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RESEARCH ARTICLE

Heterogeneous multi-product competition in Taiwan's newspaper industry

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Taiwan's daily newspaper industry is characterized by multiple products and heterogeneous competition. This article develops a game-theoretic model to analyze the strategic and competitive reaction of the incumbent in the newspaper market to a recent tabloid-like entertainment newspaper entrant and its impact on the industrial structure through a modification of Judd's multi-product competition model (1985), considering the property of heterogeneous competition in the Taiwan newspaper market. The leading incumbent operated newspapers in the general news and entertainment-oriented news segments of the market and our equilibrium analysis shows that closing its entertainment-oriented paper was the optimal response to the competitive entry in the short run. However, when the possibility that the entrant might invest in disruptive innovations in other product segments after entry is considered, the model shows that the incumbent's withdrawal from the entertainment market could induce more severe competition in the general news market and thus hurt its long-term profits. Managerial insights and implications of the analysis are discussed.

Keywords: media economics; game theory; *Apple Daily*; Taiwan newspaper industry

Introduction

The *Min Sheng Daily*, a product of the United Daily group with a colorful history of 28 years ceased publication on November 20, 2006. The *Min Sheng Daily* was once labeled as 'Taiwan's only professional entertainment newspaper which covered the people's livelihood,' (The *Min Sheng Daily* ceases, 2006) and reached a pinnacle of 570,000 copies in July 1987. In its cessation of publication declaration, the *Min Sheng Daily* proclaimed that its decision was not due to harsh competition from a new competitor (the *Apple Daily*), but was rather the result of a rapidly changing environment, coupled with tremendous changes in consumers' reading habits.

However, in the same harsh environment, the *Apple Daily*, a tabloid newspaper from Hong Kong, has started to reap positive profits only 2 years and 10 months after its launch in May 2003. According to the 2005/06 annual financial report of Next Media which owns the *Apple Daily*, by March 2006 the Taiwan branch of *Apple Daily* had earned its first positive profit of 1.2 million Hong Kong dollars (Young, 2006). Subsequently, the 2006/07 annual financial report showed total profits of

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69.4 million Hong Kong dollars (Next Media Limited Corporation, 2007). According to AC Nielsen's survey (Nielsen Media Research, 2007), at the end of March 2007, the *Apple Daily's* readership shares had reached 15.9%, closely tailing *The Liberty Times's* 16.3% and far ahead of the *United Daily's* 10.4% and the 8.5% of the *China Times*.

The *Apple Daily* entered the market as a tabloid, providing paparazzi-style scandal exposures and exhibiting a flair for flaunting sex and violence in full-color. The so-called 'Apple Effect' moved the traditionally defined 'serious reporting' to celebrity/entertainment tabloids, so that only firms capable of transforming all types of information into 'entertainment' would survive. The first victims of this effect were those news firms providing entertainment news. The *Da Cheng Daily*, a celebrity newspaper which was once the only competition to the *Min Sheng Daily*, ceased publication by the end of February 2006. In November 2006, the *Star News*, another celebrity newspaper aimed at younger readers and also an affiliate of the United Daily group, quietly terminated operations. Finally, the *Min Sheng Daily*, despite undergoing a sequence of modifications, caved in after an 8-month struggle. An interesting question to ask is why, given that it was restructured to gradually become more market-oriented, the *Min Sheng Daily* was still unable to turn the tide. More importantly, after ridding itself of the economically burdensome *Min Sheng Daily*, will the United Daily group necessarily stop losing money? After the closing of the *Min Sheng Daily*, what will happen to Taiwan's newspaper industry?

The main purpose of this paper is to address these questions in an industrial economics model. We provide a game-theoretic analysis to explain the current competition in the industry as well as provide management insights into the future development of existing firms. Our paper starts by modifying Judd's (1985) model of multiple products when considering the property of heterogeneous competition in Taiwan's newspaper industry, and concludes that the closing of the *Min Sheng Daily* is indeed an optimal decision for the United Daily group in the short run. However, when we consider disruptive innovations (Christensen & Raynor, 2003) by extending the model to a four-stage framework where the entrant can strategically invest in R&D, we show that the United Daily group's withdrawal from the entertainment market will induce severe competition in the general news market. Based on this model, we provide some recommendations for management in regard to the current crisis in Taiwan's newspaper industry.

Notice first that since our purpose is to provide managerial insights into the present situation and future development of Taiwan's newspaper industry, Judd's model provides us with an easy and straightforward setup to focus our concerns, rather than distract readers with complicated mathematical calculations. We hope that by adopting a multiple product model which incorporates the possibility of 'disruptive innovation' mentioned by Christensen and Raynor (2003), the theoretical discussion of our paper can provide insightful explanations regarding recent developments in Taiwan's newspaper industry and provide recommendations to the management of the incumbent news firms.

The remainder of this paper is organized as follows. Section 2 describes the current status of Taiwan's newspaper industry, our purpose being to understand the fundamental properties of the market's structure, which serve as empirical justifications for our model's setup. Sections 3 and 4 present the modified Judd

(1985) model, incorporating the heterogeneous competition in the news industry and the possibility of 'disruptive innovation.' We will derive the short-term equilibrium first and then the long-term equilibrium, where we will also provide some managerial suggestions for the incumbent news firms. Section 5 concludes the paper.

