

# Price Transparency and Tacit Collusion in the Gasoline Industry in Mexico

## Transparencia de precios y colusión tácita en la industria de la gasolina en México

*(Received: 09/March/2020; accepted: 09/July/2020; published: 04/September/ 2020)*

*Paolo Riccardo Morganti\**

### ABSTRACT

Despite the introduction of new retailers in the Mexican gasoline industry in 2018, retail margins remain high regardless of the low international oil prices. This article introduces a theoretical model in which price transparency reinforces tacit collusion among retailers rather than favoring a competitive environment. Counterintuitively, the government should strive to implement price Obfuscation rather than Transparency, in order to promote socially beneficial price wars.

**Keywords:** Transparency; Tacit Collusion; Competition Policy; Cartels.

**JEL Classification:** L13; L40.

### RESUMEN

A pesar de la introducción de nuevos minoristas en la industria mexicana de la gasolina en 2018, los márgenes minoristas siguen siendo altos independientemente de los bajos precios internacionales del petróleo. Se presenta un modelo teórico en el que la transparencia de precio refuerza la colusión tácita entre los minoristas en lugar de favorecer un entorno competitivo. A pesar de que pueda parecer contra intuitivo, el gobierno debe esforzarse por implementar la ofuscación de precios en lugar de la transparencia, para promover guerras de precios que resulten beneficiosas para la sociedad.

**Palabras Claves:** Transparencia; Colusión Tácita; Políticas de Competencia; Carteles.

**Clasificación JEL:** L13; L40.

---

\*Universidad Panamericana, Escuela de Ciencias Económicas y Empresariales. E-mail: pmorganti@up.edu.mx.

## INTRODUCTION

In 2018, the Mexican government ended PEMEX's 80 year-long monopoly in the gasoline industry welcoming new retailers, in the hope of creating a healthy competitive environment. According to the "Ley de Hidrocarburos", starting from the 1<sup>st</sup> of January 2018, the retail prices for gasoline and diesel were to be determined under a free market regime. This transformation was accompanied by an increase in price transparency, implemented through publication of each station's prices on the government platform "Datos Abiertos," or on the app Gasoapp where prices are updated in real time. For comparison purposes, the U.S.A. releases at most average weekly prices by state.

Unfortunately, the new industry structure so far has failed to produce the desired competitive effects, with gasoline and diesel prices being steadily high since 2018, regardless of the low international petrol prices. While many bottlenecks in the distribution and the asymmetric structure of the industry that still sees PEMEX as a dominant player might have contributed to keeping prices high, it is striking that retail margins are significantly higher than international ones (COFECE, 2019). Moreover, such margins have been increasing, with cost savings failing to pass to consumers. As a response, the COFECE began an investigation against possible anticompetitive practices.

This article introduces a theoretical model to show how price transparency is an unexpected channel through which tacit collusion is reinforced. In the present context, transparency of prices refers to the degree to which information about retail prices is available to the public. The situation where knowledge of all the retail prices is costly or not feasible, is referred to as price-obfuscation. Tacit collusion is a silent and informal norm of conduct that helps retailers to sustain high prices by discouraging individual price cuts. Without having to agree explicitly on such behavior, retailers may converge to it after having observed the conduct of the rivals and by continuously keeping an eye on their actions. As long as everybody conforms to the desired behavior, all companies can enjoy high profits. Individually, however, every retailer has an incentive to deviate to win over part of the rivals' customers through small price cuts, which also benefit society. If the rivals are able to detect this act, they will react aggressively to preserve their market and punish the misbehaving rival through low prices. A rational firm, therefore, will not proceed with a price cut because of the fear of the subsequent price war.

Society, on the other hand, wishes to favor price cuts and hinder their detection when they occur. It is easier to sustain tacit collusion - and high prices - when patrolling the market in search for price cuts is simple and costless for gasoline companies. If this is the case, any company considering lowering its price has the certainty to be caught and punished if it proceeded. Rationally, such company will prefer to comply with the informal norm of conduct and keep its prices at high levels.

