

Determinants of fuel price control in Brazil and price policy options

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Resumo— A abertura do mercado brasileiro levou a liberalização dos preços de derivados de petróleo no início dos anos 2000. No entanto, na prática, o governo tem influenciado indiretamente os preços da gasolina, diesel e GLP através do controle que exerce sobre a Petrobras.

Os resultados do modelo proposto para comparação dos preços domésticos com os preços de referência internacionais, mostram um desalinhamento dos preços internos dos derivados entre 2011 e 2014. Os preços externos situaram-se em patamares superiores durante quase todo o período. As perdas da Petrobras com esta política de preços foram estimadas levando-se em conta as perdas diretas com importação de derivados e a renúncia de receitas de vendas desses derivados aos preços domésticos. Esse desalinhamento dos preços pode explicar parte da deterioração financeira da Petrobras desde 2011. A política de preços também teve um impacto negativo nas condições de investimento no refino.

Assim, este artigo conclui que é necessário desenvolver uma política alternativa para os preços dos derivados no Brasil. Considerando-se que a total liberalização dos preços é politicamente inviável no contexto atual, outros mecanismos, como fundos de estabilização, são propostos para garantir uma forma de precificação mais transparente.

Palavras Chave—preços dos derivados, indústria de petróleo, Petrobras, política de preços.

Abstract—The Brazilian economic liberalization in the 1990s led to oil products price deregulation in the beginning of the 2000s. Nevertheless, in practice, the government has been indirectly controlling gasoline, diesel and LPG prices through Petrobras, state owned company.

The comparison of Brazilian oil products prices with international reference price between 2011 to 2014 has shown that domestic prices were set at a lower level during most of the period. Petrobras experienced financial losses by importing products at a higher price than it was able to sell in Brazil. In addition, the company lost revenues by selling the domestic production at lower than international prices. The revenue losses relating to the price controls can explain most of its financial deterioration since 2011. Price policy also had a negative impact on downstream investment.

It is essential to design a new fuel pricing policy for Brazil. Since a market-based approach is politically unfeasible, other price smoothing mechanism such as a fuel price stabilization fund was analyzed and proposed to transparent pricing for gasoline, diesel and LPG.

Keywords—fuel prices, oil industry, Petrobras, price policy.

1. OVERVIEW

Fuel prices are deregulated since 2002 in Brazil. However, the government has been using indirect price controls to prevent energy prices to rise and, therefore, avoid inflationary pressure. Since the government is Petrobras' controlling shareholder, it can influence oil products prices and cushion the impact of international fuel prices volatility on domestic prices. Ex-refinery prices have been recently adjusted upwards at the refinery gate. Nonetheless, domestic prices remained lower than the international prices between 2011 and 2014.

This pricing policy has inflicted financial losses upon Petrobras and on the downstream structure of the oil industry. Besides compromising Petrobras' investment capacity, it constrains private downstream investment. This context highlights the need to develop a new fuel price policy to Brazil.

This paper aims to analyze how recent price policy control for gasoline, diesel and LPG affects Petrobras and downstream investment decisions. In this sense, alternative price policies for these fuels are discussed.

In addition to this introduction, that will present gasoline, diesel and LPG price composition and the evolution of their market in Brazil, this paper is divided in four other sessions. The second session presents the methodology of the paper. The third session describes the results. The fourth session proposes price policy options and the last session concludes this paper.

1.1 FUEL PRICES IN BRAZIL

Brazilian market liberalization occurred in the nineties and included Petrobras opening its capital and gradual subsidy removal from fuel prices. This led to oil products price liberalization, effectively concluded in 2002 (COLOMER e TAVARES, 2012). In addition, the 9.478 Act (Petroleum Law) established in 1997 introduced competition by defining that Petrobras should carry out its economic

activities under free competition with other companies in the oil industry.

As shown in **Figure 1**, fuel production costs is the main component of the retail price of gasoline, diesel and LPG. The fuels retail prices also include taxes (accounting for 34% of gasoline prices; 20% of diesel price and 17% of LPG price), freight costs, retail and distribution margins. Regarding gasoline and diesel, their retail prices also include ethanol and biodiesel prices (FECOMBUSTÍVEIS, 2014).

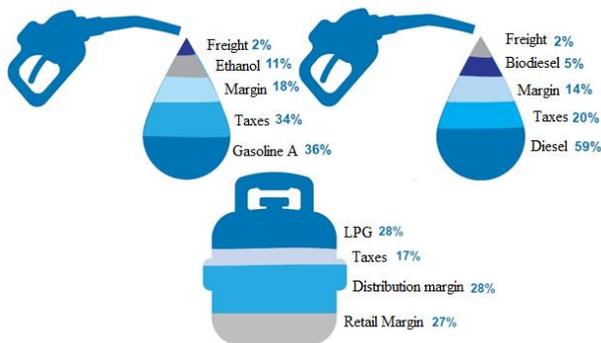


Figure 1. Components of the retail prices of gasoline, diesel and LPG (FECOMBUSTÍVEIS, 2014)

There is officially no government control of fuel prices in Brazil since 2002. However since Petrobras owns almost total refining capacity in Brazil and imports about 100% of these fuels (ANP, 2014), in practice the company is responsible for supplying the domestic market and therefore, determines domestic prices.

Petrobras' price policy is determined by the principles and goals defined by its administrative council. Federal government owns the majority of company's shares and nominate most of its board of directors.

Pricing methodology and parameters are internal to the company and it is up to the administrative council to judge its effectiveness.

