

The existence of low-end firms may help high-end firms*

Ikuo Ishibashi[†]

Department of Economics, Aoyama Gakuin University

Noriaki Matsushima[‡]

Graduate School of Business Administration, Kobe University

April 26, 2007

The first-round version for Marketing Science

*The authors are grateful to Hisao Hisamoto, Junichiro Ishida, Hiroki Kondo, Motonari Kurasawa, Masayoshi Maruyama, Keizo Mizuno, Noriaki Murakami, Tatsuhiko Nariu, Takao Ohkawa, Tetsuo Ono, Yoshiyasu Ono, Tadashi Sekiguchi, Kyohei Shibata, Daisuke Shimizu, Ryusuke Shinohara, Hideo Suehiro, Kentaro Tachi, Naoki Watanabe, Masatoshi Yamada, Lex Zhao, and seminar participants at the Kobe Summer Seminar for Half-Light Idea 2006, Kyoto University, Osaka University, and Shinshu University for their helpful comments. Of course, any errors are the responsibility of the authors.

[†] Faculty of Economics, Aoyama Gakuin University 4-4-25 Shibuya, Shibuya-ku, Tokyo 150-8366 Japan. E-mail: ishibash@econ.aoyama.ac.jp

[‡] Correspondence author: Noriaki Matsushima, Graduate School of Business Administration, Kobe University, 2-1 Rokkodai, Nada, Kobe, Hyogo 657-8501, Japan. Phone: +81-78-803-6981. E-mail: nmatsush@kobe-u.ac.jp

The existence of low-end firms may help high-end firms

Abstract

This paper provides an example of competition between high-end and low-end products benefiting high-end firms. The key factor is the existence of two heterogeneous consumer groups: (a) consumers who demand only high-end products and (b) consumers who care little whether products are high-end or low-end. We show that if the former group is larger than the latter, the profits of firms in the high-end market are larger when there are firms producing low-end products than when there are not. The result provides a new theoretical mechanism concerning the profitability and pricing of national brand firms after the entry of private labels. It also has several implications for pricing and marketing strategies. For instance, established firms should not decrease their prices after the entry of nonestablished firms. Established firms should more earnestly persuade customers that their products are status goods after the entry of nonestablished firms.

Key words: marketing strategy, pricing research, product positioning, game theory

1 Introduction

This paper provides an example of competition between high-end and low-end products benefiting the high-end firms. The key factor in our example is the existence of two heterogeneous consumer groups. One group consists of consumers who demand high-end (name-brand) products. Low-end (private-label) products are worth little to them. The other group consists of consumers who care little whether products are high- or low-end. Therefore, they buy products with the lowest price.¹ Based on these heterogeneous consumer groups, we show that if the former group is larger than the latter group, the profits of firms in the high-end market are larger when there are firms in the low-end market than when there are not.²

The logic behind our result is as follows. If no firm is in the low-end market or the price of the low-end products is sufficiently high, the high-end firms have an incentives to sell their products to the low-end consumers. Of course, once the high-end firms sell their products to them, the price in the high-end market collapses. If the low-end market is smaller than the high-end market, the increase in sales volume is offset by the decrease in price. As a result, the existence of the low-end market decreases the profits of the high-end firms. A sufficient supply of low-end products makes the low-end market unprofitable for the high-end firms and removes the high-end firms' incentive to produce more. Therefore, rivals in the low-end market become beneficial to the high-end firms. Note that the existence of low-end firms raises the price and decreases the supply of high-end products.

Our results have an implication for pricing strategies. The optimal pricing for high-end products need not be monotonically decreasing in the degree of competition in the corresponding low-end market. If the market structure is as stated above,

¹ Computer markets may be a good example of such heterogeneous groups of users. Computers designed for home use usually perform better than those designed for business use. This is because each home user uses PCs for various purposes: writing documents, listening to music, editing pictures, watching movies, and so on. Computers that perform poorly in image processing are of no use to home users. However, such computers are adequate for business users who only write documents and browse the Internet.

