ASYMMETRIC TRANSMISSION OF GASOLINE PRICES IN BRAZIL: IMPACTS OF THE NEW PETROBRAS STRATEGY AND INFLUENCE OF ETHANOL MANDATE

Francisco Teixeira Raeder, Universidade Federal Fluminense, +55 21 98834 8943, francisco.raeder@yahoo.com.br
Niágara Rodrigues, Universidade Federal Fluminense, +55 21 98030 0665, niagararodrigues@gmail.com
Luciano Dias Losekann, Universidade Federal Fluminense, +55 21 99602 3831, lucianolosekann@id.uff.br

Overview

In 2016, the Brazilian state-owned oil company, Petrobras, adopted a new pricing strategy for oil products in its refineries which aims a short-term convergence with international prices. As a consequence, fuel prices became volatile. Afterwards, the combination of rising international oil prices and Brazilian Real devaluation resulted on higher final prices of oil products, what dissatisfied consumers. In May 2018, truck drivers went on a strike and blocked highways in protest (Rodrigues and Losekann, 2018). It generated a huge impact on the Brazilian economy and raised attention to the process of price transmission of diesel and gasoline.

It is important to understand how wholesale price adjustments impact on retail prices. Economic literature indicates that fuel prices are subject to asymmetric price transmission. Generally, a positive change on wholesale prices is rapidly and fully transmitted to retail prices. On the other hand, a negative change on wholesale prices is slowly and not completely transmitted to consumers. Bacon (1991) compared this pattern to "rockets" and "feathers". Whenever these phenomena happen, there are welfare losses for consumers. The literature points that imperfect competition is the main cause of asymmetric transmission. Different aspects of imperfect competition are highlighted by the literature: market power (Meyer and Von-Cramon Taubadel, 2004); collusion (Uchôa, 2016) and search costs (Tappata, 2009).

In the Brazilian case, the ethanol mix mandate on gasoline is currently 27%. Therefore, ethanol prices influence gasoline prices, so it is a potential source of asymmetry. It is important to highlight that, in Brazil, the ethanol is produced mostly in São Paulo State, located in Southeast region. Considering the Brazilian continental dimensions, prices tend to be higher in regions far from the producing center due to transportation costs.

In this context, the purpose of this study is to test the presence of asymmetries in gasoline price transmission in two periods: before (2004-2015) and after (2016-2019) the new Petrobras pricing strategy. The influence of the ethanol mandate is emphasized, what makes the Brazilian case peculiar.

Methods

The presence of asymmetries is tested by Error Correction Models. In the first model, we considered the price transmission between refineries and distribution segment; in the second one, the focus is on the transmission between distribution and gasoline station (final prices). All the ECM terms are estimated by Dynamic Ordinary Least Squares (Polemis and Fotis, 2014). The specifications, with all variables in their natural logarithms, are the following:

$$\Delta D_{i,t} = \alpha + \tau\, sazonal + \sum_{k=1}^{K} \delta_k \Delta D_{i,t-k} + \sum_{j=0}^{J+} \beta_j^{+}\, \Delta Rf_{i,t-j}^{+} + \sum_{j=0}^{J-} \beta_j^{-}\, \Delta Rf_{i,t-j}^{-} + \sum_{m=0}^{M+} \gamma_j^{+}\, \Delta E_{i,t-j}^{+} + \sum_{m=0}^{M-} \gamma_j^{-}\, \Delta E_{i,t-j}^{-} + \theta^{+} ECM_{i,t}^{+} + \theta^{-} ECM_{i,t}^{-} + \varepsilon_{i,t} \quad (1)$$

$$\Delta Rt_{i,t} = \alpha + \sum_{k=1}^{K} \delta_k\, \Delta Rt_{i,t-k} + \sum_{j=0}^{J+} \beta_j^{+}\, \Delta D_{i,t-j}^{+} + \sum_{j=0}^{J-} \beta_j^{-}\, \Delta D_{i,t-j}^{-} + \theta^{+} ECM_{i,t}^{+} + \theta^{-} ECM_{i,t}^{-} + \varepsilon_{i,t} \quad (2)$$

where *t* is the time, in weeks; *i* is the Brazilian region (North, Northeast, South, Southeast and Midwest); *Rf*, *D* and *Rt* are the gasoline prices in Refinery, Distribution and Retail, respectively; *E* is the ethanol price in São Paulo State; *sazonal* is a dummy and assumes 1 during sugar cane harvest and 0, otherwise; *ECM* is the error-correction term, which is the lagged residual for $D = \alpha + \beta Rf + \gamma E + \lambda timetrend + \varepsilon$ and $Rt = \alpha + \beta D + \lambda timetrend + \varepsilon$ for (1) and (2), respectively; α, β, γ, θ e τ are the parameters to be estimated and; $\Delta x_t^{+} = x_t - x_{t-1} = \max\{\Delta x_t, 0\}$ and $\Delta x_t^{-} = x_t - x_{t-1} = \min\{\Delta x_t, 0\}$.

