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Marketing Innovation¤

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1. Introduction

In a market economy, in addition to innovations in products and production processes, innovating …rm depends on what I call an immediate invention e¤ect and a delayed imitation e¤ect. Similar to product or process innovation, the imitation e¤ect is negative. For marketing innovation, however, the undiscounted sum of these two e¤ects, which would be the change in industry pro…t if the innovation were simultaneously adopted by all …rms, can often be negative. By varying parameters of the duopoly model, I also show how the nature of competition a¤ects a …rm's incentive for marketing innovation. In particular, an increase in competition intensity reduces the …rm's innovation incentive for ° but can increase its incentive for ¾.

In recent years, there has been signi…cant interest in whether business method innovations should receive patent protections (e.g., Gallini, 2002; and Hall, 2003). We may consider marketing innovation as part of business method innovations, which also include …nancial innovation.[1] It is thus important to compare the private and social incentives for marketing innovation. I …nd that the private incentive is too high for the marketing innovation to acquire consumer information but too low for the marketing innovation to .2(t)-10(i)-1.8(n)((¾Tj/TT21Tf0.60

acterized by a spokes model of multiple firms[3], and at the same time I limit my attention to the innovation that reduces consumer transaction costs. I find that if the imitation delay is above some critical level, the innovation incentive is higher under a more concentrated market or for a larger firm; and otherwise the opposite is true. This suggests that for marketing innovations that are relatively easy to imitate, they are more likely to be introduced by small firms/new entrants and in less concentrated markets, while for marketing innovations that are more difficult to imitate, they are more likely to be introduced by large firms/incumbents and in more concentrated markets.

The rest of the paper is organized as follows. Section 2 sets up the basic model and derives the equilibrium profits of firms without marketing innovation. Section 3 studies the marketing innovation to acquire consumer information. I derive the value of γ to the innovating firm, compare γ with the usual product/process innovations, and discuss how γ is affected by the intensity of competition. Section 4 conducts the parallel analysis for the marketing innovation to reduce consumer transaction costs (σ). Section 5 compares the private and social incentives for marketing innovation. Section 6 extends the analysis to a model where every instantaneous game consists of multiple firms, under the assumption that firms have acquired consumer information but can have the marketing innovation to reduce consumer transaction costs. The issue of how incentives for marketing innovation depend on market structure is addressed. Section 7 concludes by discussing limitations of the paper and possible extensions.

2. The Basic Model

There is a continuum of consumers of measure 1 uniformly distributed on a line of unit length. Firms 1 and 2 are located respectively at the left and right ends of the line, each with unit production cost $c \geq 0$. Time is continuous. At every instant, each consumer desires at most one unit of the product with valuation V, and a consumer located at $x \in [0;1]$

[3] The spokes model, developed in Chen and Riordan (2003), describes a differentiated oligopoly with possibly many firms engaging in non-localized price competition.

incurs transaction (transportation) costs τx and $\tau(1-x)$ to purchase from firms 1 and 2, respectively, where τ is the coefficient of consumers' transaction cost (or unit transportation cost). Assume that the firms can separate consumers into two groups, A and B; both of which are uniformly distributed on the line: Any group-A consumer's location on the line is known to both firms, while initially any group-B consumer's location is only known to herself. The portion of group-A consumers is $\alpha \in [0; 1)$.[4] No price arbitrage is allowed between consumers and between consumer groups. Assume that $c + \frac{3}{2}\tau < V$ to ensure purchases by all consumers in equilibrium.

Suppose that, at time (normalized to) 0, one of the firms, say firm 1, has an opportunity to introduce a marketing innovation, denoted as ϕ; with cost $k \geq 0$: The new marketing technology ϕ, if introduced, can also be imitated by firm 2 with time lag $T > 0$ (for a cost normalized to zero): Firm 2 is otherwise not able to have the new marketing technology.[5] We shall take T as exogenously given and use it to examine the possible effects of alternative systems of intellectual property rights protection for marketing innovation.