While residential LPG price was not adjusted between 2011 and 2014 and industrial LPG prices were adjusted only by the end of 2014, gasoline A¹ and diesel prices were adjusted several times in the refinery gate. The comparison of domestic prices with the international benchmarks prices has shown that domestic prices remained below international prices between 2011 until the end of 2014 (**Table 1**).

Table 1. Price adjustments between 2011 e 2014 (Petrobras, 2014)

Year	Month	Adjustments		
		Diesel	Gasoline	Industrial LPG
2011	November	2%	10%	-
2012	June	3.94%	7.83%	-
	July	6%	-	-
2013	January	5.40%	6.60%	-
	March	5%	-	-
2014	November	8%	4%	-
	December	3%	5%	-
		-	-	15%

1.2 GASOLINE, DIESEL AND LPG MARKETS

While LPG demand have been stagnated, gasoline and diesel demand have been increasing fast in the last five years. On the other hand, domestic supply has not accompanied demand growth, resulting in a higher import dependency.

Gasoline market has been affected by the increase of flex fuel cars fleet since 2003. This structural change means that the performance of the ethanol industry has become a relevant factor to influence the demand for gasoline, besides other traditional variables such as consumers' income and gasoline price (ANP, 2013).

In this sense, sales of gasoline C were low until 2010 due to higher ethanol production and sales. Therefore, the year of 2010 presents a new trend for gasoline demand. This increase was stimulated by the rise of vehicles fleet and by the poor performance of ethanol industry since 2010, which has raised the price for hydrated ethanol, the competing fuel of gasoline. Even the strong growth of gasoline production in 2010 was not enough to meet demand, resulting in imports expansion (FECOMBUSTÍVEIS, 2013).

In 2011 demand continued to grow, leading to an increase in gasoline imports. Petrobras was not prepared to increase production of gasoline in its refineries. Since ethanol industry had performed well in 2009, the company had focused on diesel production in its new refineries. In 2011, gasoline imports were higher than exports for the first time since price liberalization. In 2012 and 2013 gasoline sales continued to grow, but imports didn't grow as fast as the previous years due to efficiency

¹ Gasoline A is added with anhydrous ethanol to form gasoline C which is sold at gas stations

improvements in Petrobras’ refineries and an increase of the proportion of anidrous ethanol in gasoline C (from 20% to 25% in May 2013) (FECOMBUSTÍVEIS, 2013). The volume of gasoline A sales, as well as its production and exports are presented in **Figure 2** below.

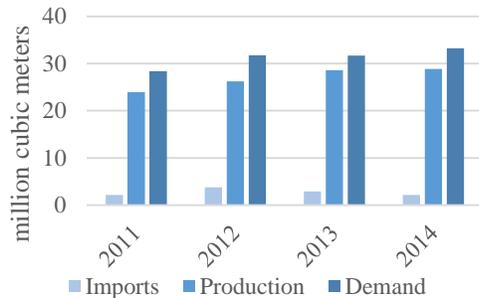


Figure 2. Gasoline imports, production and sales (ANP, 2014)

Diesel consumption pace in Brazil usually follows economic growth. Although, from 2010 on, diesel sales increase became independent from PIB growth. In this year, sales were influenced also by the low sulfur diesel that would enter the market.

Demand growth had a significant impact on the balance trade since imports had to meet the growing demand.

Diesel imports have been increasing since 2010 and reached the highest level in 2011 (9.3 million cubic meters). In 2012, efforts to improve efficiency in Petrobras’ units resulted in a reduction of diesel imports in 2012 and 2013 (**Figure 3**). The National Federation for Fuel and Lubricants Commerce (FECOMBUSTÍVEIS, 2013) hopes imports will be even lower when the new refineries begin to operate.

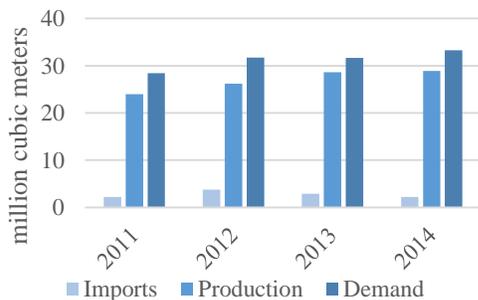


Figure 3. Diesel imports, production and sales (ANP, 2014)

LPG consumption has been growing slowly in the last years (**Figure 4**). In 2010 LPG demand grew 3.7% and was even lower in the following years due

to low economic growth and to decrease in home cooking (major use of Residential LPG). It should be highlighted that most people already have access to LPG and that it has been replaced by natural gas in the commercial and industrial sector (FECOMBUSTÍVEIS, 2013). Nevertheless, Brazilian domestic LPG production is not enough to meet demand.

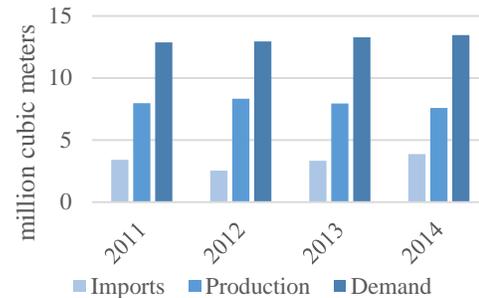


Figure 4. LPG imports, production and sales (ANP, 2014)

2. METHODOLOGY

Domestic prices were compared to international prices considering the FOB prices at the Brazilian refinery gates (ex-refinery), the international reference price and imports prices.

