INDERSCIENCE PUBLISHERS
Linking academia, business and industry through research

International Journal of Technology Management

ISSN online: 1741-5276 - ISSN print: 0267-5730
https://www.inderscience.com/ijtm

A theoretical basis for a sponsored location program as a form of joint marketing: a mixed bundling model approach

Yoshihiro Ito, Hideo Noda

DOI: 10.1504/IJTM.2023.10052649

Article History:

Received:	12 May 2021
Accepted:	21 January 2022
Published online:	20 December 2022

A theoretical basis for a sponsored location program as a form of joint marketing: a mixed bundling model approach

Yoshihiro Ito*

Nagaoka University of Technology,
1603-1 Kamitomiokamachi, Nagaoka,
Niigata 940-2188, Japan
Fax: +81-258-47-9350
Email: itoy@kjs.nagaokaut.ac.jp
*Corresponding author

Hideo Noda

Tokyo University of Science,
1-11-2 Fujimi, Chiyoda-ku,
Tokyo 102-0071, Japan
Email: noda@rs.tus.ac.jp

Abstract: This study provides the theoretical basis for a 'sponsored location program' – a joint marketing effort designed to benefit all participating parties. We present a mixed bundling model involving two firms: an online game company and an alliance partner. Our model assumes joint sales by the two firms, with generated profit allocated between them. The model implies that under a conventional sponsored location program, changing from separate sales to mixed bundling allows only one, but not both, of the firms to increase profits. But when both firms are free to set prices, changing the retailing mode allows both to increase profits.

Keywords: bundling profit; game industry; information goods; joint marketing; mixed bundling; online game; Pokémon GO; retailing mode; separate selling; sponsored location program.

Reference to this paper should be made as follows: Ito, Y. and Noda, H. (2023) 'A theoretical basis for a sponsored location program as a form of joint marketing: a mixed bundling model approach', *Int. J. Technology Management*, Vol. 91, Nos. 1/2, pp.133–144.

Biographical notes: Yoshihiro Ito is a Professor in Management at the Graduate School of Engineering, Nagaoka University of Technology, from 2017. He received his BE and ME in Material Engineering from the Waseda University, Japan, in 1988 and 1990 respectively, MBA from the Hosei University, Japan, in 1998, and PhD in Management from the Tohoku University, Japan, in 2005. He worked as a researcher for Canon Inc., Japan, from 1990 to 2006. He was an Associate Professor of Management at the Yamagata University, Japan, from 2006 to 2015. His current research interests include strategic management, innovation management and business model innovation. His work has appeared in the *Industrial Marketing Management*, *International Journal of Technology Management*, and many others.

Hideo Noda is a Professor of Economics at the Tokyo University of Science, Japan. He received his PhD in Economics from the Kyushu University, Japan, in 2004. He is a member of the Asian Association of Management Science and Applications, Japanese Economic Association, Japan Economic Policy Association, and Japan Association for Applied Economics. His current research interests include business cycle, economic growth, and global environmental problems. His work has appeared in the *Applied Economics Letters*, *Discrete Dynamics in Nature and Society*, *Journal of Cleaner Production*, *Journal of Happiness Studies*, and many others.

1 Introduction

Since the late 2000s, online content such as online games has become widely accepted by consumers because of the increasingly common use of smartphones. As a result, various marketing strategies are emerging. One major marketing strategy related to online content is that of Pokémon GO, which has received worldwide attention. In this study, we focus on a new form of joint marketing called the sponsored location program, which was introduced by Niantic Inc., the developer of Pokémon GO, and its alliance partners. The purpose of this study is to provide a theoretical basis for the sponsored location program as a form of joint marketing.

The sponsored location program is a form of joint marketing aimed at achieving a win-win relationship between an online game company and its alliance partners. The online game company sells online games independently, and gives away free online game items to consumers who purchase the products of the alliance partners. Thus, under the sponsored location program, the alliance partners can expect to attract more customers to their stores through association with a popular online game, which uses location-related information via smartphones. The sponsored location program also involves the allocation of profits obtained by bundling the products of the online game company and its alliance partners.

