter of 2011, however, the graphs suddenly present a shift, with a strong response to the price increase in the form of demand for EHC. The fall in the demand for this fuel and the consequent increase in the demand for common gasoline departed from the historical patterns observed hitherto (in the period represented by a violet rectangle), with consumption of common gasoline in the state of São Paulo increasing 40% in a short space of time (between February 2011 and March 2011). This gave rise to strong pressure of demand on the supply (and the prices) of gasoline C in said state, with repercussions throughout Brazil.

Having already discarded any effect on the prices of gasoline C of either the prices of gasoline A in the refineries or of taxes, we need to evaluate the behavior of the prices of anhydrous ethanol fuel (product responsible for 25% of the composition of common gasoline). This is illustrated in Graph 6, which sets out the weekly process of anhydrous ethanol fuel and hydrated ethanol in São Paulo.

Graph 6: Weekly Prices in the Production of EHC and EAC in São Paulo in the first semester of 2011



Source: Drawn up by the author on the basis of data from data from CEPEA/ESALQ/USP

As Graph 6 indicates, from February 2011 onwards, both the price of anhydrous ethanol and hydrated ethanol followed relatively similar ascendant trajectories until March. From the second fortnight in March/2011 onwards, there is a shift in the variation trajectories of both products. Anhydrous ethanol was subject to repeated increases until it reached a peak of de R\$ 2.75/l, in mid April/11. The prices of hydrated ethanol presented a decline albeit that they only returned to their early January/11 levels in the second fortnight in April.

Taking into account the addition of 25% of anhydrous ethanol to gasoline A in the composition of gasoline C, significant price increases in anhydrous ethanol would, to some extent, give rise to pressure for the readjustment of the prices of common gasoline. In previous years, the prices of anhydrous ethanol, despite presenting seasonal variations, did not increase sufficiently to give rise to significant alterations in the distribution and resale prices of gasoline C – as occurred in 2011.

The increase in the demand for gasoline C as a result of the migration of consumers of hydrated ethanol to gasoline C, particularly in the state of São Paulo, in a scenario of restriction of the supply of ethanol, pressured the demand for anhydrous ethanol. The consequence of this was the increase of 75.77% in these prices at the production units between the second week of March/2011, and the second week of April/2011. This generated impacts in the final price of gasoline. In the period between the first week of January/2011 and the last week of April 2011, the increase in prices for the average final consumer of gasoline C was 12.18% for the state of São Paulo and 8.36% in Brazil.

Having made these considerations it is clear that the main motives for the increase in the average price of common gasoline in the country were the behaviors observed in the ethanol market. We therefore need to examine the dynamics of this market in the search for further bases for comprehension of the evolution of the prices of common gasoline.

VI - The behavior of ethanol prices and their impact on the distribution and resale markets of common gasoline.

Note that there are two mechanisms which impact on the variation of the price of ethanol blended in gasoline currently sold in Brazil. The first of such mechanisms is the consequence of the introduction of biofuel (flex fuel) cars into the fleet of light vehicles, in 2003. The cars that have flex fuel technology can operate with a blend of gasoline and hydrated ethanol fuel (EHC) in any

proportion or with 100% of one or the other. As such, hydrated ethanol became the principal substitute for gasoline. Motorists were then able to choose between the two fuels at the time of filling up, based on personal preference and on a comparison between the prices of both fuels. It should be reminded that due to the fact that hydrated ethanol has lower calorific power than gasoline, it is only economically advantageous to the consumer to fill up with EHC when it is priced at 70% or less than the price of gasoline.

As the share of flex fuel vehicles in the national fleet of passenger cars increased, a greater degree of interrelationship has been verified between the markets of both fuels. In other words, the variation of prices in one market now has increasingly direct and immediate repercussions on demand in the other. In 2003, only 2.65% of the total number of cars produced in the country ran on biofuels. This percentage rose to around 86% of national production in 2009¹⁵ and 84% of the total of licensed vehicles in the first quarter of 2011¹⁶.

The significant increase in the share of flex fuel vehicles in the national passenger vehicle fleet has increased significantly since 2003 leading to a substantial increase in the demand for hydrated ethanol in the country. In 2010, EHC consumption was 15 million m³ corresponding to 50% of the consumption of gasoline. This demonstrates that gasoline is the main fuel purchased to power light vehicles. Analysis of the consumption of EHC and gasoline in the state of São Paulo, however, shows that, during the same period (2010) the consumption of EHC was 8.3 million m³, whilst that of gasoline was 7.4 million m³. In other words, the consumption of EHC was greater than that of gasoline in the state. This data is significant in that the state of São Paulo has the country's largest fleet of vehicles. Furthermore, as we shall see later, the migration of a substantial portion of EHC consumers in the state to gasoline, as a result of the increase in ethanol prices, was one of the factors responsible for the significant increase in the final gasoline price in the first semester of 2011.

The second mechanism via which variations in the price of ethanol can impact on the price of gasoline sold to the consumer arises from the fact that all gasoline sold to the final consumer in Brazil currently contains 20% of anhydrous ethanol in its composition. It should also be observed that this percentage is not fixed and can vary from 18 to 25% in accordance with the determinations of the Ministry of Agriculture. The gasoline sold to the final consumer in Brazil is therefore a blend of pure gasoline, called gasoline A, with anhydrous ethanol, and is known as gasoline C.

