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Paying not to sell

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HIGHLIGHTS

- A downstream monopolist may sign contracts with two differentiated upstream firms.
- The monopolist always signs costly contracts with both firms.
- Nonetheless, the monopolist never actually sells the low-quality good.
- This improves the monopolist's bargaining position over the high-quality firm.

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ABSTRACT

In this paper we show that, in the presence of buyer and seller power, a monopolist can enter into a costly contractual relationship with a low-quality supplier with the sole intention of improving its bargaining position relative to a high-quality supplier, *without ever* selling the good produced by that firm.

1. Introduction

We analyze the behavior of a monopolistic retailer that may enter into a contractual relationship with two upstream producers supplying goods of different quality. Unlike the existing literature, we assume that all firms retain bargaining power in the setting of the supply contract. We show that the monopolist always signs contracts with both firms. Although the equilibrium contracts are efficient (upstream price equals upstream marginal production cost), the monopolist sets downstream prices so as to always sell the high-quality variant of the good only. It nevertheless pays a fixed fee to the low-quality producer in order to improve its outside option and hence its bargaining position relative to the high-quality supplier. In the following, Section 2 presents the model and Section 3 identifies and characterizes its unique equilibrium. Finally, Section 4 positions our paper relative to the extant literature and discusses the robustness of our results.

2. The model

Two upstream firms, denoted as 1 and 2, produce a vertically differentiated good of quality s_1 and s_2 respectively, with $s_2 > s_1 > 0$. A downstream monopolist purchases the good(s) from one (or both) firm(s) and sells it (them) to the final consumers. Both the production and retail costs are zero.

Consumers are heterogeneous in their quality appreciation θ, which is uniformly distributed with density 1 over [0, 1]. A consumer enjoys an indirect (Mussa and Rosen, 1978) utility $U(\theta) = \theta s_i - p_i$ if she buys a product of quality s_i at price p_i, and zero if she abstains from consuming, $i \in \{1, 2\}$. As a unit mass of consumers

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exists, the market demands are written $D_1(p_1, p_2) = \left(\frac{p_2-p_1}{s_2-s_1} - \frac{p_1}{s_1}\right)$ and $D_2(p_1, p_2) = \left(1 - \frac{p_2-p_1}{s_2-s_1}\right)$ when both goods are supplied; and $D_i(p_i) = \left(1 - \frac{p_i}{s_i}\right)$ when variant i only is offered.

Consider a three-stage game. At stage 1 the downstream monopolist commits to an exclusive relationship with firm $i \in \{1, 2\}$ only, or to a non-exclusive relationship with both firms. At stage 2 the monopolist bargains simultaneously with each of its suppliers over a two-part-tariff contract (w_i, t_i), where w_i is a per-unit input price and t_i is the fixed fee. At stage 3, the monopolist sets the final price(s) for the goods purchased.

We solve by backward induction the sub-games with an exclusive contract and that with non-exclusive ones, and compare their outcomes to find the subgame-perfect Nash equilibrium of the whole game.

3. Equilibrium

3.1. Exclusive contracts

Stage 3. The monopolist commits to an exclusive relationship with producer $i \in \{1, 2\}$. The pricing stage profit for the monopolist is $(p_i - w_i)D_i(p_i) - t_i$, which is maximized for $p_i(w_i) = \frac{s_i+w_i}{2}$. By plugging the price back into the profit we find that this profit is $\Pi_i(w_i, t_i) = \frac{(s_i-w_i)^2}{4} - t_i$. The profit of supplier i is $w_iD_i(p_i) + t_i$, which, at $p_i(w_i)$, writes $\pi_i(w_i, t_i) = \frac{(s_i-w_i)w_i}{2s_i} + t_i$.

Stage 2. The optimal two-part tariff (w_i, t_i) is obtained through the generalized Nash bargaining solution. Let $\alpha \in]0, 1[$ (res. $\beta \in]0, 1[$) be the power of the monopolist in the bargaining with the high- (res. low-)quality producer, and, accordingly, let $1 - \alpha$ and $1 - \beta$ be the power of the high- and low-quality producers respectively.[1] The outside options for all the firms are zero: if no agreement is reached, no firm has alternative sources of profit. The Nash product is, therefore, $B(w_i, t_i) = [\Pi(w_i, t_i)]^{\mu}[\pi(w_i, t_i)]^{1-\mu}$, with $i = 1, 2$ and $\mu = \alpha$ (res. $\mu = \beta$) if, and only if $i = 2$ (res. $i = 1$). Maximization of $B_i(w_i, t_i)$ with respect to w_i and t_i gives $w_i = 0$ and $t_i = \frac{(1-\mu)s_i}{4}$. The variable part of the tariff is set so as to maximize the joint profits of the chain, and the total profits are apportioned according to the sharing rule determined by the bargaining weights. By plugging the optimal two-part tariff back into price, demand and profits we obtain their values at the equilibrium of these sub-games:

$$p_i^I = \frac{s_i}{2}, \qquad D_i^I = \frac{1}{2}, \tag{1}$$

$$\Pi_i^I = \mu\frac{s_i}{4}, \qquad \pi_i^I = (1 - \mu)\frac{s_i}{4}; \tag{2}$$

with $i = 1, 2$ and $\mu = \alpha$ (res. $\mu = \beta$) if, and only if $i = 2$ (res. $i = 1$). If committed to an exclusive relationship, the monopolist signs a contract with the high-(res. low-)quality producer if, and only if $\Pi_2^I > \Pi_1^I \Leftrightarrow \frac{\alpha}{\beta} > \frac{s_1}{s_2}$ (res. $\Pi_2^I < \Pi_1^I \Leftrightarrow \frac{\alpha}{\beta} < \frac{s_1}{s_2}$).

