Price-Matching Guarantees of Price Leaders

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Abstract

This paper deals with the claim of Hviid and Shaffer (1999) that in the presence of hassle costs price-matching guarantees do not cause supracompetitive prices. Our main contribution is to demonstrate that their claim is not true in general. The crucial assumption backing it is that of simultaneous price setting (Bertrand competition). We establish by means of the linear city model that for sequential price setting (Stackelberg competition) such guarantees result in supracompetitive prices even though positive hassle costs exist. The threshold value of hassle costs below which supracompetitive prices are possible is calculated and interpreted.

1 Introduction

Price-matching guarantees have been adopted by numerous firms from various branches of industry. These guarantees give customers the right to purchase the product from the firm at the lowest price in the market. The dominant view in industrial organization literature is that such guarantees facilitate supracompetitive prices. It is based on the argument that in the presence of price-matching guarantees undercutting proves to be no longer profitable because the competitor matches automatically the lower price. This view has been challenged by Hviid and Shaffer (1999). They put forward that activating such guarantees usually induces costs for customers. In order to exercise these guarantees a customer often has to compare prices and products, fill in detailed request forms and talk extensively with salespersons. Hviid and Shaffer (1999) claim that the mere existence of such hassle costs is enough to make supracompetitive prices unsupportable. They argue that, for any positive hassle costs, customers prefer to buy from the firm with the lowest price regardless of competitors have adopted a price-matching guarantee or not. As a result of this, undercutting the price of a competitor becomes profitable and this, in turn, leads to competitive prices.

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The goal of our paper is to qualify this statement of Hviid and Shaffer (1999). It turns out that their hypothesis is based on a specific form of competition. They assume that firms set simultaneously their prices. However, as will be demonstrated in the present paper, their claim cannot be maintained for sequential price competition. Indeed, if firms set sequentially their prices, then supracompetitive prices occur as long as the hassle costs do not exceed some positive threshold value. We derive this result by assuming product differentiation according to the linear city model. This model allows us to express the threshold by meaningful parameters.

To accomplish our goal the paper is structured as follows. The succeeding section presents the linear city model and sketches the functioning of price-matching guarantees. Section 3 deals with price-matching guarantees in Bertrand competition. Therein, central results of Hviid and Shaffer (1999) are applied to the linear city model. Section 4 is the most innovative part of our paper. In this section we analyze the price effects of price-matching guarantees in the linear city model with Stackelberg competition. We compare these effects with the ones derived in Section 3. Finally, Section 5 summarizes the most striking results of our paper.

2 The Linear City Model

The economic environment in which the price effects of price matching guarantees are analyzed is described by the so-called *linear city model* which is also known as the *Hotelling line*. There are two suppliers, firm 0 and firm 1, who produce the same product and there is a continuum of possible customers who are uniformly located on the unit interval $[0, 1]$. The density of consumers at each location $x \in [0, 1]$ is equal to 1 so that the total mass of customers amounts to 1. Firm 0 is located at the left end of the unit interval (position 0) and firm 1 is located at the right end of the unit interval (position 1). Each firm $i = 0, 1$ produces at constant unit cost of 0 and charges a price p_i per unit. Both firms aim at maximizing their profits. Each customer wants at most one unit of the product and derives a gross benefit of $v > 0$ from its consumption. The customers incur disutility from traveling where the disutility per unit (i.e. the distance between the two firms) is given by $t > 0$. We assume $v > 3t$. This assumption ensures that there is a complete market coverage in any Nash equilibrium. That is, all customers of the linear city purchase the product in any solution.

Let x be the position of a customer. If this customer purchases the product from firm i, then she gains a net benefit of $b_x(i) := v - t|l_i - x| - p_i$ where $l_i \in \{0, 1\}$ denotes the location of firm i. If she does not purchase the product (action $\emptyset$), her net benefit is equal to $b_x(\emptyset) := 0$. Each customer aims at maximizing her net benefit. In formal terms, she solves the optimization problem $\max_{i\in\{0,1,\emptyset\}} b_x(i)$. The market demand functions for the products of the two firms are derived from these individual decision problems. It turns out that the demand function for the product of firm 0 is given by

