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# Exclusionary contracts and investment

Greg Shaffer and Simen Ulsaker

*Prosjektet har mottatt midler fra det alminnelige prisreguleringsfondet.*

# Exclusionary contracts and investment*

Greg Shaffer† and Simen A. Ulsaker‡

**Abstract**

We study the incentives for exclusive dealing contracts in a setting where two competing manufacturers that sell through a common retailer can make non-contractible investments that enhance demand or reduce production costs. Even though industry profit is maximized when the retailer sells both manufacturers' products, the least profitable manufacturer is excluded in equilibrium. The retailer benefits from exclusive dealing, while both manufacturers are worse off by their ability to offer exclusive dealing contracts.

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# 1 Introduction

By signing an exclusive dealing contract with a manufacturer, a retailer or distributor is prevented from buying from rival manufacturers. A common justification for such contracts is that they can support the provision of the manufacturer's non-contractible investment. Marvel (1982) argues that in the absence of exclusive dealing, free-riding may lead to under-provision of a manufacturer's demand-increasing promotions. This argument is formalized and discussed further in Besanko and Perry (1993).

We model an industry where two manufacturers supply their product to a common monopolist retailer. Both manufacturers can offer exclusive dealing contracts at an initial stage. The exclusive dealing contracts can include a lump-sum compensation to the retailer, but cannot include a specification of the supply contract. After the retailer has accepted one or none of the exclusive dealing contracts, the manufacturers make non-contractible investments which may reduce production cost, increase demand, or both. The manufacturers then offer (non-linear) supply contracts to the retailer. If the retailer has signed an exclusive dealing contract with a manufacturer, only this manufacturer will make a supply contract offer. Finally, the retailer accepts or reject the supply contracts and chooses quantities of the manufacturers' products.

If no exclusive dealing contract is signed industry profit is maximized: The manufacturers' choose the investment levels that maximize the industry profit, and the retailer will choose the optimal quantities. There is thus no under-provision of service in the absence of exclusive dealing. However, in the absence of exclusive dealing, each manufacturer gets a higher payoff than his marginal contribution to the industry profit. The intuition is as follows. When offering a supply contract, a manufacturer is able to extract the difference between the industry profit when both products are sold and the industry profit when only the rival's product is sold *given the investment levels already chosen*. If the rival's optimal investment level is different under common agency than when only the rival's product is sold by the retailer, each manufacturer extracts a higher payoff than his "true" contribution to the industry profit.

Since each manufacturers' get a higher payoff than his marginal contribution to the industry profit, it follows that the retailer and either manufacturer would jointly be better off if the rival manufacturer were excluded from the industry. Not surprisingly therefore, exclusive dealing will occur in any equilibrium. In line with the pro-competitive arguments outlined above, exclusive dealing will tend to increase the investment level for the manufacturer with the exclusive dealing contract. Still, exclusive dealing reduces welfare since the firms realize the industry profit maximizing outcome when exclusive dealing is not feasible. The retailer benefits from the manufacturers' ability to offer exclusive dealing contracts, while this ability constitutes a Prisoner's Dilemma for the manufacturers. Both manufacturers' will offer exclusive dealing contracts in equilibrium, but they would both be better off if they were restrained from offering such contracts.

We follow Rasmusen et al. (1991) and Segal and Whinston (2000) in assuming that (long) term exclusive dealing contracts are offered at an initial stage, but that a firm offering an exclusive dealing contract cannot commit to a supply contract, e.g., a per-unit price for the product, at this stage. In contrast to these papers, we do not allow one upstream firm a first-mover advantage: We allow both manufacturers the opportunity to offer exclusive dealing contracts. Here we are following Mathewson and Winter (1987), O'Brien and Shaffer (1997) and Bernheim and Whinston (1998).

The rest of the article is organized as follows. In the next section, the framework of the analysis is presented. Section 3 contains our main analysis. In Section 4 we solve the model for a case where there is no investment, and show that this eliminates the incentive for exclusive dealing contracts. Section 5 concludes.

## 2 Framework

Manufacturers $A$ and $B$ (male) can supply a monopolist retailer (female) with quantities $x_A$ and $x_B$ respectively. The manufacturers can make investments $e_A$ and $e_B$, incurring costs $c_A(e_A)$ and $c_B(e_B)$. The cost of producing quantities $x_A$ and $x_B$ is given by $C_A(x_A, e_A)$ and $C_B(x_B, e_B)$ respectively.

