Exclusive Dealing and Entry, when Buyers Compete: Comment

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Abstract

In a recent paper, Chiara Fumagalli and Massimo Motta (2006) challenge the idea that an incumbent can foreclose efficient entry in the face of scale economies by using exclusive contracts. They claim that inefficient exclusion does not arise when buyers are homogenous firms that compete downstream. However, when upstream firms can compete in two-part tariffs, their equilibrium analysis contains some errors. Fixing these errors, inefficient exclusion arises when scale economies are sufficiently large or the entrant's cost advantage is not too big. Inefficient exclusion arises to protect industry profits from competition. (JEL: L12, L13, L42)

In a recent paper, Chiara Fumagalli and Massimo Motta (2006) (hereafter FM) challenge the Eric B. Rasmusen, J. Mark Ramseyer, and John S. Wiley, Jr. (1991) and Ilya R. Segal and Michael D. Whinston (2000) result of naked exclusion in which an incumbent forecloses efficient entry by exploiting the fact a rival needs a sufficient number of buyers to make its entry profitable by signing up some of them with exclusive contracts. FM argue that given buyers are

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typically firms that compete downstream rather than final consumers, an efficient entrant only needs a single deviating downstream buyer to cover its fixed costs of entry. They present a model in which buyers are homogenous price competitors, claiming the model implies a *unique* entry equilibrium whenever entry is efficient. Their result suggests exclusive deals written between an incumbent and competitive downstream buyers are no longer a concern.

In this paper, FM's equilibrium analysis is shown to contain some errors. Fixing these errors changes their conclusions for some of the cases they consider. Exclusive deals written between an incumbent and competitive downstream buyers will still often arise in equilibrium, thereby blocking efficient entry. Inefficient exclusion arises to protect industry profits from competition. The issue centers on how competition works when upstream firms sell to consumers through two competing downstream buyers in the case upstream firms can offer downstream buyers two-part tariffs. The analysis of competition in this setting turns out to be surprisingly subtle and the analysis here should be of more general interest to those modeling competition in vertical settings.

The particular model FM consider is based on the cost specification in 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 identical 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. FM derive their results under two different assumptions on wholesale pricing — upstream firms are required to set linear wholesale prices (Section I) and upstream firms are allowed to offer two-part tariff contracts (Section II). Since restricting upstream firms to charge linear wholesale prices to buyers seems inconsistent with assuming the incumbent can offer exclusive contracts with a fixed compensation in the initial stage, and since linear wholesale prices can lead to double marginalization problems, the focus in this paper is on the less restrictive case considered by FM where upstream firms are allowed to offer downstream buyers two-part tariffs.[1]

In this setting, correcting FM's analysis shows that entry only arises when scale economies are not too important *and* the entrant's efficiency advantage is sufficiently large. When either condition does not hold, exclusion arises instead. Although the specifics are changed, FM's basic insight still applies. Tough downstream competition makes it more attractive for a single buyer to deviate from an exclusive agreement since potentially it can capture the entire market by buying from the more efficient entrant. However, FM understate the ability of the incumbent, with a signed buyer, to compete in this setting. Although the incumbent is less efficient, it turns out that having a committed buyer gives it a competitive advantage since it can make use of a divide-and-conquer type strategy. Strengthened competition from the incumbent lowers the entrant's profit, implying sometimes it will need to attract both buyers to cover its fixed costs of entry. But if neither buyer signs, tough downstream competition means they obtain no profit, so they will always be willing to sign with the incumbent to avoid this situation. Here in the spirit of B. Douglas Bernheim and Michael Whinston (1998), signing exclusively with the incumbent can be a dominant strategy for buyers since doing so may be their only hope of obtaining positive profits given the intense competition that would otherwise emerge.

This last point highlights a general reason why anticompetitive exclusive deals may be more likely to arise when buyers compete downstream. Since industry profit under monopoly is generally 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 in-

[1] With linear wholesale pricing, FM also show inefficient exclusion will not arise. As they note, this result depends on buyers facing a small fixed cost to stay active. Without these fixed costs, FM correctly show there are both entry and exclusion equilibria. John Simpson and Abraham L. Wickelgren (2007) and Jose-Miguel Abito and Julian Wright (2008) show that if downstream competitors are slightly differentiated, exclusion equilibria become unique. In fact, Simpson and Wickelgren (2007) show exclusion arises with some downstream differentiation even in the absence of scale economies and even allowing for breach of contracts.

cumbent and downstream competitors, and so the "surplus" that is available to the firms for signing contracts. In earlier works, John Simpson and Abraham L. Wickelgren (2001), Christodoulos Stefanadis (1998) and Jong-Say Yong (1999) also offer related explanations for how anticompetitive exclusive deals may be facilitated by downstream competition. Downstream buyers sign to prevent a situation where they would otherwise compete away their rents. These papers, however, involve quite different environments, including that exclusive deals involve a commitment by the incumbent to provide the input at a certain wholesale price.

The next section recaps FM's model. Section II presents the main results by way of three lemmas and a proposition, while a final section discusses the results and their implications.