$$D_0(p_0, p_1) := \begin{cases} 1 & \text{if } p_0 < p_1 - t \text{ and } p_0 < v - t, \\ \frac{p_1 - p_0}{2t} + \frac{1}{2} & \text{if } |p_0 - p_1| \leq t \text{ and } p_0 + p_1 \leq 2v - t, \\ \frac{v - p_0}{t} & \text{if } v - t \leq p_0 \leq v \text{ and } p_0 + p_1 > 2v - t, \\ 0 & \text{if } p_0 > v \text{ or } p_1 < p_0 - t, \end{cases}$$

and likewise the demand function for the product of firm 1 is given by

$$D_1(p_0, p_1) := \begin{cases} 1 & \text{if } p_1 < p_1 - t \text{ and } p_1 < v - t, \\ \frac{p_0 - p_1}{2t} + \frac{1}{2} & \text{if } |p_1 - p_0| \leq t \text{ and } p_0 + p_1 \leq 2v - t, \\ \frac{v - p_1}{t} & \text{if } v - t \leq p_1 \leq v \text{ and } p_0 + p_1 > 2v - t, \\ 0 & \text{if } p_1 > v \text{ or } p_0 < p_1 - t. \end{cases}$$

Notice that the weak inequality $p_0 + p_1 \leq 2v - t$ ensures complete market coverage at prices p_0 and p_1.

If both firms form a cartel, then they would stipulate prices $v - \frac{t}{2}$. In the following sections we compare this price setting with the price setting under different modes of competition. In Section 3 we assume Bertrand competition, in Section 4 Stackelberg competition. A specific characteristic of our analysis is that in both modes of competition firms have also the option to provide a price-matching guarantee to customers.

A price-matching guarantee of a firm is a promise given to customers that it matches any lower price offered by some competitor. Given such guarantee, whenever the posted price is above the price charged by some competitor, the customers have the right to purchase the product at this lower price from the firm. Obviously, if a firm adopts such guarantee, its posted (announced) price might differ from its actual selling price. In order to distinguish between these two prices, we mark posted prices by the circumflex ˆ. Let i be a firm adopting a price matching guarantee and j be the only competitor of firm i. Then the selling price p_i of firm i is given by $p_i := \min\{\hat{p}_i, \hat{p}_j\}$.

Activating such price-matching guarantees might induce costs for the applicant. For example, the customer might spend time for price searches, filling in forms and arguing with salespersons in order to exercise the price-matching guarantee. In the following these costs are termed hassle costs and are denoted by z. We assume that $z \geq 0$ holds.

3 Price-Matching Guarantees in Bertrand Competition

The two firms of the linear city model compete with prices. In this section, we assume Betrand competition. That means, firms post simultaneously their prices. Moreover, each firm has the option to grant a price-matching guarantee to customers. Thus, a strategy of firm $i = 0, 1$ consists of two components, namely the decision which price $\hat{p}_i \in \mathbb{R}_+$ should be posted and the decision whether a price-matching guarantee $g_i \in \{PMG, no\ PMG\}$ should be provided. Formally, the strategy set of firm i is described by $S_i := \mathbb{R}_+ \times \{PMG, no\ PMG\}$. If some firm grants a price-matching guarantee, customers who activate this guarantee incur hassle costs $z \geq 0$. The situation of Bertrand competition with price-matching guarantees has already been examined by Hviid and Shaffer (1999) in a general setting. Since our linear city model is a specific manifestation of their framework, we can immediately resort to their results.

First, suppose that the activation of price-matching guarantees is hassle-free, i.e. $z = 0$. This situation is treated in Proposition 1 of Hviid and Shaffer (1999). They show that multiple Nash-equilibria exist in this case. Regarding our linear city model it turns out that any selling price between t and $v - \frac{t}{2}$ can be supported by some Nash equilibrium. The following theorem is a corollary of Proposition 1 of Hviid and Shaffer (1999). It details the Nash equilibria of the linear city model if Bertrand competition with hassle-free price-matching guarantees is supposed.