The policy of price transparency attempts to remove search costs and help consumers finding the cheapest station around their location (Diamond, 1971). However, it brings also unintended consequences. It gives a free and simple tool for gas companies to check on their rivals. Any attempt to cut prices immediately visualizes on the screen, granting the chance to rapid counter-reactions. Because of that, tacit collusion gains strength from price transparency.

## THE MODEL

There is an open debate about the effects of price transparency on competition. On the one hand, transparency favors competition because it allows consumers to increase the number of comparisons. On the other hand, price transparency can encourage collusion (see, for instance, Albæk *et al.*, 1997, for a study of collusion in the concrete Danish industry). The present model builds upon the seminal work of Green and Porter (1984) and on its version introduced in Tirole (1988). Two retailers compete choosing prices over an infinite horizon. It is necessary to assume an infinite horizon, otherwise retailers cannot escape the uninteresting outcome of the Bertrand equilibrium.

Demand is random, taking either high or low values. Without loss of generality, it is assumed that when demand is low, it is equal to zero. The realization of the demand is independently and identically distributed (iid) over time. Let  $\alpha < 1/2$  be the probability that demand is low. With remaining probability, demand is positive. When the retailers charge the same prices and demand is high, they equally split the market. The largest amount of money that the retailers can collectively extract during a high period is the monopoly profit, denoted by  $\pi^m$ . Let  $p^m$  denote the corresponding monopoly price. On the other hand, when retailers charge different prices, consumers will choose the cheapest brand following the standard Bertrand setting. The remaining retailer will face zero demand in that period. Following Stigler's assumptions (1964), prices are not perfectly observable. Because of this, the retailer facing zero demand cannot know for sure if the low market share was due to the aggressive behavior of the rival or to a slack in demand. In addition, it is assumed that a firm sets its price before the demand shock is realized: therefore, it is possible that a firm cuts its price, but still receive zero demand.

The legal level of price transparency is modeled through a parameter  $\eta$ , which represents the probability of observing a price cut if there was one. The case  $\eta = 1$  represents full price transparency, that is, the case where prices are updated in real time and are visible to any agent in the market.

Only strategies that form a Subgame Perfect Nash Equilibrium are considered. That is, it is required that a player  $i$ 's strategy from date  $t$  on maximizes the expected present discounted value of its profits given player  $-i$ 's strategy from that date on, for any history  $H_t$  at time  $t$ . All firms share the same discount factor  $\delta \in (0,1)$ . Let,

$$V_t^i = \max_{\{p_\tau^i\}_{\tau=t}^\infty} E_\alpha \left[ \sum_{\tau=t}^\infty \delta^\tau \pi_\tau^i(p_\tau^i, p_\tau^{-i}; \alpha) \right] \tag{1}$$

Notice that  $\pi_\tau^i(p_\tau^i, p_\tau^{-i}; \alpha) = 0$  whenever  $p_\tau^{-i} < p_\tau^i$ , or when a negative random shock occurs. Finally, because of stationarity,  $V_t^i = V^i$  for every  $t$ . It is well known that such games feature multiple equilibria, however it is possible to identify the best and the worst possible ones (Abreu, 1983 and 1988) and study how much cooperation can credibly be sustained. Abreu, Pearce and Stacchetti (1990) show that firms can sustain tacit collusion under the threat of a Trigger strategy, which punishes harshly any price cut from the rivals. In particular, the punishment consists of reversion to the Bertrand game forever. Notice that price cuts are in the interests of consumers and society as a whole, and therefore should be favored by authorities.

Because price cuts are not perfectly observable in our model, maximal punishment (eternal reversion to Bertrand) is not always optimal for the players. Green and Porter (1984) prove that, when in doubt about the source of low profits, it is better to have a temporary punishment phase after which firms can revert to the collusive behavior. That is, retailers choose a length of time  $T$  in which they accept to obtain zero profits.