² Rosenthal (1980) adopts a similar setting to analyze the relationship between price dispersion and number of suppliers. He considers two classes of consumers: consumers who view labels of companies as artifacts and purchase only from low-price companies and consumers who perceive significant differences among brands and purchase only 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.

high-end firms should set high prices in spite of severe competition in the low-end market.³

Given the main result of our paper, firms which produce high-end products should persuade customers that their products are status goods. Therefore, activities that enhance the status of firms might be much more important in markets, as stated above. We now discuss several ways to conduct such activities.

First, if brand values matter in a market, the owner firm should place more reliance on advertising, to create a perception of its brand as “premium” by high-end consumers. Once the brand is perceived as such, the firm can earn additional profit by competing against firms in the corresponding low-end market.

Second, we believe that the result in Randall *et al.* (1998) implies another route for such promotional activities. They show that the presence of “premium” or high-quality products in a product line enhances brand equity.⁴ Based on their research, if “high-end” status (brand equity) in a market is associated with other high-quality products in its product line, to protect its profit in the market it is beneficial for a firm to enhance the status of its *other* high-quality products. Promotional activity may indirectly enhance the profitability of a product in the market.⁵

Furthermore, if technological progress plays an important role in creating a high-end product, firms should spend more money on drastic innovations. The reason is the same: once the product satisfies the technological requirements the high-end consumers demand, a firm can ensure that its profit is stable no matter how competitive the low-end market becomes.

There is marketing literature that seems to be consistent with our arguments. First, as summarized in Soberman and Parker (2004), some empirical studies show the existence of heterogeneity of consumer preferences for national brands and private labels (or generic brands): some consumers are willing to pay more for advertised (name-brand) products whereas others believe that private-label products are the same as name brands in regard to overall quality, taste, availability, freshness,

³ Hauser and Shugan (1983) is a pioneering work about the relation between competitiveness and marketing strategies. Recently, along the same lines, Sayman *et al.* (2002) and Steenkamp *et al.* (2005) discuss these matters using empirical data.

⁴ Keller and Lehmann (2006) provide an excellent survey and direction for future research concerning brands and brand equity.

⁵ When the firm employs these promotional activities, it has to take into account the caveat of Leclerc *et al.* (2005). They have shown that in separate evaluations, people are predisposed to use firm information (how the item ranks *within the firm*) as a frame of reference to evaluate the quality of that item. As a result, customers may evaluate a high-status item from a low-status firm as being better than a low-status item from a high-status firm. To overcome this propensity, firms have to induce customers to focus their attention on differences *between the firms*.

guarantee of satisfaction, clarity of labeling, and quality of packaging, among other attributes.

Second, Pauwels and Srinivasan (2004) empirically show that the invasion of private-label food products increases the *profits* from name-brand (premium brand) goods if consumers regard the quality of the name brand as being much higher than that of private label. Although the fundamental structure of the food product industry is not exactly the same as our setting, our logic might apply with a slight modification.⁶

Third, some empirical research reports that high-end price increases as the degree of competition in the low-end market increases.⁷ Ward *et al.* (2002) show empirically that increases in the share of private-label goods are correlated with a rise in the prices of name-brand goods. Frank and Salkever (1997) provide evidence from the pharmaceutical industry that brand-name drug prices increase after the entry of generic drugs into the market and are accompanied by large decreases in the prices of generic drugs in general.

Now we discuss the related theoretical literature. To the best of our knowledge, no previous study has shown that the *profits* of high-end firms *increase* through competition with low-end firms. In the context of market entry, however, there is some literature that argues that a new entry increases the *price* of an incumbent firm's product.⁸ Inderst (2002) considers how prices react to an increase in competition. Davis *et al.* (2004) show that a low-end firm's entry makes the incumbent high-end firm's price higher than the monopoly price.