Then, we test some null hypothesis (for Eq. (1), we test (3), (4) and (5); for Eq. (2), we test (3) and (5)):

$$\sum_{j=0}^{J+} \beta_j^{+} = \sum_{j=0}^{J-} \beta_j^{-} \quad (3)$$
$$\sum_{m=0}^{M+} \gamma_m^{+} = \sum_{m=0}^{M-} \gamma_m^{-} \quad (4)$$
$$\theta^{+} = \theta^{-} \quad (5)$$

By rejecting (3), (4) and (5), there are asymmetries of magnitude between gasoline prices; asymmetries of magnitude between ethanol and gasoline prices in the wholesale; and asymmetries of speed, respectively.

Results

First, we analysed the period in which prices were stable, prior to the new strategy of Petrobras. In the transmission between refineries and the distribution segment (Eq. (1)), we rejected: (3) in 4 out of 5 regions (only in the Southeast the adjustment was symmetric); (4) in 2 regions (Midwest and South); and (5) in 3 regions (Northeast, Southeast and South). Considering the transmission between the wholesale and retail (Eq. (2)), (3) was rejected for Midwest and Southeast regions while (5) was rejected in 4 regions (the only exception is the Southeast).

Then we studied the period after the adoption of the short-term parity strategy. For Eq.(1), we rejected: (3) for Northeast, North and South; (4) for all regions except for Southeast; and (5) for Midwest and Northeast. In the case of Eq. (2), (3) was rejected for Midwest, Northeast, Southeast and South and (5) was rejected for Northeast, Southeast and South.

Finally, we estimated (2) considering average prices in Brazil. Then, we simulated two shocks (one positive and one negative) of 1% in the Distribution to compare the effects on the retail. Between 2004 and 2015, in $t=0$, the positive shock resulted in an increase of 1,50% while the negative shock resulted in a decrease of 0,99% in retail. So, in $t=0$, the consumer loss was 0,51% (1,50 - (-0,99)). In $t=1$ and $t=2$, consumer losses were 0,66% and 0,69%, respectively. Only in $t=3$ the impacts of the shocks start to decrease.

On the other hand, between 2016 and 2019, a positive shock in wholesale resulted in an increase of 1,01% in retail and a negative one, a decrease of 0,52%, in $t=0$. In this period, the consumer loss was 0,49%. On the next week, $t=1$, the consumer loss increases to 0,65% and reaches the maximum. In $t=2$ the consumer cost is 0,36% and starts to decrease.

Conclusions

Our analysis identified asymmetric price transmission in the gasoline supply industry for most Brazilian regions and periods. When prices increase in upstream activities, downstream prices are fully and rapidly impacted (“rockets”) and when prices decrease, downstream responses are less intense and slower (“feathers”).

We also identified that Petrobras new pricing strategy has changed the pattern of asymmetries along the gasoline supply segments. Between refinery and distribution, speed and magnitude asymmetries have decreased. However, the number of cases of asymmetries caused by ethanol has increased. Considering the transmission between distribution and retail, more cases of asymmetries of magnitude were detected while the number of asymmetries of speed has decreased.

The new fuel pricing strategy proved to be better for consumers in terms of welfare. After that, consumer losses have decreased not only in magnitude but also in speed, once the asymmetries decrease early. However there is still space to mitigate asymmetries. Chile, Germany and South Korea have been stimulating transparency in pricing process to decrease asymmetric transmission and it has proved to be a successful tool.

References

BACON, R. W. (1991). Rockets and feathers: the asymmetric speed of adjustment of UK retail gasoline prices to cost changes. Energy Economics, 13, issue 3, pp. 211-218.

MEYER, J., VON CRAMON-TAUBADEL, S. (2004). Asymmetric price transmission: a survey. Journal of Agricultural Economics, Oxford, v. 55, n. 3, pp. 581-611.

POLEMIS, M. L.; FOTIS, P. N. (2014). The taxation effect on gasoline price asymmetry nexus: evidences from the both sides of Atlantic. Energy Policy, 73, pp. 225-233

RODRIGUES, N.; LOSEKANN, L. D. (2018). Assimetria na transmissão de preço ao longo da cadeia de comercialização da gasolina no Brasil. In: XICBPE Congresso Brasileiro de Planejamento Energético, Cuiabá.

TAPPATA, M. (2009). Rockets and feathers: understanding asymmetric pricing. The RAND Journal of Economics, v.40, n. 4, pp. 673-696.

UCHÔA, C. F. A. (2016). Poder de mercado e transmissão assimétrica nos preços da gasolina em Salvador/BA. Revista Econômica do Nordeste, v. 47, pp. 137-151.