Discussion Paper No. 981

THE COUNTERVAILING POWER HYPOTHESIS WHEN DOMINANT RETAILERS FUNCTION AS SALES PROMOTERS

Noriaki Matsushima
Shohei Yoshida

October 2016
Revised July 2017

The Institute of Social and Economic Research
Osaka University
6-1 Mihogaoka, Ibaraki, Osaka 567-0047, Japan

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Noriaki Matsushima†

Institute of Social and Economic Research, Osaka University

Shohei Yoshida‡

Research Fellow of Japan Society for the Promotion of Science

July 4, 2017

Abstract

We consider a downstream oligopoly model with one dominant and several fringe retailers, who purchase a manufacturing product from a monopoly supplier. We then examine how the supplier's outside option influences the relation between the dominant retailer's bargaining power and the equilibrium retail price. If the market demand shrinks due to a breakdown of bargaining between the supplier and the dominant retailer, who works as a sales promoter for the product, there is a negative relation between the bargaining power and the retail price.

JEL codes: L13, D43.

Keywords: Countervailing power, Buyer power, Dominant retailer, Two-part tariff.

*We thank the seminar participants at Kyoto Sangyo, Osaka, and Shinshu Universities for their valuable discussions and comments. We gratefully acknowledge the financial support from the Japan Society for the Promotion of Science (JSPS), KAKENHI Grant Numbers JP15H03349 and JP15H05728, Grant-in-Aid for JSPS Fellows Grant Number JP16J02442, and the program of the Joint Usage/Research Center for "Behavioral Economics" at ISER, Osaka University. The usual disclaimer is applicable.

†Corresponding author: Noriaki Matsushima, Institute of Social and Economic Research, Osaka University, Mihogaoka 6-1, Ibaraki, Osaka, 567-0047, Japan. Phone: (81)-6-6879-8571. Fax: (81)-6-6879-8583. E-mail: nmatsush@iser.osaka-u.ac.jp

‡Shohei Yoshida, Institute of Social and Economic Research, Osaka University, Mihogaoka 6-1, Ibaraki, Osaka, 567-0047, Japan. Phone: (81)-6-6879-8552. Fax: (81)-6-6879-8584. E-mail: shoheiyoshida0@gmail.com.

1 Introduction

Considering the recent growth of dominant retailers such as Wal-Mart and Toys "R" Us, policy makers are now focusing on the influence of dominant retailers on market outcomes such as retail price, consumer surplus, and social welfare. Since Galbraith's (1952) argument on countervailing power, many researchers have investigated this topic in various models (e.g., von Ungern-Sternberg, 1996; Dobson and Waterson, 1997; Chen, 2003; Inderst and Valletti, 2011; Iozzi and Valletti, 2014; Gaudin, 2016, 2017; Chen et al., 2016).[1]

These previous papers, however, have not considered the dominant retailers as sales promoters. When consumers do not exactly judge the real quality of a product before and/or after the purchase, famous retailers' selling that product could enhance its credibility regarding quality. Several empirical studies show that the more favorable the store name perceptions, the higher are the buyers' product quality perceptions (e.g., Dodds et al., 1991).[2] This reputation concern of dominant retailers could influence their negotiations with suppliers. If dominant retailers have a reputation of possessing high-quality trading products, the breakdown of their negotiations with suppliers could have a negative impact on the reputation of the latter's products' quality. This is because such products are not handled by these dominant retailers. As a result, the market demand for suppliers' products becomes lesser than the demand when the dominant retailers handle these products.[3] Therefore, this kind of reputation matter provides dominant retailers an additional bargaining power, irrespective of that in the context of Nash bargaining.

To investigate the aspect mentioned above, a dominant retailer model in Chen (2003) is

[1] Detailed discussions on buyer power are available in Chen (2007), Inderst and Shaffer (2007), and Inderst and Mazzarotto (2008).

[2] Marvel and McCafferty (1984), Chu and Chu (1994), and Clerides et al. (2008) also empirically investigate the effects of famous retailers on quality perception.

[3] Another interpretation of this scenario is as follows: since dominant retailers could undertake promotional activities, if they do not exist, some consumers would be unaware of the existence of the promoted product, which obviously reduces the market demand.

useful because his model distinguishes between two types of retailers—dominant and fringe. This model assumption allows us to investigate the role of dominant retailers in the context of the buyer-supplier relationship. Therefore, we incorporate a reputation matter into the model in Chen (2003), by also considering the recent result in Christou and Papadopoulos (2015), which is a correction of Chen (2003).

