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Abstract

This paper provides an example that incumbent firms might allow potential entrants to enter a market. The market consists of two sub-markets: a high-end market and a low-end market. (i) If low-quality products are of no value to consumers in the high-end market, (ii) consumers in the low-end market will not be concerned about product quality; and (iii) if the low-end market is relatively small, then the entries of firms into the low-end market would be beneficial to the incumbent firms. To be more specific, entry into a certain market represents a commitment to prevent incumbent firms from fierce competition within the high-end market and guarantees higher profits to the incumbent firms.

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Key words: entry, handover, heterogeneous consumers, commitment, oligopoly

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1 Introduction

Standard microeconomics textbooks explain that, in an oligopoly market (e.g., Cournot oligopoly), the equilibrium price decreases as the number of firms increases, and the profits of the firms then decrease. In many real-world markets, the characteristics concerning reductions in profits and prices actually hold.[1] In markets which have those characteristics, it is natural for incumbent firms to be apprehensive about the possibility of other firms entering the market. Protests by incumbent firms against the entry deregulation are typical examples of such apprehension. In fact, market prices have frequently been observed to drop dramatically, and the profits of incumbent firms to decline, after a government allows potential entrants to enter a market (e.g., the deregulation of the Japanese taxi industry). Therefore, many economists do speculate whether potential rivals are beneficial for incumbent firms; however, they have often studied the conditions under which incumbent firms try to prevent and deter potential entrants into the market and the welfare implication of entry deterrence by incumbent firms.[2]

On the contrary, we sometimes observed counter examples about the relation between market prices and the number of firms. Established Japanese firms share their knowledge of the electricity industry with Chinese firms that are potential competitors of the Japanese.[3] Intuitively, it appears that such technological transfers would lead to reductions in the profits of the incumbent firms; nevertheless, such transfers take place. In the

[1] In several papers, it has been reported that the total profits of an industry may result in an increase in the number of firms. Using a bilateral oligopoly model, Naylor (2002a) shows that for a small number of firms, the increment in the number of firms enhances the overall profits of an industry.

[2] See, for instance, Bernheim (1984), Dixit (1980), Eaton and Ware (1987), Gelman and Salop (1983), McLean and Riordan (1989), Sørgard (1997), and Waldman (1987, 1991). Geroski (1995) provides an excellent survey on the literature of entry problems. In the literature of spatial competition with entry deterrence, see Bonanno (1987), Ishibashi (2003), Judd (1985), and Schmalensee (1978).

[3] Evidence of this has been provided by engineers of the Sanyo Electric Co., Ltd.

food industry, the invasion of private-label food products sometimes causes increases in prices and profits of name-brand products. For example, Ward *et al.* (2002) empirically show that increases in the share of private-label goods are correlated with a rise in the price of name-brand goods. Pauwels and Srinivasan (2004) empirically show that the invasion of private-label food products produces increases in the *profits* of name-brand goods. In the pharmaceutical industry, the entry of generic versions of brand-name drugs results in increases in brand-name prices. For example, Frank and Salkever (1997) provide evidence that brand-name prices increase after the entry of generic drugs into the market and are accompanied by large decreases in the prices of the generic drugs in general. When the prices of brand-name products increase, profits may also rise.[4]

Speculation on this subject raises several questions. Some of these questions focus on issues such as the reason that there are technology transfers that invite potential entrants into the market; whether such an invitation is profitable for incumbent firms; in such a case, why it is profitable; and the reason that the invasion of private-label food products induces an increment in the *profits* of name-brand goods.

In the examples reported above, a common market characteristic exists. Established products and non-established products exist in the same markets, and they are recognized as differentiated products. For instance, in the food industry, name-brand products are produced by established firms, and private-label food products are produced by non-established and established firms. These private-label food products are priced lower than name-brand products and, they frequently offer equivalent quality.[5] As summarized in Soberman and Parker (2004), some empirical studies show that some consumers are willing

[4] This is not mentioned in Frank and Salkever (1997). Moreover, it is not possible to determine whether increases in the prices of brand-name products also produce increases in profits. Nevertheless, it is possible that there is a positive correlation between the prices and the profits of the brand-name products.

[5] See Hinloopen and Martin (1997) and Connor and Peterson (1992, 1997).

to pay more for advertised (name-brand) products. In other words, some consumers believe that private-label products are the same as store-brands in regards to overall quality, taste, availability, freshness, guarantee of satisfaction, clarity of labelling, and quality of packaging, among other attributes.