The specific details of the operation of the sponsored location program are as follows. As mentioned above, we consider the alliance between the online game company that developed Pokémon GO and its alliance partners. When consumers play Pokémon GO, they encounter the PokéStop and Pokémon gyms. The PokéStop is where consumers obtain game items, while Pokémon gyms are areas where battles take place between Pokémon monsters. In this program, an alliance partner's store is designated as a Pokémon GO PokéStop, where consumers can obtain game items free of charge. The program was introduced when Pokémon GO was released in Japan, and by April 2017 the provider, Niantic Inc., had concluded contracts with seven companies: McDonald's Japan, SoftBank Group Corp., Toho Cinemas Ltd, Aeon Co. Ltd, Ito En Ltd, Joyfull Co. Ltd, and Seven-Eleven Japan Co. Ltd. In the USA, the program commenced in December 2016 with Starbucks Corp. The introduction of the sponsored location program allowed Niantic to earn revenue from its alliance partners (the sponsor companies) in addition to revenue earned from game players. Consumers could obtain free game items that normally had to be purchased, while sponsors could expect additional sales of their goods to game players who visited their stores. In January 2020, Suntory Beverage & Food Ltd., a Japanese beverage manufacturer, and

Square Enix Co., Ltd., a game provider, implemented a similar joint marketing program involving Dragon Quest Walk, a smartphone game application.

This type of joint marketing program can be analysed within the framework of the mixed bundling theory for the following reason. Bundling involves the sale of multiple items as a single set, and mixed bundling involves a combination of single-item sales and bundling. Under the sponsored location program, the products of the alliance partners and online game items are bundled, while the online game company continues to independently sell its online game items. In other words, the product sales method under the sponsored location program (i.e., joint selling of the products of the alliance partners and online game items) can be regarded as a type of mixed bundling.

Similar to Jeitschko et al. (2017), we examine joint marketing as a means of promoting the joint sales of two products. However, this study differs from previous studies in that we elucidate a form of joint marketing called the sponsored location program based on the bundling theory. In addition, after identifying a fundamental problem with the conventional sponsored location program, we examine the theoretical feasibility of increasing the profits of both participating firms.

Previous studies analysing joint sales using the bundling theory include Gabszewicz and Wauthy (2003), Kim and Serfes (2006), and Anderson et al. (2012). Gabszewicz and Wauthy (2003) assumed that consumers make mutually exclusive purchases within the framework of modeling quality differentiation, and analysed price competition when the joint purchase option is offered. Kim and Serfes (2006) and Anderson et al. (2012) analysed joint sales of products with different characteristics. Specifically, Kim and Serfes (2006) emphasised the diversity of goods to be bundled based on the model of Gabszewicz and Wauthy (2003). Anderson et al. (2012) extended the model of Kim and Serfes (2006) by considering the quality of the products. We also consider the bundling of products with different characteristics. However, modeling a combination of information goods (services) such as an online game and a physical product such as a hamburger is a unique approach that has been overlooked in previous studies.

The features of our model can be summarised as follows. First, we consider mixed bundling through joint product sales by two firms, an online game company and its alliance partner. In this joint marketing program, the profits obtained through bundling are allocated between the two firms. Second, we examine the mixed bundling of online game items, which are information goods with zero marginal cost, and the partner firm's product, with a non-zero marginal cost. Third, we analyse an asymmetric state in which online game items are sold both individually and in bundles, whereas the partner firm's product is sold only in bundles. No previous research has considered these three aspects. In this study, the crucial question is whether mixed bundling based on the sponsored location program results in greater profit for the participating firms than selling the products separately. Our model implies that when an online game company and its alliance partner introduce a conventional sponsored location program in which each firm sets the price of its good at the same level as the price that maximises profit in the separate selling situation, only one firm can increase its profit by changing the retailing mode from separate selling to mixed bundling. Thus, there is no allocation of the bundling profit between the firms that increases the profit of both firms. However, unlike the case of the conventional sponsored location program, when an online game company and its alliance partner are free to set the prices of their goods, each firm can increase their profit by changing from separate selling to mixed bundling, given that

they each receive a percentage allocation of the bundling profit. This result suggests that there is room for improvement in the conventional sponsored location program.

The remainder of this article is organised as follows. Section 2 reviews earlier studies. Section 3 explains a theoretical framework for analysing the sponsored location program as a form of joint marketing, and examines whether mixed bundling based on the sponsored location program can generate greater profit for an online game company and its alliance partner than selling their products separately. Section 4 summarises the main results and presents conclusions.

2 Literature review

To date, there have been fewer studies of the game industry than of other entertainment-related industries (MacInnes, 2006; Marchand and Henning-Thurau, 2013; Meredith et al., 2009). Although relatively few studies have been undertaken, some of the more prominent ones include those on the network effects of game hardware (Shankar and Bayus, 2003), indirect network effects of the relationship between game hardware and software (Clements and Ohashi, 2005), vertical integration of game hardware and software (Lee, 2013), and penetration pricing of game hardware or dynamic price differentiation, that is, price skimming (Liu, 2010). Few studies have examined mobile games, which have recently become a mainstream game market. Considering the size of the mobile game market, there appears to be considerable merit in examining new joint marketing approaches in relation to mobile games.