The market structure in our model is as follows. A monopoly supplier distributes its product through two channels. One channel is a dominant retailer that has a positive constant marginal cost. The dominant retailer and the supplier negotiate their trading terms (a two-part tariff contract) through Nash bargaining. The other channel comprises fringe retailers that have an increasing marginal cost technology, which is efficient for small quantities. Each fringe retailer is a price-taker at the retail level and sets its own quantity, which competes with the demand for the dominant retailer. Each of them is also a price-taker in the trade with the monopoly supplier, who unilaterally offers nondiscriminatory two-part tariff contracts to these fringe retailers. Under the framework, if the negotiation between the supplier and the dominant retailer breaks down, the retail price is determined to equalize the total quantities supplied by the fringe retailers and the market demand that has consequently reduced. The degree of market shrinkage depends on the importance of the dominant retailer as a sales promoter of the product.

There are several differences among Chen (2003), Christou and Papadopoulos (2015), and this study, regarding the retail market environments during negotiation breakdown between the dominant retailer and the supplier. In Chen (2003), the retail market is inactive; in Christou and Papadopoulos (2015), it is active and does not shrink; while in our study, it is active and does shrink.[4] Chen (2003) shows that an increase in the buyer power possessed by a dominant retailer could decrease the retail prices for consumers. However, regarding

[4] There is another difference between the three studies. Pertaining to negotiations between the supplier and the dominant retailer, Christou and Papadopoulos (2015) and our study consider the supplier's profits from fringe retailers, unlike Chen (2003).

correcting for payoffs and outside options in Chen (2003), Christou and Papadopoulos (2015) show that the countervailing power does not affect the equilibrium prices, that is, they show the "neutrality result."[5]

Our paper shows that contrary to the neutrality result in Christou and Papadopoulos (2015), an increase in the buyer power possessed by a dominant retailer could decrease the retail prices for consumers, as in Chen (2003), even when the demand shrinkage through negotiation breakdown is minimal. Furthermore, if the bargaining power of the dominant retailer is strong, an unconventional negative result could arise: Given that the number of fringe retailers is large, an increase in their number is more likely to increase the retail price.

The explanation behind the first result is as follows. A change in the bargaining power generates sales-shifting across retailers. For the supplier, a loss of bargaining power over the dominant retailer leads to a lower share of industry profits. This negative effect of the loss of bargaining power on the supplier is offset by a higher share of its outside options. In Christou and Papadopoulos (2015), a possible gain from its outside option completely negates the loss. In contrast, in our setting, if the dominant retailer functions as a sales promoter, the supplier's gain from its outside option is not sufficient to negate the loss of bargaining power due to demand shrinkage through negotiation breakdown. This is why an increase in buyer power decreases retailer prices.

The rest of this paper proceeds as follows. Section 2 describes the model. Section 3 presents the equilibrium outcome and the results of comparative statics. Section 4 concludes the paper. The Appendix provides the proofs of the lemmas and propositions in Section 3.

[5] Erutku (2005) also relaxes several assumptions in Chen (2003). Erutku (2005) changes the following: (i) the bargaining process between a dominant retailer (called "a national retailer" in his paper) and a monopoly manufacturer; and (ii) strategic interactions between the dominant retailer and its rival. He shows that the price of the dominant retailer monotonically decreases according to its bargaining power, although that of the rival has an inverted U-shaped relation to this parameter. In the context of agricultural industries, Matsushima (2016) considers how purchasing power in one of the two channels influences the profitabilities of upstream firms.

2 Model

This section presents the basic model, which is an extension of Chen (2003) and Christou and Papadopoulos (2015). Consider a monopoly supplier that produces an intermediate good without any cost, and one dominant and n fringe retailers that purchase the intermediate good from the supplier. Each retailer converts one unit of the intermediate good to one unit of final good without any cost. However, each retailer must incur an operational cost to handle the final good. The dominant retailer has a constant marginal cost c to handle one unit of the final good. In contrast, each fringe retailer has an increasing marginal cost $MC(q_f)$, where q_f is its quantity, $MC'(q_f) > 0$ and $MC(0) = 0$. These assumptions reflect that the fringe retailers are more efficient at small operational scales, while the dominant retailer is more efficient at a large scale.