Taiwan's newspaper industry

This section first describes the multiple product properties of Taiwan's newspaper industry, and then summarizes the incumbents' strategic reactions to the rapid change in the industry. The history of the industry reviewed will serve as empirical justification for our assumptions in the basic model, and will help us provide more realistic management suggestions.

Multiple products

Taiwan's newspapers can be classified into six categories: general newspapers (e.g., the *China Times*, the *Liberty Times*, and the *United Daily*), business newspapers (e.g., the *Commercial Times* and the *Economic Daily News*), entertainment newspapers (e.g., the *Da Cheng Daily* and the *Min Sheng Daily*), evening newspapers (e.g., the *China Times Evening* and *United Daily Evening*), English language newspapers, and regional newspapers (e.g., Hualien's *Keng Sheng Daily* and Tainan's *Chung Hwa Daily*). It is important to notice that, to both the public and academia (So, 1997; Tsai, 2005), the *Apple Daily* is considered to be an undisputed provider of entertainment and recreational news. Hence, our model will treat the *Apple Daily* as a newspaper providing soft information or entertainment news.¹

Declining newspaper demand, substitutes, and readership changes

Cable TV and the Internet have provided plenty of substitutes for newspapers, causing the demand for these to decline. In addition, these diverse, plentiful, cheap, and accessible media have rapidly changed people's media consumption habits. The cable TV law was passed in 1992, and cable penetration rose from 26% in 1992 to the current 85%. Furthermore, according to AC Nielsen's survey in December 2006, the percentage of the population using the Internet had risen from 40.8% in 2002 to 51.3% by the end of September 2006.

The 'television culture' is slowly replacing the culture of written language and, for some, free information on the Internet is displacing newspapers. With declining interest in public affairs, most consumers seek gossip-oriented recreational information instead of spending time and money on newspapers (Denton, 1993; Kurtz, 1993). According to Nielsen's media survey (Nielsen Media Research, 2007) since the early 1990s Taiwan's newspaper readership rate had slipped from its peak of 76% to a low of 46% by March 2007. In other words, more than 50% of Taiwan's population does not read newspapers. In another survey conducted by Rainmaker Company, the advertising revenue of newspapers has been continuously declining from near NT\$16,514 million in 2001 to NT\$14,450 million in 2006. From a holistic point of view, the golden age of newspapers in Taiwan has already passed.

Competitive entry into a heterogeneous product market

The *Apple Daily* was launched on May 2, 2003, by Hong Kong businessman Jimmy Lai Chee Yin. Six months later, the *Apple Daily* had reached an impressive 10% of total newspaper readership, ranking fourth behind the three major newspapers: the *United Daily*, the *China Times*, and the *Liberty Times*. In the first half of 2005, the *Apple Daily* took second place in terms of circulation to the top selling paper, the *Liberty Times*. In what follows, we will briefly describe how the *Apple Daily* provided differentiated products that turned consumers away from the incumbent firms, the management strategy that they adopted to quickly meet consumers' requirements, and the resulting impact that the newspaper had on the incumbents in the industry.

The *Apple Daily* adopts a reader-first attitude in deciding on the content of its news; the content of the news is chosen to satisfy the consumers' preferences, rather than to educate the public.² The *Apple Daily* interacts enthusiastically with consumers by instantly responding to consumers' suggestions on its layouts and, most of all, by conducting 'focus group interviews' with readers on a daily basis. The *Apple Daily* was the first of Taiwan's newspaper industry to establish an 'exposure hotline,' asking readers to provide potentially newsworthy material and suggestions. 'These flexible strategies to fulfill the market demand and to provide a completely market-oriented content have successfully closed the gap between the consumers and media content' (Tsai, 2005).

When faced with the competition from this new entrant, there were mainly three types of reactions from the incumbents: to give up and close down their papers, to restructure and provide new and differentiated products, and to fight back. As described, the entertainment news market was the first to encounter the competition from the *Apple Daily*. Local newspapers and evening papers were the first victims to stop publication, to be followed by the *Da Cheng Daily*, the *Star News*, and the *Evening China Times*.

Second, in the name of 'restructuring,' the incumbents introduced new products or changed their layouts in order to differentiate themselves from the *Apple Daily*'s sensational style. For example, after the launch of the *Apple Daily* in 2003, the market share of *Min Sheng Daily*, whose overall readership rates originally ranked it in fourth place, began to decline from 3.1% in 2003. In April 2005, the *Min Sheng Daily* introduced the 'Sunday News,' issued every Sunday as a 24-page, octavo-format delicate tabloid. In late March 2006, the *Min Sheng Daily* underwent an overall revamp that turned its focus to boutique consumption, comprising in-depth features on entertainment and sports that were aimed mainly at the social elite. However, these efforts did not provide sufficient differentiation to insulate the *Min Sheng Daily* from the *Apple Daily*'s competitive threat. When the *Min Sheng Daily* ceased publication in December 2006, it had a circulation of merely 80,000 copies (The *Min Sheng Daily* with, 2006).