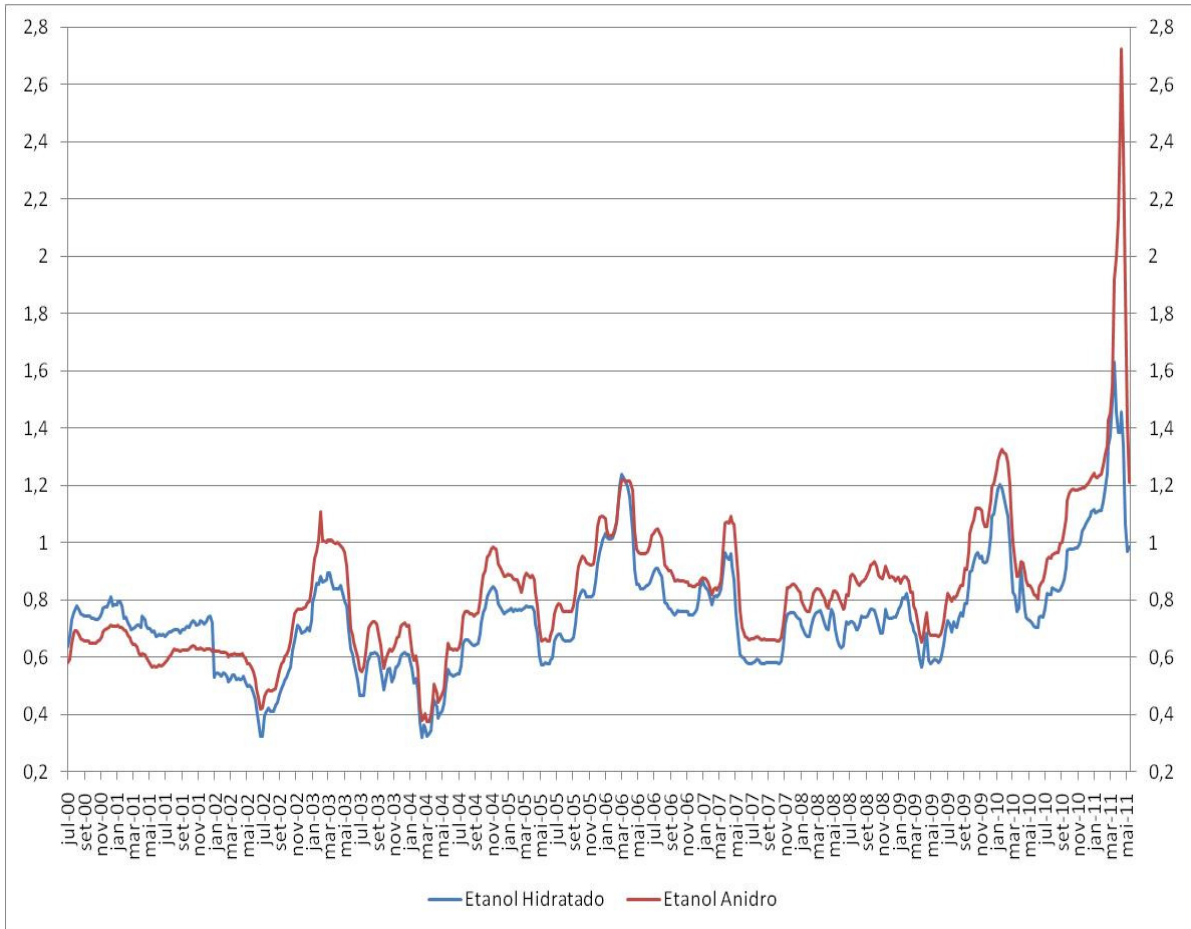
As the possibility of substitution of the demand leads to interdependence of the markets of gasoline and ethanol at the distribution and resale stages, the agents who operated in the production markets of ethanol and sugar are aware of and monitor this interdependence. As such, one factor which influences the prices of ethanol (anhydrous and hydrated) are the prices paid for the supply of said products to markets other than fuel (notably sugar and alcohol destined for non-automotive ends). This occurs not only because the products have the same raw material (sugar cane) but also because they have similar production processes. Other factors which explain the behavior of these prices are the decisions taken by producers in relation to the production volumes of anhydrous ethanol, hydrated ethanol, alcohol for non-automotive use, and sugar, in the light of the operational conditions of each productive unit and climate variables.

As can be seen in Graph 8, which sets out the evolution of monthly production prices of hydrated ethanol fuel and anhydrous ethanol fuel between 2000 and 2011, price variations of EAC and EHC followed trajectories that were relatively similar between 2000 and 2010. However, as from the beginning of 2011, there is an alteration in this behavior pattern with the shifting of price trajectory of anhydrous ethanol compared to that of hydrated ethanol.

¹⁵ Source: Anuário Estatístico 2010 Anfavea, available at <http://www.anfavea.com.br/anuario.html>

¹⁶ Source: Carta ANFAVEA Maio/2011, available at <http://www.anfavea.com.br/cartas/Carta300.pdf>

Graph 8: Monthly Production Prices of EHC and EAC between July/2000 and May/2011 (R\$/liter)