The demand function for the final good is given as $D(p)$, where $D'(p) < 0$ and $D'(p) + (p - c)D''(p) < 0$, those of which are assumed in Chen (2003).[6]

The dominant retailer negotiates with the supplier over a two-part tariff contract, $w_d q_d + F_d$, where w_d is the wholesale price, q_d is the quantity purchased by the retailer, and F_d is the fee. The fringe retailers are price-takers both in the input and final good markets.

In Stage 1, the monopoly supplier unilaterally offers a two-part tariff contract, $w_f q_f + F_f$, to each fringe retailer, where w_f is the wholesale price, and F_f is the fee. The supplier commits its offers. Under the assumption, we can derive the supply function of each fringe retailer. It is derive by $p = MC(q_f) + w_f$ or $q_f = MC^{-1}(p - w_f)$. Here we define $s(p - w_f) \equiv MC^{-1}(p - w_f)$, with $s(0) = 0$ and $s'(\cdot) > 0$. We also assume that $s'(\cdot) + (p - c - w_f)s''(\cdot) > 0$.

In Stage 2, the supplier and the dominant retailer negotiate over the two-part tariff contract, $w_d q_d + F_d$. The bargaining power of the dominant retailer is $\gamma \in (0, 1)$. If the negotiation breaks down, the market is still active but shrinks to $kD(p)$ ($k \leq 1$). This assumption reflects the role of the dominant retailer as a sales promoter. The case of $k = 1$ is equivalent with

[6] Christou and Papadopoulos (2015) employ a linear demand.

that in Christou and Papadopoulos (2015) except the functional specification in their paper.

In Stage 3, considering the production technology of the fringe retailers, the dominant retailer sets the retail price p. Given p, each fringe retailer determines its quantity. If the negotiation broke down in Stage 2, p is determined to equalize the shrunken demand $kD(p)$ and the total quantities supplied by the fringe retailers. This condition is further explained in Section 3.

3 Analysis

We first derive the equilibrium outcome in the game, and then provide the results of the comparative statics.

3.1 Equilibrium outcome

Our main objective is to discuss how formulating disagreement payoffs influences the equilibrium property. Before this, we first solve the game by backward induction.

Stage 3 We have already derived the supply function of each fringe retailer, $s(\cdot)$,

$$q_f(p - w_f) = s(p - w_f).$$

The residual demand for the dominant retailer is given as $D(p) - ns(p - w_f)$. Thus, the profit of the dominant retailer becomes

$$\pi_d = (p - c - w_d)[D(p) - ns(p - w_f)] - F_d.$$

From the first-order condition of its profit maximization problem, we obtain the optimal price $p^*(w_d, w_f) = p^*$ such that

$$[D(p^*) - ns(p^* - w_f)] + (p^* - c - w_d)[D'(p^*) - ns'(p^* - w_f)] = 0. \tag{1}$$

Note that we have $\partial p^*(w_d, w_f)/\partial w_d > 0$ from the second-order condition.

Stage 2 (bargaining outcome) Anticipating the third-stage outcome, the supplier and the dominant retailer negotiate over the two-part tariff contract, $w_d q_d + F_d$. Let π_s be the profit of the monopoly supplier. The bargaining problem is $D_d^s = \{\pi_s, \pi_d\}$, with the disagreement payoffs for the supplier and the dominant retailer being (O_s, O_d), respectively, where:

$$\begin{aligned}\pi_s(w_d, w_f, F_d, F_f) &= F_d + w_d[D(p^*(w_d, w_f)) - ns(p^*(w_d, w_f) - w_f)] \qquad (2)\\ &\qquad + n[F_f + w_f s(p^*(w_d, w_f) - w_f)],\\ \pi_d(w_d, w_f, F_d) &= (p^*(w_d, w_f) - c - w_d)[D(p^*(w_d, w_f)) - ns(p^*(w_d, w_f) - w_f)] - F_d, \qquad (3)\\ O_s &= n[F_f + w_f s(p_o - w_f)],\\ &\quad \text{where } p_o \text{ satisfies } kD(p_o) = ns(p_o - w_f) \text{ and } k \in [0,1], \qquad (4)\\ O_d &= 0.\end{aligned}$$

The equation, $kD(p_o) = ns(p_o - w_f)$ in Equation (4), is the demand-equal-supply condition, in which the negotiation between the supplier and the dominant retailer breaks down. The assumption of the supplier's disagreement payoff reflects the importance of the dominant retailer to promote the supplier's good.