Third, the major newspapers (i.e., the *United Daily*, *China Times*, and *Liberty Times*) adopted a more aggressive attitude to fight the *Apple Daily*, including offering sales discounts, making layout and content adjustments, and featuring much more sensational news (Sun, 2005). However, such 'Apple-ization' or 'tabloidization' was unable to prevent readers from turning to the fresher and newer *Apple Daily*. Since the three major papers could not both differentiate themselves from each other and mimic the *Apple Daily*, they fell into a fierce competition amongst themselves

(Li & Mai, 2003), while the *Apple Daily* established a loyal readership and differentiated itself from the other papers right from the beginning. Within 3 years, the *China Times* had lost 36% of its readers, the *United Daily* had lost 14%, and the *Liberty Times* had lost 23%. This forced the *China Times* and the *United Daily* to turn back to their original styles to keep their loyal readers. The *Liberty Times*, on the other hand, ventured further down the path of Apple-ization by further investing in providing paparazzi-type news and sharper sensationalism. In addition, the *Liberty Times* distributed a large quantity of free papers and published extra recreational issues as weekend supplements.

In sum, Taiwan's newspaper industry is characterized by multiple products and heterogeneous competition. To correctly describe these two properties, in the next section we will modify Judd's (1985) model of multiple products by considering the nature of heterogeneous product competition in Taiwan's newspaper industry. Then the model will be extended into a four-stage framework to capture the long-term development of the market equilibrium, considering that the new entrant is capable of working on R&D to increase demand in the general news market (i.e., disruptive innovations).

The basic model

Judd (1985) examined a sequential game in which a multiproduct incumbent firm, when facing competition from an entrant offering a substitute for one of its products, needs to decide whether to continue or withdraw from the invaded market. Then each firm will determine its prices in each market accordingly. Judd characterized an equilibrium where it can be optimal for the incumbent firm to withdraw from the invaded market. This is similar to the evidence in Taiwan's newspaper industry, where the entrant started invading in the low-end entertainment news market. As our purpose is to provide managerial insights into the present situation and the future development of Taiwan's newspaper industry, Judd's model provides us with an easy and straightforward setup to derive the equilibrium and to focus our attention on the development of the newspaper industry, rather than distracting readers with complicated mathematical calculations.³

We will modify Judd's model by considering the property of heterogeneous competition; that is, we assume that, except for the invaded market, the incumbent firm will also compete with other firms in another market (e.g., the general news market). This setup can generally fit similar situations being faced in other industries. For example, Yahoo is competing with eBay in the E-auction market, while Yahoo is also providing other services that are competing with Google. Another example is the telecommunications industry, where the entrants have invaded the long-distance calls market and the incumbents are competing with other firms in local phone services.

The model setting

The structure of the basic model is given as follows. First, to simplify the analysis, we assume that there are three news firms: 1, 2, and 3. There are two kinds of products in the newspaper industry: general newspaper (G) and entertainment newspaper (E). Firm 1 and firm 2 are in the general newspaper market,⁴ and firm 1 and firm 3 are in

the entertainment newspaper market. To see the correspondence to the Taiwan newspaper industry, assume that firm 1 is the *United Daily*, firm 2 is the *China Times* or *Liberty Times*, firm 3 is the entrant *Apple Daily*, and the *United Daily*'s entertainment-oriented product is the *Min Sheng Daily*. Here, in order to focus on the firms' market choices, we follow Judd (1985) in normalizing the firms' operating costs to zero, and leave for later discussion cases where this assumption is relaxed.

To capture heterogeneity among consumers, we modify Judd's (1985) assumption by considering three types of consumers: G_1 , G_2 , and E, where G_i , for $i=1$ or 2, represents a consumer oriented toward firm i in the general news market and E identifies a consumer oriented toward any entertainment newspaper, for the reasons given below. Without loss of generality, we follow Judd (1985) in assuming that there is only one consumer for each type, and each consumer purchases only one newspaper. The consumers' utilities are given as Equations (1) and (2):

$$U^{G_i} = \begin{cases} \alpha - p_i^G, & \text{if buys } G \text{ from firm } i, \\ \alpha - \lambda - p_j^G, & i \neq j, \text{ if buys } G \text{ from firm } j, \\ \alpha - \gamma - p_i^E, & i = 1, 3, \text{ if buys } E \text{ from firm } i. \end{cases} \quad (1)$$

$$U^E = \begin{cases} \alpha - p_i^E, & \text{if buys } E \text{ from firm } i, \\ \alpha - \gamma - p_i^G, & i = 1, 2, \text{ if buys } G \text{ from firm } i. \end{cases} \quad (2)$$

p_i^G and p_i^E denote firm i 's prices in the G and E markets, respectively. α reflects the benefit in terms of the satisfaction derived from reading the most preferred news; λ denotes the slight reduction in utility a consumer experiences if she buys her favorite type of news from a less preferred newspaper firm that still specializes in her favorite type of news; and γ denotes the greater loss in utility experienced if a consumer buys a less favored type of newspaper (one that specializes in providing the less preferred type of news).

Take consumer G_1 as an example. G_1 is the consumer oriented toward firm '1' in the 'general' news market, and firm 1 denotes the *United Daily*. The interpretation of U^{G_1} is as follows. If G_1 buys her favorite *United Daily*, then her satisfaction will be the highest α . Her overall utility will be the benefit in terms of the satisfaction derived from reading the paper minus the purchase price, i.e., $\alpha - p_1^G$; If G_1 buys general news from a less preferred general news firm such as the *China Times* or *Liberty Times*, then the satisfaction from reading the paper will be reduced by λ , so that the overall utility will be the benefit in terms of the satisfaction ($\alpha - \lambda$) derived from reading it minus the cost of purchasing general news from firm j (for $j \neq i$), i.e., $\alpha - \lambda - p_j^G$. However, if she buys the entertainment newspaper, then there will be a larger reduction in utility, γ , and the overall net utility gain will be the benefit in terms of the satisfaction derived from reading the paper of $\alpha - \gamma$ minus the cost of purchasing the entertainment news from either firm 1 or firm 3, i.e., $\alpha - \gamma - p_i^E$ for $i = 1, 3$. To simplify the analysis, we will assume that $\lambda < \gamma < \alpha < 2\lambda$ to capture the fact that even within the general news market, there is still heterogeneous competition.