Gasoline, diesel and LPG ex-refinery prices were obtained from the Fuel Market Monthly Reports provided by the Ministry of Mining and Energy (MME, 2014). Reference international prices were defined according to US Gulf regular gasoline and low sulfur diesel prices and propane *Mont Belvieu* provided by the Energy Information Administration (EIA, 2014). Import prices were estimated by data provided by the Secretariat of International Trade (SECEX, 2014). Reference international prices and import prices were adjusted considering the costs internalization (freight and taxes) for each oil product, as estimated by MME (2014). Therefore, oil products ex-refinery prices plus internalization costs make up International Parity Prices.

In spite of being broadly used in studies about fuel price alignment, international reference prices are not always the actual price paid by Petrobras when the company actually imports fuel. Therefore, this paper contributes to the analysis of the impacts of fuel price policy on the downstream since it also uses actual imports prices. The purpose of this paper when analyzing the economic impact of fuel prices misalignment on Petrobras is to evaluate financial losses from two perspectives. The first one estimates the financial impacts due to Petrobras importing

fuels at a higher price than it sells in Brazil since 2011. This is made by multiplying the average monthly import prices by the volume imported in each month. The negative impact of fuel prices misalignment is also associated with Petrobras' revenue losses when the company sells fuels at prices below international prices. In this case, international reference prices are used, since they would be the target if prices would move according to international market prices. In addition, financial indicators published from Petrobras (Petrobras, 2014) will be presented.

Impacts on the downstream of oil industry are analyzed in terms of attractiveness to invest on refining capacity considering the current sector concentration.

Alternative pricing mechanisms to Brazil are discussed according to international experience, by assessing liberalized markets, regulated markets and their policies.

3. RESULTS

3.1 DOMESTIC AND INTERNATIONAL PRICES EVOLUTION

It can be observed a trend for increase in gasoline prices after 2011 until 2014. International reference and import prices were above the domestic price until the end of 2014 (Figure 5). By November 2014 international prices begins to fall sharply and become lower than domestic prices.

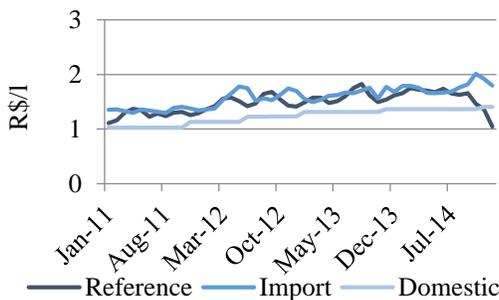


Figure 5. Gasoline price evolution (ANP, 2014; EIA, 2014)

Diesel prices evolution is similar to gasoline's trend, since international and imports prices was at a higher level than domestic prices until the end of 2014. As can be seen in Figure 6 there has been seven price adjustments in the period but domestic prices remained lower with the exception of the last two months of 2014.

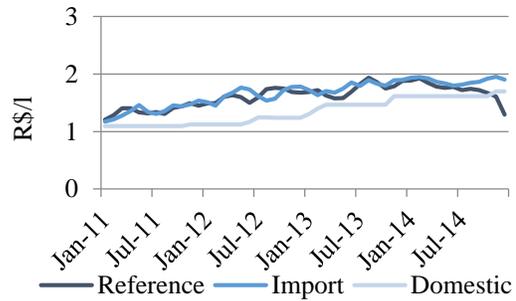


Figure 6. Diesel prices evolution (ANP, 2014; EIA, 2014)

In relation to LPG, not only domestic prices were different from reference and import prices, but also the international price trend was at different levels from import prices. Import prices were higher than reference and domestic prices. Reference prices were lower than the Industrial LPG domestic price between January 2012 and August 2013 and after June 2014. By the end of 2014 reference prices were at the level of Residential LPG domestic prices.

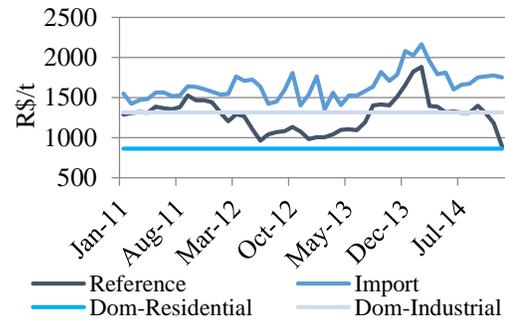


Figure 7. GLP price evolution (ANP, 2014; EIA, 2014)

3.2 IMPACTS OF PRICE CONTROL POLICY ON PETROBRAS

Diesel imports caused greater losses to Petrobras between 2011 and 2013. In 2014, LPG imports were responsible for the greater negative financial impact on Petrobras. Overall, the highest losses with fuels imports occurred in 2014, followed by 2012 and then 2013 (Figure 8).

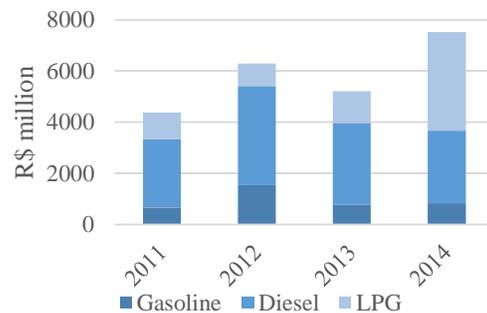


Figure 8. Import losses (Author's own elaboration)

Table 2 presents the sum and present value (considering a 10%/year return rate) of Petrobras' losses when importing fuels. From 2011 to 2014 Petrobras lost over R\$ 23 billion by importing gasoline, diesel and LPG at higher prices than it sells domestically. Considering Petrobras could have invested this amount in an alternative project the company's financial loss would be even greater and about R\$ 32 billion.