3.2. Non-exclusive contracts

Stage 3. The monopolist may sign a contract with both producers and, thus, sell both goods to the final consumers. In this case its profits are written as

$$\sum_{i=1}^{2}[(p_i - w_i)D_i(p_1, p_2) - t_i]. \tag{3}$$

Standard computations yield the optimal prices at this stage: $p_i(w_i, t_i) = \frac{s_i+w_i}{2}$, for $i = 1, 2$. Accordingly, the profits for the monopolist, the high-quality producer and the low-quality producer are $\Pi(w_1, w_2, t_1, t_2) = \frac{s_1\left[\Delta s(s_2-2w_2)+w_2^2\right]+w_1(s_2w_1-2s_1w_2)}{4s_1\Delta s} - t_1 - t_2$, $\pi_2(w_1, w_2, t_2) = \frac{w_2(\Delta s-w_2+w_1)}{2\Delta s} + t_2$ and $\pi_1(w_1, w_2, t_1) = \frac{w_1(s_1w_2-s_2w_1)}{2s_1\Delta s} + t_1$, where $\Delta s \equiv s_2 - s_1$.

Stage 2. The monopolist simultaneously bargains over the two-part tariff with the two producers.[2] The bargaining weights are unchanged compared to the case of exclusive contracts, and they are common knowledge among the firms. The outside options for the upstream firms are still zero: if no agreement is reached they cannot sell their good. Yet, in this case, the outside option for the monopolist is no longer zero, because, if the agreement with firm i is not reached, the bargaining with firm j $(i, j \in \{1, 2\}, i \neq j)$ continues, as in the case of exclusive contracts. Thus, the outside option of the monopolist in the bargaining with firm 1 is Π_2^I and that with firm 2 is Π_1^I. Accordingly, the two Nash products are

$$B_1(w_1, w_2, t_1, t_2) = \left[\Pi(w_1, w_2, t_1, t_2) - \frac{\alpha s_2}{4}\right]^{\beta}[\pi_1(w_1, w_2, t_1)]^{1-\beta}, \tag{4}$$

$$B_2(w_1, w_2, t_1, t_2) = \left[\Pi(w_1, w_2, t_1, t_2) - \frac{\beta s_1}{4}\right]^{\alpha}[\pi_2(w_1, w_2, t_2)]^{1-\alpha}. \tag{5}$$

The joint maximization of (4) and (5) yields the equilibrium two-part tariffs with non-exclusive contracts. They are $w_1^{II} = 0$, $t_1^{II} = \frac{s_1\beta(1-\alpha)(1-\beta)}{4(\alpha+\beta-\alpha\beta)}$ and $w_2^{II} = 0$, $t_2^{II} = \frac{(1-\alpha)[\alpha s_2-\beta s_1+(1-\alpha)\beta s_2]}{4(\alpha+\beta-\alpha\beta)}$.[3] By plugging these values back into the equilibrium prices and demands we obtain

$$p_2^{II} = \frac{s_2}{2}, \qquad p_1^{II} = \frac{s_1}{2}, \tag{6}$$

$$D_2^{II} = \frac{1}{2}, \qquad D_1^{II} = 0. \tag{7}$$

Since $w_i^{II} = 0$, $i \in \{1, 2\}$, the profits of the upstream firms coincide with the fixed fee of the two-part tariff: $\pi_i^{II} = t_i^{II}$, $i \in \{1, 2\}$. The profit of the downstream monopolist is

$$\Pi^{II} = \frac{\alpha s_2}{4} + \frac{s_1\beta^2(1-\alpha)}{4(\alpha+\beta-\alpha\beta)}. \tag{8}$$

We state the following.

Proposition 1. *Let* $(\alpha, \beta) \in]0, 1[^2$. *The monopolist*

(i) *Always signs contracts with both the high- and low-quality producers.*
(ii) *Never sells the low-quality good.*

Proof. $\forall(\alpha, \beta) \in]0, 1[^2$

(i) $\Pi^{II} - \Pi_1^I = \frac{\alpha s_2}{4} - \frac{\alpha\beta s_1}{4(\alpha+\beta-\alpha\beta)} > 0$; $\Pi^{II} - \Pi_2^I = \frac{s_1(1-\alpha)\beta^2}{4(\alpha+\beta-\alpha\beta)} > 0$.
(ii) $D_1^{II} = 0$. □

The monopolist always finds it optimal to sign non-exclusive contracts with both producers. These contracts are efficient, as the upstream price equals the upstream marginal production cost. Yet, the monopolist sets the downstream prices so that the equilibrium

[1] We let α and β vary over the open interval $]0, 1[$ to allow for a positive bargaining power for all the firms.

[2] The analysis is developed in the case of public contracts. However, since the monopolist knows the terms of both contracts, the distinction between public and secret contracts is immaterial here.

[3] Proof in the Appendix.