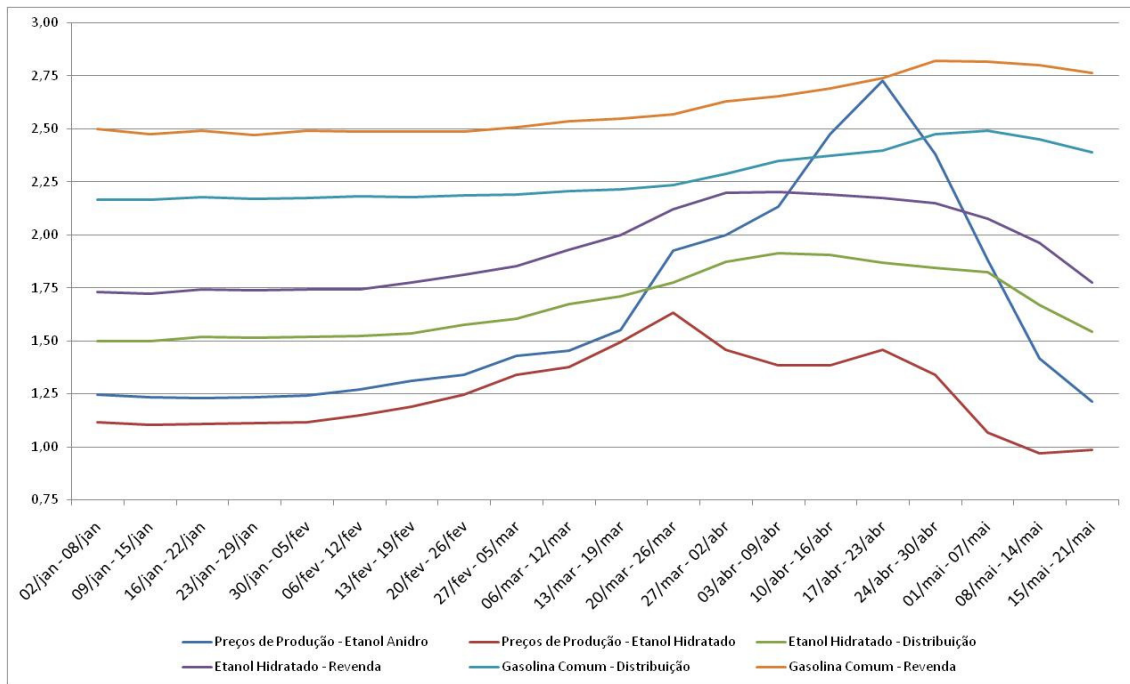


Source: Drawn up by the author on the basis of data from CEPEA/ESALQ/USP.

In observing Graph 8, it can be noted that the average production price of anhydrous ethanol attained R\$ 2.726/l, in the third week of April, which represented an increase of 119% in relation to January de 2011. In this same period, the increase in the average price of hydrated ethanol was 30.65%, reaching a maximum total of R\$ 1.632/l in the third week of March 2011. It is therefore clear that the movement of these prices was atypical and the increments were significantly differentiated.

In particular the average price of anhydrous ethanol outstripped, in mid- April 2011, the weekly average distribution prices of common gasoline (a behavior that had not been observed in previous years), as is illustrated in Graph 9, below.

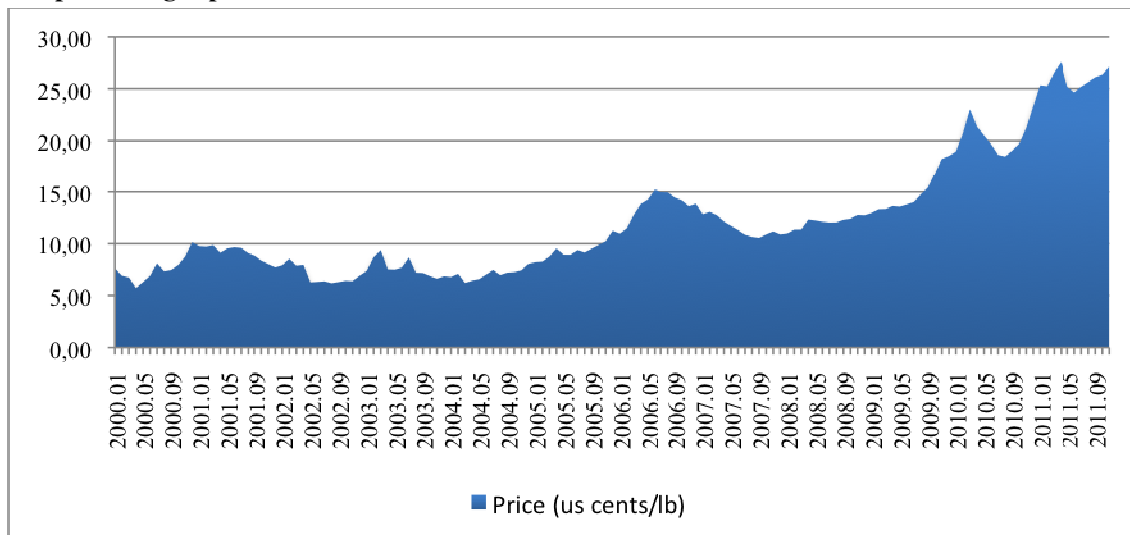
Graph 9: Average production prices of anhydrous and hydrated ethanol and the resale of hydrated ethanol and gasoline C in São Paulo (R\$/liter)



Source: Drawn up by the author on the basis of data from CDC/ANP.

A primary factor that led to the increase in the price of ethanol (anhydrous and hydrated) at the production stage was the increase in sugar prices on the international market. This significantly reduced the economic advantage of directing the production of the plants towards hydrated ethanol. As Graph 10 indicates, sugar prices increased more than 200% over the last decade and about 43% in 2009.

