Exclusive Dealing and Entry, when Buyers Compete: Comment

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1 Introduction

In a recent article, Fumagalli and Motta (2005) have challenged the Rasmusen *et al.* (1991) and Segal and Whinston (2000) logic of Naked Exclusion in which an incumbent excludes an efficient entrant by exploiting a coordination failure among buyers. Fumagalli and Motta argue that given buyers are typically firms that compete downstream rather than final consumers, an efficient entrant only needs a single deviating buyer to cover its fixed costs of entry. They argue this arises when buyers are intense competitors, suggesting in this case it is no longer an equilibrium for a buyer to sign an exclusive deal just because the buyer thinks others will also sign. Instead, Fumagalli and Motta present a model in which they claim only entry equilibria exist.

In this Note, we show that an exclusion equilibrium also arises in Fumagalli and Motta's model. In this new equilibrium, the entrant can never cover its fixed costs of entry by selling to only a single downstream buyer. In fact, exclusion of the entrant is an equilibrium outcome even if the entrant's innovation is almost drastic (implying a large cost advantage), the entrant's fixed costs of entry are negligible and if the incumbent can only use simultaneous and non-discriminatory contracts. In this sense, we provide an example of exclusion under even weaker assumptions than those used in the original Naked Exclusion literature which requires some moderate fixed costs of entry to sustain exclusion.

The model Fumagalli and Motta consider is based on Segal and Whinston (2000, Section IV) in which the incumbent faces a potential entrant that has a lower cost of production but faces some fixed cost of entry. Two homogenous downstream buyers compete in prices for final consumers. Exclusive deals involve the incumbent offering buyers a fixed compensation for agreeing not to purchase from the entrant. Fumagalli and Motta derive their results under two different assumptions on wholesale pricing — upstream firms are required to set linear wholesale prices (Section I) and upstream firms offer two-part tariff contracts (Section II). Since restricting upstream firms to set linear prices to downstream firms is inconsistent with assuming the incumbent can offer exclusive contracts with a fixed compensation, in this Note we focus on the less restrictive case where upstream firms offer downstream firms two-part tariff contracts.[1]

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[1]With linear wholesale pricing, Fumagalli and Motta argue that entry will also be the unique outcome. Their result depends on assuming buyers have to incur a small fixed cost to stay active. Without these fixed costs, there are both entry and exclusion equilibria, and exclusion equilibria are unique once Fumagalli and Motta's assumptions are changed in any number of minor ways (see, for instance, Simpson and Wickelgren, 2004 and 2005).

To understand the main difference between our analysis and that in Fumagalli and Motta, consider the case a single buyer deviates and does not sign an exclusive contract with the incumbent.[2] Fumagalli and Motta claim that the unique outcome in this case is that the deviating buyer will end up buying from the entrant, with the incumbent and the signed buyer obtaining no profit. Their equilibrium relies on the signed buyer being inactive given that the incumbent charges it above marginal cost and given that the free buyer can undercut buying from the entrant at a lower cost. We show the incumbent can do better by selling to its signed buyer at the entrant's lower marginal costs. By ensuring its signed buyer is a fierce competitor, another equilibrium arises where it is the free buyer that is inactive. This enables the incumbent's signed buyer to make monopoly profits which the incumbent extracts through a franchise fee. As a result, the entrant cannot profitably enter unless all downstream buyers are available. However, unlike Rasmusen *et al.* (1991) and Segal and Whinston (2000), we show there is no coordination failure between buyers. Both buyers prefer signing with the incumbent since doing so is their only hope of obtaining positive profits.

The next section reviews the model, which is a generalization of the model of Fumagalli and Motta. Section 3 presents the main results by way of several lemmas and a proposition. Section 4 discusses a few extensions, while a final section briefly concludes.

2 The model

An entrant E, which enjoys a lower cost of production than the incumbent I (c_E per unit instead of c_I), considers entering an industry to compete with the incumbent. The entrant faces a fixed cost of entry $F > 0$. (We do not need to restrict fixed costs to a particular range as Fumagalli and Motta do). These upstream firms sell to two identical downstream buyers, which in turn compete in prices for final consumers. The costs of the downstream firms are set to zero for simplicity. To keep the analysis as clear as possible, we do not introduce the (arbitrarily small) fixed costs that Fumagalli and Motta assume downstream buyers face to stay active. However, to ensure the model remains equivalent to theirs, we assume that buyers still have to decide whether to be active or not before they compete in prices. These decisions are natural when buyers are offered two-part tariffs — not accepting offers from either of the upstream firms is equivalent to being inactive. Subsequently, we will discuss what happens when both buyers are active, as well as what happens if buyers have small fixed costs of being active.