Let $R(x_A, x_B, e_A, e_B)$ be the retailer's resale revenue as a function of its purchases, and let $T_A(x_A)$ and $T_B(x_B)$ be the pricing schedules specifying for each manufacturer the retailer's payment as a function of the amount it purchases. The retailer incurs no other cost that what she pays the manufacturers. Then, the retailer's profit is $R(x_A, x_B, e_A, e_B) - T_A(x_A) - T_B(x_B)$.

Manufacturer $A$'s profit is $T_A(x_A) - C_A(x_A, e_A) - c_A(e_A)$, while manufacturer $B$'s profit is $T_B(x_B) - C_B(x_B, e_B) - c_B(e_B)$. Note that investment may reduce cost of production, increase demand, or both. We will assume that the revenue the retailer can generate from only selling product $i$ is not a function of $e_j$, which implies that $R(x_i, 0, e_i, e_j) = R(x_i, 0, e_i, 0)$ for any $e_j$.

The industry profit is given by

$$\Pi(x_A, x_B, e_A, e_A) \equiv R(x_A, x_B, e_A, e_A) - \sum_{i=A,B} (c_i(e_i) + C_i(x_i, e_i))$$

A fully integrated vertical structure would solve the following problem:

$$\max_{x_A, x_B, e_A, e_B} \Pi(x_A, x_B, e_A, e_B) \tag{1}$$

We will assume that the solution to this problem is unique and given by the vector $(x_A^{**}, x_B^{**}, e_A^{**}, e_B^{**})$, with the corresponding profit given by $\Pi^C \equiv \Pi(x_A^{**}, x_B^{**}, e_A^{**}, e_B^{**})$. If only product $i$ were available, an integrated structure would solve

$$\max_{x_i, e_i} \Pi(x_i, 0, e_i, 0) \tag{2}$$

Let the solution to this problem be denoted by $(x_i^*, e_i^*)$. We denote the corresponding industry profit as $\Pi^i$.

We assume that the products are imperfect substitutes in generating industry profit, and that product $A$ is more profitable than product $B$

**Assumption 1.** $0 < \Pi^B < \Pi^A < \Pi^C < \Pi^A + \Pi^B$

It will also be convenient to introduce some notation concerning optimal choices of quantities for given investment levels. For given levels $e_A$ and $e_B$, a fully integrated vertical structure would solve the following problem:

$$\max_{x_A, x_B} \Pi(x_A, x_B, e_A, e_B) \tag{3}$$

We will assume that the solution to this problem is unique and given by the vector $(\hat{x}_A^{**}(e_A, e_B), \hat{x}_B^{**}(e_A, e_B))$, with the corresponding profit given by $\hat{\Pi}^C(e_A, e_B) = \Pi(\hat{x}_A^{**}(e_A, e_B), \hat{x}_B^{**}(e_A, e_B), e_A, e_B)$. Furthermore, we assume that $\hat{\Pi}^C(e_A, e_B)$ is strictly quasi-concave in $(e_A, e_B)$. Note that $\hat{\Pi}^C(e_A^{**}, e_B^{**}) = \Pi^C$.

If only product $i$ were available, an integrated structure would solve

$$\max_{x_i} \Pi(x_i, 0, e_i, 0) \tag{4}$$

Let the solution to this problem be denoted by $\hat{x}_i^*(e_i)$. We denote the corresponding industry profit $\hat{\Pi}^i(e_i) \equiv \Pi(\hat{x}_i^*(e_i), 0, e_i, 0)$. Note that $\hat{\Pi}^i(e_A^*) = \Pi^i$. We make the following assumption.

**Assumption 2.** $\Pi(x_i^*, 0, e_i^*, 0) > \Pi(\hat{x}_i^*(e_i^{**}), 0, e_i^{**}, 0)$

Recall that $e_i^{**}$ is the optimal investment level for manufacturer $i$ when both products are available. Assumption 2 states that this investment level is no longer optimal when only this manufacturer's product is available. Furthermore, we assume that, for given levels of investment, the manufacturers are substitutes when it comes to creating industry profit:

**Assumption 3.** $\hat{\Pi}^A(e_A) + \hat{\Pi}^B(e_B) \geq \hat{\Pi}^C(e_A, e_B)$, *for any* $(e_A, e_B)$

We will consider the following game.

