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Most-favored customer clauses with differentiated goods and tacit collusion

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Abstract

The most-favored-customer (MFC) clauses are widely used by franchised retailers as well as the low-price-guarantee (LPG) clauses. Many literature discuss the anti-competition effect of the MFC clauses by using models with homogeneous products the same as what is done to the LPG clauses. Instead, I study the anti-competition effect of the MFC clauses with horizontally differentiated goods in a repeated Bertrand competition and find the anti-competition effect highly related to the homogeneity of products. The MFC clauses have a strong anti-competition effect especially when the homogeneity of product and hassle costs are low. However, considering the potential harm of tacit collusion, the MFC clauses should be concerned by the antitrust agency only when the homogeneity of product is intermediate.

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1 Introduction

Visiting different shops at different times to compare prices of goods is someone's daily life even before the use of internet has immersed in all respects of human activities. To eliminate customers' last doubt, some merchants provide their customers offers to guarantee low product prices, such as the low price guarantee (LPG) clauses and the most-favored customers (MFC) clauses. Both the LPG clauses and the MFC clauses require merchants to offer refunds to customers when a lower price is found. The difference between these two clauses is simply the place where customers find the lower price. Some merchants apply both the LPG clauses and the MFC clauses simultaneously. For example, Target.com promises to match other on-line dealers' prices for identical products and provides a price adjustment for an item customers purchased from Target.com if its price has been reduced within the eligible return window [1]. Target.com even provides price match clause for different selling channels.

Most customers treats those price guarantee clauses as benefits and a protection from high prices. However, Cooper (1986) discusses how the MFC clauses encourage a high price in a two-period model. The firms which adopt the MFC clauses will not lower their prices to the competition level for preventing from large refunds to customers who bought in the first period. Liu (2013) uses a repeated game to discuss how the LPG clauses affect the difficulty of collusion and finds that the LPG clauses will erode the gains of deviation. Hence, the lower limit of the discount rates to sustain tacit collusion becomes lower and make collusion easier. Even though only one firm adopts such policies, a price higher than the competition level can be sustained. Neilson and Winter(1992) shows that the equilibrium price set by the only firm adopting the MFC clauses is between the Betrand price and the Stackrelberg leader price. Ohnishi(2004) uses a two-stage one-period model in which only one firm uses the donation clauses similar to the MFC clauses. He shows that the advertised price is exactly the same as the Stackrelberg level.

However,empirical papers give divergent results. Chen and Liu (2011) find the MFC clauses introduced by Best Buy lower not only its own prices but also rivals'. They think the MFC clauses as a measure of price discrimination, which triggers price wars among consumer electronics chain stores. Morton (1997) finds that the average price of branded medicines facing competition of generic ones rose 4% after the MFC clauses were introduced. Instead, no significant increases in prices of branded medicines protected by patents were detected. I will propose to use a repeated Bertrand model with the horizontally differentiated products and the MFC clauses to unify those divergencies of empirical results in this paper.

The setup in this paper is close to Deneckere (1983) and Liu (2013). But I will discuss the effect of the MFC clauses on the difficulty of tacit collusion along with the change of the homogeneity of products. I find that a weaker anti-competition effect of the MFC clauses when the homogeneity of products is higher. In the case of high homogeneity of products, the gain from deviation is also large. The extra punishment brought by the MFC clauses

[1]The details can be referred to `https://help.target.com/help/subcategoryarticle?childcat=Price+Match+Guarantee&parentcat=Policies+%26+Guidelines&searchQuery=search+help`.

has little effect to deter deviation. In the case of extremely low homogeneity of products, the difference between collusive profits and competitive profits is small. Even though the anti-competition effect of the MFC clauses is strong, firms still have very few incentives to collude tacitly. The anti-competition effect of the MFC clauses could be of concern only when the homogeneity of products is intermediate.

In this paper, a baseline model will be discussed in Section 2, and the model discussing the anti-competition effect of the MFC clauses is illustrated in Section 3. Section 4 discusses how to unify divergent empirical results with the model in Section 3. Finally, Section 5 provides closing remarks.