Theorem 1 *Consider the linear city model where $v > 3t$. Suppose there is Bertrand competition between the two firms. If $z = 0$, then both firms sell the product to the same price in the Nash equilibrium. Any selling price belonging to the closed interval $[t, v - \frac{t}{2}]$ and only those can be supported by some Nash equilibrium. Furthermore,*

- *(i) if the selling price is equal to t, then both firms post this price. It might be that each, one or none of the firms adopts a price-matching guarantee.*
- *(ii) if the selling price belongs to the open interval $]t, v - \frac{t}{2}[$, then both firms post the same price and adopt a price-matching guarantee.*
- *(iii) if the selling price is equal to $v - \frac{t}{2}$, then at least one firm post this price. Both firms adopt price-matching guarantees.*

The last theorem confirms the claims of scholars like Salop (1986) and Edlin (1997) that price-matching guarantees have adverse welfare effects. They argue that price-matching guarantees can weaken or even suspend the competition between firms so that supracompetitive prices might result (see statements (ii) and (iii) of the above theorem). Their reasoning is as follows. Suppose firm i posts a supracompetitive price and grants a price-matching guarantee to customers. Such guarantee prevents firm j from undercutting firm i's posted price. Indeed, if firm j were to post a lower price compared to that of firm i, then firm i's selling price would automatically adjust to this lower price. As a consequence, firm j would not attract new customers and, thus, has no incentive to undercut the supracompetitive price of firm i.

However, Hviid and Shaffer (1999) put forward a strong argument against this claim. They show that in presence of hassle costs undercutting of the competitor's price is still profitable even if the competitor guarantees price-matching to customers. To understand their argument, consider a situation in which both firms adopt a price-matching guarantee and post prices lying above the competitive level t. That is, the posted prices of the two firms are $\hat{p}_j \geq \hat{p}_i > t$. Then, firm j can increase its profits by lowering its price to $\hat{p}_i - \epsilon$ where $0 < \epsilon < z$ holds. Such a price cut does not induce customers to activate the price-matching guarantee of firm i because paying the posted price $\hat{p}_i$ of firm i is more favorable than activating the guarantee and incurring hassle costs z. On the other hand, some customers who initially bought the product at firm i switch to firm j because firm j charges a lower price than firm i. This shift of customers to firm j makes the price undercutting of firm j a profitable option. For this reason, whenever hassle costs exist, only the ordinary Bertrand competition price t can be supported by Nash equilibria. The following theorem highlighting this result is a corollary of Proposition 3 in Hviid and Shaffer (1999).

Theorem 2 *Consider the linear city model where $v > 3t$. Suppose there is Bertrand competition between the two firms. If $z > 0$, then in any Nash equilibrium the selling price of both firms is equal t. Both firms post this price. It might be that each, one or none of the firms adopts a price-matching guarantee.*

The statements of the last two theorems are illustrated in Figure 1. This figure depicts the situation in which the customers' valuation is equal to $v := 4$ and traveling costs are equal to $t = 1$. The size of the hassle costs is displayed on the abscissa and the possible selling prices are displayed on the ordinate. As stated in Theorem 1, if there are no hassle costs, then any selling price between 1 (the ordinary Bertrand competition price) and 3.5 (the cartel price) is possible. However, if hassle costs are present, then selling price 1 is realized. That is, in this case, the price-setting coincides with that resulting from the ordinary Bertrand competition model.

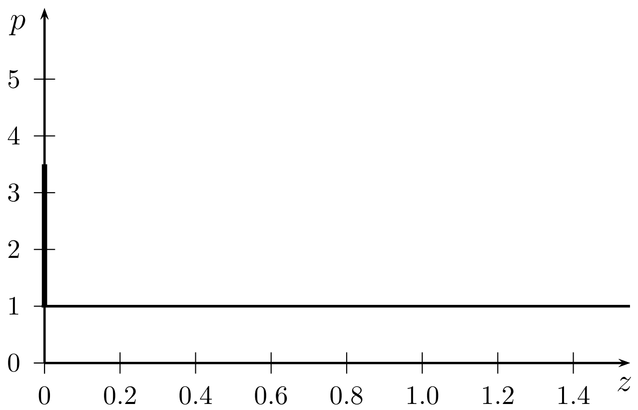

Figure 1: Selling prices in Bertrand competition

4 Price-Matching Guarantees in Stackelberg Competition

In this section, a different timing of the price-setting process is considered. Instead of assuming that the firms set simultaneously their prices we consider sequential price setting. Let us suppose that firm 0 is the price leader and chooses its price before firm 1 does. The price leader has also the option to provide a price-matching guarantee to its consumers. As in the preceding section, customers who activate such guarantee incur hassle costs $z \geq 0$. When firm 1 is choosing its price, it is informed on both the price charged by firm 0 and whether firm 0 guarantees a price-matching.