The specification of consumer E's utility is different in order to reflect the current situation in Taiwan's entertainment news market. That is, for consumer E, the satisfaction from consuming the product of either firm 1 or firm 3 is the same (i.e., α), but if she is forced to read the general news, there will be a loss of utility of γ compared to the satisfaction derived from reading an entertainment-oriented newspaper.⁵ This is assumed to be so because, comparatively speaking, Taiwan's

entertainment news is small and both of the main providers (i.e., the *Min Sheng Daily* and *Apple Daily*) have focused on the same consumer-related and entertainment news. The readers exhibit a less strong loyalty toward the news firms than they do in the general news market. This can be justified by the observation that, when the *Apple Daily* entered the market, its experimenting with a low price of NT\$5 successfully turned most readers from the *Min Sheng Daily* to the *Apple Daily*. In the case of strong loyalty, a low price strategy should not permanently move the readers to another provider.

Hence the interpretation of consumer E's utility function is that, if she buys entertainment news, her net utility gain will be the benefit from satisfaction α , minus the purchasing price p_i^E for $i = 1, 3$. If she buys the general news from either firm 1 or firm 3, there is a dissatisfaction loss γ , and hence the overall utility will be $\alpha - \gamma - p_i^G$, for $i = 1, 3$.

Sequential stages of the basic game

At the start of the game, firms 1 and 2 are in the G market, and firms 1 and 3 are in the E market. In the game, the firms make decisions sequentially as follows: at stage 1, firm 1 first decides whether to continue or withdraw from the E market. Then, at stage 2, each of the firms competitively sets the price(s) of its newspaper(s). Accordingly, there are two subgames after stage 1, namely, (1) firm 1 simultaneously operates in the G and E markets, and (2) firm 1 withdraws from the E market.⁶

Deriving the equilibrium

Since the game is a sequential one, the *subgame perfect equilibrium* (Selten, 1975) of the game will be derived by backward induction. For this end, we first calculate the equilibrium prices in each of the two subgames with respect to firm 1's stage-1 decision possibilities and then determine firm 1's equilibrium decision.

The subgame if Firm 1 stays in the E market

The equilibrium prices in this subgame are the prices where no consumer or firm will find it beneficial to unilaterally deviate. We now demonstrate that the equilibrium prices for this subgame will be $p_1^G = p_2^G = \gamma$ and $p_1^E = p_3^E = 0$.⁷ Consumers G_1 and G_2 will purchase from firm 1 and firm 2, respectively, and consumer E will be indifferent between buying from firm 1 or from firm 3.

First, since the E market is homogeneously competitive, firm 1 and firm 3 will charge competitive prices, i.e., marginal cost pricing will prevail. Since we have assumed a zero marginal cost of operation, the equilibrium prices will hence be $p_1^E = p_3^E = 0$. Second, given $p_1^E = p_3^E = 0$ in the E market, we need to demonstrate that consumers G_1 and G_2 will make choices consistent with this equilibrium and purchase product G from firm 1 and firm 2, respectively. Notice first that if both of them deviate by purchasing product E, their utilities will be the same, i.e., $\alpha - \gamma - 0$.

For both G_1 and G_2 to adhere to the equilibrium and not deviate to purchase product E, the highest possible prices that firm 1 and firm 2 can charge must be set at the levels where G_1 and G_2 are indifferent between buying product G and product E.

This requires the utilities to be the same in these two cases, that is, $\alpha - p_1^G = \alpha - \gamma - 0$, for $i = 1, 2$. Therefore, we have $p_1^G = p_2^G = \gamma$.

In addition, we need to consider the following deviation where, say, firm 1 could charge a lower price so that even G_2 finds it beneficial to purchase from firm 1. To attract G_2 , firm 1 must reduce its price to $p_1^G = \gamma - \lambda$, so that consumer G_2 will be indifferent between purchasing from firm 1 and firm 2. In this case, firm 1 will have the payoff $2(\gamma - \lambda)$. Since we have assumed earlier that $\lambda < \gamma < \alpha < 2\lambda$, this deviation cannot be profitable as $2(\gamma - \lambda)$ is less than the equilibrium payoff λ . We have restricted the range of parameters to simplify the discussion,⁸ so that a unilateral deviation will not be profitable. Since our main purpose is to study the current situation and future development of Taiwan's newspaper industry, we need this assumption to avoid burdening readers with a complicated discussion, and this also applies to the following discussion and Note 12.

Finally, we can calculate each player's payoff in this subgame. Under these prices, consumer G_1 will not unilaterally change her consumption decision, and since she can purchase from her most favored firm, the utility will be $\alpha - \gamma$. Next, since consumer E is indifferent between buying from firm 1 and firm 3, her utility will be $\alpha - 0$. Since both firm 1 and firm 3 will be operating in the E market, the competition among firms offering homogeneous products will drive the profits down to zero. In addition, as consumers rationally compare prices, the competition in the E market will influence the profits in the G market. To sum up, the firms' profits in this subgame will be $\pi_1 = \gamma$, $\pi_2 = \gamma$, and $\pi_3 = 0$.