I The model

This section briefly recaps FM's model. Two upstream firms can produce a good that can be used by two buyers as an input to produce an identical final good sold in a downstream market. There is a one-to-one relationship between the input bought by a buyer and the output sold in the final market, with the cost of transformation and resale set to zero. Market demand is denoted $Q(p)$, which as in FM is specified as

$$Q(p) = 1 - p \tag{1}$$

for simplicity. Sometimes the more general functional form for demand will be used since it makes the explanations clearer. Define the monopoly price for a constant marginal cost of w to be $p^m(w)$ and the corresponding monopoly profit to be $\Pi^m(w) = (p^m(w) - w)\, Q(p^m(w))$. Both upstream firms, the incumbent (denoted I) and the potential entrant (denoted E) face constant marginal costs, with these (from FM) satisfying

$$0 = c_E < c_I < p^m(c_E). \tag{2}$$

As in FM, c_E is set equal to zero so that $p^m(c_E) = 1/2$. This rules out wholesale prices being set below c_E (which would lead to unbounded demand). Despite this, the notation c_E and $p^m(c_E)$ will sometimes be used where it makes the explanations clearer.

The two downstream buyers (e.g. retailers) are identical from the point of view of consumers and compete in price. Each downstream buyer face an arbitrarily small fixed cost $\varepsilon > 0$ if it wants to be active. E faces a fixed cost of entry F which satisfies

$$\frac{\Pi^m(c_E) - \Pi^m(c_I)}{2} \leq F < \Pi^m(c_E) - \Pi^m(c_I), \tag{3}$$

which given (1) and (2) corresponds to assumption A2 in FM.

There are five stages to the game. In the first of these stages (labelled t_0), I proposes contracts to the two buyers, which they either accept or reject. The contracts involve I offering some fixed compensation x to buyers in return for them agreeing not to purchase from E. Let S denote the number of buyers that sign the contract ($S = 0$, 1, or 2). After observing the buyers' decisions, E makes its entry decision in stage t_1. In stage t_2, the upstream firm(s) offer contracts (two-part tariffs) to each buyer which consist of a (non-negative) per-unit wholesale price w and a (possibly negative) fixed fee ϕ, written in the form (w, ϕ). In stage t_3, buyers observe all offers and decide whether to be active and which offer to accept or whether to be inactive instead.[2] If buyers choose to be active, as well as paying (or receiving) the fixed fee ϕ, they also incur some arbitrarily small fixed cost of setup $\varepsilon > 0$. If they choose to remain inactive, their payoff is zero.[3] In the final stage t_4, active buyers compete for consumers buying the input at the wholesale price

[2] It is assumed a buyer cannot accept an offer from one firm (e.g. so as to receive compensation) and also accept an offer from another firm (e.g. so as to receive additional compensation or to buy the product at a lower wholesale price). This would follow if offers of compensation at t_2 can be conditional on the buyer not also buying from the rival firm (as was assumed at t_0).

[3] If the timing of the game was different so buyers could take compensation (if there is any) and then decide whether to be active or not, the analysis will be the same provided upstream firms can make their compensation contingent on the buyer being active.

specified in the contract signed at t_3.

II Analysis and results

This section starts by considering what happens in each of the three possible continuation games at t_2.

Subgame with no free buyers: If both buyers sign the exclusive contract at t_0 so that $S = 2$ or if E does not enter at t_1, then there will be no upstream competition in the continuation game at t_2. In this case, I's profit will be approximately the monopoly profit $\Pi^m(c_I)$. The signed buyers each obtain no profit while I obtains profit $\Pi_{I|S=2} \to \Pi^m(c_I)$ as $\varepsilon \to 0$. FM prove this result relying on the mixed strategy equilibrium in buyers' acceptance choices, with the wholesale price tending towards $p^m(c_I)$ as $\varepsilon \to 0$ (see their Appendix A). Even ruling out discriminatory offers across identical buyers at t_2, I can still do better than in FM's proposed mixed strategy equilibrium if it instead offers the contract $(p^m(c_I), -\varepsilon)$ to both buyers so that both buyers are always willing to be active.[4] Nevertheless, as $\varepsilon \to 0$, the difference in profits between their solution and this one becomes inconsequential. (Throughout the paper, equilibrium outcomes will be evaluated in the limit as $\varepsilon \to 0$. If a firm obtains a profit of $y - \varepsilon$ where y is a positive number, then the profit will be said to be positive.)

Subgame with both free buyers: Suppose instead E does enter at t_1. If neither buyer signs an exclusive contract at t_0, so that $S = 0$, FM propose an equilibrium in the continuation game at t_2 in which I offers $(c_I, 0)$ and E offers $(c_E, \Pi^m(c_E) - \Pi^m(c_I))$, with one buyer accepting

[4] If discriminatory offers are allowed, I can obviously do better offering the contract $(c_I, \Pi^m(c_I) - \varepsilon)$ to a single buyer. The buyer will accept and I obtains the maximum possible profit.

E's offer and the other remaining inactive.[5] This gives E a profit of

$$\Pi_{E|S=0} = \Pi^m(c_E) - \Pi^m(c_I). \tag{4}$$

However, these offers do not characterize an equilibrium in this subgame. E can do better offering buyers the good at I's higher marginal cost and subsidizing buyers to be active.

