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Cartels and asymmetric cost pass-through: evidence from Brazilian gas stations

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Abstract

I analyse if collusive agreements are responsible for asymmetric cost pass-through in the Brazilian retail gasoline market. I find that, overall, Brazilian stations do not present asymmetric cost pass-through. However, this phenomenon is observed in stations that belong to a cartel. This different behavior is due to cartelised stations increasing their price more than non-cartelised ones when faced by increases in costs.

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1 Introduction

Asymmetric cost pass-through is the phenomenon on which prices rise quickly after positive cost shocks but fall relatively more slowly after similarly-sized negative shock. This is a constant topic of complain from consumers.[1]

This phenomenon is well documented in the retail gasoline market (e.g., Bacon, 1991; Karrenbrock, 1991; Borenstein et al., 1997; Godby et al., 2000; Eckert, 2002; Chen et al., 2005), and, in this paper, I analyse the role of collusion as an explanation of asymmetric cost pass-through in the Brazilian retail gasoline market.[2]

Collusion can occur by two main ways: a formal agreement or by tacit collusion. Tacit collusion occurs when firms can coordinate prices even without direct communication among them.

Previous research, (e.g., Borenstein et al., 1997), suggested that tacit collusion can facilitate asymmetric cost pass-through. The idea is that retailers under collusion would refrain from cutting prices in response to a decrease in costs and would instead rely on current existing prices as a focal point for coordination. Thus, when costs decrease, collusion is easier to sustain because firms can coordinate by simply not changing their price. As a result, retailers would experiment higher margins and, therefore, higher profits. Meanwhile, costs' increase will be transmitted faster to prevent losses, since continuing to charge past prices would be less profitable as retail margins would be squeezed.

In this paper, I will depart from this possible tacit agreement and test if (observed) cartelised firms incur in asymmetric cost pass-through in the Brazilian retail gasoline market. I specifically test if cartelised stations behave differently than non-cartelised stations regarding cost pass-through.

In order to test my hypothesis, I use data from the Brazilian National Competition Authority (CADE). I observe the identity of all stations that were convicted of being

[1] This phenomenon is also labeled in the literature as prices rise as rockets and fall as feathers (Bacon, 1991).

[2] Other explanations for this phenomenon are inflation with adjustment cost in prices (Ball and Mankiw, 1994), the existence of market power (Benabou and Gertner, 1993; Borenstein and Shephard, 1996) and imperfect competition Radchenko (2005), the degree of concentration in the retail market and government intervention (Minten and Kyle, 2000), and search costs (Tappata, 2009; Lewis, 2011; Heim, 2021).

a cartel member during the period from 2006 until 2010. Therefore, I can directly test if collusion can explain the asymmetric cost pass-through phenomenon, which is the main contribution of this paper. To the best of my knowledge this is the first paper to provide evidence using data on firms convicted of cartelisation.

I find that, overall, there is no asymmetric pass-through, which is similar to the findings of da Silva et al. (2014).[3] However, I find evidence of asymmetric pass-through in cartelised stations. This result adds to the findings of Cardoso et al. (2016); they find symmetric pass-through - i.e. no difference on retail price change when facing increase or decrease in costs - in around 71% of the Brazilian gas stations. In 23% of stations they find a positive asymmetry, which is also the evidence I provide in the present paper for cartelised stations. The authors argue that asymmetric pass-through can be explained by specific characteristic of each station and find that stations with a higher margin, fewer rivals nearby, and non-white flags have a higher probability to present positive asymmetry.[4] My findings add on this previous result showing that one of these characteristics is participating in a cartel.

2 Data

I use data from the Brazilian Regulatory Agency of Petroleum, Natural Gas and Biofuel (ANP) and CADE . From ANP, I use data from the *Levantamento de Preços e Margens de Comercialização de Combustíveis* from 2006 until 2010.[5] This is a weekly survey that collects data on retail prices, as well the wholesale purchase price, in 555 Brazilian municipalities.[6] It is important to notice that not all stations are surveyed every week; the survey adopts a rotating sample (with random selection) that eventually covers all fuel stations in that municipality.[7] Thus, my dataset is an unbalanced panel.

Although gasoline acquisition price is not the only cost of a station, it counts for

[3] They did not find an asymmetric pass-through at the national level, but only in some municipalities.

[4] They studied each station, individually, on a time-series framework. After finding which stations had a positive asymmetry, they construct a dummy representing these stations. Then, they run a regression of this dummy on station's fixed characteristics to find which characteristics were correlated with positive assymetry.

[5] There are currently no cases being investigated by CADE of possible cartels during this time period. Hence, this gives me confidence that there are no other suspicious cases in the period under analysis.

[6] This number represents around 10% of the country's municipalities.