1. $A$ and $B$ can offers exclusive dealing-contracts, with compensations $\theta_A$ and $\theta_B$.
2. The retailer accepts/rejects exclusive dealing offers.
3. $A$ and $B$ make investments $e_X$ and $e_Y$, at costs $c(e_X)$ and $c(e_Y)$.
4. $A$ and $B$ offer $T_A(x_A)$ and $T_B(x_B)$ to the retailer. If the retailer has signed an exclusive dealing contract with manufacturer $i$, only this manufacturer will offer a contract. The retailer accepts one, two or none of the offered contracts and chooses $x$.

# 3 Equilibrium analysis

Since our solution concept is subgame perfection, we will begin by solving the subgame starting in Stage 4, both in the case where the retailer has signed an exclusive dealing-contract with one of the manufacturers, and in the case where she has not. Throughout, we will focus on (subgame) equilibria that are undominated from the manufacturers' perspective.

We will first consider the case where the retailer has accepted an exclusive dealing-contract from one of the manufacturer's in Stage 2. Then, only this manufacturer will offer a supply contract, and the manufacturer will extract the entire revenue generated by the retailer.

**Lemma 1.** *If the retailer has accepted and exclusive dealing contract with manufacturer $i$ Stage 2, manufacturer $i$ gets a payoff equal to $\hat{\Pi}^i(e_i)-\theta_i$ while the retailer gets a payoff equal to $\theta_i$. Manufacturer $j$ gets a payoff equal to zero.*

If, on the other hand, no exclusive dealing contract has been signed in Stage 2, both manufacturers are free to offer supply contracts in Stage 4. We then have the following result.

**Lemma 2.** *If no exclusive dealing contract has been accepted in Stage 2, manufacturer $i$'s payoff, denoted $\pi^i$, is equal to $\hat{\Pi}^C(e_A, e_B) - \hat{\Pi}^j(e_j)$ in any undominated equilibrium. The retailer gets a payoff, denoted $\pi^R$, equal to $\hat{\Pi}^A(e_A) + \hat{\Pi}^B(e_B) - \hat{\Pi}^C(e_A, e_B)$.*

*Proof.* Suppose that there exists a continuation equilibrium in which manufacturer $i$ gets strictly more than what is stated in the lemma. Then, the joint payoff of manufacturer $j$ and the retailer is strictly less than $\hat{\Pi}^j(e_j)$. Furthermore, manufacturer $j$'s payoff, denoted $\pi^j$, must be strictly less than $\hat{\Pi}^j(e_j)-\pi^R$, where $\pi^R$ is the equilibrium payoff of the retailer. Note that it must be the case that the retailer can get at most $\pi^R$ by accepting only the offer from manufacturer $i$. Now, let manufacturer $j$ deviate by offering a sell-out contract $T_j(x_j) = F_j + C_j(x_j, e_j)$. Here, $F_j = \hat{\Pi}^j(e_j) + c_j(e_j) - \pi^R - \epsilon$, and $\epsilon \in (0, \hat{\Pi}^j(e_j) - \pi^R - \pi^j)$. The retailer will accept this offer, since accepting only this offer gives her a payoff equal to $\pi^R + \epsilon$. The payoff of manufacturer $j$ following the deviation is $\hat{\Pi}^j(e_j) - \pi^R - \epsilon > \pi^j$, which implies that the deviation is profitable.

Having established that there cannot exists an equilibrium in which manufacturer $i$ earns strictly more than $\hat{\Pi}^C(e_A, e_B) - \hat{\Pi}^j(e_j)$, let us now confirm that there exists an equilibrium of the subgame with the payoffs specified in the lemma. Suppose that manufacturer $i$ offers a sell-out contract $T_i(x_i) = F_i + C_i(x_i, e_i)$, where $F_i = \hat{\Pi}^C(e_A, e_B) + c_i(e_i) - \hat{\Pi}^j(e_j)$ and that the retailer accepts the offers from both manufacturers. This will lead to the payoffs specified in the lemma. By accepting only the offer from manufacturer $j$, the retailer would get a payoff equal to its equilibrium payoff, namely $\hat{\Pi}^A(e_A) + \hat{\Pi}^B(e_B) - \hat{\Pi}^C(e_A, e_B)$. This implies that the retailer does not have a profitable deviation. Furthermore, it implies that the payoff of the retailer must be at least equal to its equilibrium payoff following any deviation from manufacturer $i$. If following a deviation from manufacturer $i$ the retailer accepts both offers, manufacturer $j$ would get its equilibrium payoff. Therefore, the payoff of manufacturer $i$ in any such continuation equilibrium is at most $\hat{\Pi}^C(e_A, e_B) - \pi^j - \pi_R = \hat{\Pi}^C(e_A, e_B) - \hat{\Pi}^j(e_j)$, which is what it gets in equilibrium. If, following the equilibrium the retailer accepts only the offer from manufacturer $i$, the payoff of the manufacturer is at most $\hat{\Pi}^i(e_i) - \pi^R = \hat{\Pi}^C(e_A, e_B) - \hat{\Pi}^j(e_j)$, which again is equal to its equilibrium payoff. □