The subgame given Firm 1's exit from the E market

We will demonstrate that the equilibrium prices in this subgame are: $p_1^G = p_2^G = \alpha$ and $p_3^E = \alpha$. Consumers G_1 and G_2 will purchase from firm 1 and firm 2, respectively, and consumer E will buy from firm 3. First, notice that since firm 1 has withdrawn from the E market, firm 3 will be the monopolist and hence the profit maximizing price will be $p_3^E = \alpha$.

Next, given $p_3^E = \alpha$ in the E market, we need to demonstrate that consumers G_1 and G_2 will follow the equilibrium and purchase product G from firm 1 and firm 2, respectively. Notice first that if both of them deviate by purchasing product E, their utilities will be the same, i.e., $\alpha - \gamma - \alpha < 0$. This enables firm 1 and firm 2 to charge the profit maximizing prices, i.e., $p_1^G = p_2^G = \alpha$, without worrying that consumers will turn to product E and derive a negative utility.

In addition, we need to consider the following deviation where, say, firm 1 could charge a lower price so that even G_2 finds it beneficial to purchase from firm 1. To attract G_2 , firm 1 must reduce the price to $p_1^G = \alpha - \lambda$, so that consumer G_2 will be indifferent between purchasing from firm 1 and firm 2. In this case, firm 1 will have the payoff $2(\alpha - \lambda)$. This deviation will not be profitable, as $2(\alpha - \lambda)$ is less than firm 1's equilibrium payoff α .

Finally, we can calculate each player's payoff in this subgame. Since all three firms have charged the profit maximizing prices, i.e., $p_3^E = p_1^G = p_2^G = \alpha$, the utilities for all consumers will be zero, that is, $\alpha - \alpha$. Similarly, the equilibrium profits for each firm are $\pi_1 = \alpha$, $\pi_2 = \alpha$, and $\pi_3 = \alpha$.

Subgame perfect equilibrium of the game

Given the equilibrium profits for firm 1 in the two subgames, respectively, we now determine firm 1's decision in the first stage. To do this, we can simply compare firm 1's payoffs from these two subgames. Because the payoff to the firm from continuing in the E market (γ) is smaller than that from withdrawing (α), firm 1 will choose to withdraw from the invaded E market.

To sum up, in the unique subgame perfect equilibrium, firm 1 will choose to withdraw from the E market. Then, all three firms will charge the same price $p_1^G = p_2^G = \alpha$ and $p_3^E = \alpha$. Consumers G_1 and G_2 will purchase from firm 1 and firm 2, respectively, and consumer E will buy from firm 3. In this equilibrium, all consumers derive zero utility, and the equilibrium profits for each firm are $\pi_1 = \alpha$, $\pi_2 = \alpha$, and $\pi_3 = \alpha$. Proposition 1 summarizes the above discussion.

Proposition 1. In the unique subgame perfect equilibrium described above, the *United Daily* (firm 1) is better off withdrawing from the entertainment market (E) when faced with the competition from the *Apple Daily* (firm 3).

The intuition as to why firm 1 can benefit from withdrawing from the E market is that, after exiting the market, it will be able to raise its price in the general news market because the price of an imperfect substitute (entertainment-oriented newspapers) will increase. This can increase firm 1's profit in the G market, where firm 2 will also benefit. Moreover, according to our analysis, after closing down the *Min Sheng Daily*, the entertainment news market will become a monopoly and such news will be provided by the *Apple Daily* only.

The extended model considering disruptive innovation

This section examines the situation where firm 3 is capable of innovating and developing new demand in the general news market. Our purpose is to see whether withdrawing from the entertainment news market is still an optimal decision for firm 1 in the long term. We extend the basic model to a four-stage game, in which firm 3 can develop new demand in the general news market through R&D financed from profits. We assume that only firm 3 will work on R&D, as this reflects an earlier observation that the *Apple Daily* is more aggressive and innovative than the incumbents. We will leave for a later discussion the cases where all firms have the R&D ability.

Subsequent stages of the extended game

The first two stages of the extended game are the same as the basic game above. That is, at stage 1, firm 1 first decides whether to continue or withdraw from the E market. Then, at stage 2, each of the firms competitively sets the price(s) of its newspaper(s). At stage 3, firm 3 decides how much to invest in an uncertain innovation to develop new customers (i.e., demand) in the general news market if the firm realizes a positive profit at stage 2. However, if firm 3 does not profit at stage 2, it will not invest in innovation and then do nothing but proceed to stage 4. At stage 4, each of the firms sets the price(s) of its newspaper(s) and competes with the other firms.

R&D technology

Let x denote firm 3's R&D investment and let $p(x)$ denote the probability of being successful in creating enough heterogeneous demand (and hence loyal readers) in the general news market. $p(x)$ is a nondecreasing convex function of x . To simplify the analysis, we assume $0 \leq (p')^{-1}(\frac{1}{2\alpha-\gamma}) \leq \alpha^0$, where -1 denotes the inverse of the first-order derivative $p'(\cdot)$.