2 The Baseline Model

There is a market with two firms producing horizontally differentiated products and proceeding the Bertand competition repeatedly. I simplify the setup in Singh and Vives (1984) and focus on the discussion of the homogeneity of products. [2] Hence, the demand faced by the two firms in each period are assumed as [3]

$$q_i = \frac{1}{1+\gamma} - \frac{1}{1-\gamma^2}p_i + \frac{\gamma}{1-\gamma^2}p_{-i},\ \gamma \in (0,1), i = 1,2,$$

where q_i and $p_i, i = 1,2$ are the quantities and the prices of Firm i respectively, and γ is used to measure the homogeneity of products produced by two firms. Further, there are no production costs for both firms.

Following the literature, such as Cheng (2001) and Matsumura and Matsushima (2012), I assume that firms use grim-trigger strategy to ensure the greatest possibility of tacit collusion. Hence, given the discount rate $\delta \in (0,1)$, the conditions to sustain tacit collusion is

$$(1-\delta)[\pi^{col} + \delta\pi^{col} + \delta^2\pi^{col} + \cdots] \geq (1-\delta)[\pi^{dev} + \delta\pi^{bert} + \delta^2\pi^{bert} + \cdots], \tag{1}$$

where π is any firm's revenues in a single period, and the superscripts col, dev, and $bert$ indicate the cases of deviation, collusion, and (Bertand) competition through this paper respectively. Hence,

$$p^{col} = \frac{1}{2}, p^{bert} = \frac{1-\gamma}{2-\gamma}, p^{dev} = \frac{2-\gamma}{4}.$$

It is clear that $p^{col} > p^{dev} > p^{bert}$. When a firm deviates from collusive equilibrium by lowering its price, the deviating firm will not let the price drop too much and keep the

[2] Singh and Vives (1984) allow products to be substitutes, independent, or compliments. However, the MFC clauses are typically provided by firms competing with similar products. I only consider the case of substitutes in this paper.

[3] In Singh and Vives (1984), inverse demands are given by

$$p_i = \alpha_i - \beta_i q_i - \gamma q_{-i}, i = 1,2.$$

The parameter γ determines whether the goods are substitutes, independent, or complements. To focus on the discussion of the homogeneity of products, αs and βs are all set equal to 1 in this paper.

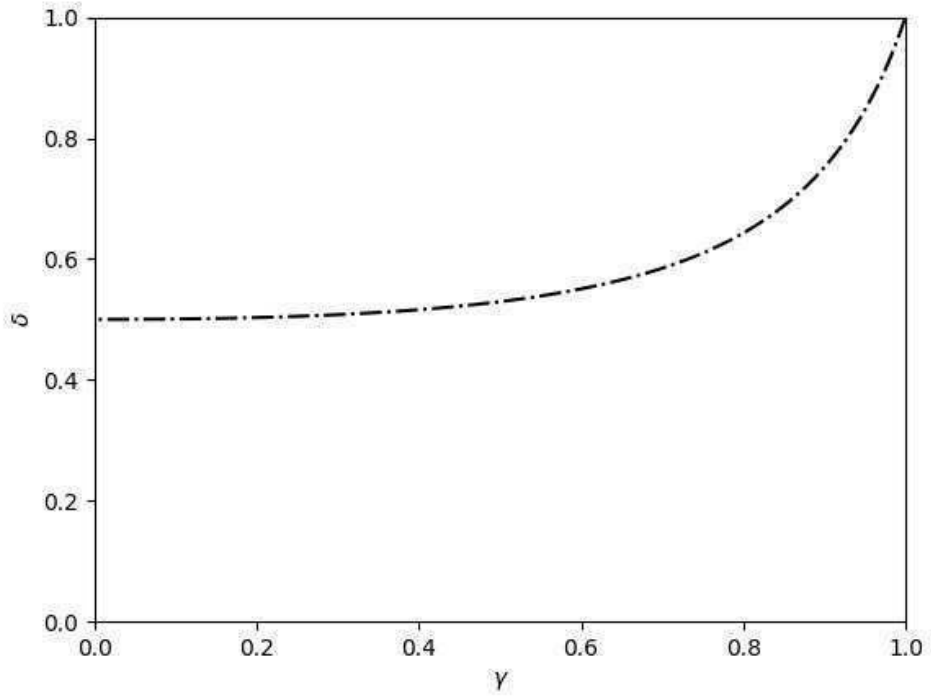


Figure 1: The Lower Limit of the Discount Rates to Sustain Tacit Collusion in the Baseline Model

price higher than the competition level to ensure high profits when deviating. Hence, I have $\pi^{dev} > \pi^{col} > \pi^{bert}$.