Lemma 2 closely resembles a seminal finding in the literature on common agency: In undominated equilibria, the manufacturers' each get their marginal contribution to the industry profit, while the retailer gets the remainder. In our case, however, the manufacturers get their marginal contributions *given the investment levels chosen in Stage* 3.

Let us now consider Stage 3. Let us first consider a situation where the retailer has signed an exclusive dealing contract with manufacturer $i$ in Stage 2. Then, the manufacturer will extract the entire industry profit when offering contracts in Stage 4. It will therefore in Stage 3 choose the investment level that maximizes the industry profit when product $j$ is not available.

**Lemma 3.** *If the retailer has signed an exclusive dealing contract with manufacturer $i$ in in Stage 2, manufacturer $i$ will choose $e_i^*$, the investment level that maximizes the industry profit when product $j$ is not available.*

*Proof.* We know from Lemma 1 that manufacturer $i$ will get a Stage 4 payoff equal to $\hat{\Pi}^i(e_i)$. In Stage 3, the manufacturer will therefore choose an investment level to solve the following problem.

$$\max_{e_i} \hat{\Pi}^i(e_i) \tag{5}$$

which has $e_i^*$ as its unique solution. □

Consider now a situation in which no exclusive dealing contract has been signed in Stage 2. Then the manufacturers will have an inventive to choose investment levels that maximize the industry profits.

**Lemma 4.** *If no exclusive dealing contract has been signed in Stage 2, manufacturer $i$ will choose $e_i^{**}$, the investment level that maximizes the industry profit when both products are available.*

*Proof.* We know from Lemma 1 that manufacturer $i$ will get a Stage 4 payoff equal to $\hat{\Pi}^C(e_A, e_B) - \hat{\Pi}^j(e_j)$. In Stage 3, the manufacturer will therefore choose an investment level to solve the following problem.

$$\max_{e_i} \hat{\Pi}^C(e_i, e_j) - \hat{\Pi}^j(e_j) \tag{6}$$

Since the manufacturer cannot affect $\hat{\Pi}^j(e_j)$, he will in effect choose $e_i$ to maximize $\hat{\Pi}^C(e_i, e_j)$. Because of the assumed strict quasi-concavity of $\hat{\Pi}^C(e_i, e_j)$, equilibrium play of the subgame starting in Stage 3 involves the manufacturers choosing $e_A^{**}$ and $e_B^{**}$. □

From Lemma 2, we know that manufacturer will get a payoff equal to $\hat{\Pi}^C(e_A, e_B) - \hat{\Pi}^j(e_j)$. Since the manufacturer cannot affect $\hat{\Pi}^j(e_j)$ when choosing its investment level, he will have an incentive to choose the investment level that maximizes the industry profit (when both products are available). When no exclusive dealing contract is signed in Stage 2, the firms thus bring about the efficient outcome: The manufacturers choose the industry profit maximizing investment levels in Stage 3, and the retailer chooses the industry profit maximizing quantities in Stage 4.

By Lemmas 2 and 4, the payoff of manufacturer $i$ when no exclusive dealing contract is signed is $\hat{\Pi}^C(e_A^{**}, e_B^{**}) - \hat{\Pi}^j(e_j^{**}) = \Pi^C - \hat{\Pi}^j(e_j^{**}) > \Pi^C - \Pi^j$, where the inequality follows from Assumption 2. Manufacturer $i$ gets a payoff equal to its contribution to the industry profit when investment levels are fixed at $(e_A^{**}, e_B^{**})$. This is however greater than its "true" contribution to the industry profit, that is, the difference between the maximal industry profit when both products are available ($\Pi^C$) and the maximal industry profit when only product $j$ is available ($\Pi^j$). The other side of the coin is that the joint payoff of manufacturer $j$ and the retailer, which equals $\hat{\Pi}^j(e_j^{**})$, is strictly less than what they could get if manufacturer $i$ was not in the industry.