Lemma 1 *FM's proposed equilibrium in the $S = 0$ subgame with two-part tariffs is not, in fact, an equilibrium. In equilibrium the incumbent offers $(c_I, 0)$ and the entrant offers $(c_I, -\varepsilon)$, implying the free buyers obtain no profit while the entrant obtains profit $\Pi_{E|S=0} \to (c_I - c_E) Q(c_I)$ as $\varepsilon \to 0$.*

Proof. Consider the deviation in which E offers $(c_I, -\varepsilon)$ to both buyers. Regardless of what the other buyer does, each buyer prefers this offer to I's offer of $(c_I, 0)$ or being inactive. (If necessary, E can always offer a slightly bigger compensation than ε). With both buyers accepting, homogenous Bertrand competition will cause them to price at c_I, which gives them no profit and E a profit of

$$\Pi'_{E|S=0} = (c_I - c_E) Q(c_I) - 2\varepsilon. \tag{5}$$

This deviation is profitable since (5) exceeds (4) given (1) and (2).

To see why I's offer of $(c_I, 0)$ and E's offer of $(c_I, -\varepsilon)$ characterize an equilibrium, note that if I offers a compensation greater than ε (so it can attract buyers) but charges a higher wholesale price w (above c_I), it will have to attract both buyers to make this deviation profitable. The compensation to each buyer has to be at least $(w - c_I) Q(w) + \varepsilon$ to make both buyers want to accept the offer rather than accepting E's offer given the other buyer accepts I's offer. Given buyers will accept this offer, I will get a gross profit of $(w - c_I) Q(w)$ but have to pay

[5] In an earlier version of their paper, FM had proposed a different equilibrium in which I and E both offered compensation to buyers with both buyers accepting E's offer. However, John Simpson and Abraham L. Wickelgren noted a profitable deviation from that equilibrium, which led FM to propose the present solution.

$2(w-c_I)Q(w)+2\varepsilon$ in compensation. I's net profit is less than $-(w-c_I)Q(w)$, which is negative given $w>c_I$. If instead, I offers a lower wholesale price (below c_I) but charges an upfront fee, then one buyer will always prefer to accept E's offer, in which case I's resulting profit must again be negative. By a similar argument, E can also not do any better than changing its offer from $(c_I,-\varepsilon)$. ■

Lemma 1 shows that when both buyers are free to choose either upstream firm, the equilibrium involves interbrand competition working in its standard way. This means buyers are left with no profit, with all profit extracted by the more efficient entrant. This is in contrast to FM's proposed equilibrium in which one free buyer was left with almost the monopoly profit $\Pi^m(c_I)$. This difference alone can substantially strengthen the power of certain types of exclusive deals. As will be discussed in Section III, it implies downstream buyers have a strong mutual incentive to avoid competition and entry.

Subgame with one free buyer: Finally, consider the continuation game at t_2 in which only one buyer (denoted $B1$) signs an exclusive contract at t_0 (so that $S=1$) and E enters at t_1. The other buyer (denoted $B2$) is free to buy from I or E. This subgame turns out to be the most complicated to analyze.

FM propose the following equilibrium. I offers $(p,0)$ to $B1$ with $p>c_I$ and offers $(c_I,0)$ to $B2$. E offers $(c_E,\Pi^m(c_E)-\Pi^m(c_I))$ to $B2$. Given these offers, the equilibrium in the t_3 subgame is for $B1$ to be inactive and $B2$ to be active (buying from E). $B2$ will sell at the monopoly price $p^m(c_E)$, obtaining profit $\Pi^m(c_I)-\varepsilon$. E's profit is $\Pi_{E|S=1}=\Pi^m(c_E)-\Pi^m(c_I)$ while I obtains no profit. However, these offers leave open a profitable deviation for I.

Lemma 2 *FM's proposed equilibrium in the $S=1$ subgame with two-part tariffs is not, in fact, an equilibrium.*

Proof. Fix E's offer to $B2$ to be $(c_E,\Pi^m(c_E)-\Pi^m(c_I))$ as in FM's proposed equilibrium.

Suppose I offers $(c_E, (c_I - c_E) Q(c_I) - \varepsilon)$ to $B1$ and $(c_I, 0)$ to $B2$. This offer ensures E's offer to $B2$ is weakly dominated by I's offer. If $B1$ is inactive, $B2$ will obtain the same payoff from I and E. If $B1$ is active, it will obtain a higher profit from I. Therefore, $B2$ will never choose E's offer. (If necessary, I can always offer $B2$ a slightly lower wholesale price to make sure E's offer is strictly dominated.) Knowing this, $B1$ will prefer to accept I's offer regardless of whether it thinks $B2$ will be active (buying from I) or not. That is, rejecting I's offer is a weakly dominated strategy. (If necessary, rejecting I's offer can be made a strictly dominated strategy by reducing I's fixed fee to $B1$ slightly.) However, with $B1$ active, $B2$ will prefer to remain inactive and avoid the fixed cost ε.[6] This means the only equilibrium in the t_3 continuation game involves $B1$ choosing to be active and $B2$ choosing to remain inactive. $B1$'s profit is $\Pi^m(c_E) - (c_I - c_E) Q(c_I)$, which is positive given $p^m(c_E)$ maximizes $(p - c_E) Q(p)$ and $p^m(c_E) > c_I$ and I's profit is $(c_E - c_I) Q(p^m(c_E)) + (c_I - c_E) Q(c_I) - 2\varepsilon = (c_I - c_E)(Q(c_I) - Q(p^m(c_E))) - 2\varepsilon$, which is positive given $p^m(c_E) > c_I$. ■

