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Exclusive Dealing and Large Distributors

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Abstract

A seminal work by Fumagalli and Motta (2006) explored that an incumbent manufacturer cannot deter an entry by exclusive dealing contract with distributors. This paper extends the flamework of Fumagalli and Motta and examines a situation in which an incumbent distributor tries to deter an entry of efficient distributor by exclusive dealing contracts with manufacturers. The result of this paper is quite opposite to that of Fumagalli and Motta. The exclusion can be successful. It is an unique equilibrium. In this sence, the effects of exclusive dealing depends on the mareket stiructure. Moreover, we extend our model with an entrant even in upstream. It may decrease the possibility of exclusion but may promote the inefficient vertical relation between the entrants.

Key words: Exclusive Dealing, Large Distributor, Entry Threat, Antitrust Policy

JEL Classification: D86, K21, L11, L13, L14, L42

1 Introduction

Whether exclusive dealing contracts prevent efficient entries or not is one of the main issues in the economic literature on vertical restraints. Recently, Fumagalli and Motta (2006) and Simpson and Wickelgren (2007) extend this issue to the case when a manufacturer offers exclusive dealing contracts to downstream distributors. This strand of literature examines the cases where one large incumbent manufacturer faces a potential efficient entrant. Their results have strong impact on the literature about exclusive dealing contracts. Fumagalli and Motta (2006), hereafter FM, have shown that when distributors compete, exclusive dealing contracts between the incumbent and

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distributors may not deter the efficient entrant[1]. We extend FM's setting and examine the effect of exclusive dealing when distributors are large and have bargaining power over upstream firms. We will show that exclusive dealing contracts between incumbents deter the efficient entrant. In this sense, the effect of exclusive dealing contracts is much different from the results of FM.

Large distributor setting is realistic and important for considering competition policies. Recently, large distributors and their buying power have a growing concern as documented in *Antitrust Law Journal* (2005), Dobson and Waterson (1999), Rey (2000) and Fumagalli and Motta (2008). So called "mega distributors", such as Wal-Mart, are highly accepted by final consumers who want to buy at low price. Many articles have been written about the observation of Wal-Mart's demanding orders for producers(e.g. Moore (1993), Norek (1997)). In addition, antitrust authorities also have become increasingly concerned about distributor's strong bargaining power (e.g. Competition Commission (2000), Federal Trade Commission (2001)). In order to capture this "buying power" aspect, we use a "large distributor model"; a model with a large incumbent in the downstream and a number of identical upstream firms.

In the literature of exclusive dealing contracts, Rasumsen et al. (1991) and Segal and Whinston (2000) have explored that exclusive dealing contracts may deter efficient entries. They have shown that buyers may not reject the exclusive dealing offer from an incumbent manufacturer when an entrant has to pay sufficient amount of entry cost. The reason is that the sales amount to a rejected buyer (or free buyer) is insufficient and the entrant cannot cover the fixed entry cost. Hence there is a possibility that all buyers accept the exclusive dealing contract. Fumagalli and Motta (2006) have shown that if buyers are distributors, this result cannot be applied. There are two main reasons. First if buyers are distributors, the sales to a rejected buyer are sufficient to cover the fixed entry cost since the distributor can sell a sufficient amount of product to consumers. Second, the benefit of rejecting the exclusive dealing offer for a buyer is significantly high, and thus it is difficult for the incumbent to compensate all opportunity costs for the exclusive dealing contracts. From those two reasons, FM concluded that it is difficult to deter the entry by offering exclusive dealing contracts to distributors.

This paper shows that the logic of this FM becomes quite opposite if an incumbent distributors

[1] Simpson and Wickelgren (2007) have shown that when exclusive dealing contracts are breachable by paying expectation damage, one of the equilibrium is that entrant can enter the market even with fully signed exclusive dealing contracts by all distributors. However, in this equilibrium, the retail market price is as high as in the case of upstream monopoly. And they conclude exclusive dealing contracts are inefficient resulting monopoly price and underproduction.

offer exclusive dealing contracts to manufacturers to prevent an efficient entrant distributor. Since we assume there is no entry cost, the minimum capacity problem explored by Rasumsen et al. (1991) and Segal and Whinston (2000) does not exist. Instead, we focus on the second point of the reasons of FM. In FM, by rejecting the offer, the distributor can get sufficient profit since the incumbent and the entrant compete with each other by their wholesale prices. On the other hand, in our model, a manufacturer rejected the offer cannot get sufficient profit, since the competition between the incumbent distributor and the entrant distributor decrease the retail price and the profit of manufacturers. Hence the incumbent distributor may be able to pay the all opportunity costs for accepting the exclusive contracts of manufacturers and deter the entry as long as the number of incumbent manufacturers is not so high.

Our result also contrasts sharply to Chicago school's argument (such as Posner (1976), Bork (1978)) that insisted an incumbent firm cannot exclude an efficient entrant by exclusive dealing contracts. Basic logic of the argument is that the efficient entrant can generate higher surplus than the (inefficient) incumbent and thus it is impossible for the incumbent to compensate the higher surplus and to deter the entry. In the large distributor model, however, the incumbent distributor does not have to compensate the total surplus. It only has to compensate the gains of a manufacturer and the efficient distributor. Since the retail price competition between an incumbent distributor and an entrant distributor makes the retail price lower than the monopoly price, the profits of manufacturers and distributors may not become so high although the consumers' surplus must be higher than the no-entry case. This means the necessary compensation level becomes not so high, and it may become possible for the incumbent distributor to pay the all necessary compensations and to exclude an efficient entry by the exclusive dealing contract.

By using this result, we extend our model to a situation with an inefficient entrant in the upstream. We will show that such inefficient entrants may decrease the possibility of agreement of exclusive dealing contract. However, with fully signed exclusive contracts, the efficient entrant distributor decides to enter the market by trading with the inefficient manufacturer. This is another source of inefficiency caused by the inefficient entry in the upstream.

This paper is organized in the following way. Section 2 presents the basic model with large distributor. It provides the case where there are N identical producers and shows the condition of entry deterrence. Section 3 compares our result with FM's result and analyze what causes this difference. Section 4 analyses the case where an inefficient entrant emerges at upstream in addition to N firms and compare the difficulties of entry deterrence with the result in Section 2.

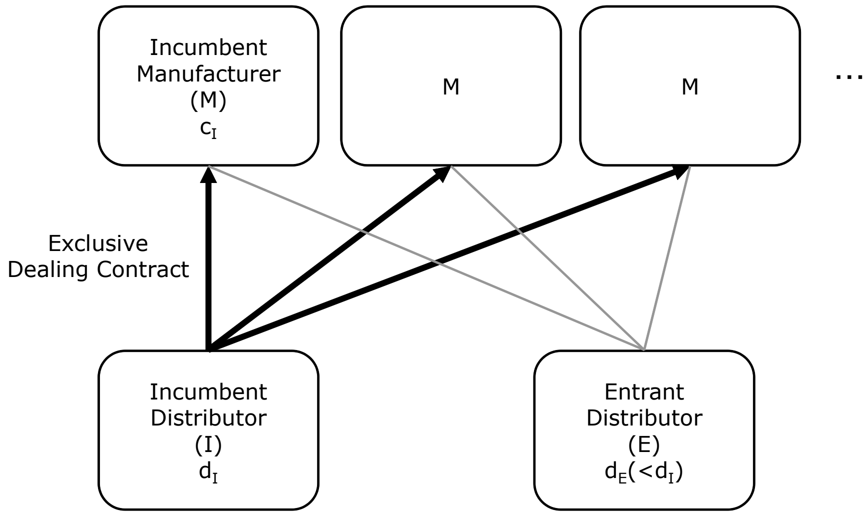

Figure 1: The Large Distributor Model

Finally, Section 5 concludes this paper including some policy implications.