We are now ready to derive the main result of the paper, namely that manufacturer $B$ is excluded equilibrium.

**Proposition 1.** *The retailer accepts a exclusive dealing contract from manufacturer $A$ in equilibrium. The retailer gets a payoff equal to $\Pi^B$. Manufacturer $A$ gets a payoff equal to $\Pi^A - \Pi^B$.*

*Proof.* Suppose that contrary to what is stated in the proposition, the retailer does not sign an exclusive dealing contract in Stage 2. Then we know from Lemmas 2 and 4 that the equilibrium payoff of manufacturer $A$ is $\hat{\Pi}^C(e_A^{**}, e_B^{**}) - \hat{\Pi}^B(e_B^{**})$ and that the equilibrium payoff of the retailer is equal to $\hat{\Pi}^A(e_A^{**}) + \hat{\Pi}^B(e_B^{**}) - \hat{\Pi}^C(e_A^{**}, e_B^{**})$. Consider now a deviation from manufacturer $A$ in which she in Stage 1 offers an exclusive dealing contract with compensation $\phi_A$ equal to $\hat{\Pi}^A(e_A^{**}) + \hat{\Pi}^B(e_B^{**}) - \hat{\Pi}^C(e_A^{**}, e_B^{**}) + \epsilon$, where $\epsilon \in (0, \Pi^A - \hat{\Pi}^A(e_A^{**}))$. Since the retailer gets more payoff by accepting this offer than her equilibrium payoff, she will accept the offer (accepting an exclusive dealing offer from retailer $B$ cannot give the retailer more than his equilibrium payoff). Given Lemmas 1 and 3, the payoff of manufacturer $A$ following the deviation is equal to $\Pi^A - \phi_A = \Pi^A - \hat{\Pi}^A(e_A^{**}) - \hat{\Pi}^B(e_B^{**}) + \hat{\Pi}^C(e_A^{**}, e_B^{**}) - \epsilon$, which, because $\Pi^A - \hat{\Pi}^A(e_A^{**}) > \epsilon$ is strictly more than its equilibrium payoff of $\hat{\Pi}^C(e_A^{**}, e_B^{**}) - \hat{\Pi}^B(e_B^{**})$.

Having established that the retailer signs an exclusive dealing contract in equilibrium, we now show that it must be the exclusive dealing offer from manufacturer $A$. Suppose otherwise, that is, that the retailer signs an exclusive dealing contract with manufacturer $B$ in equilibrium. In such an equilibrium, the payoff of the retailer cannot be more than $\Pi^B$. Consider now a deviation from manufacturer $A$ in which he in Stage 1 offers an exclusive dealing contract with compensation $\phi_A$ equal to $\Pi^B + \epsilon$, where $\epsilon \in (0, \Pi^A - \Pi^B)$. Since the retailer gets more payoff by accepting this offer than her equilibrium payoff, she will accept the deviation offer (accepting no exclusive dealing offer cannot give the retailer more than his equilibrium payoff). Given Lemmas 1 and 3, the payoff of manufacturer $A$ following the deviation is equal to $\Pi^A - \phi_A = \Pi^A - \Pi^B - \epsilon$, which, because $\Pi^A - \Pi^B > \epsilon$ is strictly more than his equilibrium payoff of zero.

Finally, we will establish that the equilibrium payoffs are as specified in the proposition. Since the retailer accepts an exclusive dealing contract from manufacturer $A$ in equilibrium, the equilibrium payoff of manufacturer $B$ is zero. Suppose now that contrary to what is stated in the proposition, the equilibrium payoff of the retailer, denoted $\pi^R$, is strictly below $\Pi^B$. Consider now a deviation from manufacturer $B$ where he in Stage 1 offers an exclusive dealing contract with $\phi_B$ equal to $\pi^R + \epsilon$, where $\epsilon \in (0, \Pi^B - \pi^R)$. Since the retailer gets more payoff by accepting this offer than his equilibrium payoff, she will accept the deviation offer (accepting no exclusive dealing offer cannot give the retailer more than his equilibrium payoff). Given Lemmas 1 and 3, the payoff of manufacturer $B$ following the deviation is equal to $\Pi^B - \phi_B = \Pi^B - \pi^R - \epsilon$, which, because $\Pi^B - \pi^R > \epsilon$ is strictly more than his equilibrium payoff of zero. □

When no exclusive dealing contract is signed, the joint payoff of each manufacturer and the retailer is less than what they could get if the rival manufacturer were not in the market. It is therefore not surprising that exclusion occurs in equilibrium and that the least profitable manufacturer (manufacturer $B$) is excluded in equilibrium.