Firms play a simultaneous price-setting game at every instant, where the price strategies are Markov—they depend only on the states of possible marketing innovation, as well as on consumers' locations if such information is available. Denote the states of innovation by vector $(s_1; s_2)$; where $(s_1; s_2) \in \{(0; 0); (\phi; 0); (\phi; \phi)\}$; representing the states of ϕ by neither innovation if and only if the bene…t is at least weakly positive. Each …rm's strategy in the game speci…es its prices in every instantaneous game as well as its decision to introduce or imitate Á. We analyze the value of innovation in the subgame perfect equilibrium of this game.

tracks consumer information e¤ectively, or ° may be a new method of gathering consumer information that allows the …rm to charge individual prices to di¤erent consumers.[7]

Consider …rst instantaneous games where only …rm 1 implements °. At every instant, the two …rms play a game where we denote …rm 1's equilibrium strategy by $p_1^j(x \mid °;0)$ for $j = A;B$ and …rm 2's equilibrium strategy by $p_2^A(x \mid °;0)$ and $p_2^B(°;0)$: Then, for consumers in group A, the equilibrium prices of …rms 1 and 2 are the same as those given by equations (1) and (2).

Thus,

$$
\begin{aligned}
p_1^B(x \mid \gamma; 0) &= \max\left\{c; c + \frac{3\tau}{2} - 2\tau x\right\}; \\
\hat{x} &= \frac{1}{4} + \frac{1}{2} = \frac{3}{4}.
\end{aligned}
$$

The equilibrium instantaneous profits of firms 1 and 2 in state $(\gamma; 0)$ thus are:

$$\pi_1(\gamma; 0) = \alpha \frac{1}{4}\tau + (1 - \alpha) \int^{-}$$

firm 2 will imitate if firm 1 innovates. Thus, a unique (subgame) perfect equilibrium exists where firm 1 will introduce γ if and only if $V^{\gamma}(T) \geq k$; where

$$V^{\gamma}(T) = \int_0^T \pi_1(\gamma;0)\, e^{-rt}dt + \int_T^{\infty} \pi_1(\gamma;\gamma)\, e^{-rt}dt - \int_0^{\infty} \pi_1(0;0)\, e^{-rt}dt$$

$$= \int_0^T \frac{1}{16}\tau(9 - 5\alpha)\, e^{-rt}dt + \int_T^{\infty} \frac{1}{4}\tau e^{-rt}($$

where Δ is the change in the instantaneous industry profit if γ were to be adopted simultaneously by all firms.

If γ were a product or process innovation (a new product with higher demand or a new production process with lower production costs), one would generally expect Δ to be positive. But here we have the opposite:

$$\pi_1(\gamma,\gamma) - \pi_1(0,0) = \pi_2(\gamma,\gamma) - \pi_2(0,0) = \frac{1}{4}\tau - \frac{1}{4}\tau(2-\alpha) = -\frac{1}{4}\tau(1-\alpha) < 0,$$

or $\delta < 0$ and $\Delta < 0$. This suggests that the simultaneous adoption of a marketing innovation by all firms can reduce industry profits.

The innovation increases the innovating firm's ability to extract consumer surplus, which benefits the innovating firm; but it also causes the competitor to respond with lower prices, which hurts the innovating firm. Before the imitation of γ by the rival, the extracting-surplus effect dominates and thus the innovating firm benefits from γ. When γ is adopted by both firms, however, the competitive-response effect becomes dominating, causing lower prices from both firms and thus lower profit for the industry.[8]

Our analysis here is closely related to the literature on price discrimination by competing firms. Consumer targeting and price discrimination are often equilibrium strategies of competing firms, and such practices can sometimes lead to lower profits for all firms involved, an outcome reminiscent of the Prisoner's' Dilemma game (e.g., Thisse and Vives, 1988; and Stole, 2003).[9] However, by modeling the strategic interaction between competitors as a dynamic process, our analysis yields quite different insights. In our model the adoption of γ by both firms also leads to lower industry profits, but γ can occur in equilibrium only if firm 1's profit is higher from introducing it: Thus it can be profitable in equilibrium for a firm to introduce a new method of consumer targeting/price discrimination, even though it eventually lowers industry profits.[10] Furthermore, when T approaches zero, or when firm 2

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can react very quickly to the introduction of ° by …rm 1, instead of a Prisoner's' Dilemma outcome, ° does not occur in equilibrium.[11]

An examination of equation (7) reveals the following:

Corollary 1 The value of ° to the innovating …rm is higher if ¿ is higher or if ® is lower.

