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Optimal contract under brand name collaboration

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Abstract

In an international Cournot duopoly, we determine the optimal contract for a brand name collaboration where the contract consists of fixed-fee and output royalty. We show that the firms always have the incentive for brand name collaboration. However, whether the optimal contract will have positive fixed-fee and positive royalty is not immediate and it depends on the factors such as the transportation cost of exporting and the consumers' initial perception about the products of the firms reflected in the consumers' maximum willingness to pay for the products. Thus, our paper shows that the possibility of brand name collaboration is significantly more than predicted in the existing literature.

Key Words: Brand name collaboration; Fixed-fee; Royalty

JEL Classification: D43, D45

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1 Introduction

Many firms from developed countries are making collaborative agreements with the firms from developing countries in recent years. The collaborative agreements not only involve transfers of superior technologies, there are many instances when the developed-country firms allow the developing country firms to use their brand names, which may create a positive marketing effect as documented in Sullivan (1998). While there is a vast literature considering collaborative agreement involving production technologies,¹ the issue of brand name collaboration, although empirically relevant, did not get much attention in the literature. As an example of brand name collaboration, let's consider the case of Ford-Otosan, formerly known as Otosan Otomobil Sanayii based in Istanbul. In 2008, Ford, the American automobile company, which is one of the biggest commercial vehicle manufacturers and exporters in Turkey conferred its brand name to Otosan. After the collaborative deal between the two companies its products are simply branded as Ford-Otosan and the revenue of the Otosan automobile company grew up reasonably. This may be because Ford made the products more appealing to the customers because of its brand name. Marjit et al. (2007) provide several examples of brand name collaboration. Aaker and Keller (1990) and Tauber (1988) on brand extensions reveal that co-branding arrangements forms positive consumer perceptions about a particular brand. In a report on Swedish firms in India, Paulsson (1986) found that the competitive firm licenses its brand name in order to exploit export opportunities.

To the best of our knowledge, Marjit et al. (2007) is the only paper that shows the profitability of a brand name collaboration under a fixed payment. It is needless to say that the total benefits from collaborative agreements involve benefits from technology transfers as well as from brand name collaborations. However, as correctly pointed out by Marjit et al. (2007), while these effects may be difficult to separate empirically, one must try to understand their theoretical implications. Against this backdrop, the purpose of this paper is to determine the optimal brand name collaboration agreement between a developed-country firm and a developing-country firm when the developed-country firm possesses a superior brand name than its developing-country counterpart.

We consider an international Cournot duopoly model where a developed-country firm and a developing-country firm compete in the developing country with homogeneous products. The developed-country firm possesses a superior brand name and needs to incur a per-unit transportation cost of exporting. The developed-country firm can transfer its brand name to the developing-country firm against an up-front fixed-fee and a per-unit output royalty. In order to focus on the brand name collaboration only, we assume away any technology difference across the firms. We show that the developed-country firm always has the incentive to transfer its brand name to the developing-country firm. However, whether the optimal contract will have positive fixed-fee and positive royalty is not immediate and it depends on the factors such as the transportation cost of exporting and the consumers' initial perception about the products of the developed-country firm and the developing-country firm reflected in the consumers' maximum willingness to pay for the products.

Our analysis differs from Marjit et al. (2007) in some important ways. Unlike them, we consider a more general collaborative agreement involving both a fixed payment and a royalty payment depending on the output. We show how the optimal collaborative agreement depends on the transportation cost of exporting and the consumers' initial difference in the maximum willingness to pay. While Marjit et al. (2007), considering brand name collaboration under a fixed-fee only, show that it occurs between similarly reputed firms, our analysis, considering both fixed-fee and output royalty, shows that it occurs under any feasible difference in the reputation. Thus, we show that the possibility of brand name

¹See Rostoker (1984), Kamien (1992) and Mukherjee (2009) for surveys on technology licensing.

collaboration is significantly higher than predicted by Marjit et al. (2007).

The remainder of the paper is organised as follows. Section 2 describes the model. Section 3 derives the results. Section 4 concludes.

