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Tatsuhiko Nariu[1], Kaoru Ueda[2], and DongJoon Lee[3]

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[1] Graduate School of Business and Administration, Kyoto University
[2] Graduate School of Economics, Nanzan University
[3] Graduate School of Economics, Kyoto University

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Abstract

This paper analyzes royalty modes in the franchise arrangements of convenience stores under double-sided moral hazard. In Japan, the majority of franchisors charge margin-based royalties based on net margins rather than sales-based royalties based on sales. We show that the franchisor can attain the first-best outcome by adopting margin-based royalties under double-sided moral hazard. We consider a case where a franchisee sells two kinds of goods; one is shipped from its franchisor and the other is purchased from another (independent) manufacturer. In this case, the franchisor is completely unable to control the wholesale price of the goods bought from the manufacturer. Therefore, the franchisor cannot achieve the first-best outcome via sales-based royalties under double-sided moral hazard.

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[1] Graduate School of Business and Administration, Kyoto University. E-mail: Nariu@econ.kyoto-u.ac.jp.
[2] Graduate School of Economics, Nanzan University. E-mail: k_ueda@nanzan.co.jp.
[3] Graduate School of Economics, Kyoto University. E-mail: kyotoun@naver.com.

1. Introduction

In resent times, the franchise arrangement has emerged as a popular arrangement within the retail industry, particularly such as convenience stores (hereafter CVS), retailing, and restaurants. A franchise arrangement generally includes the payment of a franchise fee as well as a royalty. In particular, the royalty structure is an important element in a franchise arrangement. In Japan, the majority of the convenience stores franchisors charge royalties based on the gross margin (hereafter MBR) achieved by their franchisees. There is, however, a small section of franchisors that operates on the system of charging royalties based on the sales (hereafter SBR) achieved by their franchisees.

According to the JFA (Japan Franchise Association), franchised businesses account for about 1,200 franchise brands and roughly 240,000 outlets in Japan. Their total sales in 2006 amounted to approximately 20 trillion yen, which corresponded to one third of the total retail sales figure[4]. Franchise fees are a form of compensation paid by the franchisee to the franchisor for the use of a brand's name, logo, good will, marketing and other systems. In some cases, a franchisor supplies its franchisees with its own goods and materials. Another kind of franchise arrangement, observed commonly in ventures such as car dealers and gas stations, is based on goods and the brand name. As is evident from the CVS and the food & beverage industry, the number of the other kinds of franchise arrangements that are based on business formats is increasing every year.

Under the business format franchises, the roles that the franchisor and franchisee must fulfill are expressed in the franchise arrangements. A franchise arrangement also emphasizes that both parties will initiate their efforts under the terms of the arrangement. The franchisor's role lies in brand advertisement and product innovation, while the franchisee's role is to provide a sales service and generate a local advertisement. However, whether they have met their obligations is not necessarily verifiable. In addition, the franchisor also recommends to the franchisee the essential particulars of the business activity: what to sell, where to purchase, and how to set the retail price and so on. However, the franchisee, under the franchise arrangements, also has a right to decide in

[4] See Yahagi (1994) and Kim (2001) for the franchise system and the fact-finding in Japan. See Lafontaine (1992) and Lafontaine and Slade (1997, 2007) for the franchise system in America. In America, the total sales of the franchise brands account for about 40 percent of the total retail sales.

these matters. In other words, a franchisee has partial autonomy.

This paper focuses on two types of royalty – MBR and SBR – under double-sided moral hazard that is widely prevalent in franchise arrangements. The notion of double-sided moral hazard is introduced to explain the various types of institutional arrangements. The problem of double-sided moral hazard was first analyzed in the nature of the franchise arrangement by using the theoretical tools of the firm (Rubin, 1978). Rubin also argued that the franchise relationship is an intermediate one between a firm and a market transaction. These arguments have since been formalized in franchise arrangements (Lal, 1990). The results of the empirical analysis of franchise arrangements have been found to be consistent with double-sided moral hazard, suggesting that there are, in fact, really incentive issues on both sides (Lafontaine's, 1992, p 281). In a wholesaler-retailer relationship, if there exists double-sided moral hazard and their efforts are substitutionary, the first-best outcome (jointly Pareto efficient with all rent accruing upstream) is unattainable (Romano, 1994). Moreover, vertical restraint (RPM) can control double-sided moral hazard (Romano, 1994). When the efforts of both parties are perfectly complementary, even if there exists a double-sided moral hazard in the franchise arrangements, the first-best outcome is attainable by adopting MBR or SBR (Maruyama, 2003)[5].