2 The Large Distributor Model

2.1 The Basic Model

We present a simple manufacturer-distributor model. In order to simplify the argument, we assume that demand of final consumers is 1 as long as the retail price is equal or lower than v and that is 0 if the retail price is higher than v[2]. There are N (≥ 2) identical manufacturers (M) whose constant marginal cost is c_I. There is no fixed cost for production. On the other hand, there is one incumbent distributor (ID) who faces a potential entrant distributor (ED). The marginal distribution cost of the incumbent distributor is d_I and that of the entrant distributor is d_E. We assume that $d_I > d_E$, thus the entrant is more efficient than the incumbent (see Figure 1). To enter the downstream market, we assume that ED does not have to pay any entry cost. Moreover, we assume that $v \geq d_I + c_I$.

Before the new distributor decides to enter the market, the incumbent distributor offers exclusive dealing contracts to manufacturers. The contracts commit manufacturers, if they sign, to sell their products only to the incumbent distributor. All contracts are offered simultaneously and

[2] In this sense, this paper does not treat the minimum capacity problem, which is explored by Rasmusen et al (1991). Even if we assume a downward sloping demand function, qualitative property of our results does not change.

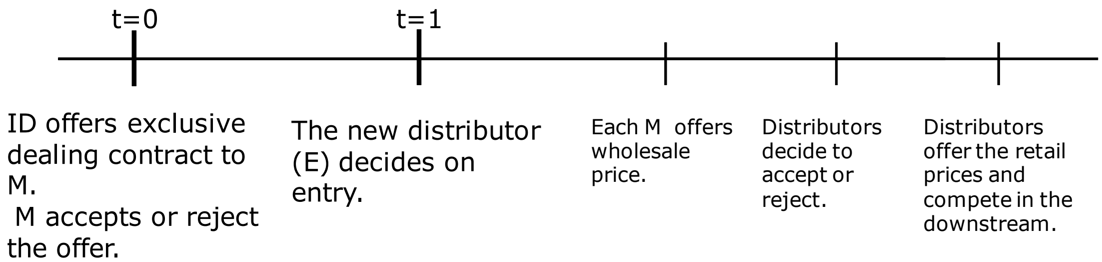

Figure 2: Timing

nondiscriminatory. S denotes the number of manufacturers that accepted the exclusive dealing contract. In order to induce manufacturers to sign the contract, ID offers a compensation x to each manufacturer. As assumed in FM, any commitments on wholesale prices or distribution margins are not included in the contract. We assume that contracts cannot be breached also as assumed in FM.

The timing of the game is as follows (also see Figure 2). At t=0, the incumbent distributor offers manufacturers exclusive dealing contracts. At t=1, we have four stages. First, after observing S, the efficient entrant distributor decides to enter or not. Second, manufacturers compete with the wholesale prices. Third, distributors decide which manufacturers they will buy from. Finally, distributors engage in retail price competition a la Bertrand. Here we adopt the tie-break rule as in the literature, that is, most efficient firm wins price competition if more than two price offers are the same. We look for subgame perfect Nash equilibria of this game and examine the effect of efficient entry at the downstream level.

2.2 Effect of Exclusive Contracts

First we examine the market equilibrium when there is no exclusive contract. Since all manufacturers have the same cost function, the wholesale price competition among the manufacturers makes the equilibrium wholesale price, w^* equal to the marginal production cost, that is $w^* = c_I$. Given the equilibrium wholesale price, the equilibrium retail price, p^* becomes $p^* = c_I + d_I$ since $d_I > d_E$. From this competition, the entrant gets $\pi_E = p^* - (c_I + d_E) = d_I - d_E$ and the incumbent gets zero. Hence, in order to prevent the entry, the incumbent distributor has an incentive to offer an exclusive dealing contract to manufacturers before the entry of new distributor. The effectiveness of exclusive dealing contracts depends upon whether the compensation payment, x is affordably low or too high to offer.

To derive the necessary compensation level, we should examine how much a manufacturer can get by rejecting an exclusive dealing contract. Suppose the incumbent distributor offered a exclusive dealing contract and all manufacturers accepted the offer, that is $S = N$. In this case, no manufacturer can supply a product to the entrant, and the entrant distributor does not enter the market [3]. By the wholesale price competition among the signed manufacturers, the equilibrium wholesale price, denoted by w_I^N (N denotes the number of signer) becomes $w_I^N = c_I$, and the incumbent distributor can set the retail price, p_I as $p_I = v$. The profit of the incumbent, π_I (without including the compensation payment x) and that of manufacturers (π_M^S and S denotes "sign") become

$$\begin{aligned} \pi_I &= v - c_I - d_I, \\ \pi_M^S &= 0. \end{aligned} \tag{1}$$

Next, suppose one manufacturer rejected the offer (hereafter we call it "outsider"), that is $S = N - 1$. In this case, the entrant manufacturer has an incentive to enter the market, but the wholesale price offer to the entrant may different from that to the incumbent since only the outsider can supply the product to the entrant. Since all manufacturers including the outsider has a chance to supply the product to the incumbent manufacturer, the wholesale price to the incumbent, w_I becomes $w_I = c_I$ by the price competition among manufacturers. On the other hand, only the outsider supplies the product to the entrant, and it has an incentive to raise up the wholesale price offer to the entrant, $w_E > c_I$. We will explore how the optimal level of w_E should be determined below.

Given these wholesale prices, the two distributors set their retail prices. The outcome of this price competition is very simple. If $w_I + d_I = c_I + d_I \geq w_E + d_E$, the entrant wins the retail price competition and get the profit $c_I + d_I - (w_E + d_E)$. On the other hand, if $w_I + d_I = c_I + d_I < w_E + d_E$, the incumbent wins the price competition and get the profit $w_E + d_E - (c_I + d_I)$.

Since the outsider can anticipate this outcome, it should set its wholesale price to be $w_E = c_I + d_I - d_E$ and it can get the profit denoted by π_O, $\pi_O = d_I - d_E$. With this outsider's wholesale price, the profit of the entrant is $c_I + d_I - (w_E + d_E) = 0$ and the incumbent loses the retail price competition and gets nothing. This outcome might be extreme. Since the entrant distributor

[3] Since we have assumed there is not entry cost, we can also say that the entrant did enter the market but has chosen to be inactive.

is an important partner for the outsider, the outsider might not have such a strong bargaining power to the entrant distributor. Hence we will examine more general cases below, but here we analyze this extreme case in which the outsider can seize such high profit.