The remainder of the paper is organized as follows. In the next section, we describe a simple Cournot game. In Section 3, we analyze a model by considering two cases: when there is no firm in the low-end market and when there are many firms in the low-end market. Then, we derive the Cournot-Nash equilibria in each case and we derive the main result. The last section concludes.

⁶ Pauwels and Srinivasan (2004) provide a plausible explanation for their finding that premium brands do not directly compete with private labels, but instead focus on serving core brand-conscious consumer segments with the introduction of new product varieties. Our logic might be a theoretical explanation of their interpretation.

⁷ Remember that, in our argument, the existence of low-end firms raises the price of high-end products and decreases the supply of high-end products.

⁸ In this context, we consider a situation in which competition between high-end and low-end firms occurs because of a low-end firms' entry.

2 Model

We consider an industry with two differentiated products (h and l). For convenience, we call h and l high-quality and low-quality products, respectively. There are two major firms (1 and 2) which produce h at a constant marginal cost normalized to zero.⁹ No fixed cost is assumed for production. In this paper, quantity competition is assumed. Let q_i be firm i 's output level. In addition, define $q = (q_1, q_2)$.

We assume two groups of consumers, H (the high-end market) and L (the low-end market). For simplicity, we consider a polar case of the heterogeneity of consumer groups. Consumers in H demand only h . That is, the quality of l is not at all sufficient for consumers in H .

[Figure 1 here]

Let p^h be the price of h . The demand function of this high-end market, $D^H(p^h)$, is given by

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

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

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

We assume $1/3 < a < 1/2$.¹⁰ Note that $D^L(p^l)$ is a linear demand function such that the highest willingness to pay is given by a and the largest demand (at $p^l = 0$) is given by b .

3 Analysis

In this section, we consider two polar cases: (1) no firm produces product l ; (2) many firms produce product l . Comparing the two cases, we derive the main result of this study.

⁹ Although the two firms are the only players in our game, we also implicitly consider firms that produce l at a constant marginal cost normalized to zero. In the next section, we analyze two cases: (i) no firm in the low-end market; (ii) perfect competition in the low-end market.

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

3.1 Case I: No firm in the low-end market

In this subsection, we consider a case that no firm produces l and the two major firms can potentially sell to both groups of consumers.

We describe how the price p^h is determined given the two groups of consumers. As long as $1 - (q_1 + q_2) \geq a$, no consumer in L buys h . Therefore, p^h is given by $1 - q_1 - q_2$. If $1 - (q_1 + q_2) < a$, some consumers in L buy h . Because h and l are completely indifferent to consumers in L , this means that $p^h = p^l = \frac{a(1+b-(q_1+q_2))}{a+b}$.

In summary, p^h is determined as follows.

$$p^h(q) = \begin{cases} 1 - q_1 - q_2 & \text{if } q_1 + q_2 \leq 1 - a \\ \frac{a(1+b-(q_1+q_2))}{a+b} & \text{otherwise.} \end{cases}$$

Let $\pi_i(q)$ be the profit function of firm i . For $i = 1, 2$, this can be expressed as follows.

$$\pi_i(q) = \begin{cases} (1 - q_1 - q_2)q_i & \text{if } q_1 + q_2 \leq 1 - a, \\ \frac{a(1+b-(q_1+q_2))}{a+b}q_i & \text{otherwise.} \end{cases} \quad (1)$$

In this case, the game becomes a simple Cournot duopoly game with a kinked demand curve. Moreover, because $a > 1/3$, the equilibrium price is less than or equal to a .¹¹ In other words, $q_1 + q_2 > 1 - a$ at the Cournot-Nash equilibrium.

The first-order condition of firm i ($i = 1, 2$) becomes the following.