The questions listed above are answered below. In addition, we show, with the use of a simple framework, how entries into the market can be profitable for incumbent firms and the circumstances under which prices can be increased. In other words, the profits of the incumbent firms could *increase* as new firms enter the market.

We consider the following market structure. The market consists of two sub-markets: a high-end market and a low-end one. Consumers in the high-end market require products of higher quality. Low-quality products are of no value to those consumers. On the other hand, consumers in the low-end market are less concerned with quality.[6] The low-end market is relatively small compared to the high-end market. In this study, there are two incumbent firms and a potential entrant. Some entry barriers may prevent a potential entrant from joining the market without the cooperation of an incumbent firm.[7]

In this setting, we show a subgame perfect equilibrium that enables an incumbent

[6] In the personal computer (PC) industry, specific businesses may require more sophisticated hardware to satisfy the demands of their business than household users, who may need a computer for personal reasons such as writing letters and listening to music. Those business users do not need PCs with low level equipments. However, typical computer users are generally satisfied with word-processing software and programs that will enable them to use the Internet.

[7] The setting discussed here is related to that in Rosenthal (1980). He also discusses a market structure in which two classes of consumers exist: those who view labels of companies as artifacts and purchase only from the low-price company; and those who perceive significant differences among the brands and purchase only from their respective favorite brands (see, Rosenthal (1980, p. 1575)). He shows that the equilibrium price increases as the number of firms increases. In his model, however, pure-strategy equilibria do not exist and the increment of the equilibrium price is evaluated on the concept of stochastic dominance. Rosenthal (1980) and most of the subsequent researches (e.g. Narasimhan (1988) and Baye *et al.* (2004)) discuss the topic of price dispersion but do not consider the relation between the profitability of incumbent firms and the existence of entrants.

firm to support a new entrant as a *local* monopolist in the low-end market. Without the entry of a new firm, the incumbents will need to produce more because the low-end market remains empty and sufficiently profitable. However, once incumbent firms sell their products to consumers in the low-end market, the price in the high-end market collapses, and then the profits of the incumbent firms drastically decrease. The entry is a credible commitment not to sell their high-quality products to consumers in the low-end market. As a result, the incumbent firms can secure high profits from the high-end market.

We now report the theoretical contribution of our results. As stated above, we show that entries might raise both the incumbent's profits and the equilibrium price.[8] To our knowledge, no previous study has shown that the profits of incumbent firms and the equilibrium price *increase* as a result of the entries of new firms into the market. However, several studies have indicated that market entries produce increases in the price of the incumbent firm's product. Inderst (2002) considers how prices react to an increase in competition. In his model, an incumbent enjoys the advantage of having a locked-in fraction of buyers. He shows that the price of a product produced by the incumbent firm may increase. He does not show that the profit of the incumbent firm increases as a result of the entry of new firms into the market. Davis *el al.* (2004) consider a duopoly model in which an incumbent firm and an entrant exist. When the entrant enters the market, the incumbent firm sets its price higher than that in the monopoly situation because serving consumers with lower willingness to pay is not beneficial. They also consider the product positioning of the firms, but they do not show the profit of the incumbent relative to that

[8] Naylor (2002b) derives a similar result in the context of wage bargaining in unionized bilateral oligopoly. He considers a simple Cournot oligopoly model in which wages are determined by bargaining in unionized bilateral oligopoly. In his model, the equilibrium price of the final product, however, always decreases as the number of firms increases. This is quite different from the price change by the entries in our model.

of the new entrant.

The organization of the remainder of the paper is as follows. In the next section, we describe a two-stage game model. In Section 3, we derive the subgame perfect equilibrium of the game constructed in the previous section. The last section is the conclusion.

2 Model

We consider an industry with two vertically differentiated products (h and l). h and l are high- and low-quality products, respectively. There are two major firms (1 and 2) and one minor firm (3). The major firms can produce h at a constant marginal cost normalized to zero. We assume that neither major firm produces l. A minor firm cannot produce any good at first. However, with a major firm's support, a minor firm can produce l at a constant marginal cost normalized to zero.[9] No fixed cost is assumed for the production of h or l.