2 The model

Assume that there is a developed country and a developing country. There is a firm in each country. Assume that firm 1 is in the developed country and firm 2 is in the developing country. These firms produce homogeneous products. We assume that the firms compete in the developing country like Cournot duopolists. Assume that the inverse market demand functions faced by firms 1 and 2 are respectively:

$$\begin{aligned} P_1 &= a_1 - q_1 - q_2 \\ P_2 &= a_2 - q_1 - q_2, \end{aligned}$$

where $a_1 > a_2 > 0$. As in Marjit et al. (2007), the difference in the consumers' maximum willingness to pay for the products of firms 1 and 2 is due to different reputation of these firms. We assume that the consumers perceive the product of firm 1 better than firm 2 and it is reflected in a higher maximum willingness to pay for the product of firm 1 than for the product of firm 2. Hence, firm 1 has a more reputed brand name than firm 2.

In order to show the effects of brand name collaboration, we assume away any difference in the cost of production. For simplicity, we assume that the constant marginal costs of production are zero. However, we assume that firm 1 needs to incur a per-unit transportation cost of exporting, $t(\geq 0)$.

The timing of the game is as follows. At stage 1, firm 1 offers a take-it-or-leave-it collaborative agreement to firm 2 consisting of an up-front fixed-fee ($F \geq 0$) and a per-unit output royalty ($r \geq 0$). Firm 2 accepts the offer if it is not worse off by accepting the offer than rejecting the offer. At stage 2, the firms produce like Cournot duopolists and the profits are realised. We solve the game through backward induction.

3 The results

Let us first consider the situation under no collaborative agreement, which provides the reservation payoffs of the firms. Under no collaborative agreement, firms 1 and 2 maximise the following expressions:

$$\underset{q_1}{Max} (a_1 - q_1 - q_2 - t) q_1 \tag{1}$$

$$\underset{q_2}{Max} (a_2 - q_1 - q_2) q_2. \tag{2}$$

Straightforward calculations show that the equilibrium outputs as

$$q_1^{nl} = \frac{1}{3} (2a_1 - a_2 - 2t) \tag{3}$$

$$q_2^{nl} = \frac{1}{3} (2a_2 - a_1 + t). \tag{4}$$

It is immediate that both firms produce positive outputs under no collaboration for any t if $t < \frac{2a_1 - a_2}{2}$ and $2a_2 > a_1$. We assume that it holds.

The respective payoffs are:

$$\pi_1^{nc} = \frac{1}{9} (2a_1 - a_2 - 2t)^2 \quad \text{and} \quad \pi_2^{nc} = \frac{1}{9} (2a_2 - a_1 + t)^2. \quad (5)$$

We now consider the case under collaborative agreement where firm 1 allows firm 2 to use its brand name and charges a non-negative up-front fixed-fee, F , and a per-unit non-negative output royalty, r . Under the collaborative agreement, firms 1 and 2 determine the respective outputs to maximise the following expressions:

$$\underset{q_1}{Max} (a_1 - q_1 - q_2 - t) q_1 + r q_2 + F \quad (6)$$

$$\underset{q_2}{Max} (a_1 - q_1 - q_2 - r) q_2 - F. \quad (7)$$

The equilibrium outputs are $q_1^c = \frac{1}{3} (a_1 - 2t + r)$ and $q_2^c = \frac{1}{3} (a_1 - 2r + t)$. The equilibrium outputs are positive if $2r - a_1 < t < \frac{a_1 + r}{2}$. The respective profits are $\pi_1^c = \frac{1}{9} (a_1 + r - 2t)^2 + \frac{r}{3} (a_1 - 2r + t) + F$ and $\pi_2^c = \frac{1}{9} (a_1 - 2r + t)^2 - F$. Firm 1 maximises the following expression to determine F and r :

$$\underset{F, r}{Max} \pi_1^c = \frac{1}{9} (a_1 + r - 2t)^2 + \frac{r}{3} (a_1 - 2r + t) + F \quad (8)$$

subject to

$$\frac{1}{9} (a_1 + r - 2t)^2 + \frac{r}{3} (a_1 - 2r + t) + F \geq \frac{1}{9} (2a_1 - a_2 - 2t)^2 \quad (9)$$

$$\frac{1}{9} (a_1 - 2r + t)^2 - F \geq \frac{1}{9} (2a_2 - a_1 + t)^2 \quad (10)$$

$$F, r \geq 0 \quad \text{and} \quad q_1^c, q_2^c \geq 0. \quad (11)$$

The constraints (9) and (10) show the participation constraints of firms 1 and 2 respectively. Condition (11) shows the non-negativity constraints for F , r and the outputs.