Since ¿ is unchanged with or without °; and since the equilibrium prices in all instantaneous games are increasing functions of ¿; we can consider ¿ as a measure of the competitiveness of the market, with a higher ¿ suggesting lower intensity in competition. Corollary 1 then suggests that the value of ° is higher when the market is less competitive.[12] One way to see the intuition for this result is the following: When the market is less competitive, there are potentially higher pro…ts that can be generated. This makes it more valuable to target consumers e¤ectively using °. As we shall see shortly, however, in general the relationship new selling channel (such as an internet store).[14] The possible states of innovation are now (Á1; Á2) 2 f(0; 0) ; (¾; 0); (¾; ¾)g; representing the states of ¾ by neither …rm, of ¾ by …rm 1 only, and of ¾ by both …rms. Everything else is the same as in the previous section.

For the instantaneous games where only …rm 1 implements ¾; consider …rst the competition for consumers in group A. The equilibrium prices of …rms 1 and 2 will be

$$p_1^A (x \text{ j } ¾; 0) = \max f c; c + ¿(1 \text{ ¡ } x) \text{ ¡ } ¹x g;$$
$$p_2^A (x \text{ j } ¾; 0) = \max f c; c + ¹x \text{ ¡ } ¿(1 \text{ ¡ } x) g;$$

and the marginal consumer $\hat{x}$ is determined by

$$¿(1 \text{ ¡ } \hat{x}) \text{ ¡ } ¹\hat{x} = 0;$$

or

$$\hat{x} = \frac{¿}{¿ + ¹}:$$

The equilibrium instantaneous pro…ts of …rms 1 and 2 from consumer group A thus are:

$$¼_1^A (¾; 0) =$$

Thus

$$p_1^B(\sigma;0) = c + \frac{1}{3}(2\tau + \mu);$$
$$p_2^B(\sigma;0) = c + \frac{1}{3}(\tau + 2\mu);$$

and

$$\hat{x} = \frac{\frac{1}{3}(\tau + 2\tau_1) - \frac{1}{3}(2\tau + \tau_1) + \tau}{\tau_1 + \tau} = \frac{1}{3}\frac{2\tau + \mu}{\mu + \tau}.$$

The equilibrium instantaneous profits of firms 1 and 2 from consumer group B thus are:

$$\pi_1^B(\sigma;0) = (1-\alpha)\frac{1}{3}(2\tau+\mu)\frac{1}{3}\frac{2\tau+\mu}{\mu+\tau} = \frac{1}{9}(1-\alpha)\frac{(2\tau+\mu)^2}{\mu+\tau};$$
$$\pi_2^B(\sigma;0) = (1-\alpha)\frac{1}{3}(\tau+2\mu)\left(1 - \frac{1}{3}\frac{2\tau+\mu}{\mu+\tau}\right) = \frac{1}{9}(1-\alpha)\frac{(\tau+2\mu)^2}{\mu+\tau}.$$

Adding profits from the two groups together, we obtain the equilibrium profits of firms 1 and 2 in state $(\sigma;0)$ as:

$$\pi_1(\sigma;0) = \frac{1}{18}\frac{\alpha\left(\tau^2 - 8\tau\mu - 2\mu^2\right) + 2(2\tau+\mu)^2}{\tau+\mu};$$
$$\pi_2(\sigma;0) = \frac{1}{18}\frac{\alpha\left(\mu^2 - 8\tau\mu - 2\tau^2\right) + 2(\tau+2\mu)^2}{\tau+\mu}.$$

Next, for all possible subgames where both firms have implemented σ; the analysis is again the same as in the previous section and thus

$$\pi_i(\sigma;\sigma) = \frac{1}{4}\mu(2-\alpha).$$

We have:

Proposition 2 Assume that σ is the possible marketing innovation at time 0, and let $V^{\sigma}(T)$ denote the equilibrium value of σ to firm 1, excluding k. Then

$$V^{\sigma}(T) = \begin{cases} \frac{1}{36r}(\tau-\mu)\frac{11\alpha\tau+4\alpha\mu-2\tau-4\mu}{\tau+\mu} & \text{if } \alpha < \frac{4\tau+2\mu}{11\tau+4\mu} \\ \frac{1}{36r}(\tau-\mu)\frac{11\alpha\tau+4\alpha\mu-2\tau-4\mu-e^{-rT}(16\tau+14\mu-5\alpha\mu+2\alpha\tau)}{\tau+\mu} & \text{if } \alpha \geq \frac{4\tau+2\mu}{11\tau+4\mu} \end{cases};$$

where (i) if $\alpha < \frac{2\tau+4\mu}{11\tau+4\mu}$; $V^{\sigma}(T) < 0$;