By solving the following maximization problem, we derive the outcome of bargaining:

$$\max_{(w_d, F_d)} [\pi_s(w_d, w_f, F_d, F_f) - O_s]^{1-\gamma}[\pi_d(w_d, w_f, F_d)]^{\gamma}.$$

First, F_d must satisfy the following:

$$\begin{aligned}F_d = (1-\gamma)[p^* - c][D(p^*) - ns(p^* - w_f)]&\\ - w_d[D(p^*) - ns(p^* - w_f)] - n\gamma w_f[s(p^* - w_f) - s(p_o - w_f)].& \qquad (5)\end{aligned}$$

The problem becomes as follows:

$$\max_{w_d} = \pi_s + \pi_d - O_s = [p^* - c][D(p^*) - ns(p^* - w_f)] + nw_f[s(p^* - w_f) - s(p_o - w_f)]. \qquad (6)$$

The first-order condition with respect to w_d is

$$\frac{\partial p^*}{\partial w_d}\left\{[D(p^*) - ns(p^* - w_f)] + (p^* - c)[D'(p^*) - ns'(p^* - w_f)] + nw_f s'(p^* - w_f)\right\} = 0, \qquad (7)$$

Or

$$[D(p^*) - ns(p^* - w_f)] + (p^* - c)[D'(p^*) - ns'(p^* - w_f)] + nw_f s'(p^* - w_f) = 0. \qquad (8)$$

Define $w_d^* = w_d(w_f)$. The second-order condition is

$$\frac{\partial^2 p^*}{\partial w_d^2}\{[D(p^*) - ns(p^* - w_f)] + (p^* - c)[D'(p^*) - ns'(p^* - w_f)] + nw_f s'(p^* - w_f)\}$$
$$+\frac{\partial p^*}{\partial w_d}\{2D'(p^*) + (p^* - c)D''(p^*) - 2ns'(p^* - w_f) - n(p^* - c - w_f)s''(p^* - w_f)\} < 0.$$

Since the first line becomes zero (by substituting Equation (8)) in equilibrium, we have

$$[2D'(p^*) + (p^* - c)D''(p^*)] - n[2s'(p^* - w_f) + (p^* - c - w_f)s''(p^* - w_f)] < 0. \qquad (9)$$

Stage 2 (the properties of the subgame outcome) Here, we check how w_f influences $p^*(w_d(w_f), w_f)$ and p_o.

First, we check how w_f influences $p^*(w_d(w_f), w_f)$. Using the first-order condition, we derive how $p^*(w_d(w_f), w_f)$ changes with w_f:

$$\frac{dp^*(w_d(w_f), w_f)}{dw_f} = -\frac{n[2s' + (p - c - w_f)s'']}{2D' + (p - c)D'' - n[2s' + (p - c - w_f)s'']}. \qquad (10)$$

By assumption in Section 2, $2s' + (p - c - w_f)s'' \geq 0$ ($s' > 0$ and $s' + (p - c - w_f)s'' > 0$). From (10), we have the following lemma:

Lemma 1 *The second-stage equilibrium price $p^*(w_d(w_f), w_f)$ is increasing with w_f. More concretely,*

$$0 \leq \frac{dp^*(w_d(w_f), w_f)}{dw_f} < 1. \qquad (11)$$

From Equations (1) and (8), we have

$$w_d = \frac{ns'(p^* - w_f)}{ns'(p^* - w_f) - D'(p^*)} w_f.$$

Because $s' > 0$ and $D' < 0$, $0 < ns' < ns' - D'$. Therefore, $w_d < w_f$.