Here, we provide a brief review of relevant previous studies on mixed bundling. Key studies in this field include those of Stigler (1963), Adams and Yellen (1976), Schmalensee (1984) and McAfee et al. (1984). Stigler (1963) used simple examples to show that mixed bundling was profitable, while Adams and Yellen (1976) extended the argument of Stigler (1963) in demonstrating the profitability of mixed bundling. Schmalensee (1984) developed the model of Adams and Yellen (1976) and concluded that mixed bundling was profitable when the levels of demand for two goods were either negatively correlated or mutually independent, and McAfee et al. (1984) provided further generalisation of the analysis presented by Schmalensee (1984). Major studies conducted either during or since the 1990s include those of Bakos and Brynjolfsson (1999, 2000). Specifically, they addressed the fact that profitability increases when the marginal costs of the goods to be included in mixed bundling are low. Furthermore, they analysed the mixed bundling of information goods with a marginal cost of zero. In contrast, we analyse the mixed bundling of an information good with zero marginal cost and a tangible product with a non-zero marginal cost.

In addition to the abovementioned studies of Gabszewicz and Wauthy (2003), Kim and Serfes (2006) and Anderson et al. (2012), related theoretical studies of two-company product bundling include those of Gans and King (2006), Tanassoulis (2007, 2011), Armstrong and Vickers (2010), Armstrong (2013) and Jeitschko et al. (2017). In particular, Gans and King (2006) undertook a pioneering study that analysed bundling in joint marketing between two firms. Tanassoulis (2007) analysed the linkage between competitive mixed bundling and consumer surpluses. Armstrong and Vickers (2010) incorporated competitive nonlinear pricing into their model and examined the conditions under which nonlinear pricing would improve consumer welfare as a result of the joint marketing of two firms' goods. Tanassoulis (2011) examined the process of convergence

across multimedia and telecommunications markets. Armstrong (2013) analysed several major studies on the bundling of two firms' goods and developed a more general argument related to this approach. Jeitschko et al. (2017) analysed the feasibility of using joint marketing to promote the joint sales of two goods offered by rival firms.

In this study, we focus on a new type of joint marketing called the sponsored location program based on the mixed bundling theory, and incorporate the three abovementioned aspects that previous studies have overlooked into our model. Thus, this study complements previous studies and provides a theoretical contribution in the area of joint marketing.

3 The model

Suppose that there are two firms, company a and company b, and the market in each product category is served by a single firm. There is a linkage between company a and company b through a form of joint marketing called a sponsored location program. Specifically, company a and company b are an online game company and its alliance partner, respectively. In addition, we refer to company a's goods as product a and company b's goods as product b. Because we assume that company a is an online game company, online game items correspond to product a. In addition, when company b (i.e., the alliance partner of company a) is a fast food company, a hamburger can be considered as an example of product b. The price of product a is expressed as p_a, the price of product b is expressed as p_b, and the price of the set of product a and product b is expressed as p_{ab}. We assume that the marginal cost of product a is zero, while the marginal cost of product b is c_b. For convenience, the marginal cost c_b is treated as a parameter.

Suppose that product a, which is sold to consumers at locations other than company b's outlets, is a single item, and product b is another single item. We also consider a set of product b and a free product a item for a consumer who purchases goods at one of company b's outlets through the sponsored location program. If the program is adopted when company a and company b are selling their respective goods, this selling style can be regarded as a form of mixed bundling.

The consumer valuation (reservation price) of product a and product b is expressed as θ_a and θ_b, respectively. Moreover, θ_a and θ_b independently follow a uniform distribution in the interval [0, 1]. Let D_a be demand for product a, D_b be demand for product b, and D_{ab} be demand for the set of both goods. Then, D_a, D_b, and D_{ab} are given by

$$D_a(p_a, p_{ab}) = (1 - p_a)(p_{ab} - p_a), \tag{1}$$

$$D_b(p_b, p_{ab}) = (1 - p_b)(p_{ab} - p_b), \tag{2}$$

and

$$\begin{aligned} D_{ab}(p_a, p_b, p_{ab}) &= (1 - p_{ab} + p_a)(1 - p_{ab} + p_b) \\ &\quad - \frac{1}{2}[p_b - (p_{ab} - p_a)][p_a - (p_{ab} - p_b)] \\ &= (1 - p_{ab} + p_a)(1 - p_{ab} + p_b) - \frac{1}{2}(p_a + p_b - p_{ab})^2. \end{aligned} \tag{3}$$

We can express the prices of product a and product b in the mixed bundling case as p_a^m and p_b^m, respectively. Because our model assumes a package deal of company a's goods and company b's goods, that is, bundling through a joint sale of the two firms' goods, the profit obtained by bundling (i.e., the bundling profit) is allocated between company a and company b. Let λ be the percentage of bundling profit allocated to company b and $1-\lambda$ be the percentage allocated to company a. For example, $\lambda = 0.7$ implies that company b receives 70% of the profit from bundling and company a receives 30%. For simplicity, we ignore the bargaining regarding the percentage allocation to each firm.