The deviation in lemma 2 involves a divide-and-conquer type strategy. This strategy involves I offering $B1$ a below-cost wholesale price (equal to E's marginal cost) with a moderate fixed fee and $B2$ a wholesale price equal to I's marginal cost with no fixed fee. The purpose is to: (i) make $B1$ a low-cost competitor so $B2$ will not want to compete if it faces $B1$; (ii) make buying from E a dominated strategy for $B2$; (iii) ensure $B1$ will be willing to be active even if $B2$ is also active (buying from I); and (iv) in so doing ensure $B2$ will not want to be active in equilibrium, leaving $B1$ as a monopolist in equilibrium. Despite I's wholesale price being below

[6] This is the only point where the analysis in this paper needs to be adjusted if downstream buyers do not face any fixed costs of being active (i.e. $\varepsilon = 0$). With $\varepsilon = 0$ and the offers given here, $B2$ could remain active, buying from I with the offer $(c_I, 0)$. In order to prevent this, I can achieve the same outcome by offering $B2$ a slightly lower wholesale price and a small fixed fee. This ensures $B2$ will not want to accept either of I or E's offers, preferring instead to remain inactive. If buyers do not face any fixed costs of being active, lemma 2 will therefore still hold, as will all of the other results stated in this paper.

its own costs, I makes a positive profit. The amount of units I provides below cost is based on the actual monopoly demand it faces. This is less than the number of units it would supply if $B2$ was active, and it is the latter sales level which determines the maximum lump-sum fee that I can charge $B1$ while ensuring its offer will always be accepted.

Note this divide-and-conquer strategy involves I setting a wholesale price that is below its own marginal cost. This is an example of *vertical limit pricing*, which Aggey Semenov and Julian Wright (2008) analyze in a more generic setting. Vertical limit pricing relies on the commitment of an upstream firm to make its downstream firm a tough competitor in the face of competition, which it does through a vertical contract. Pricing below cost at the wholesale level can be profitable since (i) it commits its downstream buyer to be aggressive so deterring competition from a rival; (ii) this ensures its downstream buyer is a monopolist so it can sustain a high retail price; and (iii) some or all of the profits associated with this high retail price can be recovered through a fixed fee.[7]

Lemma 2 established that FM's proposed equilibrium in the $S = 1$ subgame does not hold. Determining valid equilibria for this subgame is surprisingly subtle. This reflects the rich array of deviating strategies available to the firms. Specifically, any equilibrium must be robust to the type of divide-and-conquer deviation highlighted in lemma 2. In some cases, I may have to pay $B2$ to run the divide-and-conquer strategy. However, in this case, $B2$ will remain active and buy from I. To maximize the amount it can extract through $B1$, I will charge $B2$ a high wholesale price. It can then extract more profit through $B1$, which may more than offset the compensation paid to $B2$. Also possible deviations by E may involve a wholesale price set as low as marginal

[7]Here, vertical limit pricing relies on renegotiation not being allowed, which FM also assume. Otherwise, having got $B2$ to be inactive, I and $B1$ would prefer to re-contract so $B1$ is supplied at a wholesale price equal to I's own cost of c_I rather than at c_E. Semenov and Wright (2008) show that, in general, this type of re-contracting can be avoided if upstream firms can offer multi-part tariffs involving quantity discounting with three or more parts.

cost without any fixed fee or a higher wholesale price with $B2$ receiving compensation to ensure it remains active.

An additional subtlety is that some offers will lead to multiple equilibria in the t_3 continuation game, one in which $B1$ is active and $B2$ is inactive (or buys from I), and another in which $B1$ is inactive and $B2$ buys from E. In order to consider the situation most favorable to entry, in such cases it will be assumed that whenever there is an equilibrium in the t_3 continuation game in which $B2$ buys from E, it is selected. Since E is more efficient, this is consistent with the free buyer choosing the most efficient supplier whenever doing so is an equilibrium outcome.

Lemma 3 *Consider the subgame with $S = 1$ in which the rival upstream firm has entered. Suppose whenever there is an equilibrium in the t_3 continuation game in which the free buyer chooses the entrant's offer, then it will be selected. For $0 < c_I < 1/8$, the entrant does not attract the free buyer in equilibrium and obtains no profit. For $1/8 \leq c_I < \sqrt{6}/2 - 1$, the entrant attracts the free buyer in equilibrium but does not cover the lower bound on its range of possible fixed costs. For $\sqrt{6}/2 - 1 \leq c_I \leq 1/2$, the entrant attracts the free buyer in equilibrium and covers the lower bound on its range of possible fixed costs but does not cover the upper bound on its range of possible fixed costs.*