Consider now a ban on exclusive dealing. Then the equilibrium payoffs are given by Lemmas 2 and 4. The manufacturers would choose the industry profit maximizing investment levels in Stage 3, and the retailer would choose $x_A^{**}$ and $x_B^{**}$ in Stage 4. The industry profit will thus be $\Pi^C$, which is strictly greater than the industry profit when exclusive dealing is allowed, namely $\Pi^A$.

The payoff of the retailer under a ban is $\hat{\Pi}^A(c_A^{**}) + \hat{\Pi}^B(c_B^{**}) - \Pi^C$, while the payoff of manufacturer $i$ is $\Pi^C - \hat{\Pi}^j(c_j^{**})$. The joint payoff of the retailer and manufacturer $i$ is $\hat{\Pi}^i(c_i^{**})$, which is strictly below $\Pi^i$. A ban thus reduces the joint payoff of the manufacturer and the retailer.

Manufacturer $B$ obviously benefits from a ban on exclusive dealing, since he is excluded and gets zero in payoff when exclusive dealing is allowed. Is manufacturer $A$ also better off when there is a ban on exclusive dealing? The manufacturer gets $\Pi^C - \hat{\Pi}^B(c_B^{**})$ when exclusive dealing is banned, which is more than his contribution to the industry profit, $\Pi^C - \Pi^B$. When exclusive dealing is allowed, the manufacturer gets $\Pi^A - \Pi^B$, which is less than his contribution. Manufacturer $A$ thus gains from a ban on exclusive dealing. Since the joint payoff of manufacturer $A$ and the retailer is reduced by a ban on exclusive dealing, it follows that the payoff of the retailer is reduced by a ban on exclusive dealing, which we can confirm by comparing the retailers payoff under a ban, $\hat{\Pi}^A(c_A^{**}) + \hat{\Pi}^B(c_B^{**}) - \Pi^C$, with her payoff in the absence of a ban, $\Pi^B$.

The following proposition sums up.

**Proposition 2.** *A ban on exclusive dealing increases industry profit but reduces the joint payoff of manufacturer A and the retailer. The retailer's payoff is reduced by a ban on exclusive dealing, while both manufacturers' payoffs are increased by a ban on exclusive dealing.*

Exclusion arises in equilibrium because the joint payoff of the retailer and either manufacturer in any continuation equilibrium where no exclusive dealing is signed is below what they could make by excluding the rival manufacturer. For the manufacturers, the ability to offer exclusive dealing contracts constitutes a Prisoners' Dilemma. The least profitable manufacturer $B$ is excluded and will in equilibrium offer the entire profit he and the retailer could generate without manufacturer $A$ as upfront compensation to the retailer. The more profitable manufacturer $A$ will match this offer, but in doing so he is giving up so much profit to the retailer that he is worse off than if exclusive dealing contracts were not available.

# 4 No investment stage

Let us now consider a situation where the manufacturers do not make investments. The game is then as follows.

1. $A$ and $B$ can offer exclusive dealing-contracts, with compensations $\theta_A$ and $\theta_B$.
2. The retailer accepts/rejects exclusive dealing offers.
3. $A$ and $B$ offer $T_A(x_A)$ and $T_B(x_B)$ to the retailer. If the retailer has signed an exclusive dealing contract with manufacturer $i$, only this manufacturer will offer a contract.

This game is similar to the one considered in O'Brien and Shaffer (1997) and Bernheim and Whinston (1998). The main difference is the timing. In these articles, the manufacturers offer supply contracts in an initial stage, and these contracts can potentially include exclusivity restrictions. There is thus no separation between the offer of exclusive dealing contracts and supply contracts as there is in our model. We will now demonstrate that one of the main conclusions of these articles also applies with our modified timing.