Using equations (1) and (3), the profit for company a from the mixed bundling method, $\widetilde{\pi}_a(p_a^m, p_b^m, \lambda; c_b)$, can be expressed as

$$\widetilde{\pi}_a(p_a^m, p_b^m, \lambda; c_b) = p_a^m(1-p_a^m)(p_{ab}-p_a^m) + (1-\lambda)(p_{ab}-c_b) \times \left[(1-p_{ab}+p_a^m)(1-p_{ab}+p_b^m) - \frac{1}{2}(p_a^m+p_b^m-p_{ab})^2\right]. \quad (4)$$

Using equations (2) and (3), the profit for company b from the mixed bundling method, $\widetilde{\pi}_b(p_a^m, p_b^m, \lambda; c_b)$, is given by

$$\widetilde{\pi}_b(p_a^m, p_b^m, \lambda; c_b) = (p_b^m-c_b)(1-p_b^m)(p_{ab}-p_b^m) + \lambda(p_{ab}-c_b) \times \left[(1-p_{ab}+p_a^m)(1-p_{ab}+p_b^m) - \frac{1}{2}(p_a^m+p_b^m-p_{ab})^2\right]. \quad (5)$$

Under the sponsored location program between company a and company b, the relationship $p_{ab} = p_b^m$ holds. Therefore, equation (4) can be rewritten as

$$\widetilde{\pi}_a(p_a^m, p_b^m, \lambda; c_b) = p_a^m(1-p_a^m)(p_b^m-p_a^m) + (1-\lambda)(p_b^m-c_b)\left(1-p_b^m+p_a^m-\frac{1}{2}(p_a^m)^2\right). \quad (6)$$

Furthermore, equation (5) can be rewritten as

$$\widetilde{\pi}_b(p_a^m, p_b^m, \lambda; c_b) = \lambda(p_b^m-c_b)\left(1-p_b^m+p_a^m-\frac{1}{2}(p_a^m)^2\right). \quad (7)$$

The question is whether mixed bundling based on the sponsored location program will generate more profit for the participating firms than selling the goods separately. We express the prices of product a and product b in the separate selling case as p_a^s and p_b^s, respectively. Company a's profit from separate selling, $\widehat{\pi}_a(p_a^s)$, is given by

$$\widehat{\pi}_a(p_a^s) = p_a \times 1 \times (1-p_a^s). \quad (8)$$

Company b's profit from separate selling, $\widehat{\pi}_b(p_b^s; c_b)$, can be written as

$$\widehat{\pi}_b(p_b^s; c_b) = (p_b^s-c_b) \times 1 \times (1-p_b^s). \quad (9)$$

Note that the mixed bundling pricing based on the sponsored location program is the same as that under separate selling. That is, $p_a^s = p_a^m \equiv \bar{p}_a$ and $p_b^s = p_b^m \equiv \bar{p}_b$ hold. For company a, let $\Delta\pi_a(\bar{p}_a, \bar{p}_b, \lambda; c_b)$ be the difference between the profit in the separate selling case and that in the mixed bundling case. This implies that $\Delta\pi_a(\bar{p}_a, \bar{p}_b, \lambda; c_b) = \widetilde{\pi}_a(\bar{p}_a, \bar{p}_b, \lambda; c_b) - \widehat{\pi}_a(\bar{p}_a)$. Therefore, equations (6) and (8) yield

$$\Delta\pi_a(\bar{p}_a, \bar{p}_b, \lambda; c_b) = \bar{p}_a(1-\bar{p}_a)(\bar{p}_b - \bar{p}_a) + (1-\lambda)(\bar{p}_b - c_b)\Big(1 - \bar{p}_b + \bar{p}_a - \frac{1}{2}\bar{p}_a^2\Big) - \bar{p}_a(1-\bar{p}_a). \quad (10)$$

For company b, let $\Delta\pi_b(\bar{p}_a, \bar{p}_b, \lambda; c_b)$ be the difference between the profit in the case of separate selling and that in the mixed bundling case. Because $\Delta\pi_b(\bar{p}_a, \bar{p}_b, \lambda; c_b) = \widetilde{\pi}_b(\bar{p}_a, \bar{p}_b, \lambda; c_b) - \widehat{\pi}_b(\bar{p}_b; c_b)$, equations (7) and (9) lead to

$$\Delta\pi_b(\bar{p}_a, \bar{p}_b, \lambda; c_b) = \lambda(\bar{p}_b - c_b)\Big(1 - \bar{p}_b + \bar{p}_a - \frac{1}{2}\bar{p}_a^2\Big) - (\bar{p}_b - c_b)(1-\bar{p}_b). \quad (11)$$