(ii) if $\frac{2\tau+4\mu}{11\tau+4\mu} < \alpha < \frac{4\tau+2\mu}{11\tau+4\mu}$; $V^{\sigma}(T) > 0$;

$$
\begin{aligned}
&= \int_0^T \frac{1}{18}\frac{\alpha\tau^2 - 8\alpha\tau\mu - 2\alpha\mu^2 + 2(2\tau+\mu)^2}{\tau+\mu} e^{-rt} dt + \int_T^\infty \frac{1}{4}\mu(2-\alpha) e^{-rt} dt \\
&\quad - \int_0^\infty \frac{1}{4}\tau(2-\alpha) e^{-rt} dt \\
&= \frac{1}{36}(\tau-\mu)\frac{11\alpha\tau - 2\tau - 4\mu + 4\alpha\mu - e^{-rT}(2\alpha\tau + 16\tau + 14\mu - 5\alpha\mu)}{(\tau+\mu)r} \\
&= \frac{1}{36r}(\tau-\mu)\frac{\alpha\left(11\tau + 4\mu + e^{-rT}(5\mu - 2\tau)\right) - e^{-rT}(16\tau+14\mu) - 2\tau - 4\mu}{\tau+\mu} \\
&\gtreqless 0 \text{ if } T \gtreqless \frac{1}{r}\ln\left(\frac{2\alpha\tau + 16\tau + 14\mu - 5\alpha\mu}{11\alpha\tau + 4\alpha\mu - 2\tau - 4\mu}\right);
\end{aligned}
$$

and $\frac{1}{r}\ln\left(\frac{2\alpha\tau+16\tau+14\mu-5\alpha\mu}{11\alpha\tau+4\alpha\mu-2\tau-4\mu}\right) > 0$ since $11\alpha\tau + 4\alpha\mu - 2\tau - 4\mu > 0$ and

$$2\alpha\tau + 16\tau + 14\mu - 5\alpha\mu - (11\alpha\tau + 4\alpha\mu - 2\tau - 4\mu) = 9(\tau+\mu)(2-\alpha) > 0.$$

■

We notice that $V^\sigma(T)$ is independent of T when $\alpha < \frac{4\tau+2\mu}{11\tau+4\mu}$ and is otherwise increasing in T. We thus immediately have the following:

Remark 1 It is possible that the value of a marketing innovation is negative even if imitation is not possible ($T = \infty$).

In the previous section, we have seen that $V^\gamma(T) < 0$ if $T < \frac{\ln 5}{r}$, and we noted that this suggests a feature of marketing innovation possibly different from the usual innovations. The fact that it is possible to have $V^\sigma(T) < 0$ for any T further highlights the potential difference between marketing innovation and product or process innovations. To understand this difference, we can again write

$$V^\sigma(T) = \frac{1}{r}\left[\pi_1(\sigma;0) - \pi_1(0;0) + (\pi_1(\sigma;\sigma) - \pi_1(\sigma;0))e^{-rT}\right].$$

Same as for $V^\gamma(T)$, we can decompose the terms affecting $V^\sigma(T)$ into invention effect $\pi_1(\sigma;0) - \pi_1(0;0)$ and imitation effect $\pi_1(\sigma;\sigma) - \pi_1(\sigma;0)$. As before, the imitation effect is negative. However, while the invention effect is positive for γ, or

$$\pi_1(\gamma;0) - \pi_1(0;0) = \frac{1}{16}\tau(9-5\alpha) - \frac{1}{4}\tau(2-\alpha) = \frac{1}{16}\tau(1-\alpha) > 0;$$

it can be negative for ¾ here since

$$
\begin{aligned}
& \text{¼}_1(\text{¾};0)\ \text{¡}\ \text{¼}_1(0;0) \\
= \; & \frac{1}{36}(\text{¿}\ \text{¡}\ \text{¹})\frac{\text{¡}\,2\text{¿}+11\text{®¿}\ \text{¡}\ 4\text{¹}+4\text{®¹}}{\text{¿}+\text{¹}}
\end{aligned}
$$

Recall that for marketing innovation °; $V^{˚}(T)$ is higher when the intensity of competition is lower. We thus have:

Remark 2 Increased competition reduces the incentive for marketing innovation ° but may increase the incentive for marketing innovation ¾.