Graph 10: Sugar price behavior in the international market



Source: Drawn up by the author on the basis of data from International Monetary Fund, International Financial Statistics (FMI/IFS)

According to CONAB¹⁷ data, the destination of sugar cane to the production of ethanol in 2010/2011 fell by 0.5%, compared to the previous harvest. The harvesting of sugarcane for sugar

¹⁷ See “Acompanhamento da safra brasileira: cana-de-açúcar, primeiro levantamento, maio/2011”, available at http://www.conab.gov.br/OlalaCMS/uploads/arquivos/11_05_27_11_53_13_boletim_cana_portugues_-_maio_2011_1o_lev..pdf

production, on the other hand, registered an increase of 7.8% in relation to the same period. This shift reduced the supply of ethanol fuel to the market. Additionally, bad weather conditions in the first months of 2011 also contributed to reduce the supply and the yield of sugar cane in the Brazilian market.

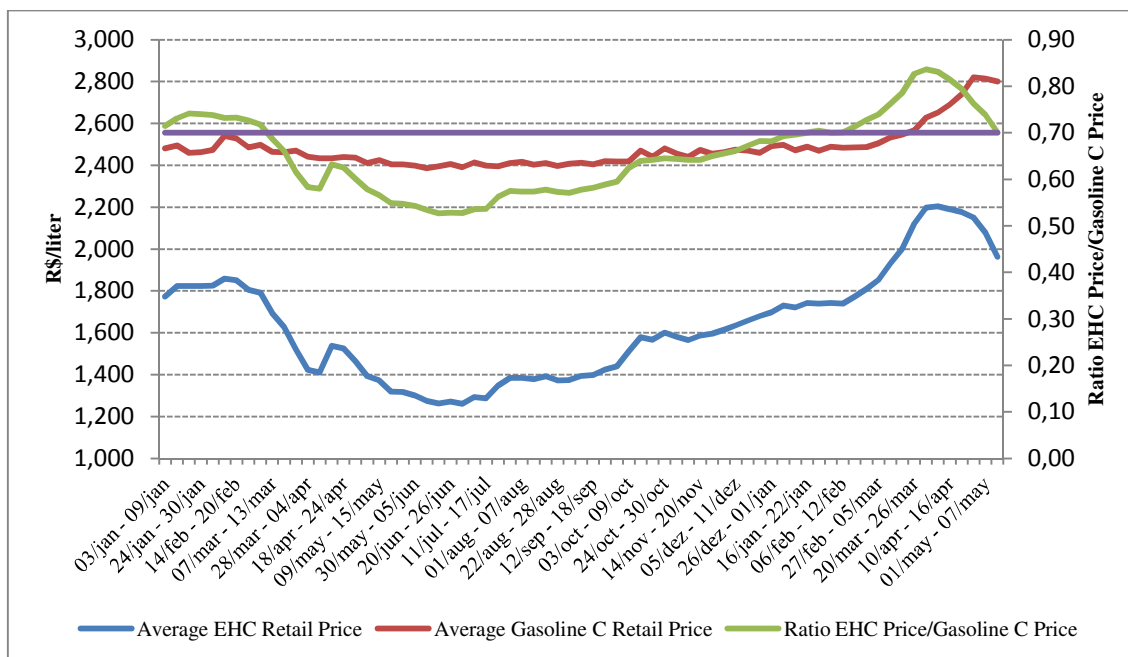
Traditionally, when there are price increases for ethanol in the intercrop periods there are economic incentives for the sugarcane producers to bring forward the harvest, in other words to beginning harvesting the cane before the programmed period so as to make the most of the price increases. The impact of bringing forward the harvest on prices in previous years generally began to be felt between mid- February and March, when prices entered into a trajectory of decline. In 2011, however, heavy rains affected the main production regions in the Center South and disrupted this mechanism of bringing production forward and contributed to increased imbalance between the supply and demand for hydrated ethanol in the country.

Therefore, the supply of anhydrous ethanol suffered severe restriction at this time, due to being in the intercrop period and difficulties in bringing the harvest forward as well as due to the reduction in the volumes produced by plants and a greater than expected increase in demand for automotive gasoline¹⁸. As a consequence the price of anhydrous ethanol increased substantially, giving rise, for the first time, to significant reflexes in the price of gasoline C throughout the country.

Thus, a third determining factor in the behavior of prices of anhydrous ethanol and, consequently, of gasoline C (previously explained in the earlier section), was the response of consumers to the increase in hydrated ethanol prices. This issue requires observation of the evolution of prices for common gasoline and ethanol between January and May of 2011 (see Graph 6). As observed, from mid - March 2011 onwards, the substitution of demand for hydrated ethanol by demand for common gasoline led to slowing down of the trajectory of price increase for the former, whilst the prices of anhydrous ethanol continued upwards.

This behavior is well illustrated in Graph 11, which sets out the relationship between the resale prices of EHC and of gasoline C in São Paulo between January 2010 and May 2011.

Graph 11: Relation between the prices of hydrated ethanol fuel and common automotive gasoline in the state of São Paulo between January and May 2011



Source: Drawn up by the author on the basis of data from CDC/ANP.

¹⁸ It should be noted here that the production of anhydrous ethanol tends to follow the expectations of ethanol producers as to demand for gasoline. As this demand was higher than expected, the effect of the sugarcane intercrop period on the price of anhydrous ethanol intensified.

The limit of 70%¹⁹ between the price of gasoline and hydrated ethanol is indicated broken orange line in the Graph. As Graph 7 indicates, from mid-February onwards, the relationship between the resale prices of EHC and gasoline C favored the consumption of the latter. Consequently, the demand for this fuel increased as more consumers perceived the economic advantage of substitution. This movement generated a response in the prices of hydrated ethanol, which, in the light of a reduction in demand from early April 2011 onwards, receded. This decrease however, was lower than that observed in previous years, when, in general, the sugarcane harvest had already occurred.