To illustrate the potential negative effect of price transparency, the analysis focuses on the case where.

**Assumption 1:**  $2\alpha > 1 - 2(1 - \alpha)\delta > 0$

According to the One-Shot Principle, it is sufficient to study the game in its collusive phase and analyze incentives for a deviation at a single time  $t$ . Let  $V^C$  be the expected discounted sum of the profits received when firms collude each period. As mentioned above, because demand is random and shocks are not perfectly observable, it is optimal to introduce a temporary punishment over  $T$  periods whenever a firm receives zero profits (Green and Porter, 1984). This punishment

consists in a price war that destroys profits for  $T$  periods, after which firms return to the collusive phase. In the Subgame Perfect Nash Equilibrium (SPNE), firms need to coordinate to a value  $T$  that sustains the equilibrium. Because punishment is costly for both retailers, they will choose the lowest possible level that satisfies the incentive compatibility constraint. Taking advantage of stationarity, the problem can be rewritten in recursive form:

$$V^c = (1 - \alpha) \left[ \frac{\pi^m}{2} + \delta V^c \right] + \alpha \delta^T V^c \quad (2)$$

which gives

$$V^c = \frac{(1 - \alpha)\pi^m/2}{1 - (1 - \alpha)\delta - \alpha\delta^T} \quad (3)$$

To sustain collusion, an Incentive Compatibility constraint must be introduced. A deviation from collusion in period  $t$  is a price that is slightly lower than  $p^m$ , which captures the whole market. The value that a retailer obtains by undercutting the rival in a given period is

$$V^d(\eta) = (1 - \alpha)[\pi^m + (1 - \eta)\delta^T V^c] + \alpha(1 - \eta)\delta^T V^c \quad (4)$$

**Remark 1:**  $\frac{dV^d}{d\eta} < 0$

It is easy to see that the value of a deviation decreases with the probability of detection. Two extreme values of  $\eta$ , which represent two opposite policies about price transparency, are analyzed.

**Case 1:**  $\eta = 0$  (*hidden prices*). In this case, the value of a deviation becomes

$$V^d(0) = (1 - \alpha)\pi^m + \delta^T V^c \quad (5)$$

Collusion would be sustainable if and only if  $V^c > V^d(0)$ . The next proposition shows that, under the previously introduced restrictions on the parameters, it is not possible to sustain collusion in the market when prices are hidden.

**Proposition 1:** *if Assumption 1 holds, it is not possible to sustain collusion in a SPNE when  $\eta = 0$ .*

**Proof:** This proof by contradiction begins by assuming that collusion is possible.

Then, from the incentive compatibility constraint

$$V^c > (1 - \alpha)\pi^m + \delta^T V^c \Leftrightarrow (1 - \delta^T)V^c > (1 - \alpha)\pi^m \quad (6)$$

Replacing the value of  $V^c$  in the inequality gives

$$\frac{1}{2} \frac{(1 - \alpha)(1 - \delta^T)\pi^m}{1 - (1 - \alpha)\delta - \alpha\delta^T} > (1 - \alpha)\pi^m$$

Which, after some algebra, becomes:

$$\delta^T < -\frac{1 - 2(1 - \alpha)\delta}{1 - 2\alpha} \quad (7)$$

By Assumption 1, and because  $\alpha < 1/2$ , the right-hand side is negative. Therefore, there cannot be any value of  $T$  nor  $\delta$  that can make the inequality satisfied. *QED*

**Case 2:**  $\eta = 1$  (*full price transparency*). When the regulation imposes real time updates of posted prices, the value of a deviation decreases to

$$V^d(1) = (1 - \alpha)\pi^m \quad (8)$$

The next proposition shows that price transparency removes incentives to deviate from the collusive states, preventing socially beneficial price wars.