In comparison with previous research, this paper analyzes why MBR is more efficient than SBR under double-sided moral hazard. We shall show that the franchisor can obtain the first-best outcome under double-sided moral hazard by adopting MBR. In addition, we shall examine a discrete model of the effects caused by whether both parties will abide by a business-format arrangement or not. In this paper, we consider the case of a franchisee that deals with two goods; one is purchased from its franchisor and the other is purchased from another independent manufacturer. Under such a condition, the franchisor has no control whatsoever on the wholesale prices of its franchisee. We shall show that a franchisor can achieve the first-best outcome under double-sided moral hazard by employing MBR.

The rest of this paper is organized as follows. In Section 2, we describe the model and characterize the first-best outcome as a benchmark. In Section 3, we show that a franchisor can achieve the first-best outcome under double-sided

[5] Our model is similar to Maruyama (2003) and Lal et al. (2000). The main difference between out setup and theirs is that our franchisee deals with two kinds of goods. However, in their models, the franchisee deals with only one goods. They obtain the different results whether the franchisor can set the wholesale price to be lower than its marginal cost or not.

moral hazard by employing MBR instead of SBR. Finally, the concluding remarks are outlined in Section 4.

2. Model

For simplicity, consider a franchiser and a franchisee. They are both assumed to be risk neutral. The franchisee deals with two kinds of goods: goods *1* and goods *2*. Goods *1* are provided by the franchisor, while goods *2* are purchased from another independent producer[6]. We assume that the franchisee is able to transact goods *2* under the franchise contract with the franchisor.

For simplicity, the demand function of the goods i for the franchisee is

$$q_i = a_i - t_i p_i - e_{Ui} + e_{Di} + s_i, \qquad i = 1,2 \tag{1}$$

where q_i is the sales volume of goods i, p_i is the retail price of goods i, e_{Ui} and e_{Di} are the effect on the demand respectively of the franchisor's and the franchisee's efforts, s_i is a random variable that denotes the state of the demand is of mean zero($Es_i=0$), and a_i and t_i are positive constants.

The franchisor decides whether to make an effort ($u=1$) or not ($u=0$). If the franchisor decides to make an effort, the demand function shifts upwards ($e_{Ui}=u_i$). This costs $k_U(1)=b_U$. However, if the franchisor does not make an effort, no cost is incurred and no influence is exerted on the demand function ($e_{Ui}=0$). The franchisee also determines whether to make an effort ($d=1$) or not ($d=0$). The effect of the franchisee's efforts on the demand follows the same mechanism as the franchisor's efforts. If the franchisee makes an effort, the demand function shifts upwards ($e_{Di}=d_i$). This costs $k_D(1)=b_D$. However, if the franchisee does not make an effort, no cost is incurred and no influence is effected on the demand ($e_{Di}=0$).

To begin with, to obtain a benchmark, we examine the joint profits between the franchisor and the franchisee. The joint profits are as follows.

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[6] We assume that the franchisee is able to purchase goods 2 from the independent manufacturer under the franchise contract. Consider a franchisee that initially managed a liquor store or a vegetable store and now operates a convenience store, selling the usual items such as liquors or vegetables and fruits purchased from another independent producer. Newspapers could be another example.

$$z(\{p_i\}_{i=1,2}, u, d, \{s_i\}_{i=1,2}) = \sum_{i=1}^{2}(p_i - c_i)q_i - k_U(u) - k_D(d)$$
$$= \sum_{i=1}^{2}(p_i - c_i)(a_i - t_i p_i + e_{Ui} + e_{Di} + s_i) - k_U(u) - k_D(d) \qquad (2)$$

where c_1 is the purchasing price of goods *1*, which the franchisor purchases from a producer and c_2 is the purchasing price of goods *2* which the franchisee purchases from another independent producer. The expected profit for Eq. (2) is as follows:

$$Ez(p_i, u, d, s_i) = \sum_{i=1}^{2}(p_i - c_i)(a_i - t_i p_i + e_{Ui} + e_{Di}) - k_U(u) - k_D(d) \qquad (3)$$