Second, we check the property of p_o. If $k = 1$, $D(p_o) = ns(p_o - w_f)$ which implies that the demand for the dominant retailer is zero at $p_o = p^*$. Thus, $p^* < p_o$. However, if k is small enough and if $p^* - w_f$ is positive in equilibrium, then $p^* > p_o$. Also, we have

$$\frac{dp_o}{dw_f} = \frac{ns'(p_o - w_f)}{ns'(p_o - w_f) - kD'(p_o)} < 1. \tag{12}$$

This implies the following:

Lemma 2 *An decrease in k makes p_o more sensitive with respect to w_f.*

The results implies that if k is smaller, an increase in the wholesale price for the fringe retailers slightly reduces the output when the negotiation breaks down because $p_o - w_f$ does not decrease so much through the increase in w_f. This property deeply relates to Proposition 4, which is explained later.

Due to the analytical complexity, we here specify the functional forms of $D(p)$ and $MC(q_f)$ as follows:

Assumption 1 *The demand function is linear in price and the marginal cost of each fringe retailer is also linear in quantity. More concretely,*

$$D(p) = a - bp, \quad \textit{and} \quad MC(q_f) = dq_f \quad \textit{or equivalently,} \quad s(p - w_f) = (p - w_f)/d.$$

Under Assumption 1, the second-stage outcome is

$$\begin{aligned} w_d(w_f) &= \frac{nw_f}{bd + n}, \\ F_d(w_f) &= \frac{(1-\gamma)(bdk + n)(ad - (bd + n)c)^2 - 4(1-k)\gamma dn^2 w_f(a - bw_f)}{4d(bd + n)(bdk + n)}. \end{aligned}$$

Stage 1 The profit of the monopoly supplier is:

$$\begin{aligned} \pi_s(w_f, F_f) = &\ F_d(w_f) + w_d[D(p^*(w_d(w_f), w_f)) - ns(p^*(w_d(w_f), w_f) - w_f)] \\ &+ n[F_f + w_f s(p^*(w_d(w_d), w_f) - w_f)]. \end{aligned}$$

The monopoly supplier sets w_f and F_f to maximize its profit, leading to:

$$w_f^* = \frac{Ha - b(bdk+n)(bd+n)c}{2bH},$$
$$F_f^* = \frac{(bd+n)^2(bdk+n-(1-k)n\gamma)^2c^2}{2dH^2},$$
$$\text{where } H \equiv (bdk+n)(bd+2n) - 2(1-k)(bd+n)n\gamma.$$

Using the above outcome, we obtain the profits of the monopoly supplier and the dominant retailer:

$$\begin{aligned}\pi_s^* =& \frac{(1-\gamma)(ad-c(bd+n))((a-bc)H-n(bdk+n)bc)}{4bdH}\\ &+n\left[\frac{(bd+n)^2(bdk+n-(1-k)n\gamma)^2c^2}{2dH^2} + \frac{n[Ha-b(bdk+n)(bd+n)c]}{4bdH^2}\right.\\ &\left.\times\left(\frac{\gamma dkHa}{bdk+n} + c(bd+n)\{b(2-\gamma)dk+2(1-\gamma)n(\gamma(k-1)+1)\}\right)\right],\\ \pi_d^* =& (p^*-c-w_d^*)\left[D(p^*)-ns(p^*-w_f^*)\right] - F_d^*\\ =& \frac{(ad-(n+bd)c)^2}{4d(n+bd)} - \left\{\frac{(1-\gamma)(ad-(n+bd)c)^2}{4d(n+bd)}\right.\\ &\left.-\frac{\gamma(1-k)n^2}{4b(n+bd)(n+bdk)}\left(a^2-\frac{(b(n+bd)(n+bdk)c)^2}{H^2}\right)\right\}\\ =& \frac{\gamma(ad-(n+bd)c)^2}{4d(n+bd)} + \frac{\gamma(1-k)n^2}{4b(n+bd)(n+bdk)}\left(a^2-\frac{(b(n+bd)(n+bdk)c)^2}{H^2}\right).\end{aligned}$$

Furthermore, we also obtain the important endogenous parameters in equilibrium:

$$\begin{aligned}p^* &= \frac{Ha+b(bd+n)(bdk+n-2(1-k)n\gamma)c}{2bH},\\ w_d^* &= \frac{n}{bd+n}\frac{Ha-b(bdk+n)(bd+n)c}{2bH},\\ F_d^* &= \left\{\frac{(1-\gamma)(ad-(n+bd)c)^2}{4d(n+bd)} - \frac{\gamma(1-k)n^2}{4b(n+bd)(n+bdk)}\left(a^2-\frac{(b(n+bd)(n+bdk)c)^2}{H^2}\right)\right\},\\ q_d^* &= \frac{ad-(bd+n)c}{2d}, \quad q_f^* = \frac{c(bd+n)[bdk+n(1-(1-k)\gamma)]}{dH}.\end{aligned}$$

3.2 Comparative statics

We provide several results of comparative statics.