Summing up, a strategy of price leader firm 0 consists of two components, namely the decision on the posted price and the decision whether to adopt a price-matching guarantee. Thus, its strategy set is given by $S_0 := \mathbb{R}_+ \times \{PMG, no\ PMG\}$ as in the Bertrand competition case. The price follower firm 1 has to figure out with which prices it should react to any of these strategies. Its strategy set is given by $S_1 := \mathbb{R}_+^{S_0}$. To solve this sequential competition game between the two firms, the solution concept of subgame perfect Nash equilibrium is applied. We follow the backward induction method to figure out its solutions.

By proceeding backwards, we have to deal first with the decision problem of firm 1 who reacts to the decisions of firm 0. Suppose firm 1 observes that firm 0 posted price $\hat{p}_0$, but does not grant a price matching guarantee.

In this case the reaction function of firm 1 takes the form

$$p_1^S(\hat{p}_0, no\ PMG) := \begin{cases} \frac{1}{2}\hat{p}_0 + \frac{1}{2}t, & \text{if } 3t > \hat{p}_0 \geq 0, \\ \hat{p}_0 - t, & \text{if } v > \hat{p}_0 \geq 3t, \\ v - t, & \text{if } \hat{p}_0 > v. \end{cases}$$

For the situation in which firm 0 guarantees price matching we examine separately the cases (i) $z \geq t$ and (ii) $t > z \geq 0$. If hassle costs are above or equal to the traveling costs, the reaction function of firm 1 takes the form

$$p_1^S(\hat{p}_0, PMG) := \begin{cases} \frac{1}{2}\hat{p}_0 + \frac{1}{2}t, & \text{if } 3t > \hat{p}_0 \geq 0, \\ \hat{p}_0 - t, & \text{if } v > \hat{p}_0 \geq 3t, \\ v - t, & \text{if } \hat{p}_0 > v. \end{cases}$$

Obviously, for this case, the reaction function corresponds to that arising if firm 0 adopts no price-matching guarantee. Consider the remaining case $0 \leq z < t$. For this case, the reaction of firm 1 is described by the function

$$p_1^S(\hat{p}_0, PMG) := \begin{cases} \frac{1}{2}\hat{p}_0 + \frac{1}{2}t, & \text{if } t + 2z > \hat{p}_0 \geq 0, \\ \hat{p}_0 - t, & \text{if } v - \frac{t}{2} + \frac{z}{2} > \hat{p}_0 \geq t + 2z, \\ v - \frac{t}{2} - \frac{z}{2}, & \text{if } \hat{p}_0 \geq v - \frac{t}{2} + \frac{z}{2}. \end{cases}$$

Firm 0 as the price leader takes into account these reactions of firm 1 when it is deciding on its posted price $\hat{p}_0$ and whether it should promise a price-matching guarantee to customers. To detect firm 0's optimal strategy, we proceed as follows. First, we split its profit maximization problem into two subproblems. More precisely, we analyze separately the cases not providing a price matching and providing a price matching guarantee. For each of these two cases, the profit-maximizing price setting is deduced. Finally, in order to determine whether firm 0 should adopt a price-matching guarantee, we compare the profits generated in the two cases.

Suppose firm 0 does not provide a price matching guarantee so that its posted price is always equal to its selling price. Obviously, this case corresponds to the ordinary Stackelberg competition game. Then, the following link between firm 0's price setting and its profits exists:

$$\pi_0(\hat{p}_0) = \begin{cases} \left(\frac{t-\hat{p}_0}{4t} + \frac{1}{2}\right)\hat{p}_0, & \text{if } 3t > \hat{p}_0 \geq 0, \\ 0, & \text{if } \hat{p}_0 \geq 3t. \end{cases}$$

Obviously, a profit-maximizing price leader never chooses a price above or equal to $3t$. Therefore we can focus on the interval $3t > \hat{p}_0 \geq 0$ without loss of generality. By standard optimization techniques, posted price $\hat{p}_0^* := \frac{3}{2}t$ maximizes the profit of the price leader. Such price setting implies that price follower firm 1 charges price $p_1^* := \frac{5}{4}t$. Consequently, the profit of the price leader is $\pi_0^* := \frac{9}{16}$ and that of the price follower is $\pi_1^* := \frac{25}{32}t$. Both firms are better off in sequential price setting than in the simultaneous price setting. Firm 0 reaches $\frac{3}{8}$ of all customers and firm 1 the remaining $\frac{5}{8}$.