Proof. (i) If $0 < c_I < 1/8$, the equilibrium in the continuation game starting at t_2 involves:

$$I \text{ offers } \left(c_E, \Pi^m\left(c_E\right) - \varepsilon\right) \text{ to } B1,$$

$$I \text{ offers } \left(p^m\left(c_E\right), -\left(\Pi^m\left(c_E\right) - \Pi^m\left(p^m\left(c_E\right)\right)\right)\right) \text{ to } B2,$$

$$E \text{ offers } \left(c_E, 0\right) \text{ to } B2.$$

If $B2$ thinks $B1$ will be active, it will strictly prefer I's offer. If $B2$ thinks $B1$ will be inactive, it is indifferent between accepting the two offers. (If necessary, I can always offer a slightly higher compensation to make $B2$ strictly prefer its offer.) This ensures $B2$ will accept I's offer. As a result, $B1$ will also accept I's offer. (If necessary, I can always offer a slightly lower fixed fee to make $B1$ strictly prefer accepting its offer). Thus, the equilibrium in the t_3 continuation game is that $B1$ and $B2$ both buy from I. I's profit is $\Pi^m(p^m(c_E)) - (c_I - c_E) Q(p^m(c_E)) - \varepsilon = 1/16 - c_I/2 - \varepsilon$ which is positive for $c_I < 1/8$. Note since in the proposed equilibrium E already offers to sell at cost, it cannot offer any more surplus in order to attract $B2$. On the other hand, if I tries to extract any more surplus, then given the rule on equilibrium selection in t_3, $B2$ will switch to E and $B1$ will be inactive.[8] As a result, E obtains no profit in equilibrium when $0 < c_I < 1/8$.

(ii) If $1/8 \leq c_I \leq 1/4$, I can no longer afford to make the offer in (i). Instead, in equilibrium I offers the most it can afford to give $B2$ assuming this would enable it to attract both buyers. The equilibrium in the continuation game starting at t_2 involves:

$$I \text{ offers } \left(c_E, \Pi^m(c_E) - \varepsilon\right) \text{ to } B1,$$

$$I \text{ offers } \left(p^m(c_E), -\left(\Pi^m(c_E) - (c_I - c_E) Q(p^m(c_E)) - \varepsilon\right)\right) \text{ to } B2,$$

$$E \text{ offers } \left(c_E, (c_I - c_E) Q(p^m(c_E)) - \Pi^m(p^m(c_E)) + \varepsilon\right) \text{ to } B2.$$

With these offers, there is an equilibrium in the t_3 continuation game in which $B1$ will be inactive and $B2$ will buy from E. To see this, suppose $B1$ is expected to be inactive. If $B2$ accepts I's offer, it will get $\Pi^m(p^m(c_E)) + \Pi^m(c_E) - (c_I - c_E) Q(p^m(c_E)) - 2\varepsilon$, which equals $5/16 - c_I/2 - 2\varepsilon > 0$. It will get exactly the same profit if it instead accepts E's offer. If necessary, E can always offer slightly more to make $B2$ strictly prefer its offer. Given this, $B1$ will indeed prefer to be inactive. E's resulting profit is $(c_I - c_E) Q(p^m(c_E)) - \Pi^m(p^m(c_E)) + \varepsilon = c_I/2 - 1/16 + \varepsilon$, which is positive for $c_I \geq 1/8$.

[8] If I offers the same surplus to $B2$ by offering $(w, \Pi^m(w) - \varepsilon)$ to $B1$ and $(p^m(w), -(\Pi^m(c_E) - \Pi^m(p^m(w))))$ to $B2$ for some other w, it would maximize its profit by choosing $w = 4c_I/3 - 1/3$. This wholesale price is negative for $c_I < 1/4$, which explains why setting $w = c_E = 0$ is the best it can do given a negative wholesale price would lead to unbounded demand by $B1$.

If E tries to extract any more surplus, then $B2$ will switch to I's offer which will dominate. If I tries to offer a greater compensation to attract $B2$, it will make a loss. If I only sells to $B2$, even if it sells at cost c_I, $B2$ will prefer E's offer so this will not enable it to profitably attract any demand. Finally, suppose I adopts the deviation strategy considered in lemma 2. It offers $(c_E, (w - c_E) Q(w) - \varepsilon)$ to $B1$ and $(w, 0)$ to $B2$ with $w > c_E$ such that if $B1$ accepts and $B2$ is inactive then I's profit is non-negative. For this to give I non-negative profits would require $w > \left(1 - \sqrt{1 - 2c_I}\right)/2$ so that $(w - c_E) Q(w) > (c_I - c_E) Q(p^m(c_E))$. However, if $B1$ is expected to be inactive, $B2$ will still prefer to accept E's offer since $\Pi^m(w) < \Pi^m(p^m(c_E)) + \Pi^m(c_E) - (c_I - c_E) Q(p^m(c_E))$ for this range of c_I and w. Thus, the proposed offers characterize an equilibrium for $1/8 \leq c_I \leq 1/4$.

In this equilibrium, E's profit is lower than the lower bound on the range of possible fixed costs in (3) if $c_I < \sqrt{6}/2 - 1$, while it is lower than the upper bound on the range of possible fixed costs in (3) if $c_I \leq 1/4$.