First-Best Outcome

For simplicity, we assume that both the franchisor and the franchisee decide to initiate their efforts (u and d), and the franchisee sets a retail prices p_i for goods i before the state of demand s_i is realized. We define the first-best outcome by (u^*, d^*, p_i^*), which maximizes the expected joint profits. Therefore, the franchisee chooses the retail prices in order to maximize the excepted joint profits as follows:

$$Max \quad Ez, \quad w.r.t. \; p_i, \qquad i=1,2 \qquad (4)$$

From the FOC, we obtain the expected optimal retail prices as follows:

$$p_i^*(u,d) = \frac{(a_i + e_{Ui} + e_{Di} + t_i c_i)}{2t_i}, \qquad i=1,2 \qquad (5)^7$$

By substituting Eq. (5) into Eq. (3), the expected joint profits are

$$Ez^*(u,d) = \sum_{i=1}^{2}\frac{(a_i + e_{Ui} + e_{Di} - t_i c_i)^2}{4t_i} - k_U(u) - k_D(d) \qquad (6)$$

The expected joint profits depend on whether the franchisor and the franchisee choose to initiate efforts. There are four possible cases, in accordance with the

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[7] When both parties do not make efforts, consider a maximization problem of the expected joint profit. In such a case, the expected margin and sales volume are $p_i - c_i = (a_i - t_i c_i)/2t_i$ and $Eq_i = (a_i - t_i c_i)/2$, respectively. Therefore, we assume that $a_i - t_i c_i > 0$.

efforts made.

$$Ez^*(1,1) = \sum_{i=1}^{2} \frac{(a_i + u_i + d_i - t_i c_i)^2}{4t_i} - b_U - b_D$$
$$Ez^*(1,0) = \sum_{i=1}^{2} \frac{(a_i + u_i - t_i c_i)^2}{4t_i} - b_U$$
$$Ez^*(0,1) = \sum_{i=1}^{2} \frac{(a_i + d_i - t_i c_i)^2}{4t_i} - b_D$$
$$Ez^*(0,0) = \sum_{i=1}^{2} \frac{(a_i - t_i c_i)^2}{4t_i}$$

The first and the second terms in parenthesis in the LHS in the above equations denote the values of the franchisor's effort and the franchisee's efforts, respectively. Analogous properties hold for the optimal retail price $p^*(u, d)$ and the expected sales volume $Eq^*(u,d)$.

A double-sided moral hazard occurs in the condition where both parties need to make efforts in order to maximize the expected joint profits. It is not difficult to imagine that the double-sided moral hazard in such a circumstance is consistent with the reality. The necessary and sufficient condition for the first-best outcome, which both parties make efforts and the optimal retail price is $p_i^*(1,1)=(a_i+u_i+d_i+t_ic_i)/2t_i$, is

$$Ez^*(1,1) > max\{ Ez^*(1,0), Ez^*(0,1), Ez^*(0,0)\}$$

For the sake of simplicity, we denote the following.

$$h_U \equiv \sum_{i=1}^{2} \frac{u_i}{2t_i}\left[(a_i - t_i c_i) + \frac{(u_i + d_i)}{2}\right],$$
$$h_D \equiv \sum_{i=1}^{2} \frac{d_i}{2t_i}\left[(a_i - t_i c_i) + \frac{(u_i + d_i)}{2}\right], \text{ and}$$
$$g \equiv \sum_{i=1}^{2} \frac{u_i d_i}{4t_i}$$

Furthermore, we assume that h_U and h_D are sufficiently larger than b_U and b_D, respectively. Specifically, this assumption takes the following form.

Assumption 1. *$h_U > b_U$ and $h_D > b_D$.*

We specify the first-best outcome for given Assumption 1 as follows.

Proposition 1. *Given Assumption 1, the first-best outcome specifies that*
(1) Both the franchisor and the franchisee make efforts.
(2) The franchisee sets the equilibrium retail prices $p_i{}^*(1,1)$.

Proof)
Under the Assumption 1, we obtain the following results.

$$Ez^*(1,1) - Ez^*(1,0) = \sum_{i=1}^{2} \frac{d_i}{2t_i}\left[(a_i + u_i - t_i c_i) + \frac{d_i}{2}\right] - b_D = h_D + g - b_D > g > 0 \qquad (6\text{-}1)$$

$$Ez^*(1,1) - Ez^*(0,1) = \sum_{i=1}^{2} \frac{u_i}{2t_i}\left[(a_i + d_i - t_i c_i) + \frac{d_i}{2}\right] - b_U = h_U + g - b_U > g > 0 \qquad (6\text{-}2)$$

$$\begin{aligned} Ez^*(1,1) - Ez^*(0,0) &= \sum_{i=1}^{2} \frac{(u_i + d_i)}{2t_i}\left[(a_i - t_i c_i) + \frac{(u_i + d_i)}{2}\right] - (b_U + b_D) \\ &= (h_U + h_D) - (b_U + b_D) > 0 \end{aligned} \qquad (6\text{-}3)$$

Q.E.D.