Table 2. Import losses 2011-2014 (R\$ million)

	Gasoline	Diesel	LPG	Total
Sum	3,808	12,569	7,020	23,396
Present Value	5,299	18,148	9,057	32,504

Regarding Petrobras' revenue losses, diesel was also the most damaging fuel between 2011 and 2013, followed by gasoline and LPG. In 2014, gasoline was responsible for the highest negative impact on the company's revenue. The year of 2012 was the worst in terms of revenue losses as whole (**Figure 9**).

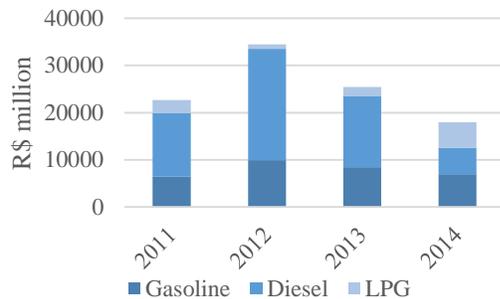


Figure 9. Revenue losses (Author's own elaboration)

According to **Table 3** Petrobras' sales revenues could be R\$ 100 billion higher if it had sold fuels at the international parity price. Considering that the company could have applied this amount in an alternative project, Petrobras had a negative financial impact of over R\$130 billion between 2011 and 2014.

Table 3. Revenue losses, 2011-2014 (R\$ million)

	Gasoline	Diesel	LPG	Total
Sum	31,748	57,716	11,032	100,496
Present Value	28,295	86,582	16,083	130,960

The economic impact fuel imports and sales had on Petrobras are reflected in the company's financial indicators. As shown in **Figure 10** Petrobras' debt increased in 70% from 2011 to 2013. Barbosa (2013) shows that Petrobras' net debt increase was even

higher and doubled between 2011 and 2013. In absolute values total debt and net debt rose by R\$ 100 billion from 2011 to 2013.

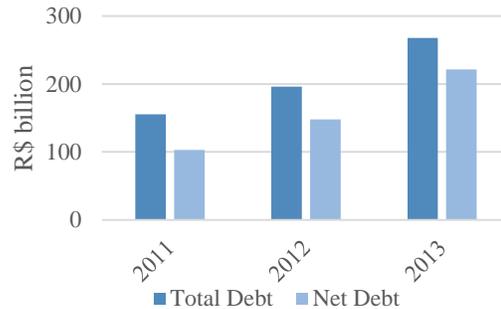


Figure 10. Petrobras' total debt and net debt (2011-2013) – (Barbosa, 2014)

Figure 11 shows a financial index for Petrobras. From 2011 and 2013, the index increased over two times due to cash generation insufficient to meet the investment needs. One of the reasons for the low cash generation in the period was the price misalignment for oil products.

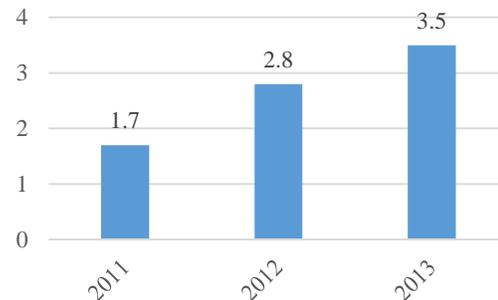


Figure 11. NetDebt/AdjustedEBITDA Index (2011-2013) – (Barbosa, 2014)

Considering the net result by business sector, it is clear that the financial deterioration of Petrobras is due to its weak financial performance in its refining and supply division. By analyzing the year of 2012, when the company had the lowest performance, it can be concluded that Petrobras' net profit was lower than the financial loss the company had on its refining and supply division (**Table 4**).

Table 4. Net Result by Petrobras' business division 2010-2014 (R\$ million) – (Petrobras, 2014)

Segment	2010	2011	2012	2013	2014*
E&P	29.558	40.575	45.452	42.266	21.447
Refining&Supply	3.796	-9.970	-22.931	-17.764	-8.691
Gas&Energy	1.247	3.138	1.733	1.387	1.217
Biofuel	-92	-157	-218	-254	-141

Distribution	1.276	1.175	1.793	1.843	956
International	1.398	1.967	1.436	3.775	1.143
Total	35.881	33.110	20.959	23.007	10.977

*Second trimester

Additionally, Petrobras' market value was reduced as of 2010, reversing the growth trend from the previous year. As shown in **Figure 12**, between 2010 and 2013, the company's market value decreased 43%.

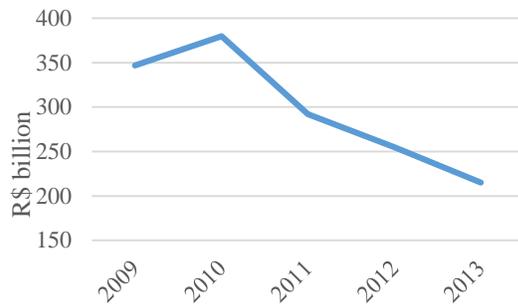


Figure 12. Petrobras' market value (Petrobras, 2014)

3.2 IMPACTS ON DOWNSTREAM INVESTMENT

Downstream of oil industry in Brazil is affected by the current price policy, especially regarding the refining sector. As Petrobras is responsible for almost all the refining capacity in the country, the company's price policy defines domestic fuel prices and, therefore, has an effect on the refining margins (COLOMER e TAVARES, 2012). Besides uncertainties arising from the pricing policy, domestic fuel prices misalignment causes Brazilian refining margins to squeeze when comparing to international margins. Thereafter, refining in Brazil is not attractive for other companies to invest (ACCIOLI e MONTEIRO, 2013).