Consider the case in which the firms select p_a maximising $\widehat{\pi}_a(p_a)$ and p_b maximising $\widehat{\pi}_b(p_b; c_b)$, respectively. When the profit from separate selling by company a, $\widehat{\pi}_a(p_a^s)$, is maximised, a price of 1/2 is selected. When the profit from separate selling by company b, $\widehat{\pi}_b(p_b^s; c_b)$, is maximised, a price of $(1+c_b)/2$ is selected. In this case, equation (10) implies that

$$\Delta\pi_a(1/2, (1+c_b)/2, \lambda; c_b) = -\frac{1}{4}(1-c_b)\Big(\frac{7}{4} - c_b\Big)\lambda + \frac{1}{4}(1-c_b)\Big(\frac{7}{4} - c_b\Big) + \frac{1}{8}c_b - \frac{1}{4}, \quad (12)$$

and equation (11) implies that

$$\Delta\pi_b(1/2, (1+c_b)/2, \lambda; c_b) = \frac{1}{4}(1-c_b)\Big(\frac{7}{4} - c_b\Big)\lambda - \frac{1}{4}(1-c_b)^2. \quad (13)$$

Let λ^* be λ when $\Delta\pi_a(1/2, (1+c_b)/2, \lambda; c_b) = \Delta\pi_b(1/2, (1+c_b)/2, \lambda; c_b)$. From equations (12) and (13), λ^* is given by

$$\lambda^* = \frac{c_b^2 - \frac{17}{8}c_b + \frac{7}{8}}{(1-c_b)\Big(\frac{7}{4} - c_b\Big)}.$$

Based on equations (12) and (13), Figure 1 shows the relationship between the percentage allocation of bundling profit and incremental overall profit (i.e., the increase in the sum of the profit obtained by separate selling and that obtained by bundling).

From Figure 1, it can be seen that when $\lambda = \lambda^*$, the profit from separate selling is greater than that from mixed bundling for the two firms, because $\Delta\pi_a = \Delta\pi_b < 0$. In other words, given $\lambda = \lambda^*$, the overall profit of both company a and company b decreases by changing the retailing mode from separate selling to mixed bundling. Therefore, there is no merit in an alliance between company a and company b based on the sponsored location program.

If $\Delta\pi_a(1/2, (1+c_b)/2, \lambda; c_b) > 0$, then

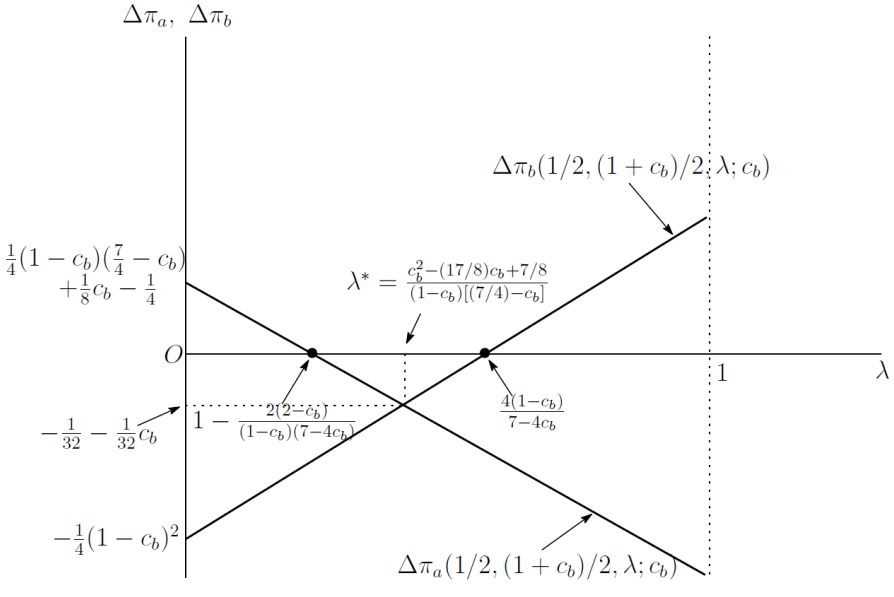
$$\lambda < 1 - \frac{2(2-c_b)}{(1-c_b)(7-4c_b)}. \quad (14)$$

If $\Delta\pi_b(1/2, (1+c_b)/2, \lambda; c_b) > 0$, then

$$\lambda > \frac{4(1-c_b)}{7-4c_b}. \quad (15)$$

As can be seen from Figure 1, equations (14) and (15) imply that both company a and company b cannot increase their profit by changing the retailing mode from separate selling to mixed bundling, given a certain percentage allocation of the profit from the bundling of an online game company's goods and its alliance partner's goods. In other words, our model implies that, under a conventional sponsored location program in which each firm sets the price of its good at the same level as the price that maximises profit in the separate selling case, either the online game company or its alliance partner can increase its profit, but not both.