Arranging Inequation (1), I have

$$\delta \geq \frac{\pi^{dev} - \pi^{col}}{\pi^{dev} - \pi^{bert}}. \tag{2}$$

Substitute π^{col}, π^{dev}, and π^{bert} solved above into Inequation (2) to obtain the requirement for tacit collusion

$$\delta \geq \frac{(\gamma - 2)^2}{\gamma^2 - 8\gamma + 8}. \tag{3}$$

Referring to Figure 1, It can be found that the lower limit of δ is higher as the homogeneity of products γ is larger. The homogeneity of products has a significant impact on the difficulty of tacit collusion. When the homogeneity is becoming higher, both the collusive profits and the competitive profits drop because of severer competition. But the former drops slower than the latter. Hence, it is more difficult to collude tacitly when the homogeneity is higher. Chang (1991) also gives similar results. Further, as γ approaches to 1, the lower limit of δ also approaches to 1. Suppose that two products are perfectly homogeneous. Any collusive

firm will deviate by lowering its price by a infinitely small amount to seize the whole market. Thus, no collusion can be sustained.

3 The Anti-Competition Effects of the MFC Clauses

When a firm adopts the MFC clauses, it makes a credible promise that customers who buy its product this period can get refunds if the price becomes lower in the next period. It is assumed here that the amount of refunds for each unit of product is exactly the difference of the prices in these two periods [4]. In practice, refunds are often only given to those customers who make requests, not to all customers who bought in the last period, because some customers do not make requests due to hassle costs. I assume that the share of qualified customers who will claim the refund is $a \in (0, 1]$ [5]. Because of menu costs or other concerns, for example, preventing customers from postponing their purchases strategically, I also assume that both firms will proceed the Bertrand competition immediately after the deviation period.

I will show that the deviation price is still between the collusive price and the competition price after the MFC clauses are introduced. The subscript m is used to denote the case with the MFC clauses through this paper. Even with the MFC clauses, firms set the same prices as in the baseline model and earns the same amount of profits from sales when two firms colludes or proceeds the Betrand competition.

Lemma 1 *The deviation price under the MFC clauses cannot be higher than the collusive price.*

Proof: I will show that the profits resulted from deviation will be lower than the collusive profits if the deviation price under the MFC clauses is higher than the collusive price. Thus, no firms have incentives to deviate then. Suppose that a firm choose $p_m^{dev} \geq p^{col}$ to maximize

$$\pi_m^{dev} = (\frac{1}{1+\gamma} - \frac{1}{1-\gamma^2}p_m^{dev} + \frac{\gamma}{1-\gamma^2}p^{col})p_m^{dev} - \delta_m \left[(p_m^{dev} - p^{bert}) \cdot q_m^{dev} \cdot a\right],$$

where $q_m^{dev} = \frac{1}{1+\gamma} - \frac{1}{1-\gamma^2}p_m^{dev} + \frac{\gamma}{1-\gamma^2} \cdot p^{col}$, the quantity sold by the deviating firm. It can be shown that

$$\frac{d}{d\ p_m^{dev}}\left[(\frac{1}{1+\gamma} - \frac{1}{1-\gamma^2}p_m^{dev} + \frac{\gamma}{1-\gamma^2}p^{col})p_m^{dev}\right]_{p_m^{dev}=p^{col}} = -\frac{2-\gamma}{2(1-\gamma^2)} + \frac{1}{1+\gamma} < 0, \forall\gamma \in (0,1).$$

That is, a deviating firm will generate smaller revenue than the collusive revenue from a deviation price higher than the collusive price. Adding on the nonnegative refunds, the profits resulted from deviation must be smaller than the collusive profits when choosing a deviation price higher than the collusive price. □

[4] It is assumed that no punitive refunds are paid to customers in this paper.