Since firm 1 offers a take-it-or-leave-it contract to firm 2, the optimal up-front fixed fee must satisfy

$$F^* = \frac{1}{9} (a_1 - 2r + t)^2 - \frac{1}{9} (2a_2 - a_1 + t)^2. \quad (12)$$

Hence, firm 1's maximisation problem (eq. 8) reduces to the following

$$\underset{r}{Max} \pi_1^{c,t} = \frac{1}{9} (a_1 + r - 2t)^2 + \frac{r}{3} (a_1 - 2r + t) + \frac{1}{9} (a_1 - 2r + t)^2 - \frac{1}{9} (2a_2 - a_1 + t)^2, \quad (13)$$

subject to the non-negativity constraints.

Ignoring the non-negativity constraints on r , we get the optimal per-unit output royalty as $r^* = \frac{1}{2} (a_1 - 5t)$. If $t \geq \frac{a_1}{5}$, the non-negativity constraint implies that the optimal royalty is zero. The corresponding equilibrium up-front fixed fee is $F^* = \frac{4}{9} (a_2 + t) (a_1 - a_2)$.

If $t < \frac{a_1}{5}$, the equilibrium royalty is $r^* = \frac{1}{2} (a_1 - 5t)$, which satisfies the constraint for positive outputs, i.e., $2r - a_1 < t < \frac{a_1 + r}{2}$. The corresponding equilibrium fixed-fee is $F^* = \frac{1}{9} (2a_2 - a_1 + 7t) (a_1 - 2a_2 + 5t)$. Given our assumption of $2a_2 > a_1$ (which is required for the positive output of firm 2 under no collaboration for any t), $F^* > 0$ for $t > \frac{2a_2 - a_1}{5}$. Hence, the equilibrium contract consists of $F^* > 0$ and $r^* > 0$ for $\frac{2a_2 - a_1}{5} < t < \frac{a_1}{5}$.

If $t \leq \frac{2a_2 - a_1}{5}$, we get that $F^* = 0$, implying that the collaborative agreement consists of only output royalty for $t < \frac{2a_2 - a_1}{5}$. The equilibrium output royalty in this situation follows from firm 2's participation constraint and is $r^* = (a_1 - a_2)$.

It is easy to check that while the above contracts make firm 2 indifferent between collaboration and no collaboration, firm 1 is always better off under collaboration compared with no collaboration, suggesting that brand name collaboration always occurs if firm 1 can choose the up-front fixed-fee and the output royalty.

We summarise the above discussion in the following proposition.

Proposition 1 *Brand name collaboration agreement always takes place between firms 1 and 2. The equilibrium collaborative agreements are:*

(a) *When $0 \leq t \leq \frac{2a_2 - a_1}{5}$, the equilibrium fixed-fee is zero and the equilibrium royalty is $r^* = (a_1 - a_2)$.*

(b) *When $\frac{2a_2 - a_1}{5} < t < \frac{a_1}{5}$, the equilibrium contract consists of $F^* = \frac{1}{9}(2a_2 - a_1 + 7t)$ ($a_1 - 2a_2 + 5t$) and $r^* = \frac{a_1 - 5t}{2}$.*

(c) *When $\frac{a_1}{5} \leq t < \frac{2a_1 - a_2}{2}$, the equilibrium fixed-fee is $F^* = \frac{4}{9}(a_2 + t)(a_1 - a_2)$ and the equilibrium royalty is zero.*

The reason for the above proposition is as follows. There are two motives for brand name collaboration. On the one hand, it tends to increase the industry profit by increasing the consumers' maximum willingness to pay for firm 2's product. On the other hand, it tends to increase the industry profit by increasing the output of firm 2 and reducing the output of firm 1, thus saving the transportation cost. Firm 1 can extract the benefit from brand name collaboration through fixed-fee and output royalty. The output royalty also helps to soften competition ex-post collaboration by increasing firm's marginal cost.