The evolution of the resale prices of gasoline C in the first semester of 2011 is, therefore, a reflection on the scarcity of supply of anhydrous ethanol during the intercrop period, in a context of sustained growth of the participation of *flex-fuel* cars in the national fleet of vehicles. This situation was aggravated by the increase in international price quotations for sugar, which encouraged export of the product and therefore, greater production of sugar in detriment to ethanol. It was also aggravated by the difficulties encountered by the economic agents in bringing forward the sugarcane crushing in the second bimester of 2011, which further intensified the shortage of supply of the product at the time of increased demand.

7- The Brazilian government reaction

In order to avoid the risk of a shortage of ethanol and with a view to containing the increase in the price of fuels the Brazilian government introduced emergency measures, such as (i) a temporary reduction in the compulsory percentage blend of anhydrous ethanol a gasoline, which fell from 25% to 18%²⁰ and (ii) permitting the import of ethanol under a differentiated specification. In other words, the government, via the ANP²¹ eased the specification of ethanol fuel to be sold in the country in order to facilitate import for the supply of the internal market.

These measures were mainly temporary and designed to contain any further deterioration in the situation until the sugarcane harvest began and supply of the product returned to normal. The first one was successful, in the sense that it represented an immediate reduction of approximately 158,000 m³ in the anhydrous ethanol demand. The second measure impact should be further examined.

It should also be noted that, given the adverse conditions for the immediate increase of the domestic production of ethanol as well as the restrictions on the capacity for the increase of gasoline by Petrobras, Brazil was forced to recourse to the import of gasoline and ethanol in order to meet the sudden demand for the fuel in the first semester of 2011. In order to better understand the full consequences of this fact it is necessary to evaluate, for the year 2011, the relationship between the price of gasoline A on the international market and the price of this fuel on the national market, as well as the impact the import of significant volumes²² of gasoline A by Petrobras in order to meet demand on the Brazilian market may have had on the internal price of the product.

Initially we will set out a comparison of the of the gasoline A realization price^{23:24} charged by Petrobras and the international reference price of said fuel, both expressed in terms of R\$/l, for the period from January 2008 to May 2011^{25:26}. The result of this comparative exercise can be seen on Graph 12. Observing Graph 12, we can infer that, given the relationship between national and international prices for gasoline A, since January 2011 there is no advantage, in economic terms, to the import by Petrobras of this fuel, particularly if such import were to be of significant volumes on a regular basis. This situation is very similar to that observed between January and August of 2008,

¹⁹ See footnote 10.

²⁰ See Provisional Measure 532/2011.

²¹ See ANP Resolution n° 7/2011.

²² Significant volumes are imports of over 30,000 cubic meters.

²³ Ex-refinery costs (without transport costs) and before taxes.

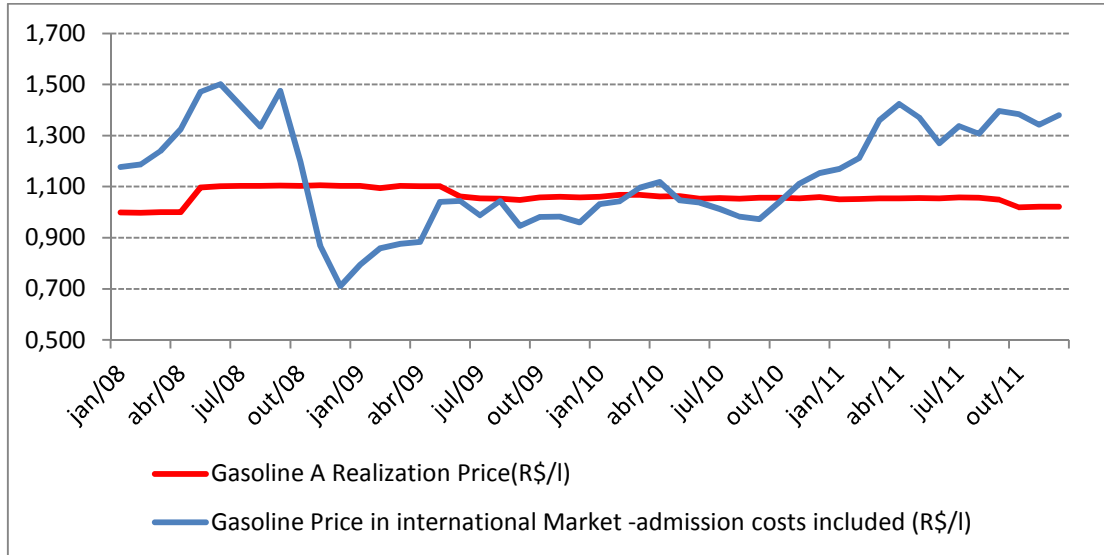
²⁴ Price calculated on the basis of information sent by Petrobras to ANP in accordance with the provisions of ANP Ordinance N°. 297/2001

²⁵ As the reference price for gasoline A we used the simple average of the daily price quotation released by Platts for gasoline with an octane rating of 87 and 93 on the New York market (The Platts reference contracts are NY UNL 87 Cargo and NY UNL 93 Cargo)

²⁶ The amount of R\$ 0.053 was added to the reference value as an estimate of the costs of admission of the product.

when the international market was subject to a trend of rising prices and the internal market maintained price stability of gasoline A prices so that the price relation did not provide any incentive for the import of this product.