If the innovation is successful, then there will be a new consumer G_3 who is loyal to firm 3's general news, and the utility received is defined in a similar way to Equation (1). Otherwise, if the innovation fails, there are two possibilities regarding whether firm 3 enters the G market or not. If firm 3 does not enter the G market, there is no effect on the other incumbents' pricing strategies at stage 4. If firm 3 does enter the G market, firm 3's G product is homogeneous with products G_1 or G_2 (as a result of the failure in creating a heterogeneous product). Therefore, firm 3's entry to the G market will affect the other firms' pricing decisions. A rigorous way of incorporating these two possibilities is to use a probability for each case to take place. However, in the first case, only firm 1's decision about withdrawal will be affected and the other firms' pricing strategies will remain unchanged. For analytical ease, we assume away the first possibility and presume by default a homogeneous competition in G between firm 3 and firms 1 and 2, if firm 3's innovation is not successful.

Deriving the equilibrium

We now derive the subgame perfect equilibrium by solving backward the sequence of the stages. That is, we first derive the stage-4 subgame equilibria, respectively, given that firm 3 succeeds in its G-product innovation and that it fails. Then we decide firm 3's R&D input. Finally, we characterize the equilibrium prices at stage 2, and then firm 1's withdrawal decision.

Subgame equilibrium for stage 4

Remember that firm 3 will participate in the stage-4 market competition only if firm 1 has already withdrawn from the E market. If firm 1 stays in the E market, firm 3's profit in the E market will be zero due to competition in homogeneous products (see the basic model). Firm 3 will not have the ability to invest in R&D and enter the general news market. Therefore, the equilibrium profits will be $\pi_1 = \pi_2 = \gamma$ and $\pi_3 = 0$.

However, if firm 1 withdraws from the E market, so that firm 3 has a chance to make a positive profit, the equilibrium will depend on whether firm 3 is successful in R&D. First, if firm 3 can successfully develop new demand in the G market, then the calculation of the equilibrium prices of the G products will be similar to that in the basic model. That is, in this case, firm 3 will develop the loyal reader G_3 , whose greatest benefit from reading firm 3's general news will be α . There will be a reduction in utility γ if she purchases the general news from firm 1 or firm 2. With the assumption that $\lambda < \gamma < \alpha < 2\lambda$, the equilibrium prices will be $p_1^G = p_2^G = p_3^G = \alpha$. Since the general news firms all charge, there is no need to prevent consumer E from switching to the general news and hence firm 3 will charge the monopolistic price

$p_3^E = \alpha$. To sum up, the equilibrium profit for each firm will be $\pi_1 = \alpha$, $\pi_2 = \alpha$, and $\pi_3 = 2\alpha$.

Moreover, if firm 3 fails to create new demand for G, then the homogeneous competition will drive the prices down to $p_1^G = p_2^G = p_3^G = 0$.¹⁰ Furthermore, to prevent consumer E from switching to the G market, p_3^E must be set at a level where consumer E is indifferent between consuming products E and G, that is, $\alpha - p_3^E = \alpha - \gamma - 0$. Hence, $p_3^E = \gamma$. In this situation, the equilibrium profits will be $\pi_1 = 0$, $\pi_2 = 0$, and $\pi_3 = \gamma$.

Firm 3's R&D decision at stage 3

Given stage 4's market equilibrium as above, firm 3 needs to decide the level of R&D (i.e., x), given the probability $p(x)$ for innovation success (thus firm 3 will have a profit of 2α at stage 4). Of course, the likelihood that the innovation fails is $1-p(x)$, and when this happens, firm 3 will have a profit of γ at stage 4. Therefore, given a withdrawal decision already made by firm 1, firm 3 will maximize its expected profit as described below¹¹:

$$\begin{aligned} & \max_x \{p(x)2\alpha + (1 - p(x))\gamma - x\} \\ & \text{subject to } 0 \leq x \leq \alpha. \end{aligned} \quad (3)$$

Since $\gamma < 2\alpha$ and $p(x)$ is a non-decreasing convex function, the maximization problem is well defined and the optimal x will exist. Let x^* denote this optimal R&D level. x^* must satisfy $p'(x^*)(2\alpha - \gamma) = 1$,¹² and firm 3's optimal profit at stage 4 will be $p(x^*)2\alpha + (1 - p(x^*))\gamma - x^*$. However, we will eschew a more detailed discussion on the optimal R&D level, as our focus is on the firm's market choice. It is obvious from the first-order condition that, when α is greater or γ is smaller, the R&D input is higher.

Subgame equilibrium at stage 2 and firm 1's decision about withdrawal at stage 1

Notice that the subgame equilibrium profits from the E product competition at stage 2 of this extended game are the same as those in the basic game. That is, the equilibrium profits at this stage will be $\pi_1 = \alpha$, $\pi_2 = \alpha$, and $\pi_3 = \alpha$ if firm 1 withdraws from the E market or $\pi_1 = \gamma$, $\pi_2 = \gamma$, and $\pi_3 = 0$ if firm 1 stays in the E market. We now can identify firm 1's decision about withdrawal or not, after we have characterized the subgame equilibria at stages 2, 3, and 4. To this end, we compare firm 1's total profits from the decisions to withdraw and to stay. As stated earlier, if firm 1 remains in the E market, then firm 3's profit in the E market will be zero due to the homogeneous products competition. Then firm 3 will not invest in R&D and enter the G market. Therefore, firm 1's profit from the G product sales at stage 4 is also $\pi_1 = \gamma$. Its combined profits from stage 2 and 4 will be 2γ .