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

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

Lemma 1 *If no firm is in the low-end market, the unique Cournot-Nash equilibrium is $q_1 = q_2 = (1+b)/3$ and firms 1 and 2 obtain $a(1+b)^2/(9(a+b))$.*

3.2 Case II: Many firms in the low-end market

In this subsection, we assume that there are so many minor firms competing in the low-end market that no major firm wants to sell its product to consumers in L . For

¹¹ If the whole market consists of only the high-end market, $q_1 = q_2 = 1/3$ is the unique Cournot-Nash equilibrium, and the equilibrium price becomes $1/3 (< a)$. This implies that $p > a$ cannot be the equilibrium price.

simplicity, we can assume perfect competition the low-end market and $p^l = 0$. The setting is similar to the case in which the two major firms cannot supply to the low-end market.

We can say that the two major firms play a simple Cournot duopoly game with $D^H(p^h)$. A simple calculation shows that the Cournot-Nash equilibrium is $q_1 = q_2 = 1/3$, and each firm's equilibrium profit is $1/9$. We summarize this result as follows.

Lemma 2 *If l is sufficiently supplied by minor firms, the unique Cournot-Nash equilibrium is $q_1 = q_2 = 1/3$ and firms 1 and 2 obtain $1/9$.*

3.3 Comparison

Using the results obtained so far, we determine the condition under which case II is more profitable than case I for the two major firms. From Lemmas 1 and 2, the condition is as follows:

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

Therefore, we obtain the following result.

Proposition 1 *If $a(2+b) < 1$ holds, then an adequate supply of l is beneficial to the two major firms.*

Figure 2 shows the region in which this proposition holds. Note that $a(2+b) < 1$ does not hold for any $b > 0$ as long as $a > 1/2$. A rough intuition of the proposition is as follows. If no firm is in the low-end market, price elasticity below a becomes higher than that of $D^H(p^h)$. This property induces the two major firms to produce more. However, these 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 existence of low-end firms (as a credible incentive not to overproduce) becomes beneficial to firms 1 and 2.

[Figure 2 here]

We have to note that *two high-end firms are needed* to derive our main result. In other words, if there is only one high-end firm, the existence of low-end firms is always detrimental. When there is only one high-end firm, it can set its quantity of production without taking the rival (high-end) firm's response into account. If the firm considers that supplying its product to consumers at H and L is optimal, then it will do so; otherwise, it will not. The existence of low-end firms deprives

the monopolist of this kind of freedom. Thus, the low-end firms do not provide any benefit to the high-end firm.

We have to claim that Proposition 1 does not depend on the number of producers of l . Even if there is only one producer of l , we can derive the same result.¹²

4 Concluding Remarks

In this paper, we show that the presence of low-end firms might be beneficial for incumbent high-end firms. The existence of low-end firms induces high-end firms to sell their products only to high-end consumers. The resulting price raise outweighs the resulting sales loss.

Our model can be extended easily to a dynamic game of entry deterrence. Suppose that the output level by incumbent low-end firms is insufficient and the high-end firms have incentives to sell their products to low-end consumers. Our result implies that the incumbents might “invite” entries if the incumbents cannot establish subsidiaries that produce low-end products.

Although our simple model is useful to provide a clear explanation, it is also a little specific. In reality, there must be various situations and effects that produce the same results as ours. Therefore, the construction of other frameworks would be a worthy undertaking for future research.

¹²The result is available upon request.