If the transportation cost is very small, the competition softening effect of royalty becomes the dominant factor and firm 1 charges the royalty rate in a way so that the market shares of the firms remain the same under collaboration and no collaboration. Hence, in this situation, the equilibrium fixed-fee is zero. On the other hand, if the transportation cost is sufficiently high, firm 1's market share is small, and the transportation cost saving motive encourages firm 1 to increase firm 2's benefit from collaboration as high as possible. In this situation, firm 1 does not have any incentive to distort firm 2's output choice by imposing a positive output royalty. Hence, firm 1 charges only positive fixed-fee and zero royalty for sufficiently high transportation cost. For intermediate transportation cost, both the competition softening effect and the transportation cost saving effect are important and firm 1 prefers to charge positive fixed-fee and positive output royalty.

Although the implications of a positive transportation cost and output royalty follow from the above result, it may worth highlighting them here. It follows from Proposition 1(a) that if there is no transportation cost, as considered in Marjit et al. (2007), firm 1 charges only a positive royalty. Hence, unless there are other reasons, such as imitation or the problem of varying outputs of firm 2, the fixed-fee contract considered in Marjit et al. (2007) is not justifiable in this situation. The fixed-fee contract considered in Marjit et al. (2007) may not justifiable even for non-zero but low transportation cost (see Propositions 1(a) and 1(b)). However, if the transportation cost is high, as in Proposition 1(c), firm 1 charges only an up-front fixed-fee. This situation justifies the fixed-fee contract considered in Marjit et al. (2007), even if there is no imitation and the outputs of firm 2 are verifiable. Thus, we show that the value of the transportation cost plays an important role in determining the optimal collaborative agreement.

The above analysis also suggests that the presence of output royalty ensures that brand name collaboration occurs always, which is in contrast to Marjit et al. (2007). Marjit et al. (2007) considered only fixed-fee, and therefore, ignored the competition softening effect

of output royalty. Hence, brand name collaboration was not profitable in their analysis if the brand names of firms 1 and 2 were sufficiently different, since brand name collaboration would expose firm 1 to a fierce competition from firm 2. However, the use of an output royalty in our analysis allows firm 1 to control the intensity of competition by affecting firm 2's marginal cost. In fact, firm 1 can always keep the same intensity of competition after brand name collaboration to that of before brand name collaboration by charging an output royalty equal to $(a_1 - a_2)$. This competition softening effect of royalty creates the possibility of a profitable collaboration always in our analysis.

Like the existing literature (Marjit et al., 2007), we conduct our analysis under the assumption that the antitrust law prevents collusive agreement between the firms. The anti-competitive nature of the collusive agreement may induce the antitrust authority to prevent collusion between the firms. The non-negativity constraints on the fixed-fee and output royalty considered in our analysis reflect this restriction. For example, if we ignore transportation cost and also ignore the non-negativity constraint on the fixed-fee and output royalty, the equilibrium royalty rate is $r^* = \frac{a_1}{2}$. It is easy to check that this royalty rate allows firm 1 to produce like a monopolist and firm 1 can satisfy firm 2's participation constraint by paying firm 2 its reservation payoff. However, the non-negativity constraint on the fixed-fee, due to the antitrust law, prevents firm 1 from charging so high royalty. We assume that the antitrust law is also responsible for preventing merger between the firms. Moreover, merger agreements often involve significant costs due to organizational, managerial and technological reasons (see, e.g., Hart and Tirole, 1990 and Beladi et al. 2009) and these costs associated with merger may make merger as an unprofitable option. If we follow this line of justification, it is then implicit in our analysis that the cost of brand name transfer is lower than the cost of forming a merger. It is intuitive that if the firms could merge, the firms could earn higher profits compared to the brand name collaboration considered in this paper.

4 Conclusion

Although brand name collaboration is empirically relevant, the theoretical literature did not pay much attention to this aspect. In an international Cournot duopoly, we determine the optimal contract for a brand name collaboration where the contract consists of fixed-fee and output royalty. We show that the firms always have the incentive for brand name collaboration. However, whether the optimal contract will have positive fixed-fee and positive royalty is not immediate and it depends on the factors such as the transportation cost of exporting and the consumers' initial perception about the products of the firms reflected in the consumers' maximum willingness to pay for the products. Thus, our paper shows that the possibility of brand name collaboration is significantly more than predicted in the existing literature.

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