Consider a case where the two conditions in **Assumption 1** are not satisfied at the same time. In such a case, the first-best outcome requires both efforts. **Proposition 1** does not satisfy this strictly necessary condition. Therefore, the first-best outcome is restricted under **Assumption 1**.

Note Eq. (6-3). Therefore, h_U and h_D can be interpreted as profit increments due to the franchisor's and franchisee's efforts, respectively. As a matter of fact, **Assumption 1** implies that the profit increment created by each effort is larger than the cost increment produced by each effort. Let us compare Eq. (6-1) with Eq. (6-3). When the franchisor makes an effort, the payoff increment due to franchisee's effort correspond to *g*. Similarly, let us compare Eq. (6-2) with Eq. (6-3). When the franchisee makes an effort, the payoff increment due to franchisor's effort coincide exactly with *g*. Therefore, the value of *g* can be interpreted as the synergy effect between their efforts. Further, **Proposition 1** implies that the first-best outcome requires that the franchisee set the equilibrium retail price $p_i{}^*(1,1)$, and both parties make efforts under the condition that the profit increment created by each effort is greater than the respective cost increment.

3. Margin-based Royalty vs. Sales-based Royalty

In the previous section, we showed the first-best outcome requiring both efforts and a retail price $p_i*(1,1)$ under **Assumption 1**. When goods are on sale under a franchise arrangement, it is efficient for the franchisor to achieve the first-best outcome. However, since the realization of each effort is unverifiable, it is difficult for the franchisor to enforce their effort levels through a contract clause. It is not inevitable that both parties will initiate their optimal efforts. In this section, we show that the franchisor can attain the first-best outcome by adopting MBR under a double-sided moral hazard.

The timing of the game is organized as follows. At stage one, the franchiser offers its franchisee a franchise contract[8] that prescribes the wholesale price for goods *1* (w_1), a franchise fee (F), a type and rate of royalty(r). The franchisee decides whether to accept the contract or not. If the franchisee does not accept it, the game is terminated. In this case, both payoffs are zero. If the franchisee accepts it, it pays the franchise fee to its franchisor. At stage two, both parties decide whether they will make efforts or not. It is worth noting that both efforts are unverifiable to the third party. Before the state of nature is realized, the franchisee sets the retail price in order to maximize its expected profit[9]. At stage three, after the state of nature is realized, the volume of sales of each type of goods is determined under each given retail price. Finally, the purchase payments and the royalty are transferred according to the original contract. We focus on the sub-game perfect equilibrium of the game.

3.1 Margin-based Royalty

To begin with, we show that the first-best outcome is attainable via MBR. When the state of demand s_i is realized, the expected profit of the franchisee for given MBR is.

$$Ey = (1-r)\left\{\sum_{i=1}^{2}(p_i - v_i)(a - t_i p_i + e_{Ui} + e_{Di})\right\} - k_D(d) - F$$

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[8] It is a take-it-or-leave-it offer without any negotiation on the terms.

[9] If the franchisee has private information to the state of nature, s_i, the joint profits will increase when the franchisor delegates the right to decide the retail price to the franchisee.

where v_i is the purchasing prices of goods *i*. Note that the first-best price of goods *1* purchased from the franchisor is equal to the wholesale price(v_1=w_1) and the first-best price of goods *2* purchased from the independent producer is equal to the shipping price(v_2=c_2). From the FOC, the retail price is

$$p_i^M = \frac{(a + e_{Ui} + e_{Di} + t_i v_i)}{2t_i} \tag{7}$$

where the superscript *M* denotes the case that the franchisor has adopted MBR. By substituting Eq. (7) into the franchisee's expected profit function, we obtain

$$Ey^M(u,d) = (1-r)\left\{\sum_{i=1}^{2}\frac{(a + e_{Ui} + e_{Di} - t_i v_i)^2}{4t_i}\right\} - k_D(d) - F \tag{8}$$

Next, we turn to stage two. Let us compare Eq. (4) with Eq. (7). Note that the necessary and sufficient condition require that the franchisor set w_1=v_1=c_1 for goods *1* at stage one.