First, we examine whether Christou and Papadopoulos's (2015) neutrality result holds in our setting.

Lemma 3 *Under Assumption 1, an increase in the countervailing power decreases the wholesale prices for the dominant and fringe retailers if $k < 1$, that is, $\partial w_d^*/\partial\gamma < 0$ and $\partial w_f^*/\partial\gamma < 0$ if $k < 1$.*

In contrast to the results of Christou and Papadopoulos (2015) ($\partial w_d/\partial\gamma = 0, \partial w_f/\partial\gamma = 0$), the countervailing power affects both wholesale prices when we consider demand shrinkage under negotiation breakdown. That is, we obtain different results in Lemma 3.

The partial derivative of p^* with respect to γ is:

$$\frac{\partial p^*}{\partial\gamma} = -\frac{(1-k)(bd+n)(bdk+n)n^2c}{H^2}.$$

Thus, we obtain the following result:

Proposition 1 *Under Assumption 1, an increase in the countervailing power decreases the retail price, and increases consumer surplus if $k < 1$, that is, $\partial p^*/\partial\gamma < 0$ if $k < 1$.*

To explain the mechanism behind Proposition 1, we first explain Christou and Papadopoulos's (2015) neutrality result. Their result comes from the non-profitability of "sales-shifting" across retailers. For the supplier, a loss of bargaining power leads to a lower share of the industry profits, which is nevertheless offset by a higher share of its outside option. If demand and marginal cost functions are linear, a possible gain from its outside option completely negates the loss. Thus, they have $\partial w_f^*/\partial\gamma = 0$.

In contrast, our result shows that their assumption regarding the supplier's outside option (O_s) is crucial to derive their neutrality result. In other words, if the dominant retailer works as a sales promoter of the supplier's product, the supplier's gain from its outside option is not sufficient to negate the loss of bargaining power. To overcome this loss, the supplier makes fringe retailers stronger by decreasing w_f. Although Lemma 3 and Proposition 1 have contrasting effects on the quantity of each fringe retailer, the effect in Lemma 3 dominates that in Proposition 1, leading to:

Lemma 4 *Under Assumption 1, $\partial q_f^*/\partial\gamma > 0$ for any $k < 1$. In addition, $\partial q_f^*/\partial k < 0$.*

Since a smaller k reflects a stronger bargaining power of the dominant retailer, the effect of k on w_f^*, p^*, and q_f^* has a completely reverse relation to that of γ on w_f^*, p^*, and q_f^*.

Second, we show how the value of k affects the profitabilities of the monopoly supplier and the dominant retailer. By using the first-order derivative of π_s^* with respect to k, we can show the following result:

Proposition 2 *Under Assumption 1, the profit of the monopoly supplier monotonically increases with an increase in k.*

Since a larger k reflects a stronger bargaining position of the monopoly supplier, in contrast to the effect of γ, the monopoly supplier benefits from an increase in k.

Proposition 3 *Under Assumption 1, the profit of the dominant retailer decreases with k if k is large enough.*

This proposition is a flip side of Proposition 2 because a stronger bargaining position of the monopoly supplier is more likely to decrease the profit of the dominant retailer.[7]

Finally, we examine how the number of fringe retailers, n, affects the retail price. Before we show the effect, we check the effect of n on the wholesale prices:

Lemma 5 *Under Assumption 1, an increase in the number of fringe retailers increases the wholesale prices for the fringe retailers if and only if*

$$n > bd\left(\frac{(1-k)\sqrt{2(1-k)k\gamma} - k(1-2(1-k)\gamma)}{1-2(1-k)k\gamma}\right).$$

The reason behind the result is as follows. When γ is sufficiently low, the supplier can exploit the whole industry profit by two-part tariff. Since the expansion of fringe retailers harms the

[7] Contrary to the relation between π_s and k, there is no clear relation between π_d and k because $\partial\pi_d^*/\partial k$ can be positive for sufficiently small k.

monopoly profit by reducing the retail price, the supplier raise the wholesale price for the fringe retailers. On the other hand, when γ is sufficiently high, the objective of the supplier is to enhance the profit from the outside option. When n is large, the retail price when the negotiation breaks down becomes low due to a large production of fringe retailers. To increase the retail price, the supplier raises the wholesale price.