Market demand is denoted $Q(p)$, which is assumed to have the standard properties, as well as being log-concave. The assumption of log-concavity, which allows for the linear demand specification used by Fumagalli and Motta as a special case, is sufficient but not necessary to obtain our results.[3] The monopoly price for a firm with cost c is denoted $p^m(c)$. The entrant's cost advantage is assumed to be non-drastic so that $p^m(c_E) > c_I > c_E$. Finally, define the incumbent's monopoly profit $\Pi_I^m = (p^m(c_I) - c_I)\,Q(p^m(c_I))$ and the entrant's monopoly profit $\Pi_E^m = (p^m(c_E) - c_E)\,Q(p^m(c_E))$.

[2] We also note problems with Fumagalli and Motta's analysis in the subgames where both buyers sign the incumbent's exclusive contract and where both buyers reject the incumbent's exclusive contract. Simpson and Wickelgren (2005) have independently noted a problem with Fumagalli and Motta's analysis in the latter subgame. However, we show that correcting Fumagalli and Motta's analysis in these subgames has little impact on their conclusions unless other assumptions are also altered.

[3] The assumption is used in lemma 3. However, lemma 3 continues to hold with constant elasticity demand, which is log-convex.

There are five stages to the game. In the first stage, the incumbent proposes contracts to the two buyers, which the buyers either accept or reject. The contracts involve the incumbent offering some fixed compensation x to buyers in return for them agreeing not to purchase from the entrant. Note this involves the upstream firm being able to make a lump-sum payment to the downstream firm, something we will also allow both upstream firms to do in the wholesale pricing stage. We focus on the case where only simultaneous and non-discriminatory offers are made, but the results continue to hold if discriminatory or sequential offers can be made. Let S denote the number of buyers that sign the contract ($S = 0$, 1, or 2). After observing the buyers' decisions, the entrant makes its entry decision. In the third stage, the upstream firm(s) offer contracts (two-part tariffs) to each buyer which consist of a per-unit price p and a (possibly negative) fixed fee ϕ, written as (p, ϕ). As in the existing literature, these offers can also be contingent on whether a buyer signed the initial contract or not. In the fourth stage, buyers decide whether to be active (accept one of the upstream firm's offers) or not. In the final stage, buyers compete for consumers by setting a linear price.

3 Entry and exclusion equilibria

When both buyers sign the incumbent's exclusive contract, the equilibrium analysis in the game that follows is straightforward since the entrant will then not enter. However, if one or both buyers reject the incumbent's exclusive contract and the entrant enters, the equilibrium analysis of the continuation game that follows is more subtle. We consider each subgame in turn.[4]

Lemma 1 *Consider the subgame where both buyers sign with the incumbent. There exists an equilibrium in which buyers obtain no profit, while the incumbent obtains the monopoly profit* Π_I^m.

Proof. With no free buyers, the entrant cannot sell to any downstream buyers, and so is irrelevant to the analysis (it cannot obtain any profit from entry). The incumbent can extract the maximal possible profits by offering each buyer the contract $(p^m(c_I), 0)$ in stage three. Buyers will not obtain any profit (so are just willing to be active), while the incumbent obtains the monopoly profit. If buyers require a positive profit to be active, the incumbent can always offer an arbitrarily small subsidy to achieve essentially the same outcome. ■

Lemma 1 shows that if both downstream buyers sign exclusive contracts with the incumbent, the incumbent will extract monopoly profit by selling to each buyer at the monopoly price. When one buyer instead deviates and does not sign the incumbent's contract, and the rival upstream firm enters in stage two, we characterize two possible equilibria. The first, characterized in lemma 2, replicates Fumagalli and Motta's equilibrium in our more general setting.

