

Discounts as a Barrier to Entry[†]

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To what extent can an incumbent manufacturer use discount contracts to foreclose efficient entry? We show that off-list-price rebates that do not commit buyers to unconditional transfers—like the rebates in EU Commission v. Michelin II, for instance—cannot be anticompetitive. This is true even in the presence of cost uncertainty, scale economies, or intense downstream competition, all three market settings where exclusion has been shown to emerge with exclusive dealing contracts. The difference stems from the fact that, unlike exclusive dealing provisions, rebates do not contractually commit retailers to exclusivity when signing the contract. (JEL D43, D86, K21, L13, L14, L42, L60)

Following many real-world examples, suppose we observe a dominant manufacturer offering the following rebate contract to a retail buyer who is considering buying a few units from an alternative small supplier: “As long as you buy exclusively from me, you get 10 percent off the list price on all units you purchase; otherwise, you pay the full list price for as many units as you want.” How can the antitrust authority be sure that such a contract is not offered to monopolize the market? Despite its similarity to an exclusive dealing arrangement, which has been shown to effectively foreclose the entry of a more efficient rival in a variety of market settings, one main objective of this paper is to explain why in those same settings the rebate contract above cannot be anticompetitive.

One of the most controversial issues in antitrust and competition policy is indeed the potential exclusionary effects of exclusive dealing arrangements, discount contracts (e.g., rebates), and related vertical practices. This controversy dates back at least to *United States v. United Shoe Machinery*, and *Standard Fashion*

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v. Magrane Houston,¹ and has remained very much alive since then, as illustrated by recent rulings regarding rebates on both sides of the Atlantic; for example, *EU Commission v. Michelin II*, *EU Commission v. British Airways*, *AMD v. Intel*, *Allied Orthopedic v. Tyco Healthcare Group LP*, and *ZF Meritor v. Eaton*.²

What makes these rulings controversial is that these practices can arise without an exclusionary motive and, more importantly, be efficient. Exclusivity, either de jure through explicit provisions or de facto through rebate schemes, may foster relationship-specific investments between manufacturers and retailers by solving hold-up and free-riding problems (Marvel 1982; Spiegel 1994; Segal and Whinston 2000a). Rebates may also be used in a bilateral monopoly setting to avoid double marginalization when demand is known to both sides, and as a screening device when demand is known only to downstream retailers (Kolay, Shaffer, and Ordovery 2004), or simply to stimulate retailers' sale efforts (Conlon and Mortimer 2013).³

According to the so-called Chicago critique (Posner 1976; Bork 1978), efficiency gains are all that matter when evaluating these contracts, because a downstream retailer would never sign an exclusive that reduces competition unless fully compensated for doing so, which the incumbent manufacturer cannot afford if the entrant is more efficient. We know now, however, that the Chicago critique fails to hold in a variety of settings; namely, when the entrant's cost is unknown to both the incumbent and the buyer (Aghion and Bolton 1987; Spier and Whinston 1995; Choné and Linnemer 2015), when scale economies require the entrant to serve more than one buyer (Rasmusen, Ramseyer, and Wiley 1991; Segal and Whinston 2000b; Spector 2011), and when buyers are not local monopolies (e.g., retailers that sell in completely separate markets) but rather downstream competitors (Simpson and Wickelgren 2007; Abito and Wright 2008; Asker and Bar-Isaac 2014).

Although these post-Chicago models have focused on the exclusionary potential of exclusive dealing contracts, there appears to be a growing consensus that discounts conditional on exclusivity, like the one in our opening example, may also be used for similar exclusionary purposes (e.g., Rey et al. 2005; Beard, Ford, and Kaserman 2007; Motta 2009; New York Attorney General in *State of New York v. Intel*).⁴ This is particularly important since the anticompetitive potential of exclusives is greatly diminished if, as the legal practice in common law countries seems to suggest, they cannot rely on penalties above expected damages (Masten and Snyder 1989; Simpson and Wickelgren 2007). This alleged exclusionary equivalence, also witnessed in court rulings, is supported by claims that can be organized around the same post-Chicago ideas:

CLAIM 1 (Rebates as Entry Fees): *An incumbent may use rebates to impose a penalty on new entrants, analogous to a liquidated damages clause in the rent-shifting*

¹ *United States v. United Shoe Machinery Corporation*, 89 F. Supp. 357 (D. Mass. 1950); and *Standard Fashion Co. v. Magrane-Houston Co.*, 258 U.S. 346 (1922).

² See, respectively, *Manufacture Française des Pneumatiques Michelin v. Commission*, Case T-203/01 (Michelin II), [2003] ECR II-4071; *British Airways plc v. Commission*, Case T-219/99, [2003] ECR II-5917; *Intel Corp. v. Advanced Micro Devices, Inc.*, 542 U.S. 241, 124 S. Ct. 2466, 159 L. Ed. 2d 355 (2004); *Allied Orthopedic Appliances Inc v. Tyco Healthcare Group LP*, 2010 U.S. App. LEXIS 259 (9th Cir. 2010); and *ZF Meritor, LLC v. Eaton Corp.*, 696 F.3d 254 (3d Cir. 2012).

³ Exclusives can also be the result of fierce competition between two or more incumbent suppliers that need to screen consumers (Calzolari and Denicolo 2013).

⁴ See *State of New York v. Intel Corporation*, No. 1:2009cv00827—Document 272 (D. Del. 2011).

model of Aghion and Bolton (1987). The buyer will buy from the rival supplier only if the latter offers a price lower than that charged by the incumbent minus the rebate. Thus, the rebate plays the role of an entry fee designed to extract the efficiency gains of new entrants, which in the presence of imperfect information, leads to some exclusion.