As highlighted by Funke (2012), major refining investments in Brazil were made in the decade of 1980. From 2000 on, Petrobras initiated an effort to increase national refining capacity, through the following projects: Abreu Lima (Pernambuco), Comperj (Rio de Janeiro)².

Whereas, according to the Energy Research Company (EPE, 2014) Brazil will only become fuel self-sufficient in 2019, and in the case of gasoline, not before 2023 (even considering the increase in ethanol production). In turn, Petrobras' Strategic

Plan 2030 (2014) forecasts that the balance between supply and demand will happen only in 2020. It should be noted that EPE's and Petrobras's estimates were made before Petrobras canceled two refineries projects at the beginning of 2015.

Petrobras being the sole company to invest in refining results in refining capacity growth below demand pace, leading to higher external dependency. National refining capacity has grown at an average 1.1% rate per year between 2002 and 2013 (**Figure 13**).

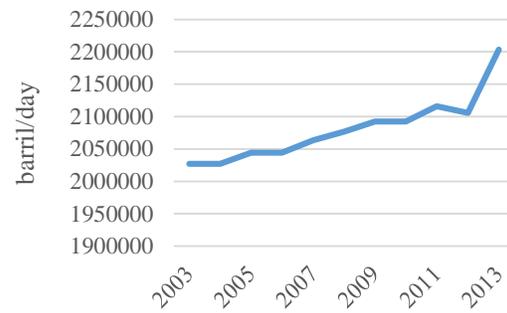


Figure 13. Refining capacity evolution (ANP, 2014)

Even though the fuel distribution segment is less concentrated than the refining sector, Petrobras also play an important role. With regard gasoline and diesel distribution, the company accounted for the highest market share (29% for gasoline and 40% for diesel distribution) by means of its subsidiary (BR Distribuidora). Concerning LPG distribution, Petrobras held the second position in relation to its market share. Liquigás, a Petrobras subsidiary for LPG distribution was responsible for 22% of LPG distribution in Brazil (**Table 5**).

Table 5. Major distributors' shares in the gasoline, diesel and LPG distribution market. (ANP, 2014b)

Oil Product	Distributor	2010	2011	2012	2013
Gasoline C	BR	30%	30%	29%	29%
	Ipiranga	20%	20%	20%	21%
	Shell*	11%	17%	16%	16%
	Cosan*	7%			
	Alesat	6%	5%	5%	6%
	Total	2%	2%	2%	2%
Diesel	BR	41%	40%	39%	37%
	Ipiranga	22%	23%	23%	23%
	Shell*	10%	15%	14%	15%
	Cosan*	6%			

² In the beginning of 2015 Petrobras gave up two other refinery projects Premium I (Maranhão) e Premium II (Ceará).

Diesel	Alesat	3%	3%	3%	3%
	Sabba	2%	2%	2%	2%
LPG	Ultragaz	23%	23%	23%	23%
	Liquigás	22%	23%	23%	23%
	SHV Gas	22%	21%	21%	21%
	Nacional Gás	19%	19%	19%	19%
	Copagaz	7%	8%	8%	8%
	Consigaz	2%	2%	3%	3%

In contrast, retail market in Brazil can be considered as a competitive structure. **Table 6** shows retailers with Petrobras brand (Br Distribuidora) were responsible for 20% of the market share. Off-brand³ gas stations account for the highest market share in the gasoline and diesel retail market.

Table 6. Major retailers' shares in the gasoline and diesel retail market. (ANP, 2014b)

	2010	2011	2012	2013
Off-brand	43.6%	43.3%	42.3%	40.7%
BR	19.9%	19.9%	19.9%	20.0%
Ipiranga	13.4%	13.8%	14.2%	14.8%
Shell*	5.8%	9.5%	9.8%	10.0%
Cosan*	4.0%			
Alesat	3.6%	3.6%	3.7%	3.8%

*Cosan and Shell formed a joint venture in 2011 called Raizen

While the retail market is a competitive segment of the downstream in Brazil, the distribution has an oligopolistic structure and the refining depends mostly on Petrobras' activities. After over a decade of market liberalization, domestic supply still relies on Petrobras, either by the company's imports or by its production at the refineries. This context has significant implications to market structure and competition. Competition could be stimulated by increasing the number of participants in imports or in refining activities. Although, if a company decides to compete with Petrobras by importing oil products, it would face prices misalignment, and therefore, the risk of obtaining a negative refining margin.

In addition, there is an entry barrier related to the scale necessary to operate in the national oil products market. A new entrant focused in a local market would face an established company large enough to cover the national market and retaliate the new

entrant. Therefore, no potential entrant would take the risk to import and dispute market share with Petrobras.

As an alternative, potential entrants could also enter the market by buying Petrobras shares on its refineries or by building new refineries. In this case, the current price policy represents the major risk to new entrants. Fuel price policy based on government policy to control inflation combined with the dominant position of Petrobras in the oil refining in Brazil, has resulted in constrained investments in refining capacity. Therefore, by keeping the current price policy, the downstream sector will tend to be even more concentrated.

This context leads the Brazilian market to a situation in which foreign companies produce and export oil from Brazil and monetizes it in a better condition than Petrobras. This is expected to happen more intensely since the upstream is relatively more open to other companies and Brazil's oil production tends to increase in the future.