[7] Stations do not know when they are being surveyed. They only find out this information when the person conducting the survey for ANP arrives on the station to collect the information.

around 86% of the retail price (see Table 1). Thus, I use the wholesale price as a proxy for costs. Notice that this variable is not available for all station-week observations.[8] Since its value is key for my analysis, I do not perform any inputation procedure; if there is a missing value, I do not use it in my analysis.

Additionally, the survey has information on stations characteristics, which I use to construct the following control variables: whether a station is branded or not (and the brand itself)[9], the number of total stations in a market (which proxies for the intensity of competition), and the number total unbranded stations in a market. Furthermore, the survey has information on the date on which the prices were collected and the *CNPJ* (an unique identifier number for any firm in Brazil).

From CADE, I obtain information on all administrative cases of suspicious cartels in the Brazilian retail gasoline market and the outcome of the cases. I use data from all convicted cases. Therefore, I observe which station was convicted of being a cartel member and the duration of the cartel.

Table 1 provides descriptive statistics. Notice that the standard deviation of retail prices is larger than that of cost which suggests that the retail price series enlarge retailer's cost changes. Moreover, the standard deviation for change in prices is also larger than the one for change in costs.

Table 1: Descriptive Statistics

Variable	Mean	Std	Min	Max
Price (Reais/liter)	2.59	0.1596	1.9600	3.5000
Cost (Reais/liter)	2.216	0.099	1.111	2.955
Change in price	0.0001	0.0934	−0.8900	1.0000
Change in costs	−0.0007	0.0383	−1.1589	1.0032
Number of stations in a market	69.72	186.3742	1	1899
Number of unbranded stations in a market	23.51	77.4947	0	1159
Number of different brands in a market	7.52	3.5646	1	37
Branded (dummy)	0.6803	0.4663	0	1
Cartel (dummy)	0.0013	0.0362	0	1
Total number of observations		963812		

[8]Stations are required to submit retail prices, but wholesale prices are not mandatory, and, thus, sometimes not collected.

[9]Although not common, some stations changed their brand during the time period under analysis.

3 Empirical Strategy

I model the cost pass-through as follows:

$$\Delta P_{it} = \beta_1^+ \Delta C_{i,t}^+ + \beta_1^- \Delta C_{i,t}^- + \beta_{2,CM}^+ (\Delta C_{i,t}^+ \times CM) + \beta_{2,CM}^- (\Delta C_{i,t}^- \times CM) + \alpha \times X_{it} + \mu_i + \delta_t + \epsilon_{it}, \quad (1)$$

where $\Delta P_{it} = P_{it} - P_{i,t-1}$ is the variation of prices in station i and week t, $\Delta C_{it} = C_{it} - C_{i,t-1}$ is variation in costs. CM is a dummy variable that has value one if a station i belongs to a cartel in week t, and zero otherwise. X is a vector of control variables described in Section 2, and α is the parameter associated with them. μ_i is a station fixed effect[10], δ_t is week fixed effect, and ϵ_{it} is the error term.

Equation (1) allows asymmetric pass through because I enable the adjustment process for increases to be different than for decreases. Specifically, $\Delta C_{it}^+ = \max\{\Delta C_{it}, 0\}$, and $\Delta C_{it}^- = \min\{\Delta C_{it}, 0\}$. Therefore, to test asymmetric price transmission one needs to test the following hypothesis: $\beta_1^+ = \beta_1^-$. If I reject this hypothesis then I have evidence of asymmetric cost pass-through.

Notice that this comparison tests asymmetric pass-thorugh for the whole market. In order to test this hypothesis for cartelised stations, the testable hypothesis is the following: $\beta_1^+ + \beta_{2,CM}^+ = \beta_1^- + \beta_{2,CM}^-$. If I reject this hypothesis, then I have evidence of asymmetric cost pass-through for cartelised stations.

4 Results

4.1 Main Result

The results of estimating equation (1) are presented in Panel A of Table 2, and the test of difference between the sum of coefficients is presented in Panel B. Standard errors are clustered at the municipality level.

The first column indicate that the upstream and downstream coefficients representing

[10]Note that, among other characteristics, this fixed effect captures time invariant geographic characteristics, such as if the station is located in a highway. In my sample, stations' location did not change.

the contemporaneous response of retail prices to cost changes are very similar and the difference is not statisticaly different from zero. This suggests a symmetric pass-through in the overall market, and it is in line with da Silva et al. (2014).

In columns 2 and 3, I incorporate the existence of cartels, and the difference between these columns is the addition of control variables. Results remain the same for the overall market. They also suggest that cartelised stations increase their price more than non-cartelised stations when faced with an increase in the wholesale price. Nonetheless, the results do not suggest a different behaviour when faced by decrease in the wholesale price.

Computing the total reaction to wholesale price variation in cartelised stations, the difference is 0.334 Brazilian Reais, and it is statistically different from zero. Thus, this result provides evidence that cartelised stations present an asymmetric cost pass-through.