[5] If the punitive refunds are allowed, a can be set greater than 1

Lemma 2 *The deviation price under the MFC clauses cannot be lower than the competition price.*

Proof: I will show that any deviation price lower than the competition price is not optimal. Suppose that a firm choose $p_m^{dev} \leq p^{bert}$ to maximize

$$\pi_m^{dev} = (\frac{1}{1+\gamma} - \frac{1}{1-\gamma^2}p_m^{dev} + \frac{\gamma}{1-\gamma^2}p^{col})p_m^{dev} - (p^{col} - p_m^{dev}) \cdot q^{col} \cdot a.$$

Refunds are only given in the first competition period. Then, it can be shown that

$$\frac{d\ \pi_m^{dev}}{d\ p_m^{dev}}\Big|_{p_m^{dev}=p^{bert}} = \frac{\alpha+2}{2(1+\gamma)} + \frac{\gamma}{2(1-\gamma^2)} - \frac{2(1-\gamma)}{(1-\gamma^2)(2-\gamma)} > 0, \forall a, \gamma \in (0,1).$$

Thus, no deviation price should be lower than the competition price. □

A deviation price higher than the collusive price will decrease the revenue, and a deviation price lower than the competition price will make the deviating firm give too many refunds. Accordingly, even under the MFC clauses, the deviation price is still between p^{col} and p^{bert}.

Proposition 1 *The deviation price under the MFC clauses must be between p^{col} and p^{bert} if any firm has incentives to deviate.*

I will turn to the case $p^{bert} < p_m^{dev} < p^{col}$ now. The deviating firm should choose p_m^{dev} to maximize

$$\pi_m^{dev} = (\frac{1}{1+\gamma} - \frac{1}{1-\gamma^2}p_m^{dev} + \frac{\gamma}{1-\gamma^2}p^{col})p_m^{dev} - (p^{col} - p_m^{dev}) \cdot q^{col} \cdot a - \delta_m \left[(p_m^{dev} - p^{bert}) \cdot q_m^{dev} \cdot a\right].$$

The interior solution of p_m^{dev} is

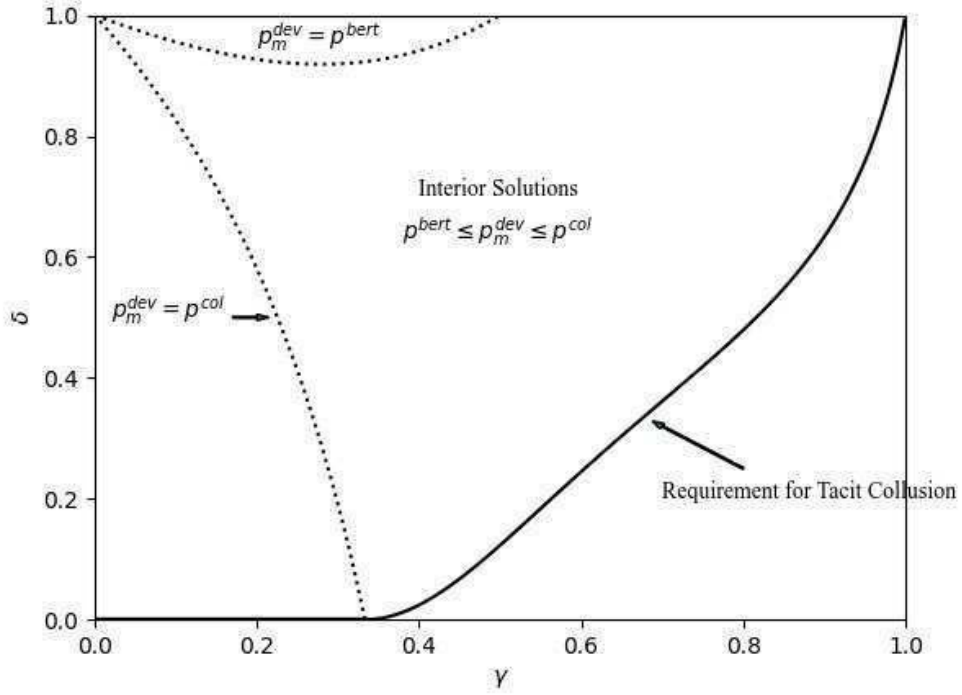
$$p_m^{dev} = \frac{-a \cdot \gamma^2 \cdot \delta + a \cdot \gamma^2 + 6a \cdot \gamma \cdot \delta - 3a \cdot \gamma - 6a \cdot \delta + 2a + (\gamma-2)^2}{4(a \cdot \gamma \cdot \delta - 2a \cdot \delta - \gamma + 2)}. \tag{4}$$