Let us turn to the case in which the price leader provides a price matching guarantee. First, suppose that the hassle costs are above the traveling costs. Then the profit of the price leader depends on its posted price in the following way:

$$\pi_0(\hat{p}_0) = \begin{cases} \left(\frac{t-\hat{p}_0}{4t} + \frac{1}{2}\right)\hat{p}_0, & \text{if } 3t > \hat{p}_0 \geq 0, \\ 0, & \text{if } \hat{p}_0 \geq 3t. \end{cases}$$

Analogous to the Stackelberg competition case without price-matching guarantees, the posted price $\hat{p}_0^{**} := \frac{3}{2}t$ maximizes the profit of the price leader. Consequently, the price charged by the follower and the profits of the two firms also correspond to that of the Stackelberg case without price-matching. Since the profits of the price leader without and with price-matching guarantee are identical, the price leader is indifferent between the two price policies. We conclude that in a situation in which the hassle costs exceed or are equal to the traveling costs, price-matching guarantees have no anti-competitive effect. Thus, for high hassle costs, the result of Hviid and Shaffer (1999) is confirmed even in the Stackelberg competition framework. This result is summarized in the following remark

Remark 1 *Consider the linear city model where $v > 3t$. Suppose there is Stackelberg competition between the two firms. If $z \geq t$, then the price leader sells the product at price $\frac{3}{2}t$ and the price follower sells the product at price $\frac{5}{4}t$. The price leader might or might not adopt a price-matching guarantee.*

Consider the situation in which the hassle costs are below the traveling costs. Then relationship between the posted prices of firm 0 and its profits is described by the function

$$\pi_0(\hat{p}_0) = \begin{cases} \left(\frac{t-\hat{p}_0}{4t} + \frac{1}{2}\right)\hat{p}_0, & \text{if } t + 2z > \hat{p}_0 \geq 0, \\ \left(-\frac{z}{2t} + \frac{1}{2}\right)\hat{p}_0, & \text{if } v - \frac{t}{2} + \frac{z}{2} > \hat{p}_0 \geq t + 2z, \\ \left(\frac{v-\hat{p}_0}{t}\right)\hat{p}_0, & \text{if } v > \hat{p}_0 \geq v - \frac{t}{2} + \frac{z}{2} > \hat{p}_0, \\ 0, & \text{if } \hat{p}_0 \geq v. \end{cases}$$

We immediately deduce from these relationships, that firm 0 does not post a price $\hat{p}_0 \geq v$. Moreover, since π_0 is decreasing on the interval $[v - \frac{t}{2} + \frac{z}{2}, v]$ and increasing on the interval $[t + 2z, v - \frac{t}{2} + \frac{z}{2}]$ the price $v - \frac{t}{2} + \frac{z}{2}$ maximizes firm 0's profit on the interval $[t + 2z, \infty[$. The profit-maximizing price on the interval $[0, t + 2z]$ is $t + 2z$ whenever $z \leq \frac{1}{4}$, and $\frac{3}{2}$, otherwise. As can be easily checked, whenever $z \leq \frac{1}{4}$ holds, price $v - \frac{t}{2} + \frac{z}{2}$ yields a higher profit then price $t + 2z$.

While the price leader posts price $v - \frac{t}{2} + \frac{z}{2}$ and guarantees price-matching to customers, the price follower undercuts the posted price of the price leader by the amount of the hassle costs, i.e., it charges price $v - \frac{t}{2} + \frac{z}{2}$. At these prices, the market share of firm 0 is equal to $\frac{1}{2} - \frac{z}{2t}$ and that of firm 1 is equal to $\frac{1}{2} + \frac{z}{2t}$. Customers of firm 0 are indifferent between activating the price-matching guarantee in order to pay the price charged by firm 1 and paying the posted price of firm 0. Obviously, if activating the price-matching guarantee is hassle-free, then the cartel prices are realized as in the Bertrand competition case. However, unlike the simultaneous price setting, the equilibrium is unique in this case. In presence of positive hassle costs less than one quarter of the traveling costs, the posted price of the price leader exceeds the cartel price and the price charged by the price follower undercuts the cartel price. Indeed, the higher the hassle costs, the higher the price posted by the price leader and the lower the price charged by the price follower. The size of the price spread is always equal to the hassle costs. Because these results are of importance, we reproduce them in the following remark.