Bringing these two results together, they imply that cartels impose asymmetries through the upstream effect, i.e. price increases are of a greater magnitude than price decreases.[11] This positive asymmetry is also found by Salvini et al. (2022) for Brazilian gas stations that incur in asymmetric price transmission.[12]

The results obtained in the present paper are also in line with Cardoso et al. (2016). They found that around 71% of Brazilian gas stations have no asymmetry on cost pass-through, whilst 23% have positive asymmetry (which is the result I obtained in the present paper).[13] They argue that individual characteristics of stations can explain this behaviour. The present paper adds on these results showing that being a member of a cartel is one of the characteristics that can explain asymmetric cost pass-through.

Finally, it is important to highlight that the empirical evidence obtained in this section cannot be interpreted as causal. With the empirical model and data used, I provide evidence that cartelised stations behave differently from non-cartelised ones regarding asymmetric cost pass-through, but this does not imply that cartels cause asymmetric cost pass-through.

[11] Rocket and feathers pattern.

[12] They found this result not considering cartel cases and within a different time frame than the one analysed in the present paper.

[13] This is the "rockets and feathers' pattern.

Table 2: Results

Panel A: Estimates of cost pass-through

	Dependent Variable: ΔP_{it}		
	Model 1	Model 2	Model 3
$\Delta C^{+}_{i,t}$	0.1259^{***}	0.1257^{***}	0.1257^{***}
	(0.0120)	(0.0120)	(0.0120)
$\Delta C^{-}_{i,t}$	0.1285^{***}	0.1286^{***}	0.1286^{***}
	(0.0107)	(0.0107)	(0.0107)
$\Delta C^{+}_{i,t} \times CM$		0.2394^{*}	0.2396^{*}
		(0.1228)	(0.1229)
$\Delta C^{-}_{i,t} \times CM$		-0.0988	-0.0990
		(0.0731)	(0.0731)
Controls:	No	No	Yes
Week fixed-effects:	Yes	Yes	Yes
Station fixed-effects:	Yes	Yes	Yes

Panel B: Test of difference between the sum of coefficients

	Model 1	Model 2	Model 3
$\Delta C^{+}_{i,t} = \Delta C^{-}_{i,t}$	-0.0026	-0.0029	-0.0029
$\Delta C^{+}_{i,t} + \Delta C^{+}_{i,t} \times CM = \Delta C^{-}_{i,t} + \Delta C^{-}_{i,t} \times CM$		0.3353^{*}	0.3357^{**}

Note: * denotes signficance at 10%, ** at 5%, and *** at 1%. Standard-errors are clustered at the municipality level.

4.2 Robustness

The results presented in the last section were based on an unbalanced panel. As a robustness check, I also reestimate equation (1) in an aggregated way. Since stations are surveyed at least once a month, I create a station-month panel. In this case, the retail and wholesale prices are the average, respectively, of all observed retail and wholesale prices of each station in each month.

This new set of results is presented on Table 3 and they confirm the findings of the previous section: there is asymmetric cost pass-through in cartelised markets. Moreover, the asymmetry is due to the upstream effect.

Notice that although the qualitative results are similar, the magnitude is different. There are some possible explanations for this result. First, with monthly data I do not lose many observations due to not observaing the cost variable every week, thus altering a little bit the sample size. Second, monthly data contains an accumulated

change within 4 weeks, and thus the price difference between two periods tend to be greater.

Table 3: Results - Monthly Estimation

Panel A: Estimates of cost pass-through	
	Dependent Variable: ΔP_{it}
$\Delta C^{+}_{i,t-1}$	0.4750^{***}
	(0.0627)
$\Delta C^{-}_{i,t-1}$	0.3954^{***}
	(0.0354)
$\Delta C^{+}_{i,t-1} \times CM$	0.4504^{*}
	(0.2387)
$\Delta C^{-}_{i,t-1} \times CM$	-0.2815
	(0.3049)
Controls:	Yes
Week fixed-effects:	Yes
Station fixed-effects:	Yes
Panel B: Test of difference between the sum of coefficients	
$\Delta C^{+}_{i,t} = \Delta C^{-}_{i,t}$	0.0796^{*}
$\Delta C^{+}_{i,t} + \Delta C^{+}_{i,t} \times CM = \Delta C^{-}_{i,t} + \Delta C^{-}_{i,t} \times CM$	0.8115^{**}

Note: * denotes signficance at 10%, ** at 5%, and *** at 1%. Standard-errors are clustered at the municipality level.

5 Conclusion

In the present paper, I analyse if cartelised gas stations present asymmetric cost pass-through. The results suggest that cartelised stations incur in asymmetric cost pass-through, whereas this is not the case for non-cartelised stations. Moreover, the data suggest that this asymmetry occurs because cartelised stations increase more their price, when faced by increases in the wholesale price, than non-cartelised ones. Therefore, this paper provides direct evidence that cartels can explain asymmetric cost pass-through instead on relying in tacit collusion explanations. However, these findings cannot be interpreted as a causal relationship, which is an avenue for future research

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