Lemma 5 leads to the following result:

Proposition 4 *Under Assumption 1, an increase in the number of fringe retailers, n, increases the retail price and decreases consumer surplus if and only if:*

$$n > \frac{bdk(\sqrt{2\gamma}(1-k)+1)}{2(1-k)^2\gamma - 1} \quad \text{and} \quad k < 1 - \frac{1}{\sqrt{2\gamma}}. \tag{13}$$

The effect of a marginal increase in the number of fringe retailers can be decomposed into the three terms as follows:

$$\frac{dp^*}{dn} = \underbrace{\frac{\partial p^*}{\partial n}}_{\text{Direct Effect (-)}} + \underbrace{\frac{\partial p^*}{\partial w_d}\frac{\partial w_d}{\partial n}}_{\text{Cost Effect }(-/+)} + \underbrace{\frac{\partial p^*}{\partial w_f}\frac{\partial w_f}{\partial n}}_{\text{Fringe-Shrinkage Effect }(-/+)} \tag{14}$$

In fact, the last term is significantly affected by k. The intuition behind the result is as follows. The condition of the proposition requires that γ is sufficiently high. When n increases, to sustain the retail price level in which the negotiation breaks down (p_o), the supplier raises the wholesale price for the fringe retailers. Since this reduces the total output of the fringe retailers, when k is small, an increase in the wholesale price does not reduce the output so much (see Lemma 2). This implies that when n is sufficiently large and k is small, the value of last term becomes positive and large, so that it dominates the direct negative effect. Note that the right-hand side of the first fraction in (13) decreases with an increase in γ. That is, an increase in the number of fringe retailers is less likely to improve the consumer surplus when the dominant retailer has a strong bargaining power.

4 Conclusion

We consider a downstream oligopoly model with one monopoly supplier, one dominant retailer, and fringe retailers, by taking into account the role of the dominant retailer as a sales promoter of the supplier's product. We assume that the existence of the dominant retailer is important to sustain the downstream demand size at a certain level. More concretely, the demand size shrinks if the negotiation between the dominant retailer and the supplier breaks down.

We show that an increase in the buyer power possessed by a dominant retailer could decrease the retail prices for consumers as in Chen (2003), even when the demand shrinkage through negotiation breakdown is minimal. Furthermore, if the bargaining power of the dominant retailer is strong, an unconventional negative result could arise: An increase in the number of fringe retailers is more likely to increase the retail price if their number is large. In this case, conventional competition policy might backfire on consumer surplus.

We could extend the model to a two-region model in which products in two regions are geographically differentiated, and the retail market in each region comprises a dominant and several fringe retailers that trade with a local monopoly supplier. That is, each region is connected through the retail level transactions, which restrict the monopoly power of the dominant retailer in each region. Although the extension complicates the analysis, this could be a potential avenue for future research.

Appendix: Proofs

Proof of Lemma 3.

Differentiating w_f^* with respect to γ, we have:

$$\frac{\partial w_f^*}{\partial \gamma} = -\frac{(1-k)(bdk+n)(bd+n)^2 cn}{[b^2d^2k + 2n^2[1-(1-k)\gamma] + bdn(1-2\gamma+2k(1+\gamma))]^2} < 0. \tag{15}$$

Note that $w_d^* = nw_f^*/(bd+n)$ also decreases with γ. ∎

Proof of Proposition 1.

We have already shown that $\partial p^*/\partial\gamma < 0$ if $k < 1$. We define consumer surplus in equilibrium as follows:

$$CS = \frac{b(q_d^* + nq_f^*)^2}{2}.$$

Differentiating CS with respect to γ, we have

$$\frac{\partial CS}{\partial\gamma} = b(q_d^* + nq_f^*)\frac{\partial(q_d^* + nq_f^*)}{\partial\gamma} = -b^2(q_d^* + nq_f^*)\frac{\partial p^*}{\partial\gamma} > 0, \tag{16}$$

if $k < 1$. ■

Proof of Lemma 4.