CLAIM 2 (Discriminatory Rebates and Demand Foreclosure): *In the presence of multiple buyers and scale economies, the incumbent may use rebates to lock-in a subset of buyers to prevent the rival from reaching the minimum viable scale of operation, forcing all remaining buyers to buy from him at the monopoly price. This strategy is profitable as the cost dispensed on rebates is more than offset by the extra revenues from monopolizing the remaining buyers, and is analogous to the divide-and-conquer strategy implemented with exclusives in the naked-exclusion models of Rasmusen, Ramseyer, and Wiley (1991) and Segal and Whinston (2000b).*

CLAIM 3 (Upstream Exclusion and Downstream Competition): *In the presence of intense downstream competition, as in the models of Simpson and Wickelgren (2007) and Asker and Bar-Isaac (2014), a dominant manufacturer may offer rebates to incentivize retailers to not deal with a more efficient entrant, as increased upstream competition will permeate to the downstream market, dissipating industry profits in the form of lower prices to final consumers.*

It seems from these claims that rebates and exclusive dealing contracts may lead to the same anticompetitive outcome, the only difference being *how* the exclusivity is implemented. Once signed, exclusive contracts implement the exclusivity by requiring buyers to pay a penalty in case they also buy from an alternative source. Rebates, by contrast, the argument goes, achieve the same result by forcing buyers to forgo a discount in case they do not conform to the exclusivity. All-unit rebates appear particularly well suited for this. The reason is that the incumbent only needs to offer a small per-unit discount to have a huge impact on a retailer's profit when the entrant is rather small and/or the incumbent's product is a must-stock item. Indeed, using the language of the EU Commission (2009, par. 39), the incumbent can use the "non-contestable" portion of the buyer's demand (that is to say, the number of units that would be purchased by the buyer from the incumbent in any event) as leverage to decrease the price to be paid for the "contestable" portion (that is to say, the number of units for which the buyer is willing to find substitutes). Therefore, when the buyer decides to purchase the contestable units elsewhere, she forgoes all the discounts, most importantly those applied to the non-contestable units. This can be substantial, especially when the contestable demand is small, as contentiously argued in some recent cases, notably *AMD v. Intel*.

The contribution of this paper is to show, however, a much more fundamental difference between exclusives and rebates subtly hidden in the description above: *when* the exclusivity is committed. Exclusives commit buyers to the exclusivity *ex ante*—at the time the contract is signed and before the entrant shows up—by forcing the retailer to pay a penalty in case of breach. Rebates, by contrast, induce the exclusivity *ex post* by rewarding buyers once purchasing decisions are made. This difference is so fundamental that rebate contracts like the one in our opening example—including

a list price and an off-list-price discount upon compliance with the exclusivity—cannot be anticompetitive in any of the post-Chicago settings of Claims 1, 2, and 3 where exclusion has been shown to emerge under exclusives.⁵ This non-exclusionary result is important because many rebate contracts we observe in practice,⁶ and in particular those examined in recent antitrust cases (e.g., *EU Commission v. Michelin II*, *EU Commission v. British Airways*), share these characteristics.

The general nature of our result suggests the existence of a fundamental underlying principle. Because exclusion of an otherwise efficient rival is in itself inefficient, if all relevant parties were to participate simultaneously in the bargaining process, and sufficiently complete contracts (e.g., nonlinear prices) are available for the parties to sign, exclusion could not arise. One may call this a *generalized Chicago critique*. The key to all post-Chicago models, which explains why exclusion may emerge, is that some market participant, usually the entrant, is *momentarily* absent from the bargaining table. This opens up an opportunity for the incumbent to use his first-mover advantage to extract additional rents from a third party, the entrant in Claim 1, some retail buyers in Claim 2, and final consumers in Claim 3, which sometimes requires the exclusion of a more efficient entrant.

However, as all market participants eventually take part in the bargaining process, the incumbent can sustain such an inefficient outcome only if buyers are effectively locked-in ex ante, that is, before the entrant shows up. This explains why exclusion is always possible with exclusives, provided that penalties can be made arbitrarily large, but not with off-list-price rebates. The latter's lack of ex ante commitment translates in that retailers make all their decisions, most importantly whether to become the incumbent's exclusive distributor or not, only after observing offers from all parties. This ex post flexibility on the buyer side forces the incumbent to offer larger rewards to keep buyers aligned with the inefficient outcome ex post, which makes any anticompetitive scheme unprofitable to begin with.⁷

There is a way, however, in which the incumbent can restore the anticompetitive potential of rebates: to commit retailers ex ante to make an unconditional transfer in exchange for a generous rebate ex post. Whether the transfer is made up-front or later is not important, as long as retailers commit to it regardless of what they do ex post, even if they do not buy from the incumbent at all. Unconditional transfers act as an ex ante commitment device because they restrict the buyer's flexibility ex post by forcing her to take an action before observing all offers. Interestingly, and despite being the only way to restore the anticompetitive potential of rebates in these post-Chicago settings, such transfers have never been mentioned nor documented in any of the antitrust cases listed above.⁸

⁵ Following Asker and Bar-Isaac (2014), there may be cases in which the incumbent can use lump-sum rebates, as opposed to off-list-price rebates, to exclude a more efficient rival. This distinction is only relevant when retailers are intense downstream competitors, as we discuss in Sections IB and IV.

⁶ For example, rebates used by the chocolate and candy manufacturer Mars with retail vending operators, as documented by Conlon and Mortimer (2013).

⁷ A similar intuition explains (i) why exclusives lose their exclusionary grip if liquidated damages must satisfy efficient breach (Masten and Snyder 1989; and Simpson and Wickelgren 2007), and (ii) the need for an ex ante commitment in the tying model of Whinston (1990). We go back to both intuitions and their connection to the generalized Chicago critique in Section V.

⁸ Limited liability and/or asymmetric information (e.g., Ide and Montero 2015) may severely restrict the use of these unconditional transfers.

While unconditional transfers must invariably appear in any off-list-price rebate contract signed for anticompetitive reasons, they are not strictly necessary when offered for efficiency reasons; for example, to deter inefficient entry. The intuition is that in the latter case, rebates actually increase social surplus so the incumbent does not need to sustain an inefficient outcome *ex post*. The need for an *ex ante* commitment is also absent in some exclusionary bundling models that analyze bundled discounts for otherwise completely unrelated products (e.g., Nalebuff 2004, 2005; Greenlee, Reitman, and Sibley 2008). The mechanism of action behind these models, however, is more closely related to a price discrimination argument than to a post-Chicago one. We explain this, as well as inefficient entry, in Section V.

The paper's key message is that post-Chicago models not only rely on the incumbent having a first-mover advantage, but also on the incumbent using contractual arrangements that extract and distribute surplus before the entrant shows up. Since rebates are by construction exercised *ex post* (i.e., after buyers hear from the entrant), the incumbent cannot use them to exploit his first-mover advantage, and as a result, they cannot be used to foreclose efficient entry unless they involve unconditional transfers.