**Proposition 3.** *When there is no investment stage, the vector* $(\hat{x}_A^{**}(0,0), \hat{x}_B^{**}(0,0))$ *is chosen in any undominated exclusive dealing equilibrium. Manufacturer i's payoff,* $\pi^i$*, is equal to its marginal contribution to the industry profit,* $\hat{\Pi}^C(0,0) - \hat{\Pi}^j(0)$*. The retailer's payoff, denoted* $\pi^R$*, is equal to* $\hat{\Pi}^A(0) + \hat{\Pi}^B(0) - \hat{\Pi}^C(0,0)$*.*

*Proof.* Suppose that there exists a continuation equilibrium in which manufacturer $i$ gets strictly more than what is stated in the proposition. Then, the joint payoff of manufacturer $j$ and the retailer is strictly less than $\hat{\Pi}^j(0)$. Manufacturer $j$'s payoff is then strictly less than $\hat{\Pi}^j(0) - \pi^R$. Note that it must be the case that the retailer can get at most $\pi^R$ by accepting the exclusive dealing offer from manufacturer $i$. Now, let manufacturer $j$ deviate by offering an exclusive dealing contract with compensation $\theta_j = \pi^R + \epsilon$, where $\epsilon \in (0, \hat{\Pi}^j(0) - \pi^R - \pi^j)$. The retailer will accept this offer and gets a payoff equal to $\pi^R + \epsilon$. The payoff of manufacturer $j$ following the deviation is $\hat{\Pi}^j(0) - \theta_j = \Pi^j - \pi^R - \epsilon > \pi^j$, which implies that the deviation is profitable.

We will now establish that there exists an equilibrium as stated in the proposition. Let manufacturer $i$ $(i = A, B)$ offer exclusive dealing-contract with $\theta_i = \infty$. The retailer will reject both offers, something that by Lemmas 2 and 4 gives it an equilibrium payoff equal to $\hat{\Pi}^A(0) + \hat{\Pi}^B(0) - \hat{\Pi}^C(0,0)$, with manufacturer $i$ getting a payoff equal to $\hat{\Pi}^C(0,0) - \hat{\Pi}^j(0)$. Consider a possible deviation from manufacturer $i$. A continuation equilibrium after the deviation in which the retailer rejects both exclusive dealing offers will leave all firms with their equilibrium payoffs. In a continuation equilibrium in which the exclusive dealing offer from manufacturer $i$ is accepted, the retailer must get at least its equilibrium payoff, since this is what it can get by rejecting both offers. The continuation payoff of the manufacturer is therefore at most $\hat{\Pi}^i(0) - \hat{\Pi}^i(0) - \hat{\Pi}^j(0) + \hat{\Pi}^C(0,0) = \hat{\Pi}^C(0,0) - \hat{\Pi}^j(0)$ which is exactly what it gets in equilibrium. □

O'Brien and Shaffer (1997) and Bernheim and Whinston (1998) found that when competing manunfacturers offered contracts to a common monopolist retailer, exclusion did not occur in any undominated equilibria. In Section 3, we found that exclusion does occur in any equilibrium when the manufacturers make non-contractible investments.

In addition to allowing the manufacturers the ability to make investments, the timing of our game is also slightly different from the timing in O'Brien and Shaffer (1997) and Bernheim and Whinston (1998). Proposition 3 establishes that our exclusion result is not simply a result of the difference in timing in our model and the models of O'Brien and Shaffer (1997) and Bernheim and Whinston (1998).

# 5 Conclusion

A pro-competitive argument for the use of exclusive dealing contracts is that they support demand-enhancing (but non-contractible) investments by manufacturers. In this article we consider an industry where two competing manufacturers sell their products through a common retailer. Our results are partly in line with the pro-competitive argument for exclusive dealing: If the manufacturers are allowed to offer exclusive dealing contracts, exclusion will occur in equilibrium and will tend to give higher investment from the manufacturer still in the market. However, our model does not provide a pro-competitive argument for the use of exclusive dealing. Exclusion does not occur because the level of investment is sub-optimal under common agency (because, say, free-riding), but rather because the manufacturers extract more profit from the industry than what they contribute. Our model thus illustrates that from a welfare perspective, it is not sufficient that exclusive dealing increases investment from the manufacturer protected by the exclusivity agreement. Furthermore, while exclusive dealing reduces industry profit, it hurts not only the excluded manufacturer but also the non-excluded manufacturer. It is the retailer that gains from the manufacturers' ability to offer exclusive dealing contracts. Earlier research showing that retailers may benefit from exclusion have typically focused on situations where shelf space is scarce. Our model provides an explanation of why retailers may benefit from (anti-competitive) exclusion even in situations where shelf space is not scarce.

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