Remark 2 *Consider the linear city model where $v > 3t$ is satisfied. Suppose there is Stackelberg competition between the two firms. If $0 \leq z \leq \frac{1}{4}t$ holds, then the price leader posts price $v - \frac{t}{2} + \frac{z}{2}$ and grants a price-matching guarantee and the price follower charges price $v - \frac{t}{2} - \frac{z}{2}$.*

This result stands in contrast to the result obtained in the preceding section. Unlike the result under Bertrand competition, supracompetitive prices can be realized under price matching guarantees even if the activation of this guarantee is costly to customers. Indeed, if the hassle costs are less than one quarter of the traveling costs between the two competitors, price guarantees induce supracompetitive prices which are close to the cartel price. This is true for any customers' valuation of the product and any size of traveling costs as long as our assumption $v > 3t$ is satisfied.

In the following, we determine the threshold value of hassle costs for which supracompetitive price are possible. Our linear city model enables us to describe it by the customers' valuation for the product and their traveling costs. According to Remark 1 and 2 the threshold has to be less than the traveling costs t, but greater than one quarter of them. For this reason, it is justified to restrict ourselves to the case $t > z > \frac{1}{4}t$ and compare the profit of the price leader at price $v - \frac{t}{2} - \frac{z}{2}$ with its profit at price $\frac{3}{2}$. It turns out that the threshold $\tilde{z}$ is determined by the formula

$$\tilde{z} := t + v \left(\sqrt{1 - \frac{9}{4} \left(\frac{t}{v} \right)^2} - 1 \right) .$$

If the actual hassle costs are below this threshold, the price leader posts price $v - \frac{t}{2} + \frac{z}{2}$ and adopts a price-matching guarantee while the price follower charges price $v - \frac{t}{2} - \frac{z}{2}$. If the actual hassle costs are above this threshold, the price leader posts price $\frac{3}{2}t$ and the price follower charge $\frac{5}{4}t$. Note that the latter prices correspond to those arising in the ordinary Stackelberg competition game. Whenever these Stackelberg prices are realized, the price leader is indifferent between adopting or not adopting a price-matching guarantee. However, even if such a guarantee is granted, customers do not activate it. The reason is that the spread between the price posted by the price leader and the price charged by the price follower is less than the hassle costs of activitating the guarantee. In the case that the actual hassle costs are equal to this threshold, the price leader is indifferent between the two price policies described above. Formally, the strategy of the price leader in the subgame perfect Nash equilibrium is described by

$$(p_0^S, g_0^S) := \begin{cases} (v - \frac{t}{2} + \frac{z}{2}, PMG) & \text{if } 0 \le z < \tilde{z}, \\ (v - \frac{t}{2} + \frac{z}{2}, PMG) \text{ or } (\frac{3}{2}t, PMG) \text{ or } (\frac{3}{2}t, no\ PMG) & \text{if } z = \tilde{z}, \\ (\frac{3}{2}t, PMG) \text{ or } (\frac{3}{2}t, no\ PMG) & \text{if } z > \tilde{z}. \end{cases}$$

Putting the strategies of the price leader (p_0^S, g_0^S) and of the price follower $p_1^S(.)$ together, the subgame perfect Nash equilibria of the Stackelberg competition game with price matching guarantees are specified. The actual price setting of the two firms under such competition is summarized in the following theorem.

Theorem 3 *Consider the linear city model where $v > 3t$ holds. Suppose there is Stackelberg competition between the two firms.*

(a) If $0 \le z < \tilde{z}$, then the price leader posts price $v - \frac{t}{2} + \frac{z}{2}$ and provides a price-matching guarantee to customers. The price follower charges price $v - \frac{t}{2} - \frac{z}{2}$.

(b) If $z = \tilde{z}$, then the price leader posts price $v - \frac{t}{2} + \frac{z}{2}$ or $\frac{3}{2}t$ and the price follower charges price $v - \frac{t}{2} - \frac{z}{2}$ or $\frac{5}{4}t$, respectively. The price leader provides a price-matching guarantee to customers if it posts price $v - \frac{t}{2} + \frac{z}{2}$. Otherwise, it may or may not provide it.