4. PRICE POLICY OPTIONS

Canadian and North American fuel markets can be considered competitive markets. In Brazil, there is a political barrier to align domestic prices to international prices, since it would turn internal prices vulnerable to international volatility.

On the other hand, international experience shows that a number of developing countries controls fuel prices in some way. They include measures such as stabilization funds that may be combined or not with pricing formulas (price bands, moving average, etc.) in order to smooth domestic prices volatility prices⁴. This section will briefly describe the Canadian and North American market. In the sequence, the Chilean and Peruvian attempt to control fuel prices will be presented.

As discussed before, it is clear that there is a need to consider a different pricing mechanism to Brazil. The pricing policy should avoid subsidies by the government and allow predictability to price changes. In this sense, it will be possible to reduce investment risks to potential entrants on refining market.

³ Off-brand gas stations are not bound to distributors and purchase from whichever distributor offers the best price or best payment term. There are also groups owning gas stations with different brands.

⁴ It is worth highlighting international oil and oil products prices volatility were low as from 2010. Therefore, international prices volatility was not the most important issue driving price policies at least until the end of 2014.

4.1 COMPETITIVE MARKETS

Besides Canada and the United States, there are competitive fuel markets in developing countries. Developing countries usually shows instability as regards to the price police adopted, especially after mid 2009 when oil prices began to rise steadily. At this time, various developing countries slowed down their reforming process or even reversed their course towards price deregulation by establishing some pricing mechanism (KOJIMA, 2013).

6.2.1 Developing countries

From the 65 developing countries reviewed by Kojima (2013), only Cambodia, Guatemala, Turkey and Uganda did not control price. The author presents (KOJIMA, 2013) the pass through coefficient, calculated as:

$$\frac{(\text{retail price}_{\text{jun2012}} - \text{retail price}_{\text{dec2008}})}{(\text{reference price}_{\text{jun2012}} - \text{reference price}_{\text{dec2008}})}$$

In this equation, fuel prices are expressed in current US dollars and the reference world prices are FOB prices in the relevant international market. The price difference between the two periods is sufficient to allow governments to adjust prices and should be sufficiently large to reduce the noise in the data relative to other factors.

Where governments conduct frequent retail price surveys and post them on the Web, Kojima (2013) uses monthly average prices.

For countries with price control, official prices averaged over the month are used, even if black market prices were markedly higher. Lastly, when fuel is subsidized, the subsidized prices are used (KOJIMA, 2013).

Table 7 summarizes the results for countries with deregulated retail prices (Cambodia, Guatemala, Turkey and Uganda) and Brazil.

Table 7. Pass-through coefficient from international fuel prices to domestic prices – selected countries 2009 to 2012 (Kojima, 2013)

Country	Gasoline	Diesel	GLP
Cambodia	133	142	155
Guatemala	101	100	11
Turkey	127	175	165
Uganda	12	14	209
Brazil	57	30	199

Cambodia e Turkey had the highest coefficients. Turkey had the highest retail prices for gasoline and diesel, and the third highest for LPG, in part because of its high taxes (49% of the retail price for gasoline,

39% for diesel and 32% for LPG for residential consumers) (IEA 2012).

The government of Guatemala highlights on its Web site the filling stations with the lowest prices in different areas with their addresses and street maps every week.

Prices are deregulated in Uganda, and its pass-through coefficients were relatively low. Serious fuel shortages (due to factors in Kenya such as disruption of road and railway transit cargo, pipeline leaks, pipeline and refinery outages, delays in unloading of imported fuels, and slow customs clearance) in January 2009 (base year for the coefficient estimates) appeared to have given rise to lower pass-through coefficients.

The comparison between Brazil and competitive markets shows the Brazilian pass-through coefficient is relatively low for a deregulated market. Canada and the United States have not only deregulated markets, but also historically competitive markets and, therefore, are representative to understand fuel markets in this context.

6.2.2 Canada

Canada is committed to a market-based approach to determine prices for crude oil and fuels. Since 1985, under the terms of the Western Accord, government relies upon competitive markets to determine prices. Removal of price controls would give more accurate information to producers regarding their investment decisions and inform consumers about the value of the fuels they use and whether they need to adjust consumption (CANADÁ, 2014).

Additionally, international agreements, such as the North American Free Trade Agreement (NAFTA), require that Canadian producers offer their crude oil to our trading partners on the same terms they are offered to Canadian refiners. Therefore, in a competitive market Canadian producers are free to sell their oil on the world market and are not required to accept a lower price from Canadian or NAFTA refineries (CANADA, 2014).

With the exception of a national emergency, the Government of Canada has no jurisdiction over the direct regulation of retail fuel prices. Only the provinces have that authority.

According to the Canadian government (2014), evidence suggests that while making prices more stable, prices regulation does not lead to lower fuel prices for consumers (CANADA, 2014).

Retail fuel prices in Canada (2014) are composed by the cost of crude oil, transportation costs incurred to deliver gasoline to retail outlets, refining and marketing costs and margins, inventory levels and local supply problems.

6.2.3 United States

Oil products market is also deregulated in the United States. Fuel prices are mostly influenced by crude oil prices and are composed by the same factors as the Canadian prices.