However, if firm 1 withdraws from the E market, firm 1's profit at stage 2 is α as derived. Meanwhile, firm 3 will have a positive profit, with which it can invest in developing new demand in the G market. If the innovation is successful, then firm 1 still has a profit of α from stage 4. If the innovation fails, then homogeneous product competition will drive firm 1's profit down to zero. Given the optimal R&D level x^* determined in Equation (3) and the probability of success $p(x^*)$, the expected sum of profits that firm 1 can earn from stage 2 and 4 will be $(1 + p(x^*))\alpha$.

By comparison, it follows that if $\frac{1+p(x^*)}{2}\alpha < \gamma$, then withdrawing from the E market is no longer an optimal decision, when the invading firm can extend its entry to the G market by disruptive innovation. With this condition, the unique subgame perfect equilibrium of the whole game is that firm 1 stays in the E market competing with firm 3. The equilibria for stage 2 and 4 will be the same, i.e., $p_1^E = p_3^E = 0$ and $p_1^G = p_2^G = \gamma$. Hence, the firms' total profits are $\pi_1 = 2\gamma$, $\pi_2 = 2\gamma$ and $\pi_3 = 0$. Proposition 2 summarizes the above discussion.

Proposition 2. From the unique subgame perfect equilibrium derived above, given $\frac{1+p(x^*)}{2}\alpha < \gamma$, if the *Apple Daily* (firm 3) is R&D-capable while entering the general news market, the withdrawal of the *United Daily* (firm 1) from the entertainment news market will diminish its profit earned from the general news market and hence reduce its overall long-term profit.

Withdrawing from the invaded market is a short-term optimal decision for firm 1, but it can be non-optimal or even harmful in the long term. The intuition behind this is that, in the short term, firm 1 has ignored the fact that partially withdrawing can give the new entrant the opportunity to work on R&D and develop new demand in the higher-level market. Next, we will address some comparative statistics and provide several management insights to the incumbent news firms.

Discussion

If a positive operating cost is taken into consideration, then the competitive prices will be set at a higher cost (instead of zero). For example, it has been reported that the family that owned *Min Sheng Daily* was less efficient than the owners of the *Apple Daily*, and hence the operational cost was higher in the case of the *Min Sheng Daily*. When the *Apple Daily* entered the E market by charging an experimental low price of NT\$5, most consumers switched to this new entrant, resulting in a reduction in demand for the *Min Sheng Daily*. This loss in demand and the comparatively higher operating costs drove the profits of the *Min Sheng Daily* down into negative figures. Even after the *Apple Daily* raised its price to the competitive price of NT\$15, the long-term deficit forced the United Daily group to close the *Min Sheng Daily*.

Second, the results of the R&D can be expressed in terms of increasing the satisfaction of the existing (instead of new) consumers, so as to increase satisfaction from to $\alpha' (> \alpha)$ or to decrease the utility losses λ and γ . For example, a successful invention by the *Apple Daily* is the 'focus group interviews,' through which consumers' suggestions are taken directly to ensure that the content of the news can provide more satisfaction. A counter example will be the fact that both the *United Daily* and the *China Times* have also invested in diversification, including issuing magazines, books, evening news, and even network news. However, since these inventions (by diversification) have not created enough heterogeneity and hence have not provided enough satisfaction to consumers, the small profits from only part of these subsidiary businesses are insufficient to cover the losses from their newspapers. Even worse, similar to their competition in newspapers, the two news firms are being confronted by each other in the diversified markets and between their nearly homogeneous newspapers are driving their profits down.

Based on this line of reasoning, we can provide two possible expectations for the *Liberty Times*, which became fully Apple-ized following the *Apple Daily*'s launch. First, the *Liberty Times* and the *Apple Daily* will become more homogeneous in the general news market, and this will drive their profits down to competitive levels. Second, since the *Apple Daily* has pre-empted the entertainment news market, imitation by the *Liberty Times* will not create enough heterogeneity for consumers and, as a result, it is expected that Apple-izing the *Liberty Times* will cause it to lose its original demand.

Third, the results of R&D can also be broadly expressed so as to develop new markets. A successful example is the case where the *China Times* invested in cable television in May 2002, by acquiring *CTI TV* (Chen & Cheng, 2003).¹³ The new owner turned the 'money loser' *CTI TV* into a profit-maker within 3 years and, in 2005, *CTI TV* had a profit of more than NT\$100 million (Liao, 2005). Moreover, on December 26, 2005, the *China Times* bought the wireless *China TV* from the KMT, hoping to make a handsome profit like they did with *CTI TV*. Fourth, since the revenue from advertising will be positively related to market share, if we assume that each firm charges a competitive price for advertising space (denoted by A), then each firm's unit revenue will be $P_i^G + A$ or $P_i^E + A$ for $i = 1, 2, 3$. Then, with minor modifications to the equilibrium conditions, our main conclusions above will still apply.