Next, we turn to their efficient effort levels. When the franchisor chooses the first-best effort level, the franchisor sets a royalty rate *r* so that the franchisee's first-best effort is more profitable than the franchisee's no-effort. This is illustrated in the following equation.

$$\mathrm{Ey}^{\mathrm{M}}(1,1) > \mathrm{Ey}^{\mathrm{M}}(1,0)$$

where

$$Ey^M(1,1) = (1-r)\sum_{i=1}^{2}\left[\frac{(a_i + u_i + d_i - t_i c_i)^2}{4t_i}\right] - b_D - F$$
$$Ey^M(1,0) = (1-r)\sum_{i=1}^{2}\left[\frac{(a_i + u_i - t_i c_i)^2}{4t_i}\right] - F$$

In order to induce the franchisee to choose $d=1$ under the conditions that w_1=c_1 and $u=1$, the following necessary condition should be satisfied.

$$Ey^{M}(1,1) > Ey^{M}(1,0) = (1-r)\sum_{i=1}^{2}\frac{d_i}{2t_i}\left[(a_i + u_i - t_i c_i) + \frac{d_i}{2}\right] - b_D = (1-r)(h_D + g) - b_D > 0 \quad (9)$$

Eq. (9) implies that, in order to induce the franchisee's effort, the franchisor should set the royalty rate *r* to be somewhat low.

Franchisor's Behavior

Next, we turn to the franchisor's behavior in stage two. The expected profit of the franchisor is

$$E\pi(u,d) = (w_1 - c_1)(a_1 - t_1 p_1 + e_{U1} + e_{D1}) + r\left\{\sum_{i=1}^{2}(p_i - v_i)(a_i - t_i p_i + e_{Ui} + e_{Di})\right\} - k_D(u) + F$$

The first term in the RHS is the selling price received on providing goods *1* to the franchisee. The second term in the RHS is the royalty paid by the franchisee to the franchisor. Substituting Eq. (7) into the above equation yields

$$E\pi(u,d) = \sum_{i=1}^{2}\left[\frac{(a_i - t_i p_i + e_{Ui} + e_{Di})}{2}\right]\left[\frac{r(a_i - t_i p_i + e_{Ui} + e_{Di}) + 2t_i(v_i - c_i)}{2v_i}\right] - k_D(u) + F$$

As mentioned previously, it is necessary for the franchisor to set $w_1=v_1=c_1$ in order to obtain the first-best outcome under MBR. Let us consider the franchisor's efficient effort level. To achieve the first-best outcome, the franchisor should set the royalty rate in a way that induces it to make an effort under the condition that the franchisee makes an effort. This case is illustrated in the following equation.

$$\mathrm{E}\pi^{\mathrm{M}}(1,1) > \mathrm{E}\pi^{\mathrm{M}}(0,1)$$

where

$$E\pi^{M}(1,1) = r\sum_{i=1}^{2}\frac{(a_i + u_i + d_i - t_i c_i)^2}{4t_i} - b_U + F$$

$$E\pi^{M}(0,1) = r\sum_{i=1}^{2}\frac{(a_i + d_i - t_i c_i)^2}{4t_i} + F$$

For given $w_1=c_1$ and $d=1$, the condition for inducing the franchisee to choose $u=1$ is as follows.

$$E\pi^M(1,1) > E\pi^M(1,0) = r\sum_{i=1}^{2}\frac{u_i}{2t_i}\left[(a_i + d_i - t_i c_i) + \frac{u_i}{2}\right] - b_U = r(h_U + g) - b_U > 0 \quad (10)$$

Eq. (10) implies that, in order to induce the franchisor's effort, the franchisor should set the royalty rate r to be more or less high. From Eq. (9) and Eq. (10), therefore, in order to induce that $d=1$ and $u=1$ for given $w_1=c_1$, the franchisor should set the royalty rate r as follows:

$$\frac{b_U}{(\mathrm{h}_U + \mathrm{g})} < \mathrm{r} < \frac{1 - b_U}{(\mathrm{h}_U + \mathrm{g})} \quad (11)$$

In fact, if the royalty rate is too low, Eq. (10) is not satisfied, that is, the franchisor will not make an effort. Conversely, if it is too high, Eq. (9) is not satisfied, which implies that the franchisee will not make an effort. We assume then that the synergy effect between their efforts, g, would have to be sufficiently large. This assumption takes the following specified form.