Lemma 2 *Consider the subgame where one buyer signs and one buyer does not sign the exclusive contract, and the rival upstream firm enters. There exists an equilibrium in which the signed buyer and the incumbent obtain no profit, while the entrant's profit is* $\Pi_E^m - \Pi_I^m > 0$ *and the free buyer's profit is* Π_I^m.

Proof. Assume that for any given set of offers in stage three, whenever it is an equilibrium in the fourth stage for the signed buyer to be inactive then this equilibrium is selected. Suppose the incumbent

[4] The level of compensation x and the entrant's fixed cost F play no role in these subgames, since they have already been incurred in stage one and two, so we ignore them in the lemmas that follow.

offers its signed buyer the contract $(p, 0)$ with $p > c_I$ and the free buyer the contract $(c_I, 0)$, while the entrant offers the free buyer the contract $(c_E, \Pi_E^m - \Pi_I^m)$. Given these offers, the signed buyer cannot make any profit if the free buyer chooses to be active, and so cannot do better than being inactive. If the signed buyer is inactive, the free buyer cannot do better than being active and buying from the entrant since the franchise fee charged by the entrant is designed to leave the free buyer indifferent between buying from the incumbent at c_I and buying from the entrant at c_E after paying the franchise fee. (If necessary, the entrant could always lower the franchise fee slightly to make the free buyer strictly prefer buying from the entrant.) Since it supplies units at its marginal cost, the entrant's profit just equals the franchise fee $\Pi_E^m - \Pi_I^m$. The free buyer will sell at the monopoly price $p^m(c_E)$, obtaining profit of Π_E^m less the franchise fee, which gives it a profit of Π_I^m.

Neither the incumbent nor entrant can do better changing their offers at stage three. If the entrant tries to extract more profit, the free buyer will take up the incumbent's offer. If the incumbent sets the per-unit price to its signed buyer closer to c_I, it is still an equilibrium for the free buyer to be active and the signed buyer to be inactive given the free buyer purchases at a per-unit price of c_E from the entrant. ■

For the same subgame, lemma 3 characterizes another equilibrium which has very different properties.

Lemma 3 *Consider the subgame where one buyer signs and one buyer does not sign the contract, and the rival upstream firm enters. There exists an equilibrium in which the buyers and the entrant obtain no profit, while the incumbent's profit is* $(p^m(c_E) - c_I) Q(p^m(c_E)) > 0$.

Proof. Assume that for any given set of offers in stage three, whenever it is an equilibrium in the fourth stage for the signed buyer to be active then this equilibrium is selected. Suppose the incumbent offers its signed buyer the contract (c_E, Π_E^m) and the free buyer the contract $(p, 0)$ with $p > p^m(c_E)$, while the entrant offers the free buyer the contract $(c_E, 0)$. Given these offers, the free buyer cannot make any profit if the signed buyer chooses to be active, and so cannot do better than being inactive. If the free buyer is inactive, the signed buyer cannot do better than being active since either way it obtains no profit. (If necessary, the incumbent can always lower the franchise fee slightly to make the signed buyer strictly prefer to be active.) Taking into account the loss from selling $Q(p^m(c_E))$ units below its own cost, the incumbent's profit is

$$(p^m(c_E) - c_I) Q(p^m(c_E)). \tag{1}$$

Since the entrant's innovation is assumed to be non-drastic, profit in (1) is positive.

Neither the incumbent nor entrant can do better changing their offers at stage three. The entrant cannot do better given it already offers the maximal possible surplus to buyers and receives no demand. It remains to prove that the incumbent cannot do better increasing the per-unit price w^s charged to its signed buyer. In this case, the free buyer will choose to be active regardless of what the signed buyer decides to do since it can always accept the entrant's offer and buy at c_E, undercutting the signed buyer in the downstream market. If it is to do better, the incumbent will therefore have to offer the free buyer profits of at least $(w^s - c_E) Q(w^s)$ in order that it accepts the incumbent's offer (given the entrant continues to offer a per-unit price of c_E). It can do this by offering the free buyer the contract $(p^m(w^s), -(w^s - c_E) Q(w^s))$. The incumbent will then lower the franchise fee offered to its signed buyer to $\phi^s = (p^m(w^s) - w^s) Q(p^m(w^s))$, so that the signed buyer is still willing to be active.