The rest of the paper is organized as follows. In Section I, we present the basic ingredients of our model that form the basis of the rent-shifting model of Aghion and Bolton (1987), the naked-exclusion models of Rasmusen, Ramseyer, and Wiley (1991) and Segal and Whinston (2000b), and the downstream-competition models of Simpson and Wickelgren (2007) and Asker and Bar-Isaac (2014). Sections II, III, and IV analyze the three claims that motivated our analysis, taking the model to each of these three post-Chicago setups, respectively. In Section V, we highlight how the need for an *ex ante* commitment crosses all three exclusionary settings, which is then contrasted with situations in which such commitment is not necessary; for example, to prevent inefficient entry. We conclude in Section VI with a summary of our results and a closer look at some of the antitrust cases listed above.

I. The Model

A. Notation

Consider a unit mass of final consumers with reservation value v for a good that can be supplied by two (risk-neutral) manufacturers. Manufacturer I is an incumbent supplier that can produce the good at a constant marginal cost $c_I < v$. Manufacturer E , on the other hand, is a potential entrant that can produce the good at constant marginal cost $c_E < v$ only after paying a fixed entry cost $F \geq 0$. Our only departure from the basic structure of existing post-Chicago models is that only a fraction $\lambda \leq 1$ of final consumers see no difference between I 's and E 's products; the remaining fraction buy either I 's products or nothing at all. In the language of the EU Commission (2009), λ is the contestable demand, which in most antitrust cases is thought to be rather small. In addition, and given our focus on the possibility of writing anticompetitive contracts, we assume that entry is efficient; that is, $c_E + F/\lambda < c_I$, unless otherwise indicated.

Manufacturers do not supply directly to final consumers but indirectly through (risk-neutral) retail buyers, who, for the sake of simplicity, have no costs other than

those of purchasing the good from one or both manufacturers. We will consider cases of one retail buyer (as in the rent-shifting setup of Claim 1); two independent retail buyers, each serving half of the market (as in the naked-exclusion setup of Claim 2); and two retail buyers competing intensely for final consumers (as in the downstream-competition setup of Claim 3). We denote these buyers by B , or $B1$ and $B2$ if more than one.

The timing of the game in any of these settings is as follows. On date 1, I can make a take-it-or-leave-it contract offer to B (or to $B1$ and $B2$). The form of the contract offer is specified below, as we will consider both rebate and exclusive contracts. On date 2, E has the opportunity to make a take-it-or-leave-it offer to B in a take-or-pay contract for λ units.⁹ Then, on date 3, E decides whether to enter or not. If he does not, his contract is automatically canceled; if he does enter, he pays the entry cost F . Finally, on date 4, B buys according to the existing contracts; otherwise, B is served through the spot (wholesale) market, where I and E compete in (nonlinear) prices.

B. Classes of Rebate Contracts

We consider two classes of rebates, all of which are granted upon compliance with exclusivity.¹⁰ The first class includes rebates like the one in our opening example. Written as (r_i, R_i) , these rebate contracts include a list price r_i at which buyer Bi is free to buy from I as many units as she likes, and a discount off-the-list-price R_i applied to all units purchased if she conforms to the exclusivity requirement. Under these contractual arrangements, Bi will be paying r_i for each of I 's units if she decides to buy from both I and E , and $r_i - R_i$ if she decides to buy exclusively from I . Good examples of these off-list-price rebates, which are the most common of all, are found in *EU Commission v. Michelin II* and *EU Commission v. British Airways*.

Rebates in the second class differ from those in the first in that the discount is not established per unit but on a lump-sum basis. Written as (r_i, L_i) , under these contractual arrangements Bi pays the list price r_i , regardless of how much she buys, and receives the lump-sum transfer L_i if, in addition, she buys exclusively from I . Note that the distinction between off-list-price and lump-sum is immaterial in Claims 1 and 2. When buyers are local monopolies that face a fixed and certain demand, only the rebate's total matters to them, whether L_i or $R_i q_i$, where q_i is the fixed quantity to be purchased by buyer Bi (1 in Claim 1 and $1/2$ in Claim 2). This changes when buyers compete, as in Claim 3, because q_i is no longer fixed but depends on prices in the downstream market, which, in equilibrium, depend on the marginal costs internalized by buyers when setting these prices. Thus, a buyer that decides to conform to the exclusivity under either contractual arrangement faces a marginal cost of $r_i - R_i$ under an off-list-price rebate or r_i under a lump-sum rebate. Perhaps the best examples of lump-sum rebates are Intel's, as documented in *AMD v. Intel*.

The natural benchmark to a rebate contract in these post-Chicago models is an exclusive dealing arrangement. Although exclusives vary from setting to setting,

⁹Notice that in this linear world E 's optimal choice is to sell either λ or nothing. Also, since E may be relatively small, it is important to point out that our main results do not change if the bargaining power between E and B is more evenly split.

¹⁰In this simple linear setting, there is no reason to grant rebates for anything less than exclusivity.

they all can be written as (t_i, w_i, D_i) , where t_i is a lump-sum payment from I to Bi on date 1 in exchange for the exclusivity, w_i is the wholesale price, which can be nonlinear, and D_i is the penalty (i.e., liquidated damages) that Bi must pay I for breaching the exclusivity that was agreed to on date 1.

II. Claim 1: Rebates as Entry Fees

The first of the three claims has its roots in Aghion and Bolton (1987), the first of the post-Chicago models to generate inefficient foreclosure with exclusive contracts. In this setup there is a single buyer B and entry costs play no role, so for simplicity we let $F = 0$. Neither B nor I knows c_E at the time of contracting; they only know that c_E is distributed according to the cumulative distribution function $G(\cdot)$ over the support $[0, c_I]$, which ensures that entry is socially efficient for any possible realization of c_E . As usual, G/g is nondecreasing and $(1 - G)/g$ is nonincreasing, where $g(\cdot) = G'(\cdot)$. This rent-shifting setup also assumes that E 's offer on date 2, if any, does not lead I and B to renegotiate a contract that they had signed on date 1. This would be the case if B is the only one informed about E 's contract offer (and c_E is still unknown to I and possibly, but not necessarily, to B).¹¹ In any case, the value of c_E becomes publicly known at the opening of the spot on date 4.