5. Comparing Private and Social Incentives

We now address the policy issue: From the society's point of view, is there too much or too little marketing innovation? We shall assume that the objective of a society is to maximize social surplus.

value of σ would be

$$\begin{aligned}
\bar{S} &= \int_0^T \left[\int_0^{-} (\tau - \mu) x dx + \int_{\frac{\mu}{\tau-\mu}}^{-} \tau x dx - \int_{-}^{\frac{\tau}{\tau-\mu}} \mu x dx \right] e^{-rt} dt + \int_T^{\infty} 2 \int_0^{-} (\tau - \mu) x dx e^{-rt} dt \\
&= \int_0^T \frac{1}{4} \tau \frac{\tau - \mu}{\tau + \mu} e^{-rt} dt + \int_T^{\infty} \frac{1}{4} (\tau - \mu) e^{-rt} dt = \frac{1}{4} \tau (\tau - \mu) \frac{1 - e^{-rT}}{r(\tau+\mu)} + \frac{e^{-rT}}{4r} (\tau - \mu) \\
&= \frac{1}{4} (\tau - \mu) \frac{\tau + e^{-rT} \mu}{r(\tau + \mu)}.
\end{aligned}$$

From Proposition 2, we have:

$$V^{\sigma}(T) \leq \frac{1}{36r} (\tau - \mu) \frac{-2\tau + 11\alpha\tau - 4\mu + 4\alpha\mu}{\tau + \mu};$$

and thus

$$\begin{aligned}
\bar{S} - V^{\sigma}(T) &\geq \frac{1}{4} (\tau - \mu) \frac{\tau + e^{-rT} \mu}{r(\tau + \mu)} - \frac{1}{36r} (\tau - \mu) \frac{-2\tau + 11\alpha\tau - 4\mu + 4\alpha\mu}{\tau + \mu} \\
&= \frac{1}{36} (\tau - \mu) \frac{11\tau(1 - \alpha) + 9e^{-rT}\mu + 4\mu(1 - \alpha)}{r(\tau + \mu)} > 0.
\end{aligned}$$

If, on the other hand, the decision on imitation is made privately but the decision on innovation is made socially, the social value of σ would be

$$\underline{S} = \begin{cases} \int_0^{\infty} \frac{1}{4} \tau \frac{\tau - \mu}{\tau + \mu} e^{-rt} dt = \frac{1}{4} \frac{1}{r} \tau \frac{\tau - \mu}{\tau + \mu} & \text{if} \quad \alpha < \frac{4\tau + 2\mu}{11\tau + 4\mu} \\ \int_0^T \frac{1}{4} \tau \frac{\tau - \mu}{\tau + \mu} e^{-rt} dt + \int_T^{\infty} \frac{1}{4} (\tau - \mu) e^{-rt} dt = \frac{1}{4} (\tau - \mu) \frac{\tau + e^{-rT}\mu}{r(\tau + \mu)} & \text{if} \quad \alpha \geq \frac{4\tau + 2\mu}{11\tau + 4\mu} \end{cases}.$$

We have

$$\underline{S} - V^{\sigma}(T) \geq \begin{cases} \frac{1}{4} \end{cases}$$

Therefore, for ¾ the social incentive exceeds the private incentive. The reason for this seems to be the following: The reduction in transaction costs is always socially bene…cial. The innovating …rm bene…ts from the cost reduction, which makes its product more attractive to consumers, but it also su¤ers from the competitive response of the rival in the form of reduced prices. This loss due to the rival's competitive response is a private cost but not a social cost.

To summarize, we have:

Proposition 3 Relative to the socially optimal level, the private incentive is too high for ° but too low for ¾:

In recent years, there have been growing interests in the issue of whether business method innovations should receive patent protection; such protection can increase T (delaying possible imitation) and potentially increase the private bene…t of innovation. To the extent that we may consider marketing innovation as an important form of business method innovations, our analysis can shed light on this issue. For certain marketing innovation, such as ° here, patent protection would not be socially desirable since the private incentive is already too high. For marketing innovations for which private incentive is too low, such as cost. Consumers are uniformly distributed on the network of spokes. The location of a consumer is fully characterized by a vector $(l_i; x_i)$; which means that the consumer is on l_i with a distance of x_i to firm i.[17] Since all the other firms are symmetric, the distance from consumer $(l_i; x_i)$ to any variety j, $j \neq i$; is $\frac{1}{2} - x_i + \frac{1}{2} = 1 - x_i$. Obviously, the duopoly model is a special case of the spokes model with $n = 2$.