(iii) Suppose $1/4 < c_I < 1/2 = p^m(c_E)$. In this case, by the same line of argument as given in (ii), the equilibrium in the continuation game starting at t_2 involves:

I offers $(w, \Pi^m(w) - \varepsilon)$ to $B1$,

I offers $(p^m(w), -(\Pi^m(w) - (c_I - w) Q(p^m(w)) - \varepsilon))$ to $B2$,

E offers $(c_E, (c_I - w) Q(p^m(w)) - \Pi^m(p^m(w)) + \Pi^m(c_E) - \Pi^m(w) + \varepsilon)$ to $B2$,

where $w = 4c_I/3 - 1/3$. (Note in (ii), with $c_I \leq 1/4$, this would have implied $w \leq c_E = 0$, which is why we set $w = c_E = 0$ there. It now implies a positive wholesale price; i.e. above c_E.) The rest of the argument follows as in (ii). E's resulting profit is the fixed fee collected from $B2$. This is $-1/12 + 2c_I/3 - c_I^2/3 + \varepsilon$, which is positive. $B2$'s profit is $(1 - c_I)^2/3 - 2\varepsilon$. In this equilibrium, E's profit is higher than the lower bound on the range of possible fixed costs in (3) but lower than the upper bound on the range of possible fixed costs in (3). ■

In lemma 3, E's equilibrium profit is kept low since it cannot extract much profit through the free buyer given doing so would allow I to undercut with a divide-and-conquer type strategy in which the free buyer is compensated for accepting I's offer. Although I is less efficient, it can still offer the free buyer a good deal since if the free buyer chooses I there is monopoly profit for I to spread around. This means E has to leave most of its profit with the free buyer. This explains why, although E generally captures the whole market, it cannot cover its fixed cost of entry unless it has a strong cost advantage and its fixed cost of entry is small enough.

In fact, when the cost difference between the two firms is small, E cannot attract the free buyer at all even though it is more efficient. I exploits the fact it can sell through both buyers by making its signed buyer an aggressive competitor (with a wholesale price of c_E) so that it is possible to bribe the free buyer to be non-competitive (so it agrees to a wholesale price of $p^m(c_E)$). Facing an aggressive competitor, the free buyer strictly prefers I's bribe to buying from E, even if E sells to it at cost. I can then extract its signed buyer's resulting monopoly profit through a fixed fee. How big does I's bribe to the free buyer have to be?

If buyers are expected to coordinate on the equilibrium in the t_3 continuation game in which they buy from I, then the bribe can be trivial, and I will always profitably attract the free buyer with this strategy. Assume instead, as in lemma 3, that buyers coordinate on the equilibrium in the t_3 continuation game in which they buy from the more efficient firm whenever possible. This means to attract the free buyer, I has to make the free buyer prefer its offer even if the free buyer expects the signed buyer to be inactive. In this case, E can offer the free buyer up to its monopoly profit $\Pi^m(c_E)$ by selling to it at its cost c_E. I's bribe does not need to be as high as this since the free buyer will obtain a profit of $\Pi^m(p^m(c_E))$ in the retail market if it buys from I and does not face competition from the signed buyer. Since I can recover E's full monopoly profit through the fixed fee it charges its signed buyer, it will therefore pocket the difference between this fixed fee and its bribe, that is, the amount $\Pi^m(p^m(c_E))$. The cost of running this strategy is that, in equilibrium, it has to provide the signed buyer with goods below its own cost, the cost of which is $(c_I - c_E)\, Q\,(p^m\,(c_E))$. The resulting net profit is positive provided the cost difference between the two firms is small enough.[9]

Equilibria of full game: Having characterized equilibria in the relevant continuation games, proposition 1 characterizes the corresponding equilibria of the full game.

Proposition 1 *Consider FM's model in which upstream firms can offer two-part tariffs. There will be an entry equilibrium if (i)* $\sqrt{6}/2-1 \leq c_I < 1/4$ *and* $1/8-(1-c_I)^2/8 \leq F \leq c_I/2-1/16$ *or (ii)* $1/4 < c_I < 1/2$ *and* $1/8-(1-c_I)^2/8 \leq F \leq -1/12+2c_I/3-c_I^2/3$*. For all other parameter values considered in FM's model, there will be an exclusion equilibrium instead in which the incumbent obtains almost its monopoly profit.*

Proof. There are three cases to consider.

(i) If $\sqrt{6}/2-1 \leq c_I \leq 1/4$ and $1/8-(1-c_I)^2/8 \leq F \leq c_I/2-1/16$, lemma 3 implies that in the $S=1$ continuation game, E covers its fixed costs of entry and $B2$ obtains a profit of $5/16-c_I/2-2\varepsilon$. This is greater than I's monopoly profit, meaning I cannot profitably exclude. In equilibrium, I will not offer buyers any compensation for signing at t_0. Either only one buyer signs or no buyers sign. E will enter.

(ii) If $1/4 < c_I < 1/2$ and $1/8-(1-c_I)^2/8 \leq F \leq -1/12+2c_I/3-c_I^2/3$, lemma 3 implies that in the $S=1$ continuation game, E covers its fixed costs of entry and $B2$ obtains a profit of $(1-c_I)^2/3-2\varepsilon$, which is greater than I's monopoly profit and so again I cannot exclude. In equilibrium, I will not offer buyers any compensation for signing at t_0. Either only one buyer signs or no buyers sign. E will enter.