The same as what I did in Section 2, I can calculate the lower limit of the discount rates, which can sustain tacit collusion, to evaluate the difficulty of tacit collusion. Adding the refunds brought by the MFC clauses, tacit collusion can be sustained when

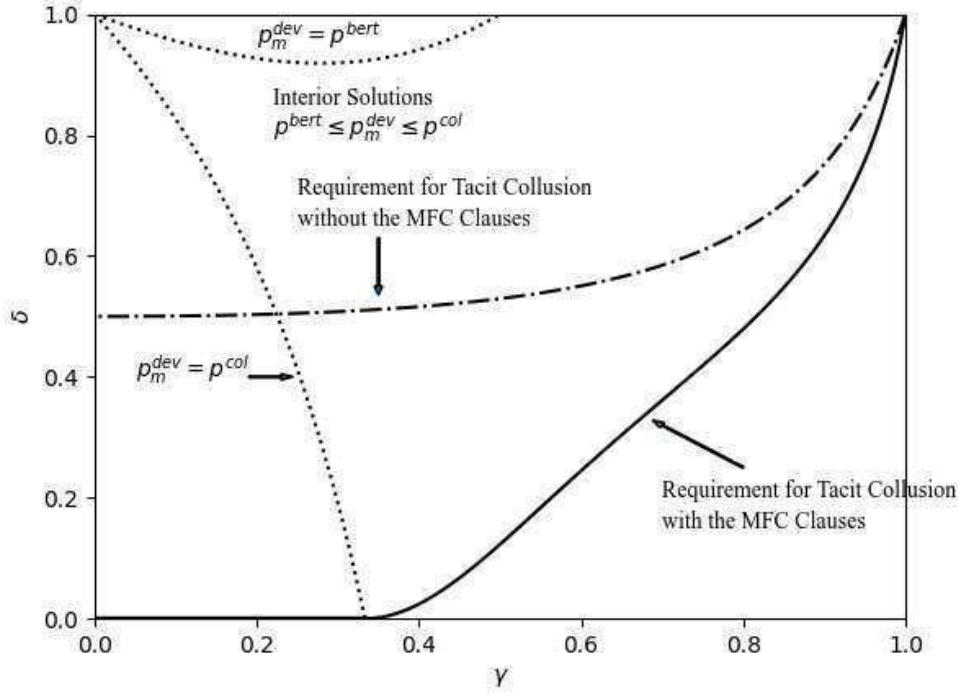
$$\pi^{col} \geq (1-\delta_m)\left[\pi_m^{dev} - (p^{col} - p^{dev}) \cdot q^{col} \cdot a - \delta_m(p_m^{dev} - p^{bert}) \cdot q^{dev} \cdot a\right] + \delta_m \cdot \pi^{bert} \tag{5}$$

Inequation (5) is more complicated than Inequation (1). It is difficult to solve the lower limit of the discount rates explicitly like Inequation (2). In addition, p_m^{dev} in Equation (4) may not be within the range between p^{bert} and p^{col}. Thus, extra constraints, not discussed in Section 2, are necessary to ensure that tacit collusion can occur. The solution will be simulated below with different levels of hassle costs. I set $a = 0.05, 0.5$ or 1.