If the compensation level is equal to the profit of the outsider when $S = N - 1$, any manufacturers has no incentive to reject the exclusive contract. Hence the necessary compensation level, x^* becomes as follows, $x^* = \pi_O = d_I - d_E$[4]. Next, we must check whether this necessary compensation level is too high for the incumbent distributor to offer or not, that is whether the incumbent can get more than (or equal to) Nx^* by deterring the entrant. The incumbent can get $\pi_I = v - c_I - d_I$ when $S = N$. This means that as long as $v - c_I - d_I - Nx^* \geq 0$, the incumbent distributor has an incentive to offer the exclusive dealing contract and the entry of the entrant distributor will be deterred in equilibrium. Thus we get the following maximum N, N^*, which sustains the exclusion[5].

$$\begin{aligned} & v - c_I - d_I - N(d_I - d_E) \geq 0 \Leftrightarrow \\ & N \leq N^* = \frac{(v - c_I - d_I)}{d_I - d_E}. \end{aligned} \tag{2}$$

In the argument above we have only checked the case where there is only one outsider. If there are more than one outsider, how does the outcome change? To answer this question, let us suppose there are $N - S (\geq 2)$ outsiders. Even in this case, the wholesale price to the incumbent must be equal to the marginal production cost, that is $w_I = c_I$. On the other hand, the wholesale price to the entrant may differ from the previous case. It is $w_E = c_I$ since the price competition among the outsiders would occur. Hence in the retail price competition, the entrant wins and gets the profit $d_I - d_E$, but the outsiders get nothing. This means the necessary compensation level is zero. Thus, it is sufficient to consider one outsider case to derive the necessary compensation level. We summarize this outcome above in the next proposition[6].This outcome contrasts sharply to the FM model.

Proposition 1 *If an incumbent distributor faces an efficient entrant and the number of upstream*

[4] We assume that if manufacturares are indifferent between signing and rejecting, they sign. In other words, the incumbent offers $x^* = \pi_o + \delta$ and δ is very small.

[5] Hereafter, let us ignore the integer problem for simplicity.

[6] Note that even if we assume the exclusive dealing contracts are breachable by paying expectation damage, we have an unique exclusion equilibrium.

In the large distributor model, we do not have multiple equilibrium that Simpson and Wickelgren (2007) have without assuming product defferenciation.

firm is less than $N^* = (v - c_I - d_I)/(d_I - d_E)$, there exists an unique equilibrium where the incumbent excludes the entrant by exclusive dealing contracts.

Proof. (1) First, we examine the market equilibrium when $S = N$. If $S = N$, no manufacturer supply the product to the entrant distributor. Hence the incumbent distributor chooses its retail price to be equal to v. On the other hand, the equilibrium wholesale price should be c_I by the price competition among the signed manufacturers. Thus the incumbent distributor gets $\pi_I = v - c_I - d_I$ and signed manufacturers get nothing.

(2) Next, we examine the case in which $S = N - 1$, that is there is only one outsider. By the price competition between the entrant manufacturer and the incumbent manufacturer, the equilibrium retail price p^* becomes $p^* = Max[w_I + d_I, w_E + d_E]$. The incumbent distributor gets $Max[0, w_E + d_E - w_I - d_I]$ and the entrant distributor gets $Max[0, w_I + d_I - w_E - d_E]$. Since all manufacturers (including the outsider) have a chance to supply the product to the Incumbent distributor, the wholesale price competition among the manufacturers realizes $w_I = c_I$. On the other hand, only the outsider can supply the product to the entrant distributor. Hence the outsider has a chance to set its wholesale price for entrant, w_E, $w_E > c_I$. The optimal wholesale pricing, w_E, for the outsider is derived by solving the following problem

$$\begin{aligned} &Max \quad w_E - c_I \\ &s.t. \quad\;\; w_E + d_E \le c_I + d_I. \end{aligned}$$

Hence the optimal w_E is $w_E = c_I + d_I - d_E$ and the profit of the outsider is $\pi_O = d_I - d_E$.

(3) When $S \le N - 2$, that is there are more than or equal to two outsiders. Even in this case, $p^* = Max[w_I + d_I, w_E + d_E]$, the incumbent distributor gets $Max[0, w_E + d_E - w_I - d_I]$, and the entrant distributor gets $Max[0, w_I + d_I - w_E - d_E]$. Moreover, $w_I = c_I$ by the price competition among manufacturers. w_E becomes different, however. Since there are at least two outsiders, by the price competition among outsiders, $w_E = c_I$. Hence all signed manufacturers and all outsiders get zero profit and $p^* = c_I + d_I$. The incumbent distributor gets zero and the entrant distributor gets $d_I - d_E > 0$.

(4) Since all manufacturers can expect those outcomes at t=0, a manufacturer has an incentive to reject the exclusive dealing contract If $x < d_I - d_E$. Hence, x should be equal to the deviation profit $\pi_O (= d_I - d_E)$.

(5) Lastly we should check whether the incumbent distributor has an incentive to pay xN or not. Since $\pi_I = v - c_I - d_I$ when $S = N$, $v - c_I - d_I \ge (d_I - d_E\,)N$ is the profitability condition

for the incumbent distributor who offers the exclusive dealing contract to all N manufacturers. By rearranging this condition, we get the resultof the proposition. ■

In the next section, we will examine why our result is quite opposite to that of FM. Before that, we will check the robustness of this result. First, we examine the situation in which distributors offer the wholesale price to the manufacturers. Even if the incumbent distributor offers a wholesale price to manufacturers, the wholesale price is $w_I = c_I$ since this offer is the best for the incumbent. As long as the offer is a type of "take-it-or-leave-it", signed manufacturers should accept the offer. If the entrant distributor has a bargaining power to offer such take-it-or-leave-it wholesale price offer to the outsider, the entrant also sets $w_E = c_I$. This means the outsider get zero profit and the necessary compensation level is zero. Hence the entry deterrence can be realized for any N.

Next, we examine the situation in which the entrant distributor has a partial bargaining power to the outsider. In the previous argument, we have assumed that even though the outsider-entrant line (the vertical structure) can get $d_I - d_E$ but all of this rent goes to the outsider by the high wholesale price offered to the entrant distributor. In some cases, however, the entrant may bargain with the outsider about the wholesale price (i.e. the sharing of the rent). In particular, the entrant distributor can negotiate the wholesale price with the outsider, and the entrant can get a bargaining power against the outsider. In order to incorporate such possibility, let us assume that the wholesale price from the outsider to the entrant distributor, w_E becomes as follows,

$$w_E = c_I + \theta(d_I - d_E). \tag{3}$$

θ is the parameter of the outsider's bargaining power and $0 \leq \theta \leq 1$. The outsider and the entrant separate the integrated profit by this proportion denoted by θ. Given this wholesale price, the entrant distributor sets the retail price as $c_I + d_I$ to win the price competition to the incumbent distributor. Then the entrant gets

$$\pi_E = c_I + d_I - c_I - \theta(d_I - d_E) - d_E = (1 - \theta)(d_I - d_E).$$

In this case, the necessary compensation level becomes, $x^* = \theta(d_I - d_E)$. Hence the profit function of the incumbent when N manufacturers accepted the compensation x^* is

$$\begin{aligned} & v - c_I - d_I - Nx^* \\ = \ & v - c_I - d_I - N\theta(d_I - d_E) \end{aligned}$$

From this profit function we get the incumbent's participation constraint as follows;

$$N \leq N^*(\theta) = \frac{(v - c_I - d_I)}{\theta(d_I - d_E)}. \tag{4}$$

The previous extreme case is corresponding to the case when $\theta = 1$. If $\theta < 1$, $N^* < N^*(\theta)$and it becomes easier to realize the entry deterrence by the incumbent distributor[7].