The incumbent's total profits from the signed buyer, given it supplies $Q\left(p^m\left(w^s\right)\right)$ units at w^s, will be $\left(p^m\left(w^s\right)-c_I\right)Q\left(p^m\left(w^s\right)\right)$. If we subtract the subsidy to the free buyer, then the incumbent's profit becomes

$$\left(p^m\left(w^s\right)-c_I\right)Q\left(p^m\left(w^s\right)\right)-\left(w^s-c_E\right)Q\left(w^s\right). \tag{2}$$

Note the first term in (2) is maximized when $w^s=c_I$. However, the second term $-\left(w^s-c_E\right)Q\left(w^s\right)$ is decreasing in w^s on $\left[c_E,p^m\left(c_E\right)\right]$. Since $p^m\left(c_E\right)>c_I$, the profit maximizing choice of w^s must therefore occur for $w^s<c_I$. We can rewrite (2) as

$$\left(p^m\left(c_E+\Delta\right)-\left(c_I+\Delta\right)\right)Q\left(p^m\left(c_E+\Delta\right)\right)-\Delta\left(Q\left(c_E+\Delta\right)-Q\left(p^m\left(c_E+\Delta\right)\right)\right) \tag{3}$$

where $w^s=c_E+\Delta$ and $0\leq\Delta<\left(c_I-c_E\right)$. We wish to show profits in (3) are less than in (1) when $\Delta>0$. With log-concave demand, Amir *et al.* (2004) show the margin between a monopolist's price and constant marginal cost decreases in the cost parameter. This implies $p^m\left(c_E+\Delta\right)-\left(c_I+\Delta\right)$ is decreasing in Δ. Given demand $Q\left(p^m\left(c_E+\Delta\right)\right)$ is also decreasing in Δ, this means the first term in (3) is decreasing in Δ. Taking into account the second term is always negative when $\Delta>0$, (3) attains its maximum over $0\leq\Delta<\left(c_I-c_E\right)$ when $\Delta=0$. Thus, the incumbent is worse off increasing the per-unit price it offers its signed buyer above c_E. ■

Lemma 3 shows that a buyer which deviates and does not sign with the incumbent when the other buyer does ends up with no profit. Moreover, the rival upstream firm makes no profit post entry, so it can never recover any fixed costs of entry. This is in sharp contrast to the entry equilibrium in lemma 2. The reason for the difference in findings reflects that Fumagalli and Motta ignore a profitable strategy for the incumbent, which is to make its signed buyer a fierce competitor. By ensuring its signed buyer's marginal cost equals the entrant's marginal cost, the deviating buyer cannot profit from accepting the entrant's offer when the signed buyer is active. If the free buyer is then inactive, it gives the signed buyer a monopoly which the incumbent exploits through a high franchise fee.[5] The result holds for log-concave demand functions such as $q\left(p\right)=\left(\left(a-p\right)/b\right)^{\eta}$, of which linear demand is a special case, and exponential demand $q\left(p\right)=e^{\left(a-p\right)/b}$. It also holds for constant elasticity demand $q\left(p\right)=ap^{-\eta}$, which is log-convex.[6]

The final lemma characterizes the equilibrium in the subgame in which both buyers reject the incumbent's contract offer. Given buyers are identical in this case, the upstream firms may not be able to set discriminatory offers in stage three. As discussed in the proof, the equilibrium proposed holds regardless of whether or not upstream firms can set discriminatory offers. Moreover, our equilibrium differs from that proposed by Fumagalli and Motta, which is not in fact an equilibrium.

Lemma 4 *Consider the subgame where both buyers reject the incumbent's contract, and the rival upstream firm enters. There exists an equilibrium in which both buyers purchase from the entrant, with the buyers and the incumbent obtaining no profit, while the entrant's profit is* $\left(c_I-c_E\right)Q\left(c_I\right)>0$.

Proof. Consider the contracts in stage three in which both the incumbent and the entrant offer $\left(c_I,0\right)$. Both buyers will be willing to be active, buying from the entrant and obtaining zero profit. (If necessary, the entrant can always offer a small subsidy to make each buyer strictly prefer to be active

[5] We discuss the case where both buyers are active at the end of this section.