Figure 2 illustrates the case of $a = 0.5$. In Panel a, Figure 2, there are four regions. Because the high discount rates on the top region increase the value of punishment resulted from refunds, the optimal deviation price is the competition price, which cannot generate



(a)



(b)

Figure 2: The Lower Limit of the Discount Rates to Sustain Tacit Collusion with the MFC Clauses When $a = 0.5$

profits higher than the collusive profits. Firms have no incentive to deviate. Similarly, on the left region, in which γ is small, the deviating firm cannot earn from deviation more than tacit collusion because of low homogeneity of products and refunds resulted from the MFC courses. Firms also have no incentives to deviate. In the center region, the optimal deviation price is between the collusive price and the competition price. But the discount rates are high enough to deter the deviation there, given the corresponding level of γ. Only the combinations of γ and δ in the right region encourage firms to deviate and tacit collusion cannot be sustained there.

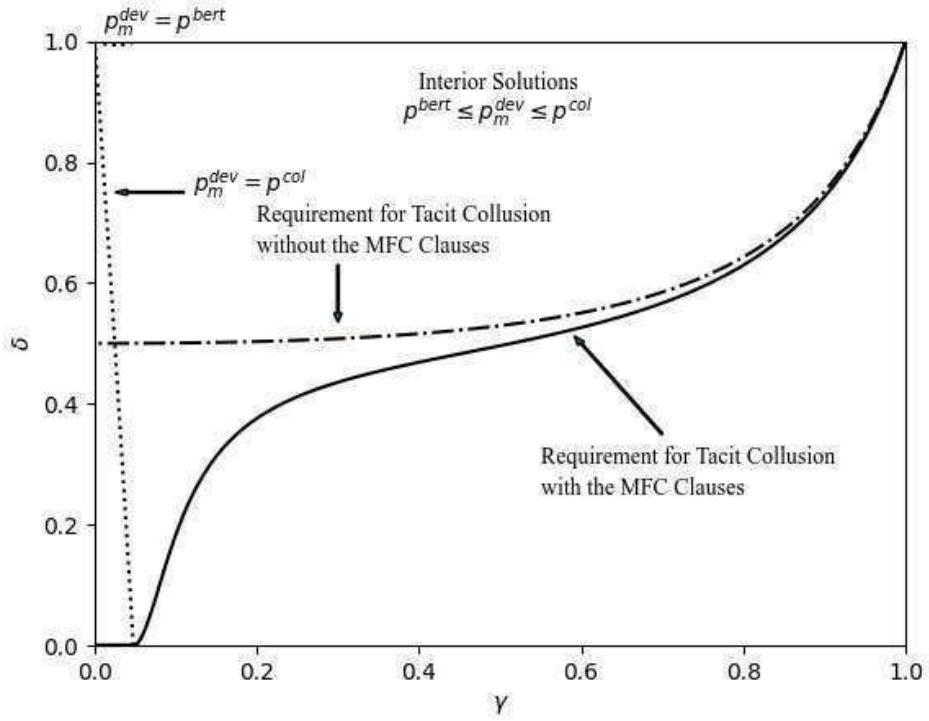
In summary, the border of the region where tacit collusion can be sustained starts from the origin, goes along the x-axis, and continues with an up-sloping curve, depicting the equality of Inequation (5). When γ is low enough, tacit collusion must be able to be sustained even though firms do not care about punishments in the following periods. In the opposite, when γ is high, the scenario is close to that without the MFC clauses. The profits from deviation is such large that tacit collusion is difficult to sustain. From Panel b, Figure 2, it can be found that the requirement for tacit collusion with the MFC clauses is lower than without the MFC clauses. Overall speaking, it is easier to collude with the MFC clauses. The refunds brought by the MFC clauses provide extra punishments for deviation and make tacit collusion easier.

The scenarios of high and low hassle costs are illustrated in Figure 3. When hassle cost is extremely low, all customers claim the refunds ($a = 1$). In Panel b, Figure 3, the top region and the left region are both expanded significantly. Comparing Panel b, Figure 2, tacit collusion can be sustained more easily because the punishment under the MFC clauses becomes severer. In the opposite, as hassle cost is higher or a is smaller, the combination of δ and b which can sustain tacit collusion becomes fewer. In Panel a, Figure 3, it can be found that the requirement for tacit collusion with the MFC clauses is close to that without the MFC clauses as a approaches to zero.