Figure 1 The relationship between the percentage allocation of bundling profit and incremental overall profit



Next, we consider the case in which firms set a price for an item that differs from the price that maximises profit in the separate selling case. Thus, we now define $\Delta\Pi_a(p_a^m, p_b^m, \lambda; c_b)$ as

$$\Delta\Pi_a(p_a^m, p_b^m, \lambda; c_b) = \widetilde{\pi}_a(p_a^m, p_b^m, \lambda; c_b) - \widehat{\pi}_a\left(\frac{1}{2}\right)$$

and $\Delta\Pi_b(p_a^m, p_b^m, \lambda; c_b)$ as

$$\Delta\Pi_b(p_a^m, p_b^m, \lambda; c_b) = \widetilde{\pi}_a(p_a^m, p_b^m, \lambda; c_b) - \widehat{\pi}_b\left(\frac{(1+c_b)}{2}; c_b\right).$$

Therefore, we obtain

$$\begin{aligned}\Delta\Pi_a(p_a^m, p_b^m, \lambda; c_b) &= p_a^m(1-p_a^m)(p_b^m - p_a^m) + (1-\lambda)(p_b^m - c_b) \\ &\quad \times \left(1 - p_b^m + p_a^m - \frac{1}{2}(p_a^m)^2\right) - \frac{1}{4} \qquad (16)\end{aligned}$$

and

$$\Delta\Pi_b(p_a^m, p_b^m, \lambda; c_b) = \lambda(p_b^m - c_b)\left(1 - p_b^m + p_a^m - \frac{1}{2}(p_a^m)^2\right) - \frac{(1-c_b)^2}{4}. \quad (17)$$

Let λ^{**} be λ when $\Delta\Pi_a(p_a^m, p_b^m, \lambda; c_b) = \Delta\Pi_b(p_a^m, p_b^m, \lambda; c_b)$. From equations (16) and (17), λ^{**} is given by

$$\lambda^{**} = \frac{1}{2} + \frac{p_a^m(1-p_a^m)(p_b^m - p_a^m) + \frac{(1-c_b)^2}{4} - \frac{1}{4}}{2(p_b^m - c_b)\left(1 - p_b^m + p_a^m - \frac{1}{2}(p_a^m)^2\right)}. \quad (18)$$

When $\lambda = \lambda^{**}$, equation (17) can be rewritten as

$$\begin{aligned}\Delta\Pi_b(p_a^m, p_b^m, \lambda^{**}; c_b) = {} & \frac{1}{2}(p_b^m - c_b)\left(1 - p_b^m + p_a^m - \frac{1}{2}(p_a^m)^2\right) \\ & + \frac{1}{2}p_a^m(1-p_a^m)(p_b^m - p_a^m) - \frac{(1-c_b)^2}{8} - \frac{1}{8}. \end{aligned} \quad (19)$$

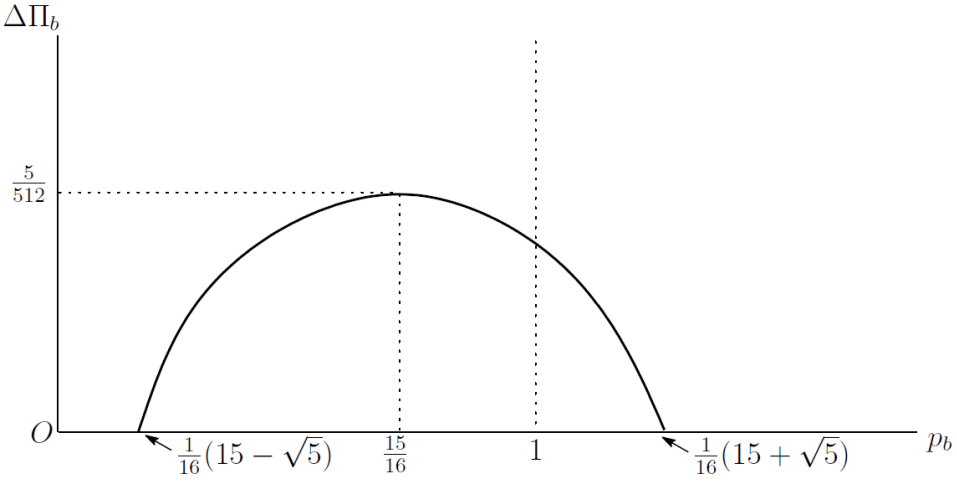
In our model, there are no real roots of p_a and p_b maximising $\Delta\Pi_a(p_a^m, p_b^m, \lambda^{**}; c_b) = \Delta\Pi_b(p_a^m, p_b^m, \lambda^{**}; c_b)$. Therefore, we use an example in which $p_a > 0$, $p_b > 0$, and $c_b > 0$ meet the requirement of $\Delta\Pi_a(p_a^m, p_b^m, \lambda^{**}; c_b) = \Delta\Pi_b(p_a^m, p_b^m, \lambda^{**}; c_b) > 0$. Here, we set c_b = 1/4 for simplicity. If p_a^m = 1/2, then equation (19) implies that