To characterize the contracts I will offer in equilibrium we need first to compute agents' outside options, i.e., agents' payoffs when B is not supplied by a contract but served in the spot market. Since entry is efficient, E will enter and offer his units at a price slightly below c_I , while I will offer a nonlinear schedule with a list price c_I and a fixed fee of $(1 - \lambda)(v - c_I)$ conditional upon purchasing at least one unit. Therefore, payoffs in this no-contract benchmark are, respectively, $\pi_I^{NC} = (1 - \lambda)(v - c_I)$, $\pi_E^{NC} = \lambda(c_I - c_E)$, and $\pi_B^{NC} = \lambda(v - c_I)$.¹²

A. Exclusive Contracts

To fully appreciate how rebates perform in this rent-shifting setup, we need to understand first how exclusives work. Suppose that I offers B the exclusive contract $(t = 0, w, D)$,¹³ where $w \leq v$ is the wholesale price and D is the penalty that B must pay if she decides to buy from E . If B signs the contract, E can still persuade her to buy λ units from him on date 2 if D is not set too high. Since B will charge v to final consumers in any event, the price w_E that E needs to offer B to persuade her to switch must satisfy

$$(1) \quad v - (1 - \lambda)w - D - \lambda w_E \geq v - w$$

or $w_E \leq w - D/\lambda$. Thus, E will enter only if the most he can charge, $w - D/\lambda$, is enough to cover his cost c_E .

¹¹Dewatripont (1988) was the first to show that contracts as commitment devices are renegotiation-proof if asymmetric information is introduced at the renegotiation stage.

¹²Note that payoffs do not change if, in the absence of a contract between I and B , E offers a contract to B on date 2.

¹³Assuming $t = 0$ results in no loss of generality, even if $\lambda < 1$. The proof is analogous to the one in Aghion and Bolton (1987).

Since B will end up paying w for each unit regardless of entry, the exclusive-dealing program that I solves is

$$(2) \quad \max_{w,D} \pi_I^{ED}(w, D) = [(1 - \lambda)(w - c_I) + D] G(w - D/\lambda) \\ + (w - c_I) [1 - G(w - D/\lambda)]$$

subject to B 's participation constraint $v - w \geq \pi_B^{NC}$, which immediately implies that $w < v$. In the case of entry, which happens with probability $G(w - D/\lambda)$, I sells $1 - \lambda$ units at price w and receives compensation D for the λ units that B buys elsewhere; otherwise, I is the only one selling at price w .

Using B 's participation constraint to replace $w = v - \pi_B^{NC}$ in (2) and solving for D leads to the well-known Aghion and Bolton (1987) exclusionary outcome

$$(3) \quad w^* - \frac{D^*}{\lambda} \equiv \tilde{c}_E = c_I - \frac{G(\tilde{c}_E)}{g(\tilde{c}_E)}$$

and $w^* = v - \pi_B^{NC}$. If we substitute the latter and $D^* = \lambda(w^* - \tilde{c}_E)$ into (2), we obtain $\pi_I^{ED}(w^*, D^*) = (1 - \lambda)(v - c_I) + \lambda(c_I - \tilde{c}_E)G(\tilde{c}_E)$, which is greater than π_I^{NC} since $\tilde{c}_E < c_I$. As first shown by Aghion and Bolton (1987) for $\lambda = 1$, these exclusive contracts are not only profitable for both I and B to sign, but they have anticompetitive implications in that they block the entry of some efficient rivals. In his effort to extract rents from potential entrants, I is ready to foreclose those with costs $c_E \in [\tilde{c}_E, c_I]$.

As discussed by Masten and Snyder (1989) and more recently by Simpson and Wickelgren (2007), the exclusionary potential of these exclusives is subject to the possibility of using penalties that can be enforced in court. If, as the legal practice in common law countries seems to suggest, an exclusive contract cannot rely on penalties above the expected damages that I will experience in the event that B breaches the contract, i.e., $D \leq \lambda(w - c_I)$, then the exclusive loses its exclusionary grip altogether, i.e., $w - D/\lambda \geq c_I$. Given this legal constraint, it is natural that attention has shifted toward alternative vertical practices with apparently similar exclusionary potential, such as rebates.

B. Rebate Contracts

According to Claim 1, I should have no problems replicating the anticompetitive outcome (3) with the off-list-price rebate (r, R), or with the lump-sum rebate (r, L), for that matter. To see the validity of this claim, suppose that I offers B on date 1 the contract (r, R), with $r \leq v$. If B accepts, then E 's offer w_E must satisfy the following:

$$(4) \quad v - (1 - \lambda)r - \lambda w_E \geq v - r + R,$$

or $w_E \leq r - R/\lambda$, in order to induce B to buy from him on date 2.¹⁴ In antitrust circles, the term $r - R/\lambda$ is commonly known as the *effective price* of the contestable demand, which is the price that E must compete with, and is lower than $r - R$ because when B buys from E , she foregoes not only the discounts on the marginal units, but on all units.

Since E will enter only if his cost c_E is below the effective price, I 's expected payoff in case B accepts the rebate contract is equal to

$$(5) \quad \pi_I^R(r, R) = (1 - \lambda)(r - c_I)G(r - R/\lambda) + (r - R - c_I)[1 - G(r - R/\lambda)],$$

where the first term is the profit from selling $1 - \lambda$ units at price $r \leq v$, which happens when there is entry and the rebate R is not granted, and the second term is the profit from selling all the units at price $r - R$, which happens with probability $1 - G(r - R/\lambda)$.¹⁵

An apparent similarity to the exclusive program above is hard to overlook. In fact, one can arrive at (5) from (2) by simply relabeling w as $r - R$ and D as $(1 - \lambda)R$. This suggests that the exclusivity clause could be made equally costly to break under either contract: in one case by paying the penalty D and in the other by giving up an equivalent amount $(1 - \lambda)R$ in rebates for the remaining units. There is, however, a fundamental difference between the two schemes, so that a contract (r, R) not only fails to deliver the exclusive's anticompetitive outcome (3), but any anticompetitive outcome at all.

PROPOSITION 1: *In the rent-shifting setup of cost uncertainty, it is never profitable for I to offer an anticompetitive rebate contract (r, R) , that is, a contract where $r - R/\lambda < c_I$.*

PROOF:

Rearranging (5) and using $x \equiv r - R/\lambda$ yields

$$(6) \quad \pi_I^R(r, x) = (1 - \lambda)(r - c_I) + \lambda(x - c_I)[1 - G(x)].$$

Since $r \leq v$, otherwise B does not buy from I whenever there is entry, writing an anticompetitive (r, R) contract with $x < c_I$ leaves I with strictly less than $\pi_I^{NC} = (1 - \lambda)(v - c_I)$. ■

Intuitively, while it is true that both rebates and exclusives give B the flexibility to not purchase from I at all (which explains the ex post participation restrictions $r \leq v$ and $w \leq v$), the two differ on how much is required from B ex ante, i.e., at the time of signing the contract on date 1. In an exclusive contract, B has already

¹⁴In principle, one can think also of contracts with $r > v$, in which case the left-hand side of (4) reduces to $\lambda(v - w_E)$. It can be shown, however, that these contracts are strictly dominated by contracts with $r \leq v$. If r is increased above v and R is increased accordingly to keep I 's profit $r - R - c_I$ unchanged, the effective price $r - R/\lambda$ also remains unchanged. But, if an arbitrarily small possibility exists that B might buy from E , then I is strictly worse off because B will not buy units from I above her reservation price.