[6] To see this, substitute the corresponding monopoly price $p^m=\eta/\left(\eta-1\right)w_s$ into (2). Taking out the common factor $ap^{-\eta}$, it is clear both the effective margin and the quantity demanded are decreasing in w_s, so that the incumbent's profits are still maximized by setting $w_s=c_E$.

and buy from the entrant.) The entrant obtains a profit of $(c_I - c_E) Q(c_I)$ and the incumbent makes no profit. To show this is an equilibrium, consider all possible deviations.

If the entrant offers a subsidy but charges a higher per-unit price $w^f > c_I$, it will have to attract both buyers to make this deviation profitable. If one buyer accepts the entrant's offer, the other buyer can then get a profit of $\left(w^f - c_I\right) Q\left(w^f\right)$ accepting the incumbent's offer (buying at c_I). Thus, the subsidy to each buyer has to be at least $\left(w^f - c_I\right) Q\left(w^f\right)$ to make both buyers willing to accept the entrant's offer rather than that of the incumbent. The entrant's resulting profit for $w^f \geq c_I$ is $\left(2c_I - w^f - c_E\right) Q\left(w^f\right)$, which is positive for $w^f < c_I + (c_I - c_E)$. Given an increase in w^f above c_I decreases both the margin $\left(2c_I - w^f - c_E\right)$ and the demand $Q\left(w^f\right)$, the best the entrant can do is to set $w^f = c_I$.[7] If instead the incumbent offers a subsidy but charges a higher per-unit price $w^f > c_I$, it will also have to attract both buyers to make this deviation profitable. As above, the subsidy to each buyer has to be at least $\left(w^f - c_I\right) Q\left(w^f\right)$ to make both buyers want to accept the incumbent's offer rather than that of the entrant. The incumbent's resulting profit for $w^f \geq c_I$ is $-\left(w^f - c_I\right) Q\left(w^f\right)$, which is negative.[8] Thus, neither the incumbent nor the entrant can deviate and do better than in the proposed equilibrium. ■

The equilibrium characterized by lemma 4 involves both upstream firms offering per-unit prices equal to the marginal cost of the higher cost incumbent with no franchise fee. The buyers obtain no profit in equilibrium. If necessary, the entrant will offer the buyers a small subsidy to stay active, which the incumbent is unable to afford. This equilibrium differs from that proposed in Fumagalli and Motta, which is characterized by each upstream firm offering a per-unit price equal to its monopoly price ($w_I^f = p^m(c_I)$ and $w_E^f = p^m(c_E)$ respectively), and the upstream firms then offering the same subsidies to both buyers $\phi_I^f = \phi_E^f = -(p^m(c_I) - c_I) Q(p^m(c_I))/2$. In Fumagalli and Motta's proposed equilibrium, the entrant's resulting profit is the difference between its own monopoly profit and that of the incumbent. To show this is not an equilibrium, note that the entrant can instead offer $w_E^f = c_E$ and a franchise fee equal to the difference between its monopoly profit and *half* the incumbent's monopoly profit. In equilibrium, only one buyer will accept this contract (say buyer 1), given the other buyer will prefer to accept the incumbent's offer to get the positive subsidy. This makes the entrant strictly better off. Moreover, this does not require the entrant make discriminatory offers in stage three.[9]

Having characterized the equilibria in the key continuation games, it is then straightforward to characterize the equilibria of the full game. We focus on two equilibria, one entry equilibrium corresponding to Fumagalli and Motta's analysis but with the equilibrium in the $S = 0$ subgame corrected, and one corresponding to our new equilibrium in the $S = 1$ subgame.

Proposition 1 *If $F \leq \min(\Pi_E^m - \Pi_I^m, (c_I - c_E) Q(c_I))$, there exists an equilibrium in which neither buyer signs the incumbent's exclusive contract and the entrant enters.*

[7] Even if the entrant can make discriminatory offers, charging buyer 1 $w_1^f > c_I$, the most it can extract from buyer 2 is $(c_I - c_E) Q\left(w_1^f\right)$ given buyer 2 can still purchase from the incumbent at c_I. This implies lower profits for the entrant than in the proposed equilibrium.

[8] The incumbent cannot do better with discriminatory offers either. For discriminatory offers to be profitable, the incumbent must set a per-unit price to one buyer (say buyer 1) above c_I. However, then the incumbent cannot obtain any profit from buyer 2 given buyer 2 can instead buy from the entrant at c_I without a franchise fee, and the incumbent cannot obtain any profit from buyer 1 given buyer 1 will not make any sales.