$$\Delta\Pi_b(1/2, p_b^m, \lambda^{**}; 1/4) = -\frac{1}{2}\left(p_b^m - \frac{15}{16}\right)^2 + \frac{5}{512}. \quad (20)$$

From equation (20), if p_b^m = 15/16 is selected, company b can obtain 5/512 as a maximum value of the incremental overall profit. Because we consider the case of $\Delta\Pi_a(p_a^m, p_b^m, \lambda^{**}; c_b) = \Delta\Pi_b(p_a^m, p_b^m, \lambda^{**}; c_b) > 0$, this implies that when p_a^m = 15/16, the maximum value of company a's incremental overall profit is also 5/512.

Figure 2 shows the relationship between p_b^m and $\Delta\Pi_b$ in equation (20).

Figure 2 The relationship between p_b and $\Delta\Pi_b$



It can be seen from Figure 2 that when $\lambda = \lambda^{**}$, c_b = 1/4, p_a^m = 1/2, and

$$\frac{1}{16}(15-\sqrt{5}) < p_b^m < 1,$$

the relationship $\Delta\Pi_a(1/2, p_b^m, \lambda^{**}; 1/4) = \Delta\Pi_b(1/2, p_b^m, \lambda^{**}; 1/4) > 0$ holds. Note that if c_b = 1/4, then

$$\frac{(1+c_b)}{2} = \frac{5}{8} \notin \left(\frac{1}{16}(15-\sqrt{5}), 1\right).$$

Therefore, in this example, $p_b^m \neq (1+c_b)/2$ holds.

Recall that when company a (an online game company) and company b (its alliance partner) implement a conventional sponsored location program, the price of each good in the mixed bundle is the same as the price that maximises profit in the separate selling case. This illustrative example shows that by using a price other than the price that maximises profit in the separate selling case under a sponsored location program, both firms can increase their overall profit compared with the case of separate selling by each firm. When the two firms are free to set the prices of their goods, the percentage allocation of bundling profit to each firm is determined by equation (18), depending on the price of the online game company's goods, the price of the alliance partner's goods, and the cost of the alliance partner's goods.

4 Concluding remarks

In this study, we theoretically examined a specific form of joint marketing called a sponsored location program using a simple model based on the theory of mixed bundling. We presented a model of two firms, an online game company and its alliance partner, which are connected through a sponsored location program, who implemented bundled selling of the two firms' goods. Specifically, we analysed whether mixed bundling based on the sponsored location program generates more profit for the two firms than selling the products separately. In addition, we analysed whether if the firms adopt different pricing under the sponsored location program from that used under separate selling, both firms can increase their profit compared with the case of separate selling, given the percentage allocation of the bundling profit.

The main results are summarised as follows. Under the conventional sponsored location program, only either an online game company or its alliance partner, but not both, can increase their profit by changing the retailing mode from separate selling to mixed bundling, given that they receive a percentage allocation of the bundling profit. That is, given the percentage allocation of the bundling profit, both firms cannot increase their profit by changing from separate selling to mixed bundling. This is because under a conventional sponsored location program, the price of an item included in the mixed bundling method is the same as the price that maximises profit in the separate selling case. Conversely, when two firms are free to set the prices of their goods such that the price of an item in the mixed bundling methods differs from the price that maximises profit in the separate selling case, both firms can increase their profit by switching from separate selling to mixed bundling. This suggests that there is room for improvement in the conventional sponsored location program by permitting flexibility in relation to price setting in the mixed bundling case. Therefore, we conclude that adopting a conventional sponsored location program as a form of joint marketing does not always lead to a win-win outcome for both firms, although it may be advantageous for one firm.

There have been few previous studies on the sponsored location program as a form of joint marketing. The theoretical basis of joint marketing from the microeconomic perspective appears to be increasingly important. By presenting a simple model of a joint marketing program between an online game company and its alliance partner, our study helps to fill a critical gap in our understanding of joint marketing. This is the theoretical contribution of our study.