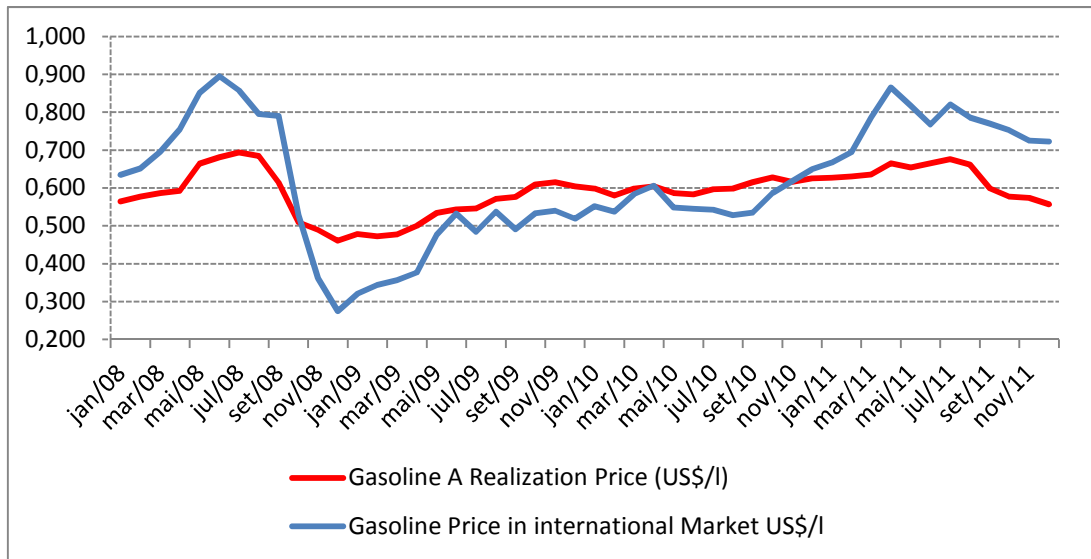
Graph 12: Gasoline Realization Price in Brazil and Gasoline Price in international market – R\$/liter.



Source: Drawn up by the author on the basis of data from Platts and ANP.

In Graph 13, we sought to carry out the same comparative exercise, this time taking into account the prices expressed in US\$/l. The aim was to observe the effect of exchange-rate variation on the Petrobras realization price and the relation of such price with the reference price for the international market. Based on the observation of Graph 13, we can infer that, given the effect of the exchange rate, Brazilian refinery price tends to follow the trend in prices charged on the international market. In periods during which there is major variation in international prices however, it can be seen that there is a substantial gap between the prices charged by Petrobras on the Brazilian market and those practiced on the international market, what could be observed throughout 2011, making gasoline imports for the Brazilian markets unprofitable.

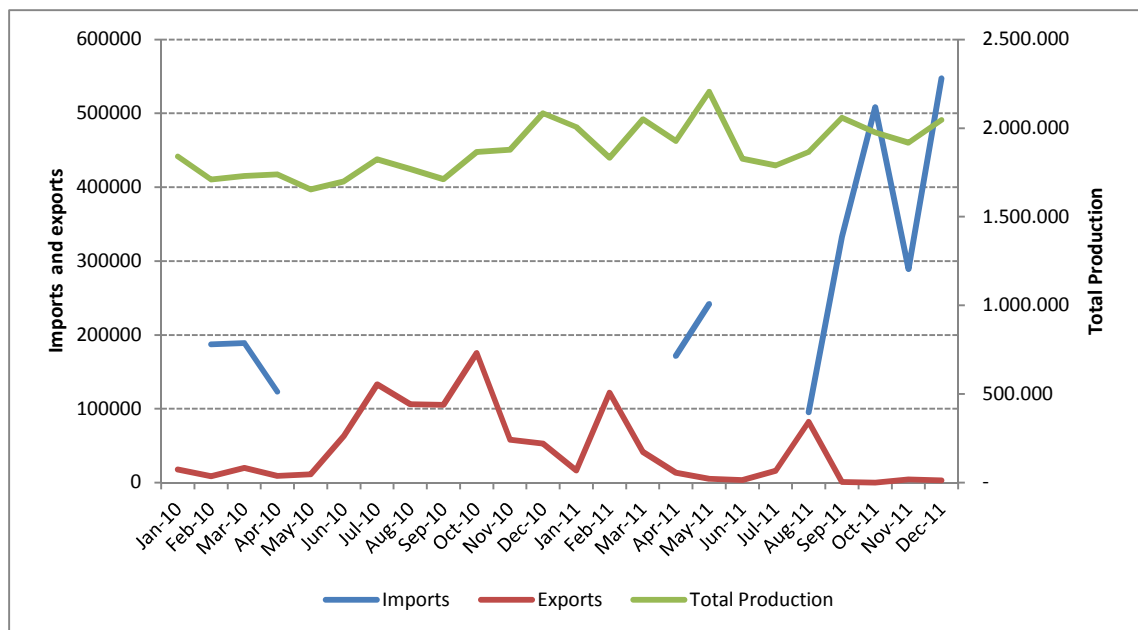
Graph 13: Gasoline Realization Price in Brazil and Gasoline Price in international market – US\$/liter.



Source: Drawn up by the author on the basis of data by Platts and ANP.

The next step in our analysis therefore was to verify the volumes of gasoline effectively imported in 2010 and 2011, as well as the percentage that they represented in the internal supply of this fuel. The objective of this exercise was to evaluate the pressure that the import of gasoline might have on the costs of the company and, on that basis, call for possible review of the policy of price stability currently in force on the domestic market. We started off with the premise that, given the significant share of the market held by Petrobras in the refining of petroleum stage and given the lack of economic attractiveness of gasoline import in 2001, 95% of the volume of imported gasoline in 2011 was imported by Petrobras. Graph 14, synthesizes this data. One piece of primary information extracted is that in the months of February and March 2010 (the period in which the relationship of prices was favorable) the imports represented around 15% of the country’s supply of gasoline A. By April 2011 this percentage was 14%, falling to 7% in May. In August, the volume of imports rose again, reaching 26% and 27% of the volume produced domestically, respectively.