ASSUMPTION 2. $g > \max\{b_U, b_D\}$.

Under Assumption 1 and Assumption 2, we characterize the following proposition:

PROPOSITION 2. *Suppose that **Assumption 1** and **Assumption 2** are satisfied. Then, the franchisor can attain the first-best efforts through the MBR franchising contract.*

Proof)

If the franchisor can set the wholesale price equivalent to its purchase price, that is $w_1=c_1$ for goods *1*, and can set the royalty rate r satisfying Eq. (11), the franchisor can attain the first-best efforts at stage two. As a result, double-sided moral hazard is settled. There is no constraint condition for setting $w_1=c_1$. However, the following condition for the royalty rate r satisfying Eq. (11) should be satisfied

$$\frac{b_U}{(h_U+g)}+\frac{b_D}{(h_D+g)}<1$$

From the facts that *$(h_U+g)>2b_U$* and *$(h_D+g)>2b_D$* under ASSUMPTION 1 and ASSUMPTION 2, the above condition is satisfied. In addition, the franchisor can set the royalty rate, *r*, satisfying Eq. (11).

Q.E.D.

Under the condition that the payoff increment due to each party's effort is larger than the cost increment, the inequalities of **Assumption 1** are satisfied. From **Proposition 1**, the first-best outcome requires that both parties make efforts and the franchisee sets the equilibrium retail prices *$p_1*(1,1)$* and *$p_2*(1,1)$*. If the synergy effect between their efforts, *g*, is sufficiently large to satisfy Assumption 2, from **Proposition 2**, the franchisor can implement a royalty rate, r, satisfying Eq. (11) under MBR. Therefore, the franchisor is able to realize, in stage two, their efficient efforts of both franchisor and franchisee. Note that the franchisor is able to charge the franchise fee on its franchisee. Therefore, the franchisor is able to maximize its expected payoff at stage one by offering a franchise contract that leads to the first-best efforts.

Furthermore, we assume that the expected total payoff increment due to each party's effort is greater than the total costs owing to such efforts. This assumption takes the following specified form.

Assumption 3. $Min\{h_U, h_D\} > b_U + b_D$.

Lemma *1. Suppose that Assumption 3 is satisfied. It leads to* $0<\frac{b_U}{(h_U+g)}<1-\frac{b_D}{(h_D+g)}<1$.

Proof)

As b_U, b_D, h_U, h_D, and g are all positive, it is obvious that

$$0<\frac{b_U}{(h_U+g)} \quad \text{and} \quad 1-\frac{b_D}{(h_D+g)}<1.$$

On the other hand, rearranging $\frac{b_U}{(h_U+g)} < 1 - \frac{b_D}{(h_D+g)}$, we can obtain:

$$b_U(h_D+g) + b_D(h_U+g) < (h_U+g)(h_D+g).$$

To begin with, suppose that *max{h_D, h_U}=h_U*. The above equation can be rewritten as follows

$$\begin{aligned}(h_U+g)(h_D+g) - b_U(h_D+g) - b_D(h_U+g) &> (h_U+g)(h_D+g) - b_U(h_U+g) - b_D(h_U+g) \\ &= (h_U+g)\{(h_D+g) - b_U - b_D\} > 0\end{aligned}$$

In a similar way, we can prove that *max{ h_D, h_U }=h_U*. Therefore, LEMMA 1 is satisfied.

Q.E.D.

Proposition 3. *Suppose that **Assumption 3** is satisfied. Then, the first-best outcome is attainable when the franchisor employs MBR.*

Proof)

Suppose that Assumption 3 is satisfied. Note that Assumption 3 is a prerequisite condition for Assumption 1 to be satisfied. Then, from Proposition 1, the first-best outcome is the case where both the franchisor and the franchisee make efforts and the franchisee sets the retail prices $p_i*(1, 1)$. Meanwhile, for given Assumption 3, Lemma 1 implies

$$0 < \frac{b_U}{(h_U+g)} < 1 - \frac{b_D}{(h_D+g)} < 1.$$

Therefore, the franchisor can set the royalty rate, r, satisfying Eq. (11) by employing MBR. Consequently, the franchisor can realize the first-best outcome if it sets the wholesale price $w_1=c_1$ for goods *1*.