References

- [1] Baye, Michael R., Morgan, John and Scholten, Patrick, 2004, Price dispersion in the small and the large: evidence from an internet price comparison site, *Journal of Industrial Economics* 52, 463–96.
- [2] Davis, Steven J., Murphy, Kevin M. and Topel, Robert H., 2004, Entry, pricing, and product design in an initially monopolized market, *Journal of Political Economy* Part 2 Supplement 112, S188–225.
- [3] Frank, Richard G. and Salkever, David S., 1997, Generic entry and the pricing of pharmaceuticals, *Journal of Economics and Management Strategy* 6, 75–90.
- [4] Hauser, John R. and Shugan, Steven M., 1983, Defensive marketing strategies, *Marketing Science* 2, 319–360.
- [5] Inderst, Roman, 2002, Why competition may drive up prices, *Journal of Economic Behavior and Organization* 47, 451–462.
- [6] Keller, Kevin Lane and Lehmann, Donald R., 2006, Brands and branding: Research findings and future priorities, *Marketing Science* 25, 740–759.
- [7] France Leclerc, Christopher K. Hsee and Nunes, Joseph C. 2005, Narrow focusing: Why the relative position of a good in its category matters more than it should, *Marketing Science* 24, 194–205.
- [8] Narasimhan, Chakravarthi, 1988, Competitive promotional strategies, *Journal of Business* 61, 427–49.
- [9] Pauwels, Koen and Srinivasan, Shuba, 2004, Who benefits from store brand entry?, *Marketing Science* 23, 364–390.
- [10] Randall, Taylor, Ulrich, Karl and Reibstein, David, 1998, Brand equity and vertical product line extent, *Marketing Science* 17, 356–379.
- [11] Rosenthal, Robert W., 1980, A model in which an increase in the number of sellers leads to a higher price, *Econometrica* 48, 1575–1579.
- [12] Sayman, Serdar, Hoch, Stephen J., and Raju, Jagmohan S., 2002, Positioning of store brands, *Marketing Science* 21, 378–397.
- [13] Soberman, David A. and Parker, Philip M., 2004, Private labels: psychological versioning of typical consumer products, *International Journal of Industrial Organization* 22, 849–861.

- [14] Steenkamp, Jan-Benedict E.M., Nijs, Vincent R., Hanssens, Dominique M. and Dekimpe, Marnik G., 2005, Competitive reactions to advertising and promotion attacks, *Marketing Science* 24, 35–54.
- [15] Ward, Michael B., Shimshack, Jay P., Perloff, Jeffrey M. and Harris, J. Michael, 2002, Effects of the private-label invasion in food industries, *American Journal of Agricultural Economics* 84, 961–973.

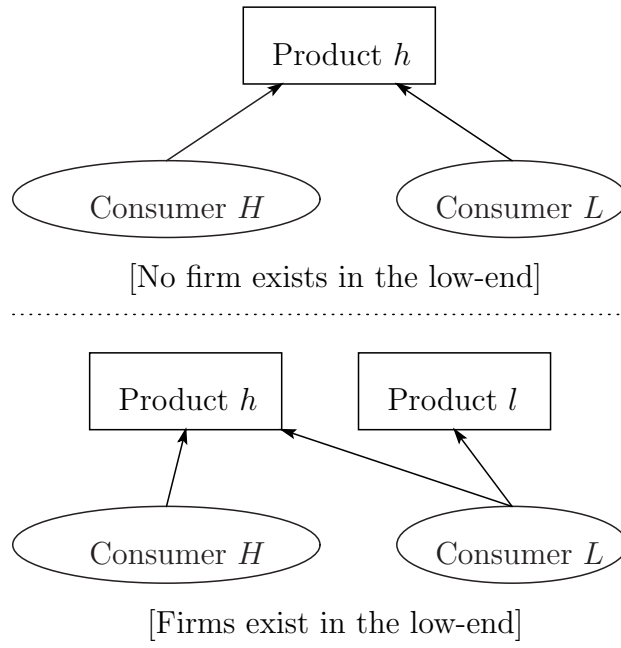


Figure 1: The market structure

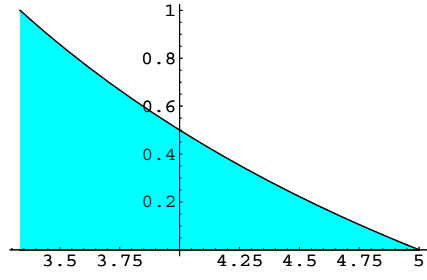


Figure 2: The parameter range within which the handover is beneficial.
(Horizontal: $10a$, Vertical: b)