To allow for asymmetry in firm sizes, we assume that varieties $1; ...; m$ $(1 \leq m < n)$; are produced by firm 1, while the rest $n - m$ firms each produces one variety. The total number of firms is thus $1 + n - m$. The location of each consumer is assumed to be known by all firms (corresponding to the case of $\alpha = 1$ in the previous section). Assume that at time 0, one of the firms can introduce marketing innovation σ that reduces the cons181Tf90)(s)2fu98Tm(24D0)22

The instantaneous profits of firm 1 and each of the other firms are:

$$\pi_1(\sigma,0,\ldots,0) = m\frac{2}{n}\int_0^{-}\left(\tau(1-2x_1)+(\tau-\mu)x_1\right)dx_1+(n-m)\int_{\frac{\mu}{\tau+\mu}}^{-}\frac{2}{n}\left(\tau x_j-\mu(1-x_j)\right)dx_j$$

$$= \frac{1}{4}m\frac{3\tau-\mu}{n}+\frac{1}{4}(n-m)\frac{(\tau-\mu)^2}{(\tau+\mu)n},$$

$$\pi_j(\sigma,0,\ldots,0) = \int_0^{\frac{\mu}{\tau+\mu}}\frac{2}{n}\left(\mu(1-x_j)-\tau x_j\right)dx_j = \frac{\mu^2}{(\tau+\mu)n}, \quad j=2,\ldots,n-m+1.$$

Similarly, in every instantaneous game with σ by firm j alone, $j=2,\ldots,n-m+1$, or in states $(0,\ldots,\sigma,\ldots,0)$, the instantaneous profits of firm 1, firm j, and firm $i\neq j\neq 1$ are respectively:

$$\pi_1(0,\ldots,\sigma,\ldots,0) = m\frac{\mu^2}{(\tau+\mu)n},$$

$$\pi_j(0,\ldots,\sigma,\ldots,0) = \frac{1}{4}\frac{3\tau-\mu}{n}+\frac{1}{4}(n-1)\frac{(\tau-\mu)^2}{(\tau+\mu)n},$$

$$\pi_i(0,\ldots,\sigma,\ldots,0) = \frac{\mu^2}{(\tau+\mu)n}, \quad i\neq j\neq 1.$$

Next, if σ has been introduced (adopted) by h firms, $h=1,\ldots n-m+1$, by also adopting σ,

Proof. Since

$$\frac{1}{2}\frac{\mu}{n} - \frac{\mu^2}{(\tau+\mu)n} = \frac{1}{2}\mu\frac{\tau-\mu}{(\tau+\mu)n} > 0;$$

innovation σ will be imitated by all firms in any equilibrium. The value of innovation to firm 1 is thus:

$$\begin{aligned}
V_1(T) &= \int_0^T \left(\frac{1}{4}m\frac{3\tau-\mu}{n} + \frac{1}{4}(n-m)\frac{(\tau-\mu)^2}{(\tau+\mu)n}\right) e^{-rt}dt + \int_T^\infty \frac{1}{2}m\frac{\mu}{n}e^{-rt}dt - \int_0^\infty \frac{m\tau}{2n}e^{-rt}dt \\
&= -\frac{1}{4}(\tau-\mu)\frac{2\tau m e^{-Tr} - n\tau + \tau n e^{-Tr} - n\mu e^{-Tr} - 2m\mu + 4\mu m e^{-Tr} + n\mu}{(\tau+\mu)nr} \\
&= \frac{1}{4}(\tau-\mu)\frac{2m\left[-\tau e^{-Tr} + \mu - 2e^{-Tr}\mu\right] + n\left[1 - e^{-Tr}\right](\tau-\mu)}{(\tau+\mu)nr};
\end{aligned}$$

and the value of innovation to firm j; $j = 2;\dots;n-m+1$; is

$$V_j(T) = \frac{1}{4}(\tau-\mu)\frac{2\left[-\tau e^{-Tr} + \mu - 2e^{-Tr}\mu\right] + n\left[1 - e^{-Tr}\right](\tau-\mu)}{(\tau+\mu)nr}:$$