Q.E.D.

3.2 Sales-based Royalty

In this subsection, we show that the first-best outcome is not attainable under

SBR. The expected profit of the franchisee is given by

$$Ey = \left\{ \sum_{i=1}^{2} \{(1-r)p_i - v_i\}(a - t_i p_i + e_{Ui} + e_{Di}) \right\} - k_D(d) - F$$

From the FOC, the retail price is

$$p_i^S = \frac{\left(a + e_{Ui} + e_{Di} + \dfrac{t_i v_i}{(1-r)} \right)}{2t_i}$$

where the superscript S denotes the fact that the franchisor has adopted SBR. Is it possible for the first-best efforts to be realized under SBR? If $u=d=1$ is realized, the franchisor should set v_i and c_i in order to have the efficient retail price $p_i*(1, 1)$. This is illustrated below.

$$p_i^S(1,1) = p_i*(1,1) \Leftrightarrow \frac{\left[a + u_i + d_i + \dfrac{t_i v_i}{(1-r)} \right]}{2t_i} = \frac{(a + u_i + d_i + t_i c_i)}{2t_i} \Leftrightarrow \frac{v_i}{(1-r)} = c_i \qquad (12)$$

Evidently, the franchisor can set the wholesale price as $w_1=(1-r)c_1$ for goods 1. As the purchasing price for goods 2 is $v_2=c_2$, the franchisor should set $r=0$ in order to satisfy Eq. (12). In other words, the franchisor must set $r=0$ and $w_1=c_1$ in order to obtain the optimal retail price under SBR.

Meanwhile, the expected payoff of the franchisor is

$$E\pi(u,d) = \sum_{i=1}^{2}(w_i - c_i)(a_i - t_i p_i + e_{Ui} + e_{Di} - v_i) + r\sum_{i=1}^{2} p_i(a_i - t_i p_i + e_{Ui} + e_{Di} - v_i) - k_U(u) + F$$

When $w_1=c_1$, $v_2=c_2$, and $r=0$ are all satisfied, the expected payoff of the franchisor is

$$E\pi = -k_D(d) + F$$

The above equation implies that the expected payoff for the franchisor decreases with the level of its effort. The result contradicts the first-best outcome that requires the franchisor to chooses $u=1$ at stage two. In fact, the franchisor has no incentive to make an effort at stage two under SBR, because the expected payoff for the franchisor decreases with the level of its effort in stage two. Therefore, the first-best outcome is not attainable under SBR.

4. Concluding Remarks

In business format franchise contract, the articles that require fulfillment are written into the contract. The parties are expressly requested to carry out their obligations under the contract. However, it is impossible for a third party to verify whether the franchisor and the franchisee have exerted appropriately in their efforts or not. A double-sided moral hazard is likely to occur under these circumstances. The franchisee may not adequately provide the retail service or the local advertising; similarly, the franchisor may not generate national advertising, nor take steps to improve product quality, or implement product innovation.

This paper examined the role of a royalty under double-sided moral hazard. The main result is that the first-best outcome, under double-sided moral hazard, is unattainable by adopting SBR. If the synergistic effect g of their efforts on demand is sufficiently large or if the profit increment due to each effort is larger than that of each cost, the first-best outcome, under double-sided moral hazard, is attainable by adopting MBR. This result explains why MBR is the preferred royal system in the franchise contracts of most convenience stores, especially, in Japan.

The crucial underlying basis of this result is the question of whether the franchisor is able to control the retail price of goods 2 or not. The research of the comparisons between margin-based tax and sales-based tax is a helpful guide to understanding this paper. Note that MBR is to margin-based tax what SBR is to sales-based tax. Suppose that both the franchisor and the franchisee make their effort appropriately. MBR does not distort the retail price like tax on payoffs. On the other hand, SBR distorts the retail price, setting it higher than what MBR would have. The distortion effected by a tax on sales can be solved by paying the franchisee a subsidy. Alternatively, if a franchisor can completely control the wholesale price, it can realize an identical effectiveness by decreasing the wholesale price. Furthermore, as shown by Maruyama (2003), when the franchisor can control the wholesale price for all goods provided only by it, MBR is equivalent to SBR. However, if the franchisor can not completely control the wholesale price, it can not resolve the distortion caused by SBR. Besides, if the franchisor remunerates for the distortion, it adversely affects the incentive to make efforts.

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