We assume two groups of consumers, H (the high-end market) and L (the low-end market). Consumers in H demand only h. That is, the quality of l is not at all sufficient for consumers in H. The demand function of this high-end market, $D^H(p^h)$, is given by

$$D^H(p^h) = \begin{cases} 0 & \text{if } p^h \in (1, \infty), \\ 1 - p^h & \text{if } p^h \in [0, 1], \end{cases}$$

where p^h is the price of h. Consumers in L are indifferent between h and l. That is, the high quality of h (compared to l) is of no use to consumers in L. The demand function of this low-end market, $D^L(p^l)$, is given by

$$D^L(p^l) = \begin{cases} 0 & \text{if } p^l \in (a, \infty), \\ b(1 - p^l/a) & \text{if } p^l \in [0, a], \end{cases}$$

where p^l is the price of l, and we assume $1/3 < a < 1/2$.[10] Note that $D^L(p^l)$ is a linear

[9] The support might be some lectures on the basic technology, cheap license fees for the major firm's important patents, or the major firm's cooperation for the outsourcing of the minor firm's product.

[10] While $1/3 < a$ is made to simplify the analysis, $a < 1/2$ is essential for our analysis.

demand function such that the highest willingness to pay is measured by a and the largest demand (at $p^l = 0$) is measured by b.

In this paper, quantity competition is assumed. Let q_i be firm i's output level. In addition, define $q = (q_1, q_2, q_3)$. Note that $q_1 + q_2$ is the (total) quantity of h, and q_3 is the quantity of l in the market.

We describe how p^h and p^l are determined given the above consumers. As long as $1 - (q_1 + q_2) \geq a(1 - q_3/b)$, the high-end and low-end markets are separated. That is, no consumer in L buys h. Therefore, p^h is given by $1 - q_1 - q_2$, and p^l is given by $a(1 - q_3/b)$. If $1 - (q_1 + q_2) < a(1 - q_3/b)$, the markets are connected. That is, some consumers in L buy h. Because h and l are completely indifferent to consumers in L, this means $p^h = p^l = \frac{a(1+b-(q_1+q_2+q_3))}{a+b}$.

In summary, the prices are determined as follows.

$$p^h(q) = \begin{cases} 1 - q_1 - q_2 & \text{if } q_1 + q_2 \leq 1 - a + \dfrac{aq_3}{b} \\ \dfrac{a(1 + b - (q_1 + q_2 + q_3))}{a + b} & \text{otherwise.} \end{cases}$$
$$p^l(q) = \begin{cases} a\left(1 - \dfrac{q_3}{b}\right) & \text{if } q_1 + q_2 \leq 1 - a + \dfrac{aq_3}{b} \\ \dfrac{a(1 + b - (q_1 + q_2 + q_3))}{a + b} & \text{otherwise.} \end{cases}$$

Let $\pi_i(q)$ be firm i's profit function. For $i = 1, 2$, it can be expressed as follows.

$$\pi_i(q) = \begin{cases} (1 - q_1 - q_2)q_i & \text{if } q_1 + q_2 \leq 1 - a + \dfrac{aq_3}{b} \\ \dfrac{a(1 + b - (q_1 + q_2 + q_3))}{a + b} q_i & \text{otherwise.} \end{cases} \tag{1}$$

For $i = 3$, it can be expressed as follows.

$$\pi_3(q) = \begin{cases} a\left(1 - \dfrac{q_3}{b}\right) q_3 & \text{if } q_1 + q_2 \leq 1 - a + \frac{aq_3}{b} \\ \dfrac{a(1 + b - (q_1 + q_2 + q_3))}{a + b} q_3 & \text{otherwise.} \end{cases} \tag{2}$$

The game consists of two stages and proceeds as follows. At the first stage, firm 1 chooses whether or not it supports firm 3.[11] For simplicity, we assume that the cost of the support is zero. At the second stage, all firms in the market choose their quantities. If firm 1 does not support firm 3 at the previous stage game, we set $q_3 = 0$. At the end of the second stage, the market opens, and each firm collects its profit.

3 Equilibrium Analysis

We use the subgame perfect equilibrium (SPE, hereafter) as the solution concept. To derive the SPE, we solve the game backward. Hereafter we use the superscript "*" to denote the equilibrium.

3.1 The second stage without firm 3

If firm 1 does not support firm 3 at the first stage, the second stage becomes a simple duopolistic competition.

Moreover, because $a > 1/3$, the equilibrium price is less than or equal to a.[12] In other words, h and l are connected at the Nash equilibrium.

Given this, the F.O.C. becomes as follows.

$$\begin{aligned} \frac{\partial}{\partial q_i}\left(\frac{a(1+b-(q_i+q_j))q_i}{a+b}\right) &= \frac{a(1+b-(2q_i+q_j))}{a+b} = 0 \quad (i \neq j) \\ &\Leftrightarrow \; q_i = \frac{1+b-q_j}{2} \end{aligned}$$

Therefore, the Nash equilibrium is $q_1 = q_2 = (1+b)/3$ and, each firm's equilibrium profit is $a(1+b)^2/(9(a+b))$. We summarize this result as follows.