[9] Simpson and Wickelgren (2005) also note that Fumagalli and Motta's proposed equilibrium for the $S = 0$ subgame is incorrect. However, they focus only on the profitable deviation for the incumbent and they do not determine the resulting equilibrium.

Proof. Assume that the equilibrium in the $S = 1$ subgame is defined by lemma 2. Then given the condition on F in the proposition, the entrant will enter provided at least one buyer does not sign the exclusive deal. Since a deviating buyer obtains higher profit in the $S = 1$ subgame defined by lemma 2 than the incumbent can profitably offer in any exclusive deal, at least one buyer will not sign the contract. Then, consistent with Fumagalli and Motta, there is both an asymmetric entry equilibrium in which one buyer signs and one does not, and a symmetric entry equilibrium in which neither buyer signs with the incumbent. If $F > (c_I - c_E) Q(c_I)$, then the incumbent can "exclude" by not offering any contract since then the rival upstream firm will not enter given it cannot recover its fixed costs of entry when neither buyer is signed, while if $F > \Pi_E^m - \Pi_I^m$, the incumbent can exclude by offering a small compensation to each buyer given at least one buyer will then want to sign and given that the entrant needs to attract both buyers to profitably enter. ■

Proposition 1 characterizes the upper bound on fixed costs for which Fumagalli and Motta's entry equilibrium exists after their equilibrium analysis in the $S = 0$ subgame is corrected. Fumagalli and Motta claim the appropriate upper bound is that $F \leq \Pi_E^m - \Pi_I^m$, which is a weaker condition than that assumed in proposition 1. If the incumbent is relatively inefficient, it turns out their condition is not always consistent with an entry equilibrium.[10] Moreover, as the next proposition shows, Fumagalli and Motta are incorrect to claim that entry is the unique outcome.

Proposition 2 *For any fixed costs of entry, there exists an equilibrium in which both buyers sign the incumbent's exclusive contract and the entrant does not enter. The incumbent obtains the monopoly profit* $(p^m(c_I) - c_I) Q(p^m(c_I))$.

Proof. From lemmas 1, 3 and 4, the entrant's profit is $(c_I - c_E) Q(c_I)$ in the $S = 0$ subgame, but is otherwise zero. This implies it will only enter if $F \leq (c_I - c_E) Q(c_I)$ and neither buyer signs with the incumbent. Even if the first condition is satisfied, the second will not be satisfied. This follows since signing is a dominant strategy for buyers for any compensation $x > 0$ (buyers get no profit in each of the continuation games $S = 0$, $S = 1$ and $S = 2$). The incumbent can therefore exclude by offering an arbitrarily small compensation, obtaining (almost) the full monopoly profit. To avoid open-set problems in defining the equilibrium, we can always assume that when buyers are indifferent between signing the incumbent's exclusive contract and not, they sign the contract, which means exclusion still arises if the incumbent offers no compensation. ■

Proposition 2 shows just how easily the incumbent may be able to exclude. Even if the entrant's innovation is almost drastic (implying a large cost advantage), if the fixed costs of entry are negligible, and the incumbent can only make simultaneous and non-discriminatory contract offers to buyers, the incumbent can still exclude offering an arbitrarily small compensation to buyers. Signing is a dominant strategy for buyers. When no other buyers sign, a buyer that does not sign gets no profit due to the intense nature of competition between rival buyers, and that the entrant has no incentive to share any of its efficiency profit with a buyer once it has already rejected the incumbent's contract offer. When at least one other buyer signs, a buyer that does not sign gets no profit since the incumbent will optimally choose to make its signed buyer a fierce competitor. In contrast, by signing a contract with the incumbent, each

[10] Fumagalli and Motta assume $Q(p) = 1 - p$ and $c_E = 0$. With this specification, if $c_I > 2/3$, then $(c_I - c_E) Q(c_I) < \Pi_E^m - \Pi_I^m$ so that their assumption that $F < \Pi_E^m - \Pi_I^m$ is consistent with $F > (c_I - c_E) Q(c_I)$. Thus, the incumbent can sometimes avoid entry simply by not offering any exclusive contract.