¹⁵Note that in this particular setting we need $\lambda < 1$ for a rebate contract to make any sense. If $\lambda = 1$, I 's problem degenerates to the choice of a single price $r - R$.

committed to an action, to pay the penalty D in case she breaches the exclusivity, at the time E approaches B with an offer and the latter decides from whom to buy and how much. There is no such ex ante commitment in a rebate contract, which explains this striking result.

To see it more formally, let us use the alleged exclusionary equivalence between rebates and exclusives to relabel w as $r - R$ and D as $(1 - \lambda)R$, so that $r - R/\lambda = w - D/\lambda = x$ and $r = w + D/(1 - \lambda)$. Equation (6) in Proposition 1 can then be rewritten as

$$\pi_I^R = (1 - \lambda)\left(w + \frac{D}{1 - \lambda} - c_I\right) + \lambda(x - c_I)[1 - G(x)].$$

Now, if the penalty is committed ex ante, as in the exclusive dealing contract, the term $D/(1 - \lambda)$ is sunk from B 's purchasing-decision perspective, which explains why ex post we only require $w \leq v$, not $w + D/(1 - \lambda) \leq v$. However, if there is no such commitment, as in the rebate contract, then the second term enters directly in B 's purchasing decision, so the relevant ex post restriction is no longer $w \leq v$ (which holds trivially in program (2) because the ex ante participation constraint already requires $w \leq v - \pi_B^{NC}$) but rather

$$r = w + \frac{D}{1 - \lambda} \leq v.$$

This severely limits the amount of surplus I can extract from B , rendering unprofitable any anticompetitive rebate offer $x = r - R/\lambda \leq c_I$.

It is important to emphasize that the result in Proposition 1 is robust to alternative discount contracts, as long as they do not involve an ex ante commitment. Consider, for example, a two-part-tariff contract in which x is the unit price and T is a conditional fixed fee, that is, a fee that is paid only upon purchasing one or more units. This contract faces the same problem as the rebate contract, in that T cannot be increased to offset the loss from setting $x < c_I$. Any attempt to increase T will stop B from buying from I . It is not surprising that these two discount contracts are perfectly equivalent in this setting because they share the same principle:¹⁶ it is not possible to foreclose the entry of a more efficient rival E unless B is forced to take some action before E shows up that effectively reduces B 's purchasing flexibility ex post. As we will see next, the same principle explains why these rebate contracts also fail to exclude in the naked-exclusion and downstream-competition setups.

III. Claim 2: Discriminatory Rebates and Demand Foreclosure

The second claim is inspired by the divide-and-conquer strategy in the naked-exclusion models of Rasmusen, Ramseyer, and Wiley (1991) and Segal and Whinston (2000b). Key assumptions here are the presence of multiple buyers and

¹⁶To see the equivalence, notice that $x = r - R/\lambda$ and $T = (r - x)(1 - \lambda) \leq (v - x)(1 - \lambda)$. Rebates can be superior to two-part tariffs in other contexts, however; for example, when there is asymmetric information (Kolay, Shaffer, and Ordover 2004; Ide and Montero 2015).

scale economies, requiring E to serve a sufficient number of buyers to achieve the minimum viable scale of operation. As a result, a contract signed by any buyer creates a negative externality on all remaining buyers by reducing the probability of entry. According to Claim 2, I can likewise foreclose E 's entry by offering rebates to lock up a critical number of buyers, enough to make it impossible for E to achieve such a minimum viable scale. This, in turn, allows I to exploit all remaining (unlucky) buyers.

We analyze this claim with the simplest possible setting. Consider two retail buyers, $B1$ and $B2$, each serving half of the final consumers in completely separate markets, so again, they will charge v to final consumers. In addition, assume that E 's fixed entry cost F is greater than the most he could obtain if dealing with just one buyer, i.e., $F > \lambda(v - c_E)/2$, which necessarily forces him to deal with both buyers to cover F . In addition, the standard naked-exclusion environment involves no uncertainty over c_E , though results do not change if we keep c_E unknown (see the online Appendix for a formal treatment of this case).

Before looking at the work of exclusive contracts and explaining why rebates fail to replicate them, keep in mind that the equilibrium outcome when I does not offer any contract or when both buyers reject I 's offers follows the same logic of the previous section. Hence, the no-contract payoffs are, respectively, $\pi_I^{NC} = (1 - \lambda)(v - c_I)$, $\pi_E^{NC} = \lambda(c_I - c_E) - F$, and $\pi_{Bi}^{NC} = \lambda(v - c_I)/2$ for $i = 1, 2$ (for more details, see the online Appendix).

A. Exclusive Contracts

We now show that the exclusionary results of existing naked-exclusion models still apply in our slightly different structure,¹⁷ but we will be brief because these results are well known. Following existing models, suppose that on date 1, I offers buyers exclusive contracts (t_i, w_i, D_i) , where t_i is transferred on date 1 from I to Bi in exchange for the buyer's promise to never buy from E (i.e., $D_i \rightarrow \infty$), and the terms of trade w_i are to be specified on date 4. It is well known that this setting accepts multiple equilibria, as a buyer's best response is to take any offer deemed exclusionary if she conjectures that the other buyer will take hers too. To avoid such coordination failures, we will follow the literature and assume that buyers can communicate with each other but cannot sign binding agreements. The equilibrium concept we adopt, then, is perfect coalition-proof Nash equilibrium (see Bernheim, Peleg, and Whinston 1987).