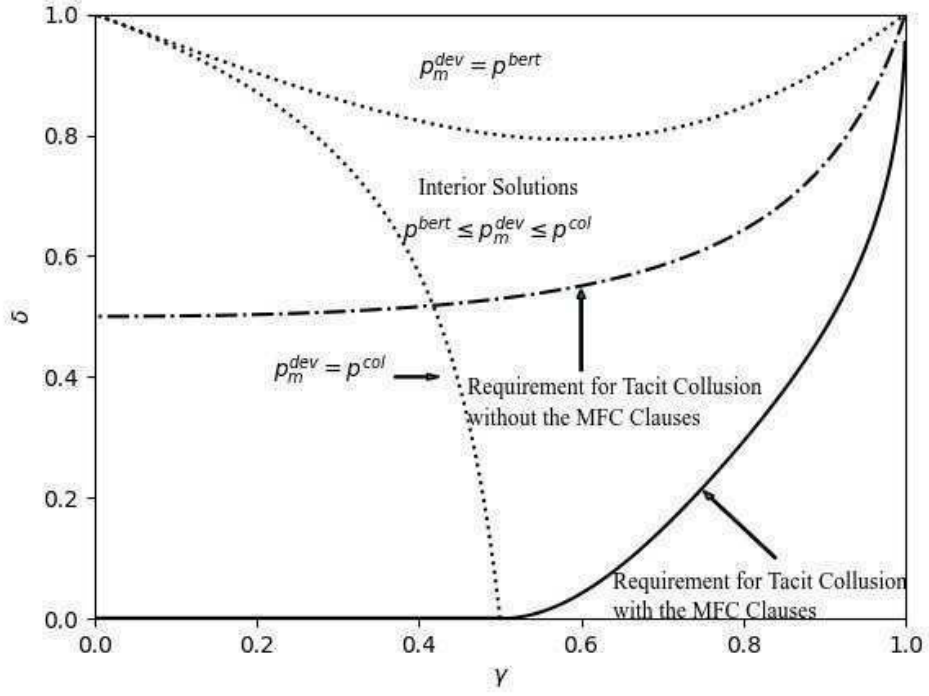
Despite the anti-competition effect brought by the MFC clauses, I do not agree the MFC clauses should be a concern of the anti-trust agency in all cases. Figure 4 shows the difference of the collusive profits and the competitive profits. The difference is extremely small when γ is small. That is, the gain firms can exploit by collusion is small. Even though the punishments can sustain tacit collusion (please refer to Figure 1), firms should have little incentives to face potential charges from the antitrust agency for such little gains. As mentioned, the MFC clauses give very little support for tacit collusion when the homogeneity of products is high. Indeed, the antitrust agency should only concern about the case with intermediate homogeneity of products.

4 Discussing Empirical Results

This paper provides a better understanding to divergent empirical results. Chen and Liu (2011) report a drop of average prices in the market of consumer electronics after the introduction of the MFC clauses. It is known that the retail market of consumer electronics is highly homogeneous. Thus, Chen and Liu (2011) can find many identical products in different stores and compare their prices. As predicted by this paper, the MFC clauses cannot



(a) $a = 0.05$



(b) $a = 1$

Figure 3: The Lower Limit of the Discount Rates to Sustain Tacit Collusion with the MFC Clauses and with Different a