3 The FM Model

3.1 FM's Main Results

In this section, we summarize the basic result of Fumagalli and Motta (2006) to compare their result with ours. We also examine our result's robustness by introducing the small fixed cost as FM in the following subsection.

First, we explain a simple version of FM's model briefly. An incumbent manufacturer (I) produces a good at a constant marginal cost, c_I. There are $N(\geq 2)$ downstream firms (D) each with identical marginal distribution cost, d_I. We assume the final consumers' demand is $Q = 1$ and the reservation price is v for simplicity[8]. A potential entrant manufacturer (E) with a lower marginal cost $c_E < c_I$ is willing to enter the upstream market. We also assume there is not fixed entry cost in this simple version of the model[9].

The timing of the game is as follows. At t=0, the incumbent offers exclusive dealing contracts to the downstream firms that requires signers to purchase only from the incumbent. Distributors

[7] Furthermore, when $\theta < 1$, we can apply this argument even in the case that $N = 1$. Let us explain this case briefly. Here we assume the manufacturer's bargaining power is denoted by θ both against the incumbent and the entrant for simplicity.

When $S = N = 1$, $w_I = \theta(v-c_I-d_I)$ and $\pi_I = (1-\theta)(v-c_I-d_I)-Nx^*$. On the other hand, when $S = N-1 = 0$, The incumbent distributor cannot have lower cost than the entrant, and the entrant distributor sets its retail price be v and the wholesale price becomes, $w_E = \theta(v - c_I - d_E)$. Thus $x^* = \theta(v - c_I - d_E)$, and the condition for successful exclusion becomes as follows; $\pi_I = (1-\theta)(v-c_I-d_I)-x^* \geq 0 \Longleftrightarrow \theta \leq (v-c_I-d_I)/(2(v-c_I)-d_I-d_E)$

Hence, if the bargaining power of the manufacturer is not so high, the exclusive dealing contract can deter the entrant even if there exists only one manufacturer. This means that even if the manufacturer has established its brand name or competes in the differentiated market, the exclusive dealing contract can be work as entry deterrence device of the incumbent, when the bargaining power is distributed relatively low to the manufacturer.

[8] Although the original FM model treats a linear demand function, here we assume this unit demand fuction for simplicity.

[9] The original version of FM considers entry cost and examines the minimum capacity constranit problem which is explored by Rasumsen et al. (1991) and Segal and Whinston (2000). FM has shown that exclusion is impossible even if there is entry cost.

determine to accept or reject it. To induce distributors to sign the contract, the incumbent offers each distributor a compensation x. In addition, the contracts cannot be breached and do not include any commitments on future prices. Although Fumagalli and Motta examined more general cases, here we focus on the case of simultaneous and nondiscriminatory contract offers. S denotes the number of distributors that accept the contract. At t=1, we have four stages. First, having observed S, the entrant decides to enter or not. Second, active upstream firms offer their wholesale prices to distributors. The incumbent can offer different prices to signers and to free distributors (here we call them "outsiders" as in the previous section). We denote the incumbent's offer by w_I^S and w_I^o respectively (s means "signer", and o means "free outsider"). E can offer wholesale prices w_E only to outsiders. We adopt the tie-break rule that at equal prices distributors choose more efficient firm. Third, distributors decide which offer to accept, or reject all. Finally, distributors compete in the final market. They offer each retail price to the final consumers and final consumers buy at the lowest-price distributor.

First we examine the game at t=2. If $S = N$, that is all distributors signed the contract. the entrant does not enter the market since there is no distributor who can trade with the entrant. In this situation the incumbent sets its wholesale price, $w_I^S = v - d_I$ to all distributors and gets the profit $\pi_I = v - d_I - c_I - Nx$. On the other hand, distributors have to set their retail price v with this wholesale price and get nothing.

Next, let suppose $S = N - 1$, that is, one distributor rejected the offer from the incumbent. In this case, the entrant manufacturer has an incentive to enter the upstream market. Thus the equilibrium wholesale price to the outsider is determined by the price competition between the incumbent and the entrant. Since the entrant has lower marginal cost, the entrant wins the competition and the equilibrium wholesale price becomes $w_I^o = w_E = c_I$. On the other hand, only the incumbent sells the product to the signed distributor. Here we suppose that the wholesale price from the incumbent manufacturer to the signed distributor is, w_I^S, and consider the retail price competition. In this case the total cost (wholesale price plus distribution cost) for the signed distributor is $w_I^S + d_I$ and that for the outsider is $c_I + d_I$. However, w_I^S must be equal or higher than c_I since the production cost for the incumbent manufacturer is c_I. This means that $w_I^S + d_I \geq c_I + d_I$ and the outsider always wins the price competition in the retail market. The profit of the outsider is $\pi_O = w_I^S - c_I$. How much the outsider can get is dependent upon w_I^S . π_O can be $v - c_I - d_I$ at most, and 0 at least. Since the incumbent cannot get any profit by setting any w_I^S (as long as $w_I^S \geq c_I$), the level of w_I^S is indeterminate and there are multiple equilibria.

At t=0, the incumbent should offer $x \geq \pi_O$. Because π_O is indeterminate and it may be too large for incumbent to offer, i.e. $Nx > \pi_I$. Therefore we also have multiple equilibria at t=0. Both exclusion and entry can occur at the equilibria.

In order to eliminate this multiplicity, Fumagalli and Motta introduced a small but positive fixed cost for distributors. The cost is denoted by ε, and $\varepsilon > 0$. In this positive fixed cost case, distributors choose whether to be active or not at the third stage of t=1 (that is after observing the all wholesale prices). This assumption can be interpreted as distributors will not purchase any goods if they anticipate that they cannot win the retail price competition. In this case, there exists only an exclusion equilibrium. Consider the case in which $S = N - 1$. The entrant enters the upstream market and offers the wholesale price $w_I^o = c_I$. On the other hand, the incumbent offers the wholesale price w_I^S to the signed distributor, but $w_I^S + d_I \geq c_I + d_I$ and it can be expected that the outsider wins the price competition even if the signed distributor accepted the offer. Thus, the signer must choose to be inactive when it must pay the positive fixed cost for distribution. Then the outsider can monopolize the retail market and it is the best strategy for it to offer the monopoly retail price v. By this strategy, its profit becomes $\pi_O = v - c_I - d_I - \varepsilon$. Since all players can anticipate this outcome, the necessary compensation level should be $x = \pi_O$ $= v - c_I - d_I - \varepsilon$. We should remind $w_I^S = v - d_I - \varepsilon$ and $\pi_I = v - d_I - c_I - \varepsilon - Nx$ when $S = N$. Hence the compensation level above is too high and $\pi_I = v - d_I - c_I - \varepsilon - N(v - c_I - d_I - \varepsilon) < 0$ since we assume that $N \geq 2$. This means that the incumbent cannot deter the entry by the exclusive dealing contract, and there must be only entry equilibria.