(iii) For all other parameter values, lemma 3 implies E will not want to enter unless both buyers are available. Thus, I only has to sign up one buyer to prevent entry. Since buyers obtain

[9] With larger cost differences between the two firms, a similar logic constraints how much profit E can extract while capturing the free buyer in equilibrium.

no profit if both do not sign, signing is a dominant strategy even for a trivial compensation. Therefore, exclusion arises as the equilibrium. I obtains almost its monopoly profit. ■

Figure 1 illustrates the implications of proposition 1. It plots the entire parameter space for which FM claim a unique entry equilibrium arises. The parameter space is broken up into two regions. The region labelled 'entry' shows where an entry equilibrium still arises.[10] The region labelled 'exclusion' shows where FM's claim does not hold, but instead the equilibrium involves exclusion. As figure 1 illustrates, exclusion is the equilibrium outcome for a large part of FM's parameter space (in terms of area, about 59 percent of the parameter space). Entry can arise when fixed costs of entry are low enough *and* the entrant's cost advantage is large. On the other hand, when either scale economies are important enough *or* the entrant's efficiency advantage is small enough, then only exclusion arises.

It is worth noting proposition 1 does not depend on whether the incumbent's exclusive contracts can be offered in a sequential fashion or only in a simultaneous and non-discriminatory fashion. In the case of the entry equilibrium, the entrant only needs one buyer to profitably enter, so there is no way for the incumbent to exploit sequential offers to prevent entry. In the case of the exclusion equilibrium, however, each buyer strictly prefers to sign regardless of what the other does since any buyer that does not sign will get nothing. So a simultaneous and non-discriminatory offer is sufficient to exclude. This reflects that there is no coordination failure between buyers in deciding whether to sign. In Rasmusen *et al.* (1991) and Segal and Whinston (2000) buyers are always jointly worse off as a result of exclusion compared to if they could both agree not to sign, reflecting that exclusion was inefficient. Here, the opposite conclusion is reached. Buyers are always jointly better off in an exclusion equilibrium compared to if they could both agree not to sign, reflecting that entry and competition hurt competing buyers.

[10] Proposition 1 does not rule out the possibility that (with other equilibrium selection rules in t_3 that are more favorable to I) an exclusion equilibrium could also arise in this parameter space.

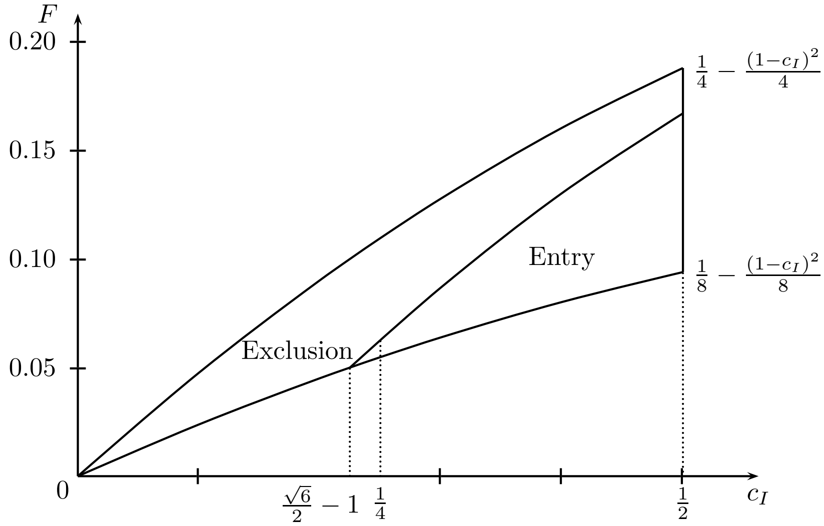

Figure 1: Exclusion and entry equilibria for the entire region considered by FM. Assumes $c_E = 0$ as in FM.

III Discussion

The "Chicago School" defence of exclusive dealing (Richard A. Posner, 1976 and Robert Bork, 1978) remains highly influential despite the works of Rasmusen *et al.* (1991), Bernheim and Whinston (1998) 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. Recently, FM extended Segal and Whinston's (2000) analysis of exclusive dealing to account for the fact that buyers are almost always competing downstream firms. They found that when buyers are homogenous price competitors, inefficient exclusion no longer arises in equilibrium thus providing support for the Chicago School view. However, as shown in this paper, their equilibrium analysis for the case in which upstream firms are allowed to compete in non-linear tariffs contains some errors. Correcting for these errors, leads to quite different conclusions. Inefficient exclusion arises in their model, and can even arise when the entrant's cost advantage is large or when scale economies are small.

Underlying the differences between these conclusions and those of FM, there are two main sources of error. First, when upstream firms compete to attract just one downstream buyer (since the other buyer has already signed with the incumbent), FM's proposed equilibrium in which the signed buyer is inactive is not an equilibrium. The incumbent can profitably sell to the signed buyer at a low wholesale price by making sure the free buyer will prefer to remain inactive, recovering profit from a fixed fee charged to the signed buyer. In an attempt to compete with the incumbent, the entrant is forced to leave more surplus with the free buyer. When the entrant's cost advantage is small, it cannot profitably attract the free buyer at all. When the entrant's cost advantage is larger, it can profitably attract the free buyer, but its profits may no longer cover its fixed costs, implying sometimes the entrant will need both available buyers to cover its fixed cost of entry.

Second, when both downstream buyers reject the incumbent's exclusive deals, FM's proposed equilibrium in which only one buyer is active is not, in fact, an equilibrium. In the corrected equilibrium, both buyers are active but obtain no profit since they compete head-to-head. As a result, when the potential entrant requires both buyers to profitably enter, each buyer will be willing to sign an exclusive deal (even for a trivial compensation) regardless of what they expect the other buyer to do. Inefficient exclusion does not rely on buyers signing exclusive contracts which jointly make them worse off, as was the case in the Rasmusen *et al.* (1991) and Segal and Whinston (2000) models of naked exclusion. Instead, when the entrant needs both buyers to profitably enter, both buyers prefer signing exclusively with the incumbent since doing so is their only hope of obtaining positive profits.