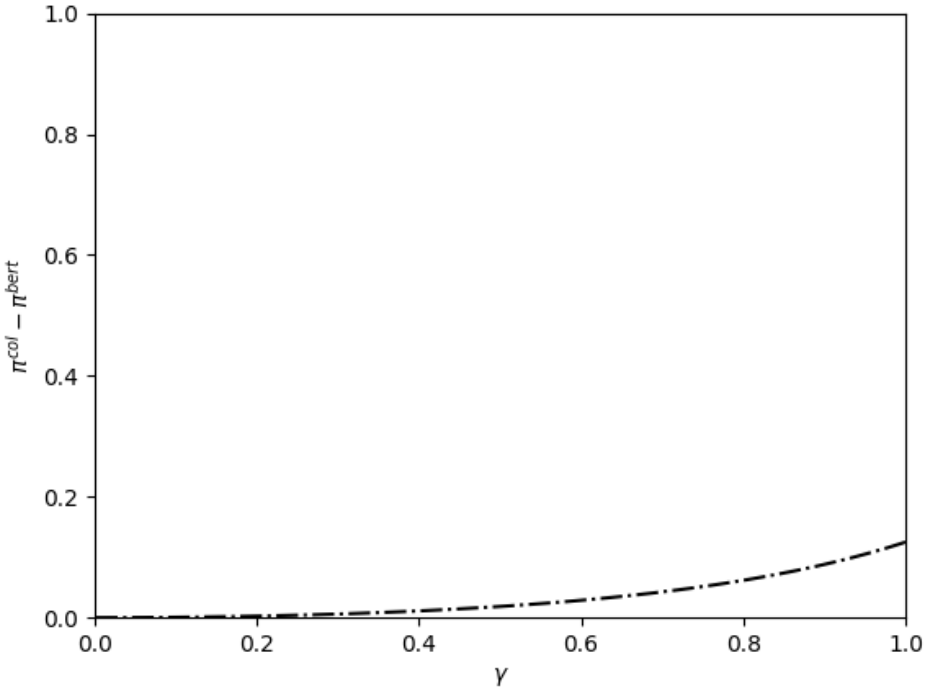


Figure 4: The Difference of the Collusive Profits and the Competitive Profits

give much support for tacit collusion. Then, Chen and Liu (2011) consider the MFC clauses as a measure of price discrimination to trigger price war. In the market of branded medicine protected by patents, Morton (1997) finds no increase in prices after the MFC clauses are introduced. There are no close substitutes for branded medicine, corresponding to the case of extremely small γ. This paper predicts that the gain of tacit collusion is small. Hence, tacit collusion is not so beneficial that it will not be triggered by the MFC clauses, either. Instead, Morton (1997) also reports an increase in the average price of branded medicines facing competition of generic ones. Even though the prices of branded medicines is higher than those of generic ones because of brand trust or other reasons, generic medicines are still considered as imperfect substitutes of branded ones. Such a market is close to the case with intermediate values of γ. According to this paper, the MFC clauses could trigger tacit collusion and increase the average price of the medicines. Overall speaking, the homogeneity of products can explain the divergent empirical results well. It is the most likely that the MFC clauses could trigger tacit collusion when the homogeneity of products is intermediate.

Many antitrust agencies in different countries are investigating the anti-competition effect of the MFC clauses in the market of online travel agencies (Akman, 2016). But this paper suggests that the antitrust agencies should concern about the case of intermediate homogeneity of products. When evaluating the anti-competition effect of the MFC clauses, the antitrust agencies should investigate the homogeneity of the products provided by the firms and their rivals. The anti-competition effects of the MFC clauses could be very limited in the case of online travel agencies because most hotels and flights can be found on different online platforms. Different platforms provide highly similar products. Accordingly, the MFC clauses provide few incentives to collude tacitly in this market.

5 Closing Remarks

I study the impacts of the MFC clauses on the tacit collusion behavior in repeated Bertrand competition with horizontally differentiated products. When the homogeneity is extremely low, the gain of tacit collusion is also extremely small. Firms have few incentives to collude tacitly. When the homogeneity is high, the gain of deviation is also large. The extra punishment brought by the MFC clauses is insufficient to hinder the deviation. Indeed, the MFC clauses may discourage firms from lowering their prices and may have a significant anti-competitive effect only when the homogeneity is intermediate. Those divergent empirical studies are in line with the findings in this paper. Hassle costs are also related to the effectiveness of the MFC clauses. In the case of low hassle costs, most of customers will request refunds after prices are dropped and the MFC clauses are effective then.

The model in this paper can be extended to allow the deviating firm to lower its price several times before proceeding Bertrand competition. Thus the process of dynamic adjustment in the repeated Bertrand competition game can be studied more thoroughly. Further, in addition to homogeneity of products and hassle costs, there might be some other factors to investigate about the effectiveness of the MFC clauses. Finally, even though a firm may adopt the MFC clauses with reasons different from tacit collusion, the MFC clauses may

have worrying anti-competition effect in some cases. The anti-trust agency should monitor the industry carefully in which the MFC clauses are widely used.

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