As a conclusion, in FM model, it is impossible for an inefficient manufacturer to deter an efficient entrant manufacturer by exclusive dealing contracts as long as downstream firms should pay very small fixed cost. If there is no fixed cost, the exclusion can be one of the equilibria.

Our result is sharply different from the result of FM mainly in the following two points. One is that the equilibrium at t=0 is unique in our model even without considering any fixed cost assumptions. The other point is that exclusion of the efficient entrant occurs at the equilibrium. Regarding the first point, even if an outsider exists, the signed manufacturers still have a chance to win in our model. Hence the whole sale price competition occurs severely and it generates the unique outcome. On the other hand, in FM model, the incumbent manufacturer realizes that it cannot win if there is an outsider and thus the wholesale price offer from it becomes indeterminate.

The second difference comes from the following reason. When there is an outside distributor in FM, the incumbent manufacturer and an entrant manufacturer compete and the wholesale price offer to the outsider becomes low. That means this competition raises the profit of the outsider and the necessary compensation level. On the other hand, in our model, the competition of the incumbent distributor and the entrant distributor decreases the equilibrium retail price and thus it does not increase the profit of the outsider. Hence it is not impossible for the incumbent distributor to deter an efficient distributor. This is an intuitive reason why the outcome of this paper is quite opposite to that of FM. The outcome shows that effects of exclusive dealing contracts are not so simple as we have imaged before. Whether the contract is offered from a manufacturer or a distributor is crucial for the outcome and the judgment of the contract.

3.2 Large Distributor Model with Fixed Cost Assumption

Now we will show that even if downstream firms (both of the incumbent and the entrant) have to cover a small but positive fixed cost ε as Fumagalli and Motta (2006), our results do not change. To incorporate this assumption, we now introduce one additional stage just before the fourth stage at t=1. Before the retail price offering, distributors choose to be active or inactive[10].

Suppose one manufacturer rejected the offer, that is $S = N - 1$. In this case, as explained in the previous section, the wholesale price to the incumbent, w_I becomes $w_I = c_I$ by the price competition among manufacturers. On the other hand, only the outsider supplies the product to the entrant. It follows that the outsider raises up the wholesale price offer to the entrant, $w_E > c_I$.

If $w_E > c_I + (d_I - d_E)$, the incumbent would be active since the total marginal cost of the incumbent, $c_I + d_I$, is lower than that of the entrant, $w_E + d_E$. In this case, the incumbent can win the retail price competition. In other words, the entrant becomes inactive since it would surely lose in the retail price competition. The outsider gains nothing by rejecting the contract. Hence it is not the best strategy for the outsider to set $w_E > c_I + (d_I - d_E)$. On the other hand, if $w_E = c_I + \theta(d_I - d_E)$ and $0 \leq \theta \leq 1$, the incumbent becomes inactive since $c_I + d_I \geq w_E + d_E$[11]. Hence the entrant distributor has a chance to set its retail price is equal to v and gets $v - d_E - w_E$. The profit of the entrant is, however,

$$\pi_E = c_I + d_I - c_I - \theta(d_I - d_E) - d_E - \varepsilon = (1 - \theta)(d_I - d_E) - \varepsilon. \tag{5}$$

[10] We assume that the wholesale price from the outsider to the entrant distributor, w_E is determined by Nash bargaining between the entrant and the outsider with θ the parameter of the outsider's bargaining power and $0 \leq \theta \leq 1$. It include the result when manufacturers can offer wholesale price to distributors with $\theta = 1$.

[11] From the assumption about the tie-breaking rule, the incumbent cannot win the price competition if $c_I + d_I = w_E + d_E$.

and we assume ε is small enough and that $(1-\theta)(d_I - d_E) - \varepsilon > 0$.

This is just same as the profit in the previous section. Therefore, the necessary compensation level x is just same as the result in the previous section ($x^* = \theta(d_I - d_E)$), and we get the following condition;

$$\pi_I \geq 0 \Longleftrightarrow N \leq N'(\theta) = \frac{(v - c_I - d_I - \varepsilon)}{\theta(d_I - d_E)}. \tag{6}$$

In particular, when $\theta = 1$, $N \leq N'(1) = (v - c_I - d_I - \varepsilon)/(d_I - d_E)$ and $N'(1) = N^*$ as $\varepsilon \longrightarrow 0$. That means even if there is a small but positive fixed cost as in the Fumagalli and Motta (2006), our argument in the previous section is not affected at all. The intuitive reason of this result is simple. In this model with fixed costs, the incumbent may become inactive if it has no chance to win the retail price competition, but it only raises the profit of the entrant distributor. If the outsider offers too high wholesale prices, the incumbent has a chance to win the retail price competition with a signer. Thus the outsider cannot raise the retail price sufficiently to absorb the increased profit of the entrant. As a result, the outsider cannot get any extra gain even if there is a fixed cost and the exclusive dealing contract can work successfully for the exclusion of entrants.

This result is still quite contrast to that of Fumagalli and Motta (2006). In the case of FM, the outsider is a distributor. Hence if other distributors became inactive, it can get very high profit by absorbing consumer surplus. On the other hand, the outsider is a manufacturer in this model. It cannot set such a high wholesale price to absorb consumer surplus, because of the threat of the signers. Therefore the outsider cannot get high payoff[12].

4 One Weak Entry at Upstream in the Large Distributor Model

In this section we introduce an entrant at upstream as in Figure 3[13]. Similar to Aghion and Bolton (1987), we assume the marginal cost of an entrant manufacturer (EM), c_E, is uncertain ex

[12] One might consider the case in which manufacturer have to pay the small fixed cost to compare the setting of FM. Even if we consider such fixed cost, however, any manufacturers do not become inactive, since all manufacturers have same cost condition and all of them have a chance to win the wholesale price competition. Hence even if we introduce the fixed cost assumption in the upstream market, we do not get the same result with FM.

[13] As Whinston (2004) states, the literature has been limited to "one buyer and several sellers, or between one seller and several buyers" (pp.175). To answer more realistic questions, "models with competing sellers and more than one buyer" and "[f]urther study of multiseller/multibuyer models" should be a high priority (pp.177). By introducing entrants both in the upstream and the downstream, we challenge the question raised by Whinston.