PROPOSITION 2: *In the naked-exclusion setup of multiple buyers and scale economies, it is profitable for I to deter E 's entry with a pair of exclusive contracts with compensations $t_1 = \pi_{B1}^{NC} + \epsilon$ and $t_2 = \epsilon$ with $\epsilon \rightarrow 0$, or vice versa.*

¹⁷The models of Rasmusen, Ramseyer, and Wiley (1991) and Segal and Whinston (2000b) assume a downward sloping demand, which creates an additional efficiency loss from linear monopoly pricing. As first noticed by Innes and Sexton (1994), this loss is not needed for (naked) exclusion to exist and is most reasonable to assume it away for wholesale markets, as firms can always use nonlinear prices. Our inelastic demand model intends to capture this in the simplest possible way. See also Section VC.

PROOF:

It is clearly an equilibrium for both $B1$ and $B2$ to accept these exclusives. $B1$ gets nothing if she rejects her offer and $B2$ does not because in that case E does not enter and I charges v in the spot. Similarly, $B2$ gets zero if she rejects her offer and $B1$ does not because again E does not enter. Finally, it is easy to see that foreclosure is a profitable strategy for I in that $\pi_I^{ED}(t_1, t_2) = v - c_I - t_1 - t_2 = (1 - \lambda/2)(v - c_I) > (1 - \lambda)(v - c_I) = \pi_I^{NC}$.¹⁸ ■

The Proposition shows that it pays I to induce one buyer to sign an exclusive for slightly more than her outside option π_{B1}^{NC} , because by doing so, the incumbent can fully exploit the other buyer.¹⁹ Note also that despite the fact that $B2$ and $B1$ would be, on aggregate, better off if they both reject their offers (and obtain a total of $\pi_{B1}^{NC} + \pi_{B2}^{NC}$), the absence of binding agreements rules out such coordination, i.e., $B2$ cannot credibly commit to any compensation that would induce $B1$ to reject her offer in the first place.

B. Rebate Contracts

Proposition 2 shows that exclusives can foreclose entry when used as part of a divide-and-conquer strategy, so the question here is whether a pair of discriminatory rebate offers (r_1, R_1) and (r_2, R_2) can be used in a similar way. Following Claim 2, the idea would be for I to de facto lock-in one of the retailers, say $B1$, by offering her such an attractive (r_1, R_1) rebate, that E would find it impossible to induce her to switch without making a loss. Therefore, E would refrain from entering, as he will be unable to achieve the minimum viable scale of operation, allowing I to fully exploit the remaining buyer $B2$ with an offer $(r_2 = v, R_2 = 2\epsilon)$ with $\epsilon \rightarrow 0$.²⁰

More formally, for the rebate contract (r_1, R_1) to effectively lock-in $B1$, it must be true that such contract is strictly preferred by $B1$ to the best deal E could possibly offer her. If w_{E1} is the price in that best deal, then this “no switching” constraint is

$$(7) \quad (v - r_1 + R_1)/2 > \lambda(v - w_{E1})/2 + (1 - \lambda)(v - r_1)/2,$$

that is, $B1$'s payoff from buying all $1/2$ units from I must be greater than the payoff from buying $\lambda/2$ units from E at price w_{E1} and $(1 - \lambda)/2$ units from I at price r_1 . If such a condition is satisfied, then entry is foreclosed and $B2$ exploited, which would result in a profit to I equal to

$$(8) \quad \pi_I^R = (r_1 - R_1 - c_I)/2 + (v - c_I - 2\epsilon)/2.$$

¹⁸Notice that in the proof, we made use of the coalition-proof Nash equilibrium concept by ruling out Nash equilibria that do not survive the coalition-proof refinement; for instance, the Nash equilibria where both buyers accept any pair of offers with $t_i \in (0, \pi_{Bi}^{NC})$ for $i = 1, 2$.

¹⁹This result is robust to different buyers' outside options. Suppose that each buyer's outside option is half the social surplus that E brings to market, $\lambda(v - c_E) - F$. It still pays I to compensate the lucky buyer, provided that v is not too close to c_I .

²⁰Without loss of generality, we can restrict attention to offers that are not contingent on the action of the other buyer. Such strategies add nothing here because I has all the bargaining power, as opposed, for example, to Rey and Whinston (2013).

From here, we can immediately deduce that I would optimally set $r_1 = v$, since any contract $(r_1 < v, R_1)$ satisfying (7) is strictly dominated by the still anticompetitive rebate $(r'_1 = r_1 + \varepsilon, R'_1 = R_1 + \lambda\varepsilon)$ that allows I to pocket an extra $\varepsilon(1 - \lambda)/2$.

This result follows the often-raised leverage argument against all-unit rebates (see EU Commission 2009, par. 39). Because $B1$ will buy $(1 - \lambda)/2$ units from I in any event, by increasing r_1 (and adjusting R_1 accordingly), I can increase at no cost the implicit penalty faced by $B1$ in case she decides to forgo the rebate. Since this leverage effect is greater the smaller the value of λ , it is not surprising then the great deal of attention and controversy around the estimation of such parameters.

Based on this leverage argument, it appears that all-unit rebates enjoy huge anticompetitive potential, and should therefore have no problem replicating the exclusionary outcome of Proposition 2. Indeed, comparing $\pi_I^R(r_1 = r_2 = v, R_1, R_2) = v - c_I - R_1/2 - R_2/2$ to $\pi_I^{ED} = v - c_I - t_1 - t_2$, one is tempted to conclude that all that is required is to set $R_1 = 2t_1$ and $R_2 = 2t_2$. This is in fact the basis of the alleged exclusionary equivalence outlined in Claim 2. As already argued in Section II, however, the rebates' lack of ex ante commitment prevents their anticompetitive use altogether.

PROPOSITION 3: *In the naked-exclusion setup of multiple buyers and scale economies, it is never profitable for I to offer a pair of discriminatory rebate contracts (r_i, R_i) for $i = 1, 2$, to foreclose efficient entry.*

PROOF:

Suppose that I offers a pair of contracts (r_i, R_i) with the idea to lock up $B1$ and exploit $B2$. We have already discussed that such offers must be of the form $(r_1 = v, R_1)$ and $(r_2 = v, R_2 = 2\epsilon)$ with $\epsilon \rightarrow 0$. If so, I 's profit is $\pi_I^R = v - c_I - R_1/2$; and $B1$ is de facto locked-in if $R_1/2 > \lambda(v - w_{E1})/2$, for any potentially profitable offer w_{E1} . Now, if E enters, his profit would be

$$\pi_E = \lambda(w_{E1} - c_E)/2 + \lambda(w_{E2} - c_E)/2 - F.$$

But there is no ex ante commitment that ties $B2$ to I , so, given that $B2$ correctly anticipates that she will get zero if E does not enter, E can persuade $B2$ to buy λ units from him at virtually her reservation price, i.e., $w_{E2} = v$. In turn, this allows E to set w_{E1} low enough just to satisfy

$$(9) \quad \lambda(w_{E1} - c_E)/2 + \lambda(v - c_E)/2 - F = 0.$$

Rearranging, we get

$$\lambda(v - w_{E1})/2 = \lambda(v - c_I) + [\lambda(c_I - c_E) - F].$$

Hence, to block E 's entry, I needs to set $R_1/2 > \lambda(v - c_I) + [\lambda(c_I - c_E) - F]$. But this implies that $(\epsilon \rightarrow 0)$

$$\pi_I^R = v - c_I - R_1/2 < (1 - \lambda)(v - c_I) - [\lambda(c_I - c_E) - F].$$

Since the no-contract benchmark guarantees I a payoff of $\pi_I^{NC} = (1 - \lambda)(v - c_I)$, exclusion is profitable only if $\pi_I^R > \pi_I^{NC}$, that is, only if $\lambda(c_I - c_E) - F < 0$, which contradicts the efficient-entry assumption.²¹ ■

Rebates' lack of ex ante commitment results in two important differences when compared to exclusive dealing contracts. The first is that to lock $B1$ with a rebate, I needs $R_1/2 > \lambda(v - w_{E1})/2$, rather than $t_1 > \lambda(v - c_I)/2$, as E always has the possibility to make a counteroffer. And second, $B2$'s rebate contract ($r_2 = v$, $R_2 = 2\epsilon$) does not impose any exclusivity obligation, as opposed to the exclusive dealing provision which does upon transferring $t_2 = \epsilon$.

These two differences explain the result in Proposition 3: because $B2$ is not ex ante contractually committed to the exclusivity, but is nevertheless fully exploited by I , E anticipates that if he enters, he can counteroffer $B2$'s rebate and appropriate $B2$'s entire surplus. Furthermore, because $B1$ has full flexibility ex post to decide whether to take I 's rebate or not (i.e., she has not taken any action before E 's offer), E can use as much surplus from $B2$ as needed to persuade $B1$ not to take the rebate. This, in turn, forces I to offer a larger reward to keep $B1$ aligned with the exclusionary outcome, rendering unprofitable any anticompetitive rebate scheme.

Similar to other post-Chicago models, to successfully implement an anticompetitive outcome in this setting, the contractual arrangement must necessarily involve an ex ante commitment. Otherwise, a more efficient entrant can always distribute surplus among buyers to make sure he is not excluded from the market.²²

IV. Claim 3: Upstream Exclusion and Downstream Competition

Up to now we have restricted attention to settings where retail buyers were assumed to be local monopolies. However, this assumption does not fit well with a number of relevant antitrust cases. In *AMD v. Intel*, for instance, the market structure consisted of a dominant incumbent manufacturer, Intel, and a small alternative supplier, AMD, selling microprocessors to original equipment manufacturers (OEMs) such as IBM, Dell, and Lenovo, which in turn competed intensely for final consumers. In this section, we look at the work of rebates in such a setting by assuming that $B1$ and $B2$ are not local monopolies, but rather undifferentiated Bertrand competitors, just like in Simpson and Wickelgren (2007) and Asker and Bar-Isaac (2014).

An important observation, first made by Fumagalli and Motta (2006), is that when retailers are intense downstream competitors, scale economies and externalities across buyers become irrelevant, since access to one retailer is all E needs to

²¹ Notice that since everything is executed ex post, the coalition-proof refinement becomes irrelevant. E makes sure to eliminate any exclusionary outcome that relies on buyers' coordination failure.

²² In a somewhat different naked-exclusion setting, where scale economies in production are replaced by network externalities in demand, Karlinger and Motta (2012) find that rebates can sometimes lead to foreclosure if E is only slightly more efficient than I . Although a complete discussion of the conditions under which rebates could lead to exclusion is relegated to Section V, we can advance that what explains their result is an exogenous restriction that reduces the set of "contracts" that E can offer to price announcements with no purchasing obligations. In terms of the *generalized Chicago critique* principle that we develop in Section V, this exogenous restriction violates a contract completeness assumption, which is particularly problematic here because it is in the interest of E and each of the buyers, both ex ante and ex post, to sign longer-term contracts that commit them to buy from E . This is why we follow the post-Chicago models of Innes and Sexton (1994), Spector (2011), and Asker and Bar-Isaac (2014), to name a few, and do not impose this restriction to the set of contracts that E can offer.

reach the entire final market. Hence, we can work with $F \geq 0$. In addition, because the outcome of the downstream market is now endogenously determined, we require some extra notation and assumptions. First, we assume that if two retailers offer the same price to final consumers but one has a lower marginal cost than the other, then all final consumers buy from the retailer with the lower cost. Second, and more importantly, we assume that retailers can price-discriminate between final consumers in the non-contestable (the $1 - \lambda$ segment) and those in the contestable portion of demand (the λ segment). We will denote by $p_{i,1-\lambda}$ the retail price that retailer $i = 1, 2$ charges for I 's products to final consumers in the $1 - \lambda$ segment and by $p_{i,\lambda}$ the price she charges for both I 's and E 's products to final consumers in the λ segment.

We adopt this particular price-discrimination assumption for several reasons. The first one is tractability: characterizing the equilibrium downstream, conditional on manufacturers' offers, is much simpler when retailers compete separately for contestable and non-contestable consumers. Second, as it will become clear shortly, in this class of models the reason exclusion arises is because of intense competition downstream. By allowing retailers to charge different prices in each segment, we intensify downstream competition to the maximum extent, making this case the most favorable for exclusion.²³ Third, the assumption is immaterial to show that rebates fail to replicate exclusives.²⁴ Finally, we believe that the possibility that retailers can discriminate across demand segments may also have some practical appeal. For example, consider one of the OEMs above buying chips from both Intel and AMD. It would be easy for this OEM to price-discriminate among contestable and non-contestable consumers—students and professionals, for example—by placing the exact same Intel chip in machines that do not look alike (similar to a damaged-good strategy).