Graph 14: Petrobras estimated gasoline imports and exports between 2010 and 2011 (M³)



Source: Drawn up by the author on the basis of ANP data.

Thus, imports represent a substantial parcel of the internal supply of gasoline in given months of 2011 and occurred so as to meet heightened internal demand (which was not being met by internal supply, even though this supply was increasing) for fuel used in Otto-cycle vehicles. The main reason for the surge in the internal consumption of gasoline A was the migration of consumers of hydrated ethanol to gasoline C. This was particularly true in the state of São Paulo and was due to the increase in the price of EHC in this period. It should also be noted that this shortage of internal supply occurred despite increased national production of Gasoline by Petrobras refineries and had significant impact on retail fuel prices.

It should be noted that, despite being significant, the imports of gasoline A in order to meet internal demand occurred in a sporadic manner: in 2010 (the period in which the price relationship was favorable) 540,000m³ thousand cubic meters were imported between February and April. In 2011 (when the price relationship was unfavorable to imports) 408,000m³ of gasoline A were imported between April and May and 1,773,000,000m³ between August and December 2011. Despite being intermittent over the year, when the imported volumes are compared with the total annual production of fuel, it can be seen that in 2011 it represented around 9% of the total volume produced by the company, whereas in 2010 this proportion was 2.6%, and less than 0.5% in 2009.

On the basis of the above we can conclude that in the event of need for import of significant volumes of gasoline A in order to meet internal demand, Petrobras will do it. However, taking into account the current price levels on the international market, maintaining the realization prices currently charged by the company on the national market will have a negative impact on the profitability for the company of the sale of the product. This may, in turn, give rise to pressure for revision of the current policy of maintaining fuel price stability on the internal market.

VIII - Measures adopted by the government

In spite of the emergency measures that had been taken, it became quite clear that additional government measures would be required if the aim was to minimize the effects in the future of possible imbalances in the ethanol fuel market on the gasoline market. This was particularly relevant given the growth of the share of flex fuel vehicles in the national automotive vehicle fleet.

In this context Provisional Measure MP 532/2011 was introduced and subsequently converted into Law n° 12.490/2011, transferring the production stage of ethanol to the sphere of competence of the ANP. The introduction of Law n° 12.490/2011 therefore represented a major shift in the position of the Brazilian government. Although the government had, in the 1970s, inserted ethanol into the national fuel matrix, it had, since then left production under the regulation of the Ministry of Agriculture. In other words, it was treated as an agricultural product because its raw material was sugarcane. Thus, with passing of the new law, ethanol, which had until then been regulated basically with the agricultural markets in mind was seen as an energy asset that was fundamental for the country. This change of regulatory paradigm has a series of institutional consequences for the industry and required from ANP to set up a new regulatory regime in order to exercise its new duties. It will also need to monitor compliance with the new regulations by the range of agents now falling within the scope of ANP regulation.

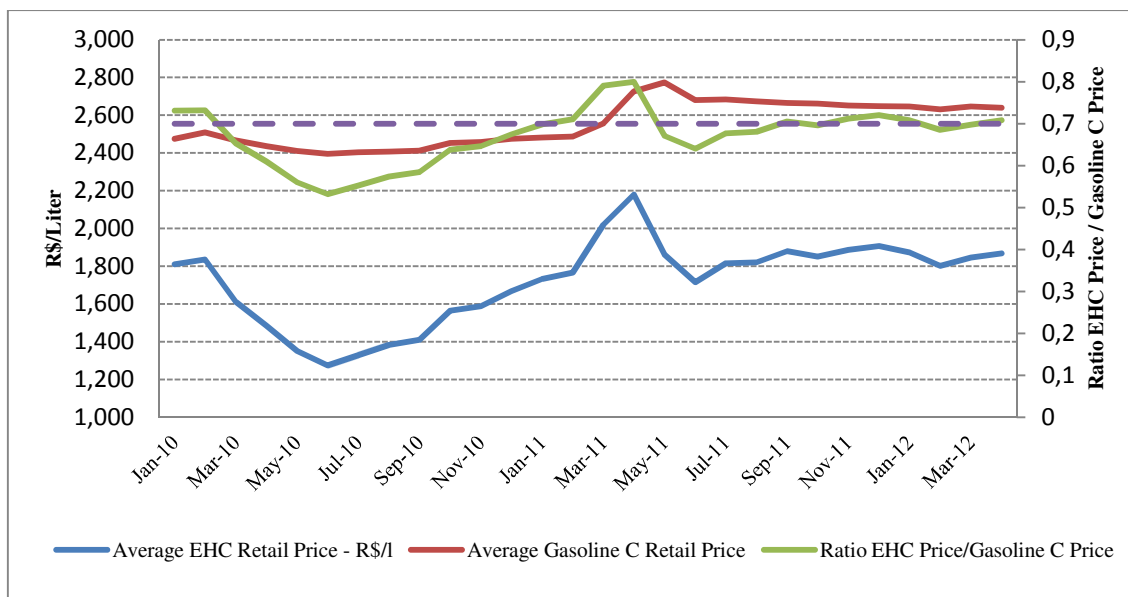
One of the main challenges for the Agency is that of guaranteeing the internal supply of ethanol. Two Resolutions have been drafted to this end (Resolution ANP N°66/2011 and Resolution ANP n°67/2011) and its main provisions include establishing criteria for the acquisition and formation of anhydrous ethanol stocks (in short, the new resolutions provide that distributors should contract in advance anhydrous ethanol and the production plants must maintain ethanol stocks compatible to the expected demand. Proving those contracts will be required for the acquisition of gasoline, and noncompliance to the new regulations would imply heavy fines for those caught with no contracts or low stocks).