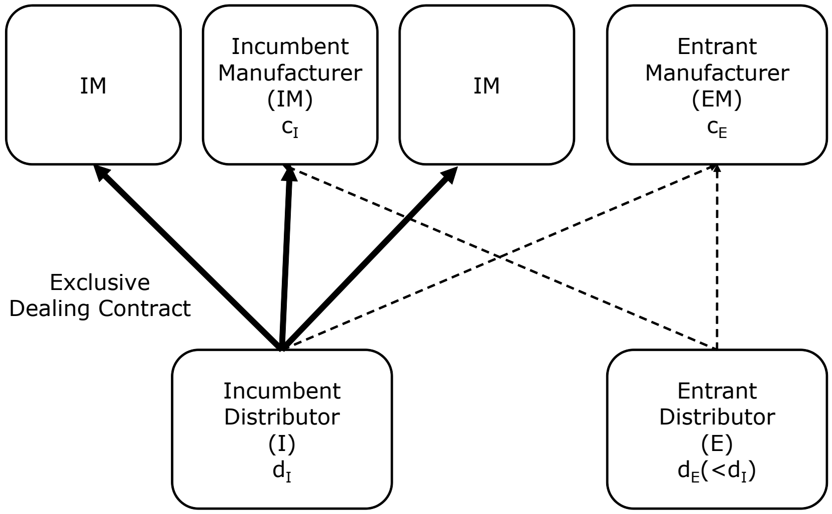

Figure 3: A Weak Entrant Manufacturer (EM)

ante[14]. At t=0, all players know that c_E is $c_E^L(> c_I)$ with probability $q(> 0)$ and $c_E^H(> c_E^L > c_I)$ with probability $(1 - q)$, that is the entrant manufacturer is less efficient than the incumbent manufacturer[15]. We assume that $c_E^H + d_E > c_I + d_I > c_E^L + d_E$ and $v \geq c_E^H + d_I$. At t=1, c_E realizes and all players recognize the realized value of c_E.

The weak entrant modifies the game slightly. At t=0, the incumbent distributor offers exclusive dealing contracts to manufacturers. At t=1, we have four stages. First, after observing S, the efficient entrant distributor (E) and the inefficient manufacturer (EM) decide to enter or not. Second, manufacturers offer wholesale prices to distributors. We denote the offers to I and E from EM by w_I^E and w_E^E respectively. Third, distributors decide whether they want to be active or not. In this model, we assume that the small positive fixed cost, $\varepsilon > 0$ for distributors cover as in Fumagalli and Motta model described above[16]. Then, the active distributors accept or reject each wholesale price offer they receive. Finally, distributors engage in retail price competition a la Bertrand[17].

[14] Even if we assume there is no uncertainty about EM's cost, qualitative property of our result does not change at all.

[15] Later in this section, we examine the case of $c_E^L < c_I$, i.e. there is a possibility that the entrant manufacturer is more efficient than the incumbent manufacturer.

[16] We apply the positive fixed cost assumption to eliminate multiplicity of wholesale price equilibrium as FM do. However, even without the fixed cost assumption, we only have $S = N$ at the equilibrium with appropriate parameters in our model unlike FM's result. We just assume the positive fixed cost for notation simplicity.

[17] Here we will not introduce Nash bargaining to determine wholesale price. As we showed in Section 2, Nash bargaining will reduce the necessary amount of x. This if an exclusion equilibrium exists without Nash bargaining

In this case, even if $S = N$, the entrant distributor can be active in the retail market when $c_E = c_E^L$. Since $c_I + d_I \geq c_E^L + d_E$, the pair of E and EM has cost advantage and the incumbent distributor cannot exclude the entrant even with fully signed contracts ($S = N$).

When $S = N$, the equilibrium wholesale price to the incumbent distributor, w_I^N should be equal to c_I by the price competition among all manufacturers (including the entrant manufacturer). Since $c_E^L > c_I$, w_I^E becomes higher than c_I and does not affect the equilibrium wholesale price to the incumbent distributor. On the other hand, only the entrant manufacturer can supply the product to the entrant distributor. Hence, the manufacturer absorbs the extra profit by raising the wholesale price. By the fact that the entrant distributor wins the retail price competition as long as $w_E^E + d_E \leq c_I + d_I$, the optimal wholesale price should be $w_E^E = c_I + d_I - d_E$ and the entrant manufacturer gets $w_E^E - c_E^L = c_I + d_I - c_E^L - d_E > 0$. All (signed) incumbent manufacturers get zero. By observing those wholesale prices, the incumbent distributor decides to be inactive since $w_I + d_I \geq w_E^E + d_E$. As a result, the entrant distributor chooses the monopoly retail price, $p = v$ and gets the profit $\pi_E = v - c_I - d_E - \varepsilon$. In this $c_E = c_E^L$ case, the efficient entrant distributor can be survived, but the inefficient entrant manufacturer supplies the product to the distributor.

On the other hand, when $c_E = c_E^H$, the incumbent distributor can exclude the efficient entrant since $c_I + d_I < c_E^H + d_E$. Even with the entrant manufacturer, the entrant distributor has no competitiveness. We will show this point. The wholesale price offer from the entrant manufacturer is equal or higher than c_E^H, $w_E^E \geq c_E^H$. On the other hand, the signers compete a la Bertrand and $w_I^N = c_I$. Hence $c_I + d_I < w_E^E + d_E$ and the entrant distributor chooses to be inactive. The retail price becomes $p = v$ and the incumbent distributor gets $\pi_I = v - c_I - d_I - \varepsilon$. In summary, at t=0, the expected payoff of the incumbent distributor is $E[\pi_I] = (1-q)(v - c_I - d_I - \varepsilon)$ and that of the (signed) incumbent manufacturers is 0 as long as $S = N$..

Next, to derive the optimal compensation level of x, let us suppose that $S = N - 1$ (one outsider exists) and examine how much the outsider can get. First we check the case $c_E = c_E^H$ (and $c_I + d_I < c_E^H + d_E$). In this case, the entrant manufacturer does not affect the market equilibrium at all. the wholesale price to the incumbent distributor becomes, $w_I = c_I$ by the price competition among manufacturers, and the entrant manufacturer does not affect the equilibrium price since $c_E^H > c_I$. The outsider maximizes the wholesale price to the entrant distributor under the constraint that the entrant distributor wins the retail price competition, and the equilibrium

scheme, there surely exits an exclusion equilibrium under Nash bargaining scheme.

wholesale price to the entrant distributor become $w_E = c_I + (d_I - d_E)$. Once again the entrant manufacturer is not effective since c_E^H is higher than this w_E. Thus the outsider can get the profit, $w_E - c_I = d_I - d_E$.

On the other hand, when c_E^L is realized, the outsider has to compete with the entrant manufacturer for supplying the product to the entrant manufacturer. By the wholesale price competition, $w_E = c_E^L$ and the outsider gets $c_E^L - c_I$. The wholesale price to the incumbent manufacturer becomes $w_I = c_I$ by the price competition among manufacturers. Since $w_I + d_I \geq w_E + d_E$, the entrant distributor wins the retail price competition even in this case. In summary, if one incumbent manufacturer rejected the offer (i.e. becoming the outsider), it can get $d_I - d_E$ with probability $1-q$ and $c_E^L - c_I$ with probability q, but the incumbent distributor gets nothing. This means the necessary compensation level, x^* should be $(1-q)(d_I - d_E) + q(c_E^L - c_I)$.