[11] The assumption that only firm 1 can support firm 3 is made for simplicity.

[12] If the whole market consists of only the high-end market, $q_1 = q_2 = 1/3$ is the unique Nash equilibrium, and the equilibrium price becomes $1/3 (< a)$. This implies that $p > a$ cannot be the equilibrium price in the subgame here.

Lemma 1 *Suppose that firm 1 does not support firm 3 at the first stage. The unique Nash equilibrium exists in the corresponding subgame such that firms 1 and 2 obtain* $a(1+b)^2/(9(a+b))$.

3.2 The second stage with firm 3

If firm 1 supports firm 3 at the first stage, the second stage becomes quantity competition by three firms. Potentially, there are two Nash equilibria in this subgame. One is such that h and l are separated, and the other is such that h and l are connected.

Hereafter, we restrict our attention to the former case because we are interested in the strategic handover of the low-end market. To discuss equilibrium outcomes in which firm 3 exists, we divide the discussion into two steps and show the outcome. First, we guess an equilibrium outcome in which h and l are separated. Second, we show that the outcome discussed in the first step is really an equilibrium outcome.

If h and l are separated at the Nash equilibrium, the relevant demand function for firms 1 and 2 must be $D^H(p^h)$. Therefore, $q_1 = q_2 = 1/3$ becomes the Nash equilibrium after a simple calculation. The equilibrium profit becomes 1/9 for each firm. Because firm 3 plays as the monopolist in the low-end market, $q_3 = b/2$ and the equilibrium profit becomes $ab/4$. We now denote the vector of the equilibrium outcome as $q^E \equiv (1/3, 1/3, b/2)$.

We now check whether or not q^E is a Nash equilibrium. If q^E appears as an equilibrium outcome, firms 1 and 2 must not have the incentive to produce more so that h and l become connected. We derive the condition under which such deviations do not occur. To connect h and l, firm 1 must produce at least[13]

$$q_1^D \equiv \frac{2}{3} - \frac{a}{2}.$$

Differentiating $\pi_1(q)$ with respect to q_1 and substituting $q_2 = 1/3$ and $q_3 = b/2$ into it, we

[13] Given $q_2 = 1/3$, $p^h = 1 - q_1 - q_2 = 2/3 - q_1$. Because $2/3 - q_1 \leq p^l = a/2$ is required to make h and l connected, firm 1 must produce at least $2/3 - a/2$.

have

$$\frac{\partial}{\partial q_1}\left(\frac{a(1+b-(q_1+q_2+q_3))q_1}{a+b}\right)\bigg|_{q_2,q_3} = \frac{a}{a+b}\left(\frac{2}{3}+\frac{b}{2}-2q_1\right).$$

If $a + b/2 \leq 2/3$, this is negative for any $q_1 \geq q_1^D$, and then firm 1 does not have an incentive to deviate. Otherwise, we have the interior solution from it:

$$q_1 = \frac{1}{3} + \frac{b}{4}.$$

In this case, the profit of firm 1 is

$$\frac{a}{a+b}\left(\frac{4+3b}{12}\right)^2.$$

If this is smaller than the profit in which h and l are separated, that is,

$$\frac{a}{a+b}\left(\frac{4+3b}{12}\right)^2 < 1/9,$$

the firm does not have an incentive to deviate. After some calculations, this can be rewritten as $3a(8+3b) < 16$.

Therefore, if $a + b/2 \leq 2/3$ or $3a(8+3b) < 16$ holds, no major firm wants to deviate. Fortunately, $3a(8+3b) < 16$ is automatically satisfied if $a+b/2 \leq 2/3$ is satisfied.[14] As a result, the only relevant condition is $3a(8+3b) < 16$, and we obtain the following lemma.

Lemma 2 *Suppose that firm 1 supports firm 3 at the first stage. If* $3a(8+3b) < 16$*, there is a Nash equilibrium in the corresponding subgame such that firms 1 and 2 obtain* $1/9$.

3.3 SPE

In this subsection, using the results obtained so far, we derive the condition for the existence of the SPE such that firm 1 supports firm 3 at the first stage on the equilibrium path.