A. No-Contract and Exclusive Benchmarks

Downstream competition changes agents' outside options in important ways, and hence, the contracts they are willing to sign. To see how, consider first the situation in which E does not enter the market. I will charge the pair of nonlinear schedules $\{w_{I1} = v, T_{I1} = 0\}$ and $\{w_{I2} = v, T_{I2} = 0\}$, where w_{Ii} is the unit-price and T_{Ii} is a conditional fixed fee, leaving retailers and final consumers with zero surplus. Retailers will then split the market and charge v to contestable and non-contestable consumers.²⁵

The situation changes for the incumbent and final consumers, however, if E enters the market. As we formally show in Appendix A, in equilibrium I will offer the schedules $\{w_{I1} = c_I, T_{I1} = (1 - \lambda)(v - c_I)\}$ and $\{w_{I2} = v, T_{I2} = 0\}$ while E will offer $w_{E1} = w_{E2} = c_I$. Hence, only one retailer will carry I 's products,

²³Indeed, as we show in Appendix B, if we work with the alternative assumption that retailers set different prices for I 's and E 's products, as opposed to different prices across demand segments, then there exist equilibria where exclusion does not arise even with exclusives. The reason is that this alternative pricing assumption softens competition downstream.

²⁴In Appendix B we also show that even if an exclusionary equilibrium with exclusives exists under this alternative price-discrimination assumption, rebates still lack any anticompetitive potential.

²⁵Notice that I can implement the same outcome but with only one retailer actually selling his units, for example, with the pair of offers $\{w_{I1} < v, T_{I1} = v - w_{I1}\}$ and $w_{I2} = v$.

$B1$, but both will carry E 's products, resulting in downstream retail prices equal to $p_{1,1-\lambda} = p_{2,1-\lambda} = v$ and $p_{1,\lambda} = p_{2,\lambda} = c_I$.

Compared to the no-contract benchmark of the naked-exclusion setup, suppliers are exactly as before (i.e., $\pi_I^{NC} = (1 - \lambda)(v - c_I)$ and $\pi_E^{NC} = \lambda(c_I - c_E) - F$), but retailers are now strictly worse off (i.e., $\pi_{B1}^{NC} = \pi_{B2}^{NC} = 0$). Any retailer's surplus is now in the hands of final consumers in the form of lower retail prices for the λ contestable units. The reason for this surplus transfer is that here, retailers only provide access to final consumers, and because of Bertrand competition in the contestable segment, access can in principle be achieved with just one retailer.

By affecting agents' outside options, downstream competition also impacts the exclusives I may offer. Consistent with Simpson and Wickelgren (2007) and Abito and Wright (2008), it is possible to establish that:

PROPOSITION 4: *In the downstream-competition setup of Bertrand retailers, I can persuade both retailers to accept exclusive contracts ($t_i > 0$, w_i , $D_i \rightarrow \infty$) for as low as $t_i = \epsilon \rightarrow 0$ for $i = 1, 2$.*

PROOF:

Recall that an exclusive offer to retailer $i = 1, 2$ leaves the wholesale price w (a price schedule consisting of a unit price w_{Ii} and, presumably, a conditional fixed-fee T_{Ii}) unspecified until the beginning of date 4. Suppose then, I offers $B1$ and $B2$ exclusives with payments of t_1 and t_2 , respectively. By accepting the exclusive, $B1$ gets just t_1 , since any additional surplus can be extracted ex post by I , regardless of what happens with the other buyer. If, instead, $B1$ rejects the exclusive, there are two cases to consider. The first is when $B2$ also rejects her offer, in which case $B1$ gets zero, as indicated by the no-contract benchmark. The second case is when $B2$ accepts her offer. Notice that the outcome of this subgame is no different than the outcome in the no-contract benchmark above, because one free retailer is all E needs to compete effectively for the contestable portion of the demand. In equilibrium of this subgame, E will offer the unit-price $w_{E1} = c_I$ to $B1$ and nothing to $B2$ because the latter is locked up by the exclusive, while I will offer the two-part tariffs $\{w_{I1} = c_I, T_{I1} = (1 - \lambda)(v - c_I)\}$ and $\{w_{I2} \geq v, T_{I2} = 0\}$ to $B1$ and $B2$, respectively, leading to equilibrium retail prices $p_{1,1-\lambda} = p_{2,1-\lambda} = v$ and $p_{1,\lambda} = p_{2,\lambda} = c_I$ and to profits $\pi_{B1} = \pi_{B2} = 0$. Hence, since $B1$ gets 0 regardless of whether she accepts or rejects the contract, I only needs to offer $\epsilon \rightarrow 0$ to induce both retailers to sign. This is clearly optimal for I , as he obtains a monopoly profit of $\pi_I^{ED} = v - c_I - 2\epsilon > (1 - \lambda)(v - c_I) = \pi_I^{NC}$. ■

The key to understanding why exclusion emerges, even in the absence of cost uncertainty or scale economies, lies in the effect of downstream Bertrand competition on retailers' profits. Intense downstream competition prevents retailers from appropriating any of the benefits of the additional upstream competition brought forward by a more efficient supplier. All these benefits are fully passed-through to final consumers in the form of lower retail prices. This makes it virtually costless for I to compensate retailers in exchange for exclusivity, allowing him to increase his profit from $\pi_I^{NC} = (1 - \lambda)(v - c_I)$ to $\pi_I^{ED} = v - c_I$.

B. Rebate Contracts

If one were to interpret Claim 3 as an extension of the logic of Proposition 4 to rebates, one would anticipate two implications. The first is that the rebates I needs to offer to persuade retailers to stick to the exclusivity can be very small because retailers are ready to accept any reward. And the second is what drives E 's foreclosure is an attempt to prevent upstream competition from eroding industry profits with lower prices to final consumers. An important contribution of this section is to show that how much of this interpretation is valid, if any, depends crucially on contract characteristics.

As we anticipated in Section I, and in contrast to what we have seen in the previous two sections, when retailers compete downstream the distinction between (r_i, R_i) and (r_i, L_i) rebates matters a great deal. The reason is that now equilibrium retail prices depend on whether rebates are granted on an off-list price or a lump-sum basis. We start our discussion with the most common rebate arrangement of all, an off-list-price rebate (r_i, R_i) . Our first result goes against Claim 3 in its entirety and follows exactly the results of Propositions 1 and 3:

PROPOSITION 5: *In the downstream-competition setup of Bertrand retailers, it is never profitable for I to offer a pair of discriminatory rebate contracts (r_i, R_i) for $i = 1, 2$, to deter E 's entry.*

PROOF:

Consider first the case in which on date 1 I offers the same rebate (r, R) to both retailers and both accept (recall that both r and R are announced on date 1). If on