Differentiating q_f^* with respect to γ, we have:

$$\frac{\partial q_f^*}{\partial\gamma} = \frac{bcn(1-k)(bd+n)(bdk+n)}{[b^2d^2k + 2n^2[1-(1-k)\gamma] + bdn(1-2\gamma+2k(1+\gamma))]^2} > 0, \tag{17}$$

if $k < 1$. Similarly, differentiating q_f^* with respect to k, we have:

$$\frac{\partial q_f^*}{\partial k} = -\frac{bcn\gamma(bd+n)^2}{[b^2d^2k + 2n^2[1-(1-k)\gamma] + bdn(1-2\gamma+2k(1+\gamma))]^2} < 0. \tag{18}$$

■

Proof of Proposition 2.

Differentiating π_s^* with respect to k, we have:

$$\begin{aligned}\frac{\partial\pi_s^*}{\partial k} \quad = \quad & \frac{n^2\gamma\left\{b^2d^2k + 2n^2[1-(1-k)\gamma] + bdn(1-2\gamma+2k(1+\gamma))\right\}^2 a^2}{4b(bdk+n)^2[b^2d^2k + 2n^2[1-(1-k)\gamma] + bdn(1-2\gamma+2k(1+\gamma))]^2} \\ & -\frac{n^2\gamma b^2(bd+n)^2(bdk+n)^2c^2}{4b(bdk+n)^2[b^2d^2k + 2n^2[1-(1-k)\gamma] + bdn(1-2\gamma+2k(1+\gamma))]^2}.\end{aligned}$$

We thus obtain the following:

$$\frac{\partial\pi_s^*}{\partial k} = 0 \Leftrightarrow c = \frac{a\left(b^2d^2k + bdn(1-2\gamma+2(1+\gamma)k) + 2n^2(1-\gamma(1-k))\right)}{b(bd+n)(bdk+n)} \equiv \hat{c}. \tag{19}$$

Note that $\partial\pi_s^*/\partial k$ is decreasing with c. Since we can show that $\hat{c} > \bar{c}$, $\partial\pi_s^*/\partial k > 0$ for all $c \in (0, \bar{c})$. ■

Proof of Proposition 3.

The partial differential of π_d with respect to k is:

$$\frac{\partial \pi_d^*}{\partial k} = -\frac{\gamma n^2 a^2}{4b(n+bdk)^2} + \frac{\gamma n^2 b(n+bd)^2((n+bdk)(2n+bd)+2\gamma(1-k)n(n+bd))c^2}{4((n+bdk)(2n+bd)-2\gamma(1-k)n(n+bd))^3}.$$

Since $\partial \pi_d^*/\partial k|_{k=1} = -\gamma n^2((2n+bd)^2a^2 - b^2(n+bd)^2c^2)/(4b(n+bd)^2(2n+bd)^2) < 0$ for any $c \in [0, \bar{c})$, the partial differential is negative around $k=1$. ■

Proof of Lemma 5.

Differentiating w_f^* with respect to n, we have:

$$\frac{\partial w_f^*}{\partial n} > 0 \Leftrightarrow n > bd\left(\frac{(1-k)\sqrt{2(1-k)k\gamma} - k(1-2(1-k)\gamma)}{1-2(1-k)k\gamma}\right). \tag{20}$$

Note that if $dw_f^*/dn > 0$, w_d^* also increases with n. ■

Proof of Proposition 4.

Differentiating p^* with respect to n, we have:

$$\frac{\partial p^*}{\partial n} > 0 \Leftrightarrow n > \frac{bdk(\sqrt{2\gamma}(1-k)+1)}{2(1-k)^2\gamma - 1}. \tag{21}$$

The condition that the denominator is positive is $k < 1 - 1/\sqrt{2\gamma}$.

Differentiating CS with respect to n, we have:

$$\frac{\partial CS}{\partial n} = b(q_d^* + nq_f^*)\frac{\partial(q_d^* + nq_f^*)}{\partial \gamma} = -b^2(q_d^* + nq_f^*)\frac{\partial p^*}{\partial n}. \tag{22}$$

Therefore, the sign of that derivative is converse to that of price. ■

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