[14] Multiplying both sides of $a+b/2 \leq 2/3$ by 24 yields $24a+12b \leq 16$. Because $a < 1/2$ by assumption, $12b > 9ab$. Therefore, it is enough to focus on $3a(8+3b) < 16$.

We require two conditions. One is $3a(8+3b) < 16$ as the analysis in the previous subsection shows. The other is that firm 1 actually benefits from the strategic handover of the low-end market. That is,

$$\frac{1}{9} \geq \frac{a(1+b)^2}{9(a+b)} \quad \Leftrightarrow \quad 1 \geq a(2+b).$$

However, a simple calculation shows that $3a(8+3b) < 16$ is automatically satisfied if $a(2+b) \leq 1$ holds.[15] Therefore, we obtain the following result.

Proposition 1 *If $a(2+b) \leq 1$ holds, then there is a subgame perfect equilibrium in which the strategic handover occurs on the equilibrium path.*

Figure 1 shows the region in which Proposition 1 holds. Note that $a(2+b) \leq 1$ does not hold for any $b > 0$ as long as $a > 1/2$. The rough intuition of Proposition 1 is as follows. If firm 3 does not enter the low-end market, the price elasticity at a lower price than a becomes higher than that of $D^H(p^h)$. This property induces the firms to produce more. However, those increases in production are not profitable to firms 1 and 2 if the low-end market is small in terms of both willingness to pay (measured by a) and market size (measured by b). Therefore, the handover of the low-end market to firm 3 (as credible commitment not to overproduce) becomes beneficial to firms 1 and 2.

We have to note that *two incumbent firms are needed* to derive our main result. In other words, if there is only one incumbent firm, such an invitation of entrants is not profitable for the incumbent firm. When there is one incumbent firm, it can set its quantity with no fear of the rival firm's response. If a firm assumes that supplying its product for consumers at H and L is optimal, then it will do so; otherwise, it will not. By entering, the monopolist loses this kind of freedom. The entry act as a constraint on the

[15] $a(2+b) \leq 1$ can be rewritten as $32a + 16ab \leq 16$. The LHS of this inequality is larger than $3a(8+3b) = 24a + 9ab$.

monopolist and does not provide any benefit to it. In the setting selected for this study, the entrant firm must show commitment against fierce competition.

3.4 Welfare Analysis

In this subsection, we investigate whether or not the social welfare improves as a result of firm 3's entry. Define $q^A \equiv ((1+b)/3, (1+b)/3, 0)$. q^A is the output profile at the Nash equilibrium in Lemma 1 or the output profile when firm 3 is out of the market. After some calculations, we obtain the quantities demanded by consumers in H and those in L as follows:

$$D^H = \frac{2a+3b-ab}{3(a+b)}, \quad D^L = \frac{b(3a+2b-1)}{3(a+b)}.$$

When firm 3 enters the low-end market, $q^E (= (1/3, 1/3, b/2))$ is realized as shown in Section 3.2. Because the markets are separated, the quantities demanded by consumers in H and those in L are

$$D^H = \frac{2}{3}, \quad D^L = \frac{b}{2}.$$

We now define Δq_H and Δq_L as follows:

$$\begin{aligned} \Delta q_H &\equiv \frac{2}{3} - \frac{2a+3b-ab}{3(a+b)} = -\frac{b(1-a)}{3(a+b)}(<0), \\ \Delta q_L &\equiv \frac{b}{2} - \frac{b(3a+2b-1)}{3(a+b)} = \frac{b(2-3a-b)}{6(a+b)}. \end{aligned}$$

In words, Δq_H (Δq_L) is the amount of change in the consumption level at H (L) by the entry of firm 3. The consumption level at H decreases by the entry.

We now evaluate those amounts and social welfare. The sign of Δq_L depends on the parameter values of a and b. If Δq_L is negative, the consumption levels in both groups decrease. In this case, it is clear that firm 3's entry is not socially beneficial. We now consider the case in which Δq_L is positive. Consider the Nash equilibrium in Lemma 1. It is noteworthy that the marginal consumers in H and L have the same willingness to pay at this equilibrium (before the entry). Given this situation, if we decrease the consumption level at H by $\Delta(> 0)$ and increase the consumption level at L by the same amount Δ, then social welfare decreases by the manipulation because the (gross) consumer surplus generated by consumers (who loss the consumption opportunity) at H is larger than that by consumers (who receive the consumption opportunity) at L. Because $|\Delta q_H| - |\Delta q_L| = b/6 > 0$, the decrease in the consumption level at H is larger than the increase in the consumption level at L. Therefore, the entry of firm 3 is undesirable from the viewpoint of social welfare.