Hence, the exclusive dealing contracts are fully signed if the number of the incumbent manufacturers satisfies the following condition[18];

$$N \leq N^{**} = \frac{(1-q)(v - c_I - d_I - \varepsilon)}{(1-q)(d_I - d_E) + q(c_E^L - c_I)}. \tag{7}$$

The number of upstream incumbent firms is less than N^{**}, exclusive dealing contracts can be signed by all incumbent upstream firms. In this "fully signed" equilibrium, when $c_E = c_E^H (\geq c_I + d_I - d_E)$, the efficient entrant distributor cannot enter the market. Obviously it generates social inefficiency. Furthermore, when c_E^L is realized, the efficient entrant distributor trades with the inefficient entrant manufacturer and wins the retail market competition. In other words, even by the exclusive dealing contracts, an entrant distributor may not be excluded but an inefficient entrant manufacturer can enter the market. It is another source of social inefficiency.

N^{**} should be lower than N^*. It implies that the existence of entrant manufacturer makes exclusion more difficult. The intuitive reason is as follows. If the cost condition of the entrant manufacturer is not so bad, c_E^L, the incumbent distributor cannot get positive profit even if all Incumbent manufacturers signed the exclusive contracts at t=0 since the combination of the entrants (E and EM) is more efficient than that of the incumbents. On the other hand, the outsider can get positive profit even when $c_E = c_E^L$. Hence the compensation level becomes relatively high for the incumbent distributor and it is more difficult to exclude the entrant distributor. Proposition 2 summarize the analysis.

[18] If we do not assume the small fixed cost $\varepsilon > 0$ for distributors the This condition becomes $\pi_I \geq 0 \iff N \leq N^{**} = \frac{(1-q)(\min(v, w_E^E + d_E) - c_I - d_I)}{(1-q)(d_I - d_E) + q(c_E^L - c_I)}$. All the analysis below remains the same even with this condition.

Proposition 2 *The possibility of entry in the upstream may make the exclusive contract by the incumbent distributor more difficult when an upstream entrant is inefficient in the sense* c_E *is* $c_E^L(> c_I)$ *with probability* $q(> 0)$ *and* $c_E^H(> c_E^L > c_I)$ *with probability* $(1-q)$*. Even if all incumbent manufacturers sign the exclusive contract, the entrant distributor can survive by trading with the inefficient entrant manufacturer. This is another source of social inefficiency.*

Proof. See above. ■

Interestingly, such entrant does not affect the outcome at all in the FM model. In the appendix, we extend the inefficient entrant model to FM model, and show that their result does not change even with an inefficient entrant distributor.

Next, we briefly examine the case where $c_E^L < c_I$, that is the entrant manufacturer is more efficient than the incumbent manufacturer with probability $q(> 0)$, and with probability $1 - q$, $c_E^H > c_I + d_I - d_E$. If $c_E = c_E^L(< c_I)$, obviously the incumbent manufacturers and the incumbent distributor get zero when $S = N$. Moreover, even if $S = N - 1$, the outsider cannot win the wholesale price competition with the entrant manufacturer, and thus the incumbent manufacturers including the outsider, and the incumbent distributor get zero. When $c_E = c_E^H$, the outcome is just the same as in the previous argument. The outsider can get $d_I - d_E$ and the incumbent distributor gets $v - c_I - d_I - \varepsilon$.

This means the necessary compensation level is $x^* = (1 - q)(d_I - d_E)$. When $S = N$, the incumbent distributor can get (without including the compensation payments) $v - c_I - d_I - \varepsilon$ with probability $1-q$ and 0 with probability q . Hence $(1-q)(v-c_I-d_I-\varepsilon)-(1-q)(d_I-d_E)N$ should be positive or zero, and the threshold level of N, denoted by N'',can be derived as follows.

$$N \leq N'' = \frac{v - c_I - d_I - \varepsilon}{d_I - d_E}. \tag{8}$$

Obviously N'' is higher than N^{**}. The more efficient the entrant manufacturer becomes, the more likely the exclusive dealing contracts prevent the efficient entrant distributor. We summarize the result by following proposition.

Proposition 3 *If there is a possibility that an entrant in the upstream is more efficient than incumbent upstream firms, exclusion occurs more likely at the equilibrium than in the case of inefficient entrant in the upstream.*

Proof. See above. ■

Comparing this condition with equation (7) with $\theta = 1$, we get $N'(1) = N''$. It implies that if entrant manufacturer is more efficient than incumbent with positive probability, the condition for fully signed exclusive dealing contracts is just same as no entrant manufacturer case. However, social welfare is larger in entrant manufacturer case than in no entrant manufacturer case. When EM exists and $S = N$, the entrant manufacturer and the entrant distributor can win the retail market competition with probability $q > 0$. This vertical structure is more efficient than the combination of incumbents.

In addition, the result that $N'' > N^{**}$ is rather counter intuitive. This means that if the productivity of the entrant manufacturer is improved, the exclusion of the entrant distributor is more likely to occur. An intuitive reason is as follows. Even if c_E^L becomes lower than c_I, the expected payoff of the incumbent distributor does not change since it cannot win the retail price competition when c_E^L is realized as long as $c_E^L \leq c_I + d_I - d_E$. On the other hand, the outsider's expected payoff substantially decreases from $q(d_I - d_E) + (1-q)(c_E^L - c_I)$ to $q(d_I - d_E)$ since it loses the wholesale price competition only if c_E^L is lower than c_I. Hence the necessary compensation level becomes lower and the threshold level of N can be higher. Because the exclusion of the entrant distributor is welfare decreasing, this result means that the technological improvement of the entrant manufacturer may decrease the social welfare [19].

5 Conclusion

The existing literature on the anti-competitive effects of exclusive dealing contracts have been developed to the case when buyers are competing distributors recently. Especially, Fumagalli and Motta (2006) have shown that intense competition among distributors eliminates the incumbent's incentive to exclude by exclusive contracts[20]. They claim that exclusive dealing contracts would not be anti-competitive in such circumstances.

Our model has suggested that this result would be reversed by assuming a distributor tries to deter an entry. We have shown that an incumbent large distributor can use exclusive dealing contracts to deter an efficient rival's entry, when the number of manufacturers is in some range. This result has important implications for antitrust policy. The incumbent distributor can foreclose by

[19] In the appendix, we introduce an inefficient entrant distributor to the Fumagalli and Motta model. We show that the result we have in Section 3 would not be affected by the entrant distributor in the FM model.

[20] They call Bertrand competition among two distributors as "extremely intense competition in downstream". Thus even though there are two large distributors in our model (implicitly it is as a result of concentration among distributors), we can say that distributors are "intensely competing" in our model along with FM's wording.

exclusivity clause when they are large. When concentration among distributors is strengthened in an industry, the incumbent may prevent a price cutting new distributor's entry by exclusive contracts. By comparison with the result of Fumagalli and Motta (2006), this would happen more certainly than entry prevention of efficient producers.

In addition, the entry in the upstream, even if the entrant is less efficient than incumbents, can make the exclusion unfeasible. Thus, by promotion of entry in the upstream, even if entrants are less efficient than incumbents, efficient entry in the downstream would be promoted.

Note that even if we assume the exclusive dealing contracts are breachable by paying expectation damage, we have an unique exclusion equilibrium. Moreover, In the large distributor model, we do not have multiple equilibria that Simpson and Wickelgren (2007) have without assuming product differentiation.