According to EIA (2014b) the retail price of diesel and gasoline includes costs of crude oil, refinery processing, marketing and distribution, retail station operation and taxes (**Figure 14**)

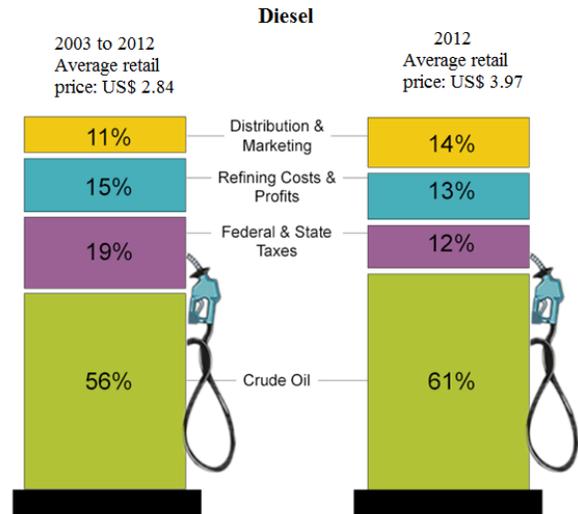
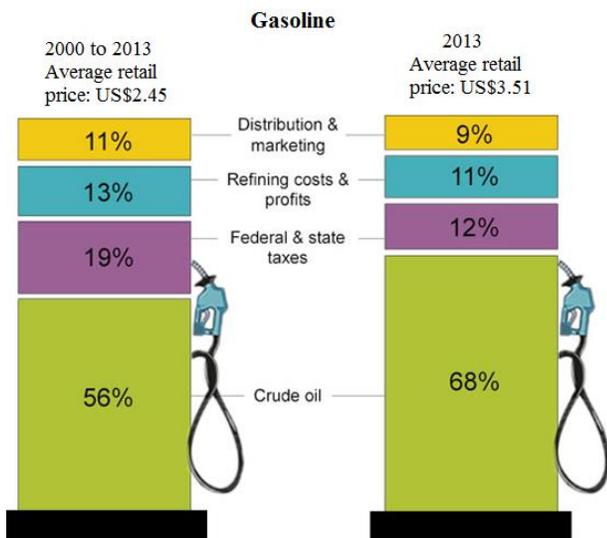


Figure 14. Diesel and gasoline price composition in the U.S. (per gallon) (EIA, 2015)

In the United States some retail outlets are owned and operated by refiners, while others are independent businesses that purchase gasoline from refiners and for resale.

Historically, the average price of diesel has been lower than the average price of gasoline⁵. However, since 2004 the price of diesel has been higher than the price of gasoline due to several reasons such as increasing worldwide demand for diesel (especially China, Europe, and the United States) and higher federal excise taxes on diesel than on gasoline (EAI, 2014b).

The retail price also reflects local market conditions and other factor like the location, number of competitors and the marketing strategy of the owner. Seasonal demand⁶ can also affect gasoline and diesel prices even when crude oil prices are stable.

Propane prices are subject to influences common to other oil product, but also to factors unique to propane: prices of competing fuels; the distance to reach a customer; and the volumes used by a customer (EIA, 2014).

Figure 15 shows how gasoline, diesel and propane prices tend to follow crude oil prices.

⁵ Com exceção dos períodos de inverno, quando a demanda por óleo combustível se eleva, elevando os preços do diesel em patamar superior ao da gasolina

⁶ Os preços da gasolina tendem a se elevar na primavera e atingem um pico no verão. No caso do diesel eles se elevam no outono e inverno,

principalmente pelo aumento da demanda de óleo combustível, por serem substitutos próximos. O preço do GLP se eleva no inverno, principalmente devido à calefação.

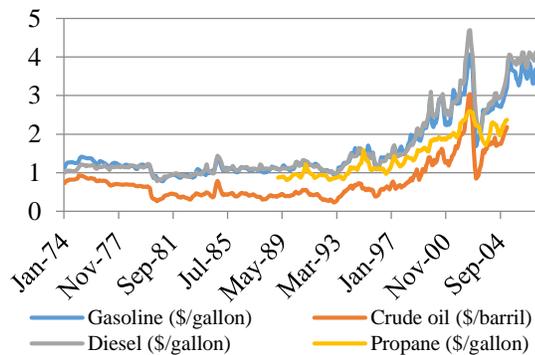


Figure 15. Gasoline, diesel, propane and crude oil prices in the U.S. (per gallon) (EIA, 2015)

Monthly gasoline, diesel and propane prices were subject to crude oil price volatility. Developed countries with low inflation rates as Canada and the United States are able to maintain a market based approach to its fuel markets. This is not the case for developing countries that are concerned with the impact international demand and supply conditions might have on domestic prices. In this sense, many developing countries end up having fuel Price control policies.

4.2 STABILIZATION FUNDS VERSUS SUBSIDIES

Stabilization funds are usually accompanied by a pricing rule to define when the fund should be saved or withdrawn. According to Federico et. al (2001) about one quarter of countries that regulated prices ran stabilizations funds to manage price smoothing process in 2001. Some of these countries abolished their stabilization funds due to its high cost.

The utility of a stabilization fund will depend on the type of price shock (temporary or permanent). If the price shock tends to be long lasting (permanent) the costs to maintain an artificial price will be higher. If the price shock is temporary, the fund utility will also depend on the duration of the cycle. In other words, if the variance of prices is too low the gains with the price smoothing mechanism will be relatively smaller. The benefits obtained from the fund will be higher in a more volatile and uncertain environment (REINHART e WICKHAM, 1994).

4.2.1 Chilean stabilization fund

Chile had established two fuel stabilization funds: i) the Petroleum Price Stabilization Fund (*Fondo de Estabilización de Precios del Petróleo*, FEPP), from 2001 to 2005; and ii) Fuel Price Stabilization Fund (*Fondo de Estabilización de Precios de los Combustibles*, FEPC) that replaced the FEPP and operated from 2005 to 2010.