Although exclusion rather than entry is shown to arise for more than half of the parameter space considered by FM, entry can still arise as an equilibrium in the corrected equilibrium. This happens when the entrant has a sufficiently large cost advantage and scale economies are not too large. In this case, as in FM, a single downstream buyer does better not signing if the other buyer is expected to sign. The incumbent and entrant will then compete aggressively to attract this free buyer, resulting in it obtaining more surplus than the incumbent can afford to offer by instead monopolizing the industry and sharing the monopoly profit amongst the buyers. Thus, FM's main insight still applies in this regard. However, whether this single buyer facilitates entry depends on whether the resulting competition for the free buyer leaves enough profit for the potential entrant to cover its fixed cost of entry. FM understate the intensity of competition by not considering the full range of strategies the incumbent can use to compete with the entrant. Allowing, in particular, for the incumbent's divide-and-conquer strategy, the rival will often not be left with sufficient profit to warrant entry.

FM's main policy conclusion is that buyer competition makes inefficient exclusion less likely. Focusing on the case where upstream firms use non-linear pricing (the focus of this paper), they note:

> "However, in most circumstances strong enough downstream competition makes it *profitable* to reject the exclusive contract — even if the signer does not exit the market — thereby limiting the possibility of using exclusive contracts in an anticompetitive way. Consider for instance the case where upstream firms use non-linear pricing. Section II showed that, when the fixed cost to operate downstream is strictly positive, the deviant buyers earns the monopoly profits and exclusion is not feasible. This result holds good even if ε is zero (and therefore the signed does not exit the market). ..." (FM, p.793)

The analysis presented in this paper paints a more complicated picture. If exclusive deals can only involve simultaneous and non-discriminatory offers, competition between buyers may make exclusion more likely, not less (since it reduces the range of parameters for which an entry equilibrium arises). On the other hand, if sequential offers can be made, competition between buyers does support cases in which entry arises that would not otherwise be the case. The extent to which competition between buyers limits the anticompetitive effects of exclusive dealing clearly depends on the nature of the exclusive deals that can be offered.

In this regard, suppose (quite plausibly) the incumbent can offer exclusive deals whose exclusivity provision is only binding if both buyers sign the contract.[11] When buyers do not compete, such conditional exclusivity will not help the incumbent. A buyer can always not sign, knowing this will then mean the other buyer will remain free as well. When buyers instead compete, buyers earn nothing if neither of them signs exclusively. As a result buyers will sign even for a trivial compensation, since as soon as one buyer does not sign, both buyers end up with nothing. Similarly, as shown in Simpson and Wickelgren (2001), Stefanadis (1998) and Yong (1999), allowing exclusive contracts in which the incumbent can commit to a low input price for the buyer can facilitate exclusion when buyers compete downstream (but does not help the incumbent if buyers are end consumers).[12] In short, competition between buyers changes the economics of exclusive dealing, but it would be wrong to conclude that it makes anticompetitive exclusive deals less likely.

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[11] I thank an anonymous referee for suggesting this type of offer.

[12] See also Appendix B of FM.

IV References

Abito, Jose-Miguel, and Julian Wright. 2008. "Exclusive Dealing with Imperfect Downstream Competition." *International Journal of Industrial Organization*, 26(1): 227-46.

Bernheim, B. Douglas, and Michael Whinston. 1998. "Exclusive Dealing." *The Journal of Political Economy,* 106(1): 64-103.

Bork, Robert H. 1978. *The Antitrust Paradox: A policy at war with itself.* New York: Basic Books.

Fumagalli, Chiara, and Massimo Motta. 2006. "Exclusive Dealing and Entry, when Buyers Compete." *American Economic Review*, 96(3): 785-95.

Posner, Richard A. 1976 *Antitrust Law: An Economic Perspective.* Chicago: University of Chicago Press.

Rasmusen Eric B., J. Mark Ramseyer, and John S. Wiley, Jr. 1991 "Naked Exclusion." *American Economic Review*, 81(5): 1137-45.

Segal, Ilya R., and Michael D. Whinston. 2000. "Naked Exclusion: Comment." *American Economic Review*, 90(1): 296–309.

Semenov, Aggey, and Julian Wright (2008) "Vertical Limit Pricing." unpublished.

Simpson, John, and Abraham L. Wickelgren. 2001. "The Use of Exclusive Contracts to Deter Entry." Working Paper. Federal Trade Commission, Bureau of Economics Working Papers: No. 241.

Simpson, John, and Abraham L. Wickelgren. 2007. "Naked Exclusion, Efficient Breach, and Downstream Competition." *American Economic Review,* 97(4): 1305-20.

Stefanadis, Christodoulos. 1998. “Selective Contracts, Foreclosure, and the Chicago School View.” *Journal of Law and Economics*, 41(2): 429-50.

Yong, Jong-Say. 1999. Exclusionary Vertical Contracts and Product Market Competition.” *Journal of Business*, 72(3): 385-406.