A Appendix

This appendix contains the proofs for the following models. In Section A, we explore other scheme to determine wholesale prices and show that whichever we apply, exclusion would occur at the equilibrium. In Section B, we examine FM model with an inefficient entrant distributor. We show that the inefficient entrant never affects the result of FM. There exists only entry equilibrium with the assumption of small fixed cost for distributors.

A.1 Other Schemes to Determine Wholesale Price

In this section, we explore other scheme to determine wholesale prices. In the basic model, each distributors can make "take it or leave it wholesale price offers" to manufactures. Instead, here we assume they make "distribution margin offers", or assume that they cannot offer any price, and manufacturers can offer their own wholesale price to distributors.

Following Comanor and Rey (2000), we employ the "distribution margin offer". At t=1, after the entry decision, distributors can offer their distribution margins instead of wholesale prices to manufacturers and manufacturers prefer lowest margin distributor. We denote margin offers from the incumbent to free manufactures m_I^f, and to captive manufacturers m_I^s. On the other hand, having entered, the entrant distributor offers margin m_E only to free manufacturers. After that, manufacturers offer wholesale price to distributors. We denote wholesale prices by w^f from free manufactures and w^s from captive manufacturers. Then distributors compete a la Bertrand in the retail market. Indeed, margin plus wholesale price, i.e. $m + w$, is the retail price. All the settings except this would remain the same as in Section 3.

If $S = N$, obviously E cannot enter the downstream. Then, I offers each IM $m_I^s = v - d_I$, and all IMs receive it. They offer $w^s = c_I$. Enjoying monopoly position, I offers consumer the retail price $P_I = v$. Followings are active players payoffs.

$$\begin{aligned} \pi_I &= v - c_I - d_I - Nx \\ \pi_{IM}^s &= x. \end{aligned}$$

When one IM deviates from signing, i.e. $S = N - 1$, E will enter. E and I offer $m_E = m_I^f = d_I$ for a free IM respectively. This is almost like Bertrand competition for IM. I also offers $m_I^s = d_I$. Now manufactures are actually competing at the retail market given distribution margins, and both the free and the captive offer $w^f = w^s = c_I$. This makes deviation would not be attractive, as resulting $\pi_{IM}^f = 0$. Thus, the number of IM would not matter. With the compensation $x = 0$, all IMs sign the contract at t=0.

A.2 FM Model with a Weak Entrant Distributor

We introduce an inefficient entrant at downstream as in Section 3. The entrant distributor, ED, has marginal cost of d_E, that is uncertain ex ante. We assume that at t=0, all player know that d_E is $d_E^L (> d_I)$ with probability q and $d_E^H (> d_E^L)$ with probability $(1 - q)$, and also assume that $d_E^H + c_E > d_I + c_I > d_E^L + c_E$. Thus ED is weakly less efficient than IM. At t=1, d_E realizes and all players know the exact value of d_E. We also assume that $d_E^H + d_I \leq v$.

The weak entrant modifies the game slightly. At t=1, first, ED will enter the upstream market. We assume no fixed entry cost for EM. Second, each manufacturer determines their wholesale prices. We denote the offers from IM and EM to EM by w_I^E and w_E^E respectively. The third and final stages are the same as the basic model in Section 2.

If $S = N$, along with the same logic, the entrant manufacturer (E) can be active with the inefficient entrant manufacturer in the retail market when $d_E = d_E^L$ due to the assumption of $d_I + c_I \geq d_E^L + c_E$. In this case, as a result of Bertrand competition, the retail price is $P_E = P_I = c_I + d_I$. With ED's payoff denoted by π_{ED}, the payoffs are

$$\begin{aligned}\pi_I &= 0 - Nx,\\ \pi_E &= 0,\\ \pi_{ID}^s &= x,\\ \pi_{ED} &= d_I + c_I - (d_E^L + c_E).\end{aligned}$$

On the other hand, when $d_E = d_E^H$, due to the assumption of $d_I + c_I < d_E^H + c_E$, the incumbent distributor can exclude the efficient entrant. Thus as a result of Bertrand competition, the retail price is $P_E = P_I = d_E^H + c_E$. The payoffs are

$$\begin{aligned}\pi_I &= d_E^H + c_E - (d_I + c_I) - Nx,\\ \pi_E &= 0,\\ \pi_{ID}^s &= x,\\ \pi_{ED} &= 0.\end{aligned}$$

Next, to derive the level of x., let us suppose that $S = N - 1$ (there is one outsider). The equilibrium would change that of in our large distributor model. In this case, the outsider has strictly less cost than the entrant distributor (ED) which d_E would be realized. Thus the entrant and the incumbent would compete a la Bertrand with their wholesale price for the outsider. The offers from E and I to the outsider are denoted by w_E^o and w_I^o respectively. We have the unique equilibrium of $w_E^o = w_I^o = c_I$ and the entrant wins the wholesale price competition for the outsider. As the same logic, the incumbent is indifferent whatever it offers signers w_I^s $(\geq c_I)$ On the other hand, the offer to the entrant distributor w_I^E and w_E^E would be undetermined. Moreover, Both I and E are indifferent of offering to EM or not. As a result of Bertrand competition, the retail price is $P_E = P_I = d_I + w_I^s$, and with the tie-break rule assumption, the outsider wins the retail price competition. Apparently the existence of ED would not affect the equilibrium. When $S = N - 1$, the outsider's payoff is $\pi_{ID}^o = w_I^s - w_E^o = w_I^s - c_I$. With the multiplicity of w_I^s, π_{ID}^o is undetermined similarly with FM model above.

To eliminate multiplicity, we can introduce a small fixed cost $\varepsilon > 0$ to distributors. In this case, $\pi_{ID}^o = v - c_I - d_I - \varepsilon$. Obviously $\pi_I = q(d_E^H + c_E - d_I - c_I) - Nx$ cannot be positive if $x \geq v - c_I - d_I - \varepsilon$. Thus there only exists an entry equilibrium, with the same logic as in their original paper. Again, the entrant distributor, ED, has no effect on the entry equilibrium.

Next we examine the case where $d_E^L < d_I$, that is the entrant distributor is more efficient than the incumbent manufacturer with probability q, and with probability $1-q$, $d_E = d_E^H > d_I + c_I - c_E$ as in the previous argument. We focus on the case with the assumption of a small fixed cost $\varepsilon > 0$ for distributors for shortness. If $d_E^L < d_I$, obviously the incumbent manufacturers and the incumbent distributor get zero even when $S = N$. Moreover, even if $S = N - 1$, the outsider cannot win the retail price competition with the entrant, and thus both the incumbent manufacturers and the incumbent distributor get zero. This means the necessary compensation level is $x = (1-q)(v - c_I - d_I - \varepsilon)$ and the incumbent distributor can get (without including the compensation payments) $d_E^H + c_E - d_I - c_I$ with probability $(1-q)$ and 0 with probability q. Hence for all $N > 0$, we have

$$\pi_I = (1-q)d_E^H + c_E - d_I - c_I - (1-q)N(v - c_I - d_I - \varepsilon) < 0. \tag{9}$$

Thus, we still have unique entry equilibrium, because the incumbent cannot profitably offer the exclusive dealing contracts to the incumbent distributors.

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