The FEPP included gasoline, diesel, LPG, and other oil products and was initially capitalized with US\$200 million borrowed from the Cooper Stabilization Fund. The mechanism was based on a max-min price rule set at $\pm 12.5\%$ of reference price, which was defined by the energy authority. If prices were above the ceiling of the band, the fund would pay a subsidy equal to the difference between the two prices. In contrast, if import prices were below the floor, 60% of the difference would be taxed and deposited into the fund (Valero, 2010). FEPP worked correctly until 2000 when market conditions permitted. However, when prices were relatively high, consumers prices did not rise and FEPP did not operated, resulting in financial loss to the National Oil Company (*Empresa Nacional de Petróleo*, ENAP).

Price band was affected by the reference price adjustment system that might have been defined under government influence. Finally, financial resources accumulated in the fund were not enough to ensure price stabilization and, therefore, the government had to inject US\$200 and US\$50 million in February and July (MÁRQUEZ, 2002).

Indeed, as highlighted by Valero (2010) the mechanism to adjust price was not transparent and it was subject to government criteria. In this sense, the fund was vulnerable to periods of high oil prices. These difficulties prompted a revision of FEPP's rules, which resulted in the new FEPP in 2000.

The new Price Stabilization Law, eliminated the asymmetry of price band (100% of the difference between the floor and import price was taxed away) and defined a new pricing formulas. Although, the fund tended to deplete (since international prices were steadily increasing) and ended up transmitting a high portion of international volatility to consumers.

In 2005, Chile created a new stabilization fund denominated Fuel Price Stabilization Fund. FEPC would be financed by the financial returns from extraordinary resources from the Cooper Stabilization Fund.

FPEC was designed to be a temporary mechanism that would operate from 2005 to 2006. The most important difference from the previous fund is that in the FPEC the margin of fluctuation of the price band was reduced to $\pm 5\%$ and import parity prices were defined in relation to WTI. Finally, ENAP's imports were removed from FEPC and it was managed by a special company's account, which imposed a high financial pressure to ENAP.

Valero (2010) highlighted that FEPC challenges were similar to those of FEPP: they were not self-financed and required capital injections by the government. Both of them were subject to government interventions and had a high fiscal cost. Although, the Chilean fuel price smoothing mechanism was followed by other countries such as Peru and Colombia.

4.2.2 Peruvian stabilization fund

Before the creation of the fuel stabilization fund, Peru aimed to reduce fuel price volatility by developing a temporary smoothing price mechanism. The mechanism adjusted an excise tax to fuels called *Impuesto Selectivo al Consumo* (ISC). The instrument included a price band in order to keep final consumer price constant. This initial attempt did not perform well since oil prices were continuously high, leading to a reduction in fiscal revenue. Therefore, by the end of 2004 a fuel price stabilization fund was put in place: *Fondo de Estabilización de Precios de Combustibles* (FEPC) (IMF, 2013b).

The FEPC initiated its operation with 60 million soles and included gasoline, LPG, kerosene, diesel and other oil products. The fund was financed directly by the treasury when its own resources were not enough to pay producers and importers the discount given to consumers. The price band was defined according to an import/export (depending on the oil product) parity reference price formula that was adjusted weekly by the ministry (Valero, 2010).

The FEPC generated sizeable fiscal costs that reached a peak in 2008 (VAGLIASINDI, 2013) because of the upward trend in international oil prices and the government's reluctance to increase the price band limit.

In 2010, the reduction in international prices represented an opportunity to introduce reform measures. Therefore, an automatic rule to update the price band was defined by the authorities and it was created a special sub-account in the treasury to finance the FEPC. By 2012 octane gasoline (used by luxury cars) and regular gasoline were removed from the fund and only diesel and LPG remained (GESTIÓN, 2015).

The reform did reduce the fiscal cost, but subsidy spending continued at high levels, since the fund maintained diesel and LPG. As a result, it succeed in reducing fiscal cost, but modestly (IMF, 2013b).

5. CONCLUSIONS

On the one hand, a market-based approach for fuel prices in Brazil is politically unfeasible. On the other hand, controlling prices by relying on Petrobras' cash holdings implies the company's financial deterioration and inadequate conditions to market competition

Hence, an alternative pricing policy to Brazil such as a stabilization fund combined with a tax adjusting mechanism and a pricing rule should be considered. The analysis shows that countries that aimed to control prices by using a stabilization fund presented a trade-off between fiscal cost and stable prices. The Chilean and Peruvian cases shows fiscal costs were high, since price bands were not always respected or their limits were not adjusted. Furthermore, when the funds were not accompanied by an automatic price band adjustment or a public and automatic formula to determine the parity price, they became financially unfeasible, since they were subject to external government changes.

In sum, international experience shows smoothing prices can have a sizeable fiscal cost, especially when prices rise continuously and when funds and price bands depends on political factors and government decisions.

Accordingly, when defining the pricing policy for Brazil it is necessary to consider a pricing rule and,

hence, a price band with an automatic adjustment mechanism. Otherwise, it will not imply effective changes in relation to actual situation. In addition, the mechanism should be designed to be self-financed in order to avoid subsidies from the government.

Finally, the mechanism should also consider Petrobras' financial deterioration and comprise all firms in the refining activity to benefit downstream competition.

In other words, the new price policy in Brazil should be transparent, aiming to reduce uncertainties related to political decisions and encourage investments in the refining sector.

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