buyer can obtain a positive compensation, which the incumbent will be willing to offer given that by signing a buyer it eliminates upstream competition and obtains a positive profit. As a result, both buyers will want to sign for an arbitrarily small compensation and the incumbent monopolizes the industry.[11]

The result in proposition 2 is in marked contrast to that in proposition 1. The key difference between the two results arises from the contrasting equilibria identified in the $S = 1$ subgame in which one buyer rejects the incumbent's exclusive deal. We show that the logic that when buyers compete downstream attracting just a single buyer will enable the entrant to cover its fixed costs need not hold when upstream firms offer two-part tariffs. In fact, in our equilibrium the entrant cannot obtain any profit unless both buyers reject the incumbent's exclusive contracts. In contrast, the incumbent can obtain the full monopoly profit even if only a single buyer signs, since then there will be no entry.

Whether the equilibrium in proposition 1 or proposition 2 prevails depends on whether the signed buyer remains active or not in the case in which only one buyer signs an exclusive deal with the incumbent. Fumagalli and Motta only consider the case in which the signed buyer is inactive. If instead the signed buyer gets to choose whether to be active first, then the equilibrium in lemma 2 no longer holds and exclusion rather than entry is predicted. In this case, the signed buyer will choose to be active given the offers characterized in lemma 3, knowing that the free buyer will then prefer to accept the incumbent's offer (say, with an arbitrarily small subsidy). Similarly, if the incumbent can offer a profit sharing agreement in stage 3, the exclusion equilibrium in proposition 2 also prevails. The incumbent can ensure the signed buyer will be active by taking all of its downstream profits through a profit sharing agreement rather than a franchise fee and instead offering it a small subsidy for remaining active. This makes being active a dominant strategy for the signed buyer. With this single modification, the proposed strategies in Fumagalli and Motta no longer characterize an equilibrium and exclusion instead prevails. Finally, if we *assume* that both buyers are active, then by the same logic, the exclusion equilibrium in lemma 3 continues to hold but the entry equilibrium in lemma 2 does not.[12]

4 Extensions

A difference between the model above and that in Fumagalli and Motta is that they assume buyers have to incur some (arbitrarily small) fixed costs ε of staying active. Given this cost, buyers decide whether they want to be active after observing the wholesale offers of the upstream firms. In the analysis above, we assumed $\varepsilon = 0$, a case Fumagalli and Motta claim also gives rise to their results. Here, we note our findings extend to allowing for some arbitrarily small $\varepsilon > 0$. In the $S = 2$ subgame, the equilibrium outcome is essentially the same as that characterized in lemma 1. The incumbent can obtain almost the same profit by offering a subsidy to each firm of ε. This ensures buyers do not need to randomize over whether to be active or not, and so generates higher profits for the incumbent than the (non-optimal) strategy considered by Fumagalli and Motta of pricing slightly below the monopoly price. Both buyers

[11] It follows that welfare is higher in this model if exclusive deals are banned. Without exclusive deals, the entrant will enter whenever its efficiency profits are at least equal to its fixed cost of entry. This ensures that entry raises productive efficiency. Moreover, allocative efficiency is also enhanced by the resulting upstream competition, which lowers prices down to the incumbent's marginal cost.

[12] Assuming both buyers have to be active runs into the problem that the incumbent will want to set arbitrarily high franchise fees to signed buyers, knowing they have no choice but to pay. For this reason, it is necessary to assume that the franchise fees (signed) buyers end up paying are bounded above by their downstream profits.

still end up with zero profit. Similarly, in the $S = 1$ subgame, both equilibria in lemma 2 and lemma 3 apply, except in lemma 3 the incumbent has to charge a slightly lower franchise fee to leave the signed buyer with a profit of ε so it is willing to be active. Given ε can be made arbitrarily small, the incumbent's profit in equilibrium will remain positive given it is strictly positive in lemma 3. The buyers and the entrant continue to obtain no profit. Finally, in the $S = 0$ subgame, the equilibrium requires the incumbent offer a per-unit price slightly above its marginal cost and use the resulting wholesale profit to subsidize the buyer's fixed cost of being active. The entrant will set the same per-unit price as the incumbent and sell to both buyers given the entrant is willing to subsidize the buyers by more than the incumbent can afford to offer. The entrant's resulting profits are almost identical to those characterized in lemma 4 (given ε is arbitrarily small).