**Proposition 2:** *if Assumption 1 holds, it is possible to sustain collusion in a SPNE when  $\eta = 1$ .*

**Proof:** from the incentive compatibility constraint

$$\frac{1}{2} \frac{(1 - \alpha)\pi^m}{1 - (1 - \alpha)\delta - \alpha\delta^T} > (1 - \alpha)\pi^m$$

Which, after some algebra, becomes

$$1 - 2(1 - \alpha)\delta < 2\alpha\delta^T \quad (9)$$

Because of Assumption 1, the inequality holds for  $T = 0$ . This is also the lowest possible value that  $T$  can take.

*QED*

## CONCLUSIONS

To weaken the code of conduct brought by tacit collusion, it is important to provide gas companies an area in which they can hide their price cuts. Because each company has a private incentive to win customers from its rivals, this incentive must be leveraged and protected from rivals' reactions. To protect it, it is suggested to do something very contradictory and controversial: gasoline prices must be obfuscated.

When prices are hidden, a gasoline company cannot know if a temporary reduction in demand is due to a rival's cutting prices or by some external environmental factors. Its reaction will be uncertain, hesitant, slow, and tentative. This reaction will carry a low punishment for a company who wants to cut prices. Therefore, cutting prices to steal market shares now becomes a viable and rational business strategy. In the long term, every firm will be forced to follow this strategy to stay in the market, and the public will finally benefit from competition.

Tacit collusion is very difficult to sustain if companies have no tools to detect price cuts. While price obfuscation is desirable to break this informal code of conduct, it could be difficult to propose to the public and to politicians to take down price transparency completely. From practical purposes, it will be better to make a compromise between price transparency and price obfuscation. A possible way is to take advantage of mobile and GPS technology, and offer a phone app that visualizes gas station prices, in a sufficiently small radius around the location of the user. It is important that not all prices are available, or the gas companies will take advantage of the information. However, if only local prices are visible, then it will be very difficult for gas companies to try to compile a full dataset or rivals' actions. At the same time, consumers will benefit by being able to find the most convenient gas station close to their position.

## REFERENCES

- Abreu, D. (1983). Repeated Games with Discounting: A General Theory and an Application to Oligopoly, Ph.D. Thesis, Department of Economics, Princeton University
- Abreu, D. (1988). On the Theory of Infinitely Repeated Games. *Econometrica*, vol. 56, no. 2, pp. 383-396, <https://doi.org/10.2307/1911077>
- Abreu, D., D. Pearce and E. Stacchetti, (1990). Toward a Theory of Discounted Repeated Games with Imperfect Monitoring. *Econometrica*, vol 58, no. 5, pp. 1041-1063, <https://doi.org/10.2307/2938299>

- Albæk, S., P. Møllgaard, and P. B. Overgaard, (1997). Government-Assisted Oligopoly Coordination? A Concrete Case. *Journal of Industrial Economics*, vol. 45, no. 4, pp. 429-44, <https://doi.org/10.1111/1467-6451.00057>
- Diamond, P. (1971). A Model of Price Adjustment. *Journal of Economic Theory*, vol. 3, no. 2, pp. 156-168, [https://doi.org/10.1016/0022-0531\(71\)90013-5](https://doi.org/10.1016/0022-0531(71)90013-5)
- Green, E. and R. Porter (1984). Non-cooperative Collusion under Imperfect Price Information. *Econometrica*, vol. 52, no. 1, pp. 87-100, <https://doi.org/10.2307/1911462>
- COFECE (2019). *Transición hacia Mercados Competidos de Energía: Gasolina y Diésel*. Cuadernos de Promoción de la Competencia, Ciudad de México: Comisión Federal de Competencia Económica.
- Stigler, G. (1964). A Theory of Oligopoly. *Journal of Political Economy*, vol. 72, no. 1, pp. 44-61. <https://doi.org/10.1086/258853>
- Tirole, J. (1988). *The Theory of Industrial Organization*, MIT Press Books, Cambridge, M.A.: The MIT Press.
- OECD, (2001). OECD Policy Roundtable (2001), Price Transparency, OECD document DAFPE/CLP 2001(22), <http://www.oecd.org/dataoecd/52/63/2535975.pdf>