Proposition 2 *The entry of firm 3 decreases social welfare.*

The paradoxical result is quite different from the traditional discussion about the excess entry theorem (e.g., Mankiw and Whinston (1986), Suzumura and Kiyono (1987), Matsumura (2000)). In the discussion, the reason that an additional entry harms social welfare stems from the entry cost (fixed cost) incurred by the entrant and the business-stealing effect (the pure replacement of the incumbent firms' supply by the entrant's). In our paper, we do not take a fixed cost incurred by an entrant into account. The driving force of the result is the decrease in the quantities supplied by the incumbent firms. Note that, if we allow more potential entrants to enter the low-end market, Proposition 2 would not hold because Δq_L (the increment in the quantity demanded by consumers at L) increases as the number of entrants increases.

4 Discussion

Those results are consistent with the following two empirical studies. We now show the empirical results that are related to ours.

Pauwels and Srinivasan (2004) demonstrate permanent performance effects of store brand entry, typically benefiting the retailer, the consumers, and premium-brand manufacturers. For the manufacturers, store brand entry is typically beneficial for premium-price national brands, but not for second-tier national brands. The increment in the profits of national brands appears in our model. Their empirical results are consistent with those of ours.[16]

Using supermarket scanner data, Ward *et al.* (2002) test several hypotheses: for instance, private-label brands have lower prices than name brands; name-brand firms defend their brands against the private-label invasion by lowering their prices. They show that when the share of private-label goods rises, the prices of name-brand goods tend to rise.[17] They also show that an increase in private-label share is correlated with either no effect or a decrease in the price of private-label goods, no effect or an increase in the price of branded goods and usually no effect or a negative effect on the overall price. As discussed in the main part, those properties hold in our model. In our model, the number of entrants does not affect the equilibrium price of incumbent firms (branded goods) but decreases the equilibrium price of the entrants (private-label goods). Moreover, as the number of entrants increases, the share of entrants (private-label goods) increases. Therefore, we think that our model can be applied to the discussion about private brands.

We can also apply the model presented here to another situation related to international trade. We now suppose that there are two markets, domestic and foreign. The demand structure is similar to that in Section 2. The domestic market is the high-end market and the foreign one is the low-end market. Two incumbent domestic firms are able to supply their products without any cost, and no transport cost exists. Under such a situation, let us suppose that one of the incumbent firms gives a new firm its own technology and induces the entry of a new firm. By the technological transfer, the incumbent firms resign from the foreign market and only supply their products to the domestic market. It is noteworthy that, if the foreign market is expected to grow gradually, such an invitation

[16] In our paper, however, we do not distinguish between the incumbent firms (national brand firms). Therefore, we cannot explain the decrease in the second-tier price in our model.

[17] As pointed out in Ward *et al.* (2002), a similar phenomenon has been observed in the pharmaceutical market, see, for instance, Frank and Salkever (1997).

of new entrants would be unprofitable for incumbent firms.

5 Concluding Remarks

In this paper, we show that it might be beneficial for incumbent firms to focus on competition in the high-end market by the handover of the low-end market to other firms. The handover keeps the price in the high-end market relatively high and the resulting incumbents' profit also becomes high if the low-end market is relatively small. We should remember that, for incumbent firms, entry is preferable to *no entry*. This is different from the argument of Ashiya (2000) in which an incumbent firm might invite a weak firm's entry to prevent a strong firm's entry.

We should mention that our result is (weakly) strengthened if we consider multiple potential entrants. Suppose that incumbent firms can earn more profits when they abandon the low-end market. Even if one entrant in the low-end market is not enough for incumbent firms to abandon, they can surely prevent their own deviations by making the low-end market sufficiently competitive.

As mentioned in footnote 16, we do not distinguish between the incumbent firms (national brand firms). Therefore, we cannot explain the result presented by Ward *et al.* (2002): the decrease in the second-tier price. The construction of a framework that would explain pricing behavior would be a worthy undertaking for future research.

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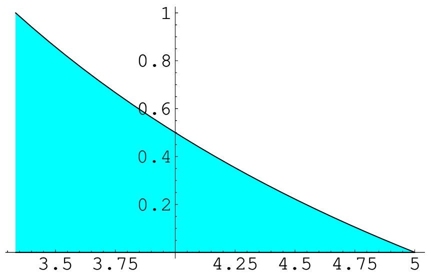

Figure 1: The parameter range in which the handover is beneficial.
(Horizontal: $10a$, Vertical: b)