(c) *If $\tilde{z} < z$, the price leader charges price $\frac{3}{2}t$ and price follower charges price $\frac{5}{4}t$. The price leader may or may not provide a price-matching guarantee to customers.*

The below figure depicts the prices posted by the two firms for different levels of hassle costs where the valuation of the customers is assumed to be $v = 4$ and the traveling costs are assumed to be $t = 1$ as in Figure 1. For these values, the threshold of the hassle costs is $\tilde{z} \approx 0.708$. If the hassle costs are below this threshold, firms set supracompetitive prices. If the hassle costs are above this threshold, firms choose the prices arising in the ordinary Stackelberg competition without price-matching guarantees. In Figure 2, the gray line illustrates the prices $\hat{p}_0$ posted by the leader and the black line illustrates the prices p_1 charged by the follower.

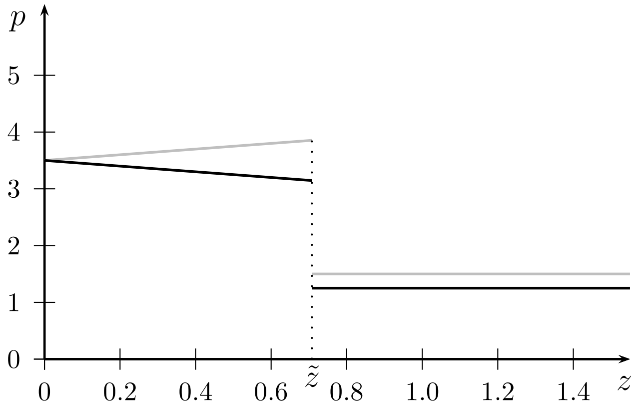

Figure 2: Selling prices in Stackelberg competition

In the remainder of this section, we discuss some comparative statics results regarding the threshold $\tilde{z}$ and the price spread $\Delta(p) := \hat{p}_0 - p_1$. First, we remark that the higher the customers' valuation of the product, the higher the threshold $\tilde{z}$. Moreover, if $v \to \infty$, then $\frac{\tilde{z}}{t} \to 1$. That is, the threshold value approaches from below the traveling costs if the customers' valuation of the product rises. Furthermore, as can be easily checked, an increase in the traveling costs implies an increase in the threshold value.

Another distinctive characteristic is that the spread between the price posted by the leader and the price charged by the follower may decrease or increase compared to an initial situation without price-matching guarantees. As presented above, the price spread is equal to $\frac{1}{4}t$ in the case without price-matching guarantees. If this option is available for the price leader and the hassle costs are below the threshold value $\tilde{z}$, the price spread corresponds to the hassle costs. Consequently, whenever the hassle costs are greater than one quarter of the traveling costs (but below threshold $\tilde{z}$), price-matching guarantees imply a widening of the price spread.

5 Summary

This paper has studied the price effects of price-matching guarantees in the linear city model for different forms of competition. In literature, it has been pointed out that price-matching guarantees deter price competition and facilitate supracompetitive prices. However, Hviid and Shaffer

(1999) put forward a strong argument against this widespread claim. They demonstrate that in the presence of hassle costs these adverse welfare effects do not occur. One main result of our paper is that this argument is not true *per se*. It depends on the market behavior of the competitors. We show that their assumption of simultaneous price setting is crucial for their claim. In Theorem 3 we establish by means of the linear city model that for sequential price setting a price-matching guarantee promised by the leader might induce supracompetitive prices even though hassle costs exist. This anti-competitive effect of price matching guarantees is present if the hassle costs are not too high. More precisely, whenever the hassle costs are less or equal to a quarter of the traveling costs between the competitors these adverse effects definitely occur. If, however, the hassle costs exceeds the traveling costs, then the competitive price levels definitely result and no adverse welfare effects are implied by price-matching guarantees. The assumptions of the linear city model enables us to specify the threshold of the hassle costs below which supracompetitive prices are realized. It turns out that the threshold increases the higher the customers' valuations for the product and the higher the traveling costs are. The spread between the price posted by the leader and the price charged by the follower may decrease (if the hassle costs are low) or increase (if the hassle costs are high, but below the threshold) after the price leader has introduced a price-matching guarantee.

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