Concluding remarks

Taiwan's newspaper industry is now at a saturated stage. The popularity of cable TV and the Internet has attracted huge numbers of consumers who had previously been oriented toward newspapers, and the new entrant, the *Apple Daily*, has worsened the situation by attracting consumers with its fresher content and more efficient management. While most of the attention has focused on the concern expressed that newspapers will become more and more sensational, this study, starting with the United Daily's decision to shut down the *Min Sheng Daily*, attempts to provide an economic interpretation for the current status of the industry. We first modified Judd's (1985) model of multiple products by taking into account the heterogeneous products competition in Taiwan's newspaper industry. Then we extended the basic model by considering disruptive innovations (Christensen & Raynor, 2003).

Our main conclusion is as follows. Closing the *Min Sheng Daily* is optimal in the short term but could lead to further reductions in profit in the general news market in the long term. The various diversifications will not necessarily result in profits if they cannot provide enough product diversity to consumers. Finally, since advertisements and networks have been very important topics in the mass media, we will leave their detailed discussion to further research. However, as demonstrated above, our model can still provide a simple analysis explaining how advertising or the Internet can change the news firms' market choices.

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Notes

1. If this assumption is violated, two of our main conclusions still apply with slight modifications in the requirements for equilibrium.
2. Educating the public was a mission of the mainstream newspapers.
3. For example, see Baumol, Panzar, and Willig (1982) for more complicated multiple product setups.
4. Although there are in fact more than two competitors in each market, for example, there are three main newspapers in the general news market (the *China Times*, *United Daily*, and *Liberty Times*), the assumption of two firms is sufficient to describe the competitive environment.
5. If this assumption is violated, two of our main conclusions will still apply with slight modifications regarding the requirements for equilibrium.
6. Since this paper focuses on the news firms' strategic choices for multiple markets, we do not consider advertising in our model. However, as the revenue from advertising is normally positively related with the readership (see Increasing newspaper revenue, 2005), our model can provide a simple analysis of advertising's effect (see Discussion). Since the effect of advertisement has been an important issue in the media literature (e.g., Gabszewicz, Laussel, & Sonnac, 2001), we will leave detailed discussion to further research.
7. This is a standard price competition equilibrium.
8. Otherwise, we need to discuss the equilibrium for every possible range for α and λ .
9. Otherwise, we need to discuss various cases of corner solutions.
10. Here, for modeling simplicity, the homogeneity among all of the three G products is assumed given the failure of firm 3 in the innovation. A more general or realistic assumption can be that firm 3's G product becomes substitutable only to either firms 1 or 2 but not both, where firms 1 and 2 remain heterogeneous. It follows that with firms 3 and 1 substitutable, the competitive prices will be $p_1^G = p_3^G = 0$ and $p_2^G = \gamma$. Otherwise, with firms 3 and 2 substitutable, then the competitive prices will be $p_2^G = p_3^G = 0$ and $p_1^G = \gamma$. Nonetheless, the results derived in the text still apply to these two situations with slight modifications to the condition that characterizes the results of the game.
11. 2α and γ are derived as above. Notice that firm 3 will not deviate by reducing its price to $\alpha - \lambda$ to generate a profit $3(\alpha - \lambda)$, since $3(\alpha - \lambda)$ is less than 2α (since $\lambda < \alpha < 2\lambda$).
12. The second-order condition will be $p''(x^*)(2\alpha - \gamma) < 0$.
13. *CTI TV*, originally named *Chuan Hsun TV*, was founded by Hong Kong businessman Ping Hai Yu, and later taken over by the *Hsiang Shan* group. The *China Times* is the third owner.

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行政院國家科學委員會補助國內專家學者出席國際學術會議報告

98年8月10日

報告人姓名	何靜嫻	服務機構 及職稱	國立政治大學經濟學系
時間 會議 地點	August 2nd – August 9st 2009, Tokyo and Singapre	本會核定 補助文號	NSC 97-2410-H-004 -060
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發表 論文 題目	(中文) 銀行產業下的資本結構與市場競爭：理論與實證 (英文) Capital Structure and Competition in the Banking Industry: Theory and Empirics,		

報告內容應包括下列各項：

一、參加會議經過

8/2 自台北出發，參加東京 2009 Far East and South Asia Meeting of the Econometric Society 的報告。東京大學不愧為第一學府，舉辦這種大型學術研討會之經驗豐富，所有行程緊湊，且各科分類程度正好，同一場報告者也有良好的經驗交換。

由於 8/5 日剛結束東京，8/6 日一早由台灣到新加坡時已經錯過開幕講題。由於大會是在 Stamford Hotel 舉行，當我們正在繞來繞去的大廳中找下午第一場 talk 時，我飄見我在英國熟識的一位同學（目前任教伯明罕大學經濟系）正在招手跟我打招呼，從這開始三天有趣且內容豐富的會議。

二、與會心得

東京的會議在每天會議中穿插如 Roger Myerson 等國際知名大師演講，行程緊湊，且分類細密。且由於大會是在校園裡舉辦，在小節中可以到校園逛逛，相較於新加坡把會議場所拉到市中心的大飯店舉辦，感覺親切許多。大飯店的會議型態比較像一般商業會議，對一般的學術界人士好像不太適合。

三、建議

大型會議的通病是小組行動，熟的朋友更熟。如何以團體活動的方式，讓大家在極短期內能夠熟絡，是成功的要素。

四、攜回資料名稱及內容

東京部分：

1. conference 各篇文章摘要
2. 東京之展覽簡介

新加坡部分：

所有議程及文章全文，主辦單位都將之公布於下列網頁中；

<http://editorialexpress.com/conference/serc2009/program/serc2009.html>

五、其他

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