In addition, we showed how the percentage allocations of the profit obtained from bundling depend on the prices of both firms' goods and the cost of the alliance partner's goods. This might provide a reference point for determining the percentage allocations of profits in negotiations between firms.

Furthermore, the findings of this study provide guidance for managers seeking to improve the performance of a conventional sponsored location program such that both an online game company and its alliance partner can increase their profit by changing from separate selling to mixed bundling. Therefore, this study not only makes an academic contribution, but also provides suggestions that will be beneficial in practice.

Acknowledgments

We are grateful to our editor and reviewers for their careful reading of our manuscript. This work was supported in part by a Grant-in-Aid for Scientific Research (C) (20K01909) from the Japan Society for the Promotion of Science.

References

Adams, W.J. and Yellen, J.I. (1976) 'Commodity bundling and the burden of monopoly', *Quarterly Journal of Economics*, Vol. 90, No. 3, pp.475–498.

Anderson, S.P., Foros, Ø. and Kind, H.J. (2012) *Product Quality, Competition, and Multi-Purchasing*, CEPR Discussion Papers, No. 8923.

Armstrong, M. (2013) 'A more general theory of commodity bundling', *Journal of Economic Theory*, Vol. 148, No. 2, pp.448–472.

Armstrong, M. and Vickers, J. (2010) 'Competitive non-linear pricing and bundling', *Review of Economic Studies*, Vol. 77, No. 1, pp.30–60.

Bakos, Y. and Brynjolfsson, E. (1999) 'Bundling information goods: pricing, profits, and efficiency', *Management Science*, Vol. 45, No. 12, pp.1613–1630.

Bakos, Y. and Brynjolfsson, E. (2000) 'Bundling and competition on the internet', *Marketing Science*, Vol. 19, No. 1, pp.63–82.

Clements, M.T. and Ohashi, H. (2005) 'Indirect network effects and the product cycle: video games in the US 1994–2002', *The Journal of Industrial Economics*, Vol. 53, No. 4, pp.515–542.

Gabszewicz, J.J. and Wauthy, X.Y. (2003) 'The option of joint purchase in vertically differentiated markets', *Economic Theory*, Vol. 22, No. 4, pp.817–829.

Gans, J.S. and King, S.P. (2006) 'Paying for loyality product bundling in oligopoly', *The Journal of Industrial Economics*, Vol. 54, No. 1, pp.43–62.

Jeitschko, T.D., Jung, Y. and Kim, J. (2017) 'Bundling and joint marketing by rival firms', *Journal of Economics and Management Strategy*, Vol. 26, No. 3, pp.571–589.

Kim, H. and Serfes, K. (2006) 'A location model with preference for variety', *The Journal of Industrial Economics*, Vol. 54, No. 4, pp.569–595.

Lee, R.S. (2013) 'Vertical integration and exclusivity in platform and two-sided markets', *American Economic Review*, Vol. 103, No. 7, pp.2960–3000.

Liu, H. (2010) 'Dynamics of pricing in the video game console market: skimming or penetration?', *Journal of Marketing Research*, Vol. 47, No. 3, pp.428–443.

MacInnes, I. (2006) 'Property rights, legal issues, and business models in virtual world communities', *Electronic Commerce Research*, Vol. 6, No. 1, pp.39–56.

Marchand, A. and Henning-Thurau, T. (2013) 'Value creation in the video game industry: industry economics, consumer benefits, and research opportunities', *Journal of Interactive Marketing*, Vol. 27, No. 3, pp.141–157.

McAfee, R., McMillan, J. and Whinston, M.D. (1984) 'Multiproduct monopoly, commodity bundling, and correlation of values', *Quarterly Journal of Economics*, Vol. 104, No. 2, pp.371–383.

Meredith, A., Hussain, Z. and Griffiths, M.D. (2009) 'Online gaming: a scoping study of massively multi-player online role playing games', *Electronic Commerce Research*, Vol. 9, Nos. 1–2, pp.3–26.

Schmalensee, R. (1984) 'Gaussian demand and commodity bundling', *Journal of Business*, Vol. 57, No. 1, pp.S211–S230.

Shankar, V. and Bayus, B.L. (2003) 'Network effects and competition: an empirical analysis of the home video game industry', *Strategic Management Journal*, Vol. 24, No. 4, pp.375–384.

Stigler, G.J. (1963) ''United States v. Loew's Inc.: a note on block-booking', *Supreme Court Review*, Vol. 1963, No. 1, pp.152–157.

Tanassoulis, J. (2007) 'Competitive mixed bundling and consumer surplus', *Journal of Economics and Management Strategy*, Vol. 16, No. 2, pp.437–467.

Tanassoulis, J. (2011) 'Is multimedia convergence to be welcomed?', *The Journal of Industrial Economics*, Vol. 59, No. 2, pp.225–253.