It can be seen from these new resolutions, particularly ANP Resolution n° 67, that the focus, at this initial stage at least, will be on minimizing the risk of further shortage in the internal supply of anhydrous ethanol, which makes up 20% of the gasoline sold to the final consumer in Brazil. The increase in the price of anhydrous ethanol was the principal factor responsible for the significant

increase in the price of gasoline experienced in the first semester of 2011 in Brazil.

Given the short period of time that has elapsed since the issue of the Resolution and given the period of time granted by the ANP to enable the economic agents to adapt to the new norms it has not yet been possible to carry out a practical analysis of the efficacy of the new ANP measures in the ethanol fuel market. Gasoline and ethanol price behavior in 2012 has not yet repeated 2011, as shown in graph 15. This result can be most likely attributed, however, to the absence of the factors that lead gasoline prices upwards in 2011 (and not to the impact of the new regulations).

Graph 15: Relation between the prices of hydrated ethanol and common automotive gasoline in São Paulo between January/2010 and April/2012.



Source: Drawn up by the author on the basis of ANP data.

It is therefore noteworthy that on November 1, 2011, Petrobras increased by 10% the price for the internal market of gasoline from its refineries. On the same day, the Brazilian government reduced the CIDE contribution from R\$0.19/l to R\$ 0.091/l, in other words the CIDE was once again used to cushion the impact on the price paid by the final consumer of the variation in fuel prices. In fact consumer prices have remained practically stable. However, given the significant reduction in the value of the federal contribution (CIDE) the government’s power to maintain stability in gasoline prices on the domestic market without substantially affecting the economic interests of Petrobras and its shareholders has been further weakened.

IX – Preliminary Conclusions

As has been indicated in this paper, the increase of ethanol and gasoline C market prices in 2011 was largely due to (partially) unforeseen behaviors of the supply and demand of both fuels. The novelty, at least concerning the Brazilian analysts, was the introduction of a new discussion/problem: prices behavior (particularly the analysis of the structural component of the observed trend) and the (so far not observed) effects of the correlation between the markets (specially the loss of Petrobras’ capacity to influence automotive fuels consumer prices due to, at least in part, an unintended effect of the Brazilian government policy incentives for flex fuel vehicles.

It is important to note that the high levels observed in the prices of hydrated ethanol in Brazil in 2011 may be explained mainly on the basis of typical movements in the market, such as: seasonality in the production of ethanol, given the existence of sugarcane intercrop periods, the increase in

demand in recent years due principally to the significant growth of the fleet of biofuel fuels and of opportunities to export sugar in a period of high prices on the international market.

Regarding the behavior of gasoline distribution and retail prices in early 2011, it can be explained (i) by the increase in the volume of gasoline C consumed, particularly in the state of São Paulo, where, as a result of the significant increase in the price of hydrated ethanol fuel in the sugarcane intercrop period, there was a major migration of consumers to gasoline C, particularly from mid -February/11 onwards; and (ii) by the significant increase (119.04%) in the price of anhydrous ethanol fuel, between the first week of January 2011 and the third week of April of the same year, as a result of the sudden pressure from demand facing a short term inelastic offer, since production could not be expanded for climatic reasons (in other years supply could be increased in the short term by bringing forward the sugarcane harvest).

In May 2011, with the beginning of the sugarcane harvest, a downward price movement began in the country, with the average resale prices for hydrated ethanol decreasing 14.02% and those of common gasoline decreasing 3.47% between the first and last week of May/2011. However, ethanol prices remained, throughout the year 2011, still high when compared to previous years (since there were still supply constraints and high international prices for sugar and non fuel ethanol pushing fuel ethanol prices upwards).

In closing it is important to highlight the fact that Provisional Measure 532/2011, of April 28, 2011, subsequently converted into Law n° 12.490/2011 conferred on the ANP competence to regulate and monitor the national production of ethanol. Putting this into practice, however, required a series of fresh regulations, which were issued throughout 2011. Therefore, the practical effects of the regulatory measures and their impact on the behavior of fuel prices in Brazil have yet to be observed.

As Almeida (2012)²⁷ points out, after the discovery of Pre Salt oil areas, Brazil found itself facing the political temptation of keeping domestic fuel prices consistently below those prevailing in the international market. Most oil-exporting countries yielded to this temptation, bringing large negative impacts to their economic and energy policy. An analysis of the current Brazilian political scene indicates that in the duel between "inflation controls" versus "rational pricing policy", the first seems to be taking advantage. However, as indicated in this paper, considering the growing demand (and pricing) correlation between gasoline and ethanol Brazilian markets, the artificial maintenance of automotive fuel price levels may prove increasingly difficult, if not impossible (at least in the manner adopted so far).

²⁷ Almeida, Edmar de. (2012) *A encruzilhada da política de precificação dos combustíveis no Brasil*. Available in <http://infopetro.wordpress.com/2012/03/05/a-encruzilhada-da-politica-de-precificacao-dos-combustiveis-no-brasil/> (accessed in April 21, 2012).