Our analysis also extends to the case with N identical downstream buyers, rather than just two. If no buyer signs with the incumbent, upstream competition will again drive per-unit prices to the incumbent's marginal cost. This leaves buyers with no profit. The incumbent can again exclude by signing up just one buyer. By following the same strategy defined in lemma 3, the incumbent can leave the entrant unable to profitably attract any of the free buyers given it sells to the signed buyer at the entrant's marginal cost. It remains an equilibrium for the signed buyer to be active and the free buyers inactive, enabling the signed buyer to obtain monopoly profits, which the incumbent extracts through a franchise fee. This enables the incumbent to obtain positive profits which it can share with any buyer(s) for signing. On the other hand, if all buyers sign with the incumbent, it can extract monopoly profits, and offer each buyer up to a $1/N$ share of these for signing up. As a result, exclusion remains an equilibrium outcome.

A more challenging extension is to allow for differentiated buyers. In a similar setting but with linear wholesale pricing, Simpson and Wickelgren (2004) have considered differentiated buyers, showing that provided differentiation is not too strong exclusion remains the unique outcome. Fumagalli and Motta reach the opposite conclusion when downstream buyers compete in quantities, reflecting that quantity competition leads to less competitive outcomes than price competition. When downstream firms are imperfectly competitive, profits under monopoly are limited by double marginalization so that downstream firms may do better not signing contracts and buying from a competitive upstream market. On the other hand, with intense downstream competition, downstream firms are left with almost no profits in equilibrium. The incumbent and its buyers can do better by signing exclusive deals which prevent the entrant from competing, and sharing the resulting monopoly profits. Once we allow for non-linear wholesale pricing, double marginalization no longer limits industry profits under monopoly. This suggests exclusion may still arise in equilibrium even with moderate levels of differentiation. However, whether this is true or not, remains to be analyzed.

Finally, it is worth noting that allowing for more flexibility in the incumbent's contracting possibilities is only likely to make exclusion easier. Discriminatory or sequential contracts, contracts with price commitments and contingent contract offers are some of the various ways upstream firms may exclude in practice. Our analysis shows that for an important benchmark case, exclusion can be achieved without using any of these.

5 Conclusion

The "Chicago School" defence of exclusive dealing (Posner, 1976 and Bork, 1978) remains highly influential despite the works of Bernheim and Whinston (1998), Rasmusen *et al.* (1991), and Segal and Whinston (2000) among others, which show that exclusive deals can be harmful. However, the logic of Posner (1976) and Bork (1978), like much of the literature which has proceeded it, either assumes buyers are final consumers or that their interests are aligned with final consumers. Once it is recognized that buyers are in fact almost always competing downstream firms, the Chicago School logic can have a very different implication. Since industry profit under monopoly is greater than under competition, downstream firms will often be willing to sign exclusive contracts to limit competition by preventing efficient entry. This raises the joint profit of the incumbent and downstream competitors, and so the "surplus" that is available to the firms for signing contracts.

In this Note, we have shown one model that is consistent with this effect. The model is based on a recent article by Fumagalli and Motta (2005), who argue competition between downstream buyers leads only to entry. We find that even under conditions more likely to sustain entry than they consider (lower fixed costs of entry, and only simultaneous and non-discriminatory contracts), inefficient exclusion can arise instead. The key reason for the difference between our results and theirs is because they ignore a profitable strategy for the incumbent that arises when only a single buyer signs the incumbent's contract. In the new equilibrium that follows, we find that a more efficient entrant must sell to both downstream buyers to cover its fixed costs of entry (even if these are arbitrarily small), and that downstream buyers will always prefer to sign with the incumbent regardless of what they think other buyers will do. Thus, unlike the earlier models of Naked Exclusion such as Rasmusen *et al.* (1991) and Segal and Whinston (2000), we find (i) any fixed costs of entry, no matter how small, can cause entry to be blocked by exclusive deals; and (ii) in the exclusion equilibrium buyers both individually and jointly prefer to sign with the incumbent so that a coordination failure between buyers is no longer needed to explain inefficient exclusion.

6 References

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