Thus, when $m > 1$ and for $j \neq 1$;

$$V_1(T) \gtreqless V_j(T)$$

if and only if

$$-\tau e^{-Tr} + \mu - 2e^{-Tr}\mu \gtreqless 0;$$

or

$$T \gtreqless \frac{1}{r}\ln\frac{\tau+2\mu}{\mu}:$$

∎

Proposition 3 offers insights on two issues concerning the relationship between market structure and incentives for marketing innovation. First, we may ask how market concentration affects the average per-firm value from the innovation (or the incentive for marketing innovation by an average firm in the market). Notice that market concentration is higher with higher m for any given n: But since for $j \neq 1$; $V_1(T) > V_j(T)$ and $V_1(T)$ increases in m if and only if $T > \frac{1}{r}\ln\frac{\tau+2\mu}{\mu}$; while $V_j(T)$ is independent of m; we conclude:

Corollary 2 When imitation is sufficiently difficult ($T > \frac{1}{r}\ln\frac{\tau+2\mu}{\mu}$), a more concentrated market will have higher incentive for marketing innovation; and otherwise the opposite is true.

Second, we can address the issue of whether a large firm (an incumbent) or a small firm (an entrant) has higher incentive for marketing innovation. Suppose that the large firm (incumbent) produces $n - 1 > 1$ varieties, and the small firm (entrant) produces the n^{th} variety, we immediately have the following:

Corollary 3 A large firm (an incumbent) has higher incentive for marketing innovation than a small firm (an entrant) if and only if imitation is sufficiently difficult ($T > \frac{1}{r}\ln\frac{\tau+2\mu}{\mu}$).

While our analysis is conducted in a specific setting, we believe that the basic insight here is valid more generally. A large and a small firm face similar trade-offs in introducing a marketing innovation. The innovator benefits from the positive invention effect and is harmed by the imitation effect. While the large firm benefits more from the invention effect, it also loses more from the imitation effect. The increase in the level of difficulty to imitate, however, benefits the large firm more by postponing the imitation effect without reducing the invention effect. This suggests that for marketing innovations that are relatively easy to imitate, they are more likely to be introduced by small firms/new entrants and in less concentrated markets, while for marketing innovations that are more difficult to imitate, they are more likely to be introduced by large firms/incumbents and in more concentrated markets.

invention e¤ect is positive and there is a su¢ cient delay before imitation. A …rm's incentive for marketing innovation also depends on market structure and the nature of competition. Within a duopoly market structure, an increase in competition intensity reduces the value of the marketing innovation to acquire consumer information but may increase the value of the marketing innovation to reduce consumer transaction cost. Holding constant the nature of competition but allowing multiple …rms, a more concentrated market or a larger …rm has higher incentives for marketing innovation when imitation is su¢ ciently di¢ cult, and otherwise the opposite is true. We also …nd that, relative to the socially optimal level, the private incentive for the marketing innovation to acquire consumer information is too high while that to reduce consumer transaction cost is too low.

As is typical in the Hotelling framework, our model has the feature that total industry output is …xed and …rms are always in direct competition. It is possible to extend this model so that market demand is not entirely inelastic. For instance, suppose that we add two additional lines to our model, this modified model, the properties of marketing innovation are more similar to those of the usual product and process innovations.

The results of our model are thus most relevant in situations where firms compete directly and marketing innovation causes significantly more output diversion than output expansion. By formulating our model in a setting where total industry output is fixed and firms are always in direct competition, we focus on features of marketing innovation that are more likely to be different from those of the usual product/process innovations, and, without the need to consider the change in industry output, the exposition is also simpler.

For the purpose of this paper we have assumed that only one firm has the opportunity to conduct marketing innovation. It is natural to extend the analysis to a setting where all firms have opportunities to innovate and may compete in innovation. One possible way such an analysis could proceed is as follows: Suppose that everything is the same as in Sections 2 and 3, except that firm 2 also has the opportunity to introduce γ with fixed cost k; and the innovating opportunity arrives for each firm stochastically and independently, innovation to a …rm may depend on the …rm's expenditures on marketing research. It would also be interesting to consider other possible forms of marketing innovation. Such analysis would lead to richer theories of markets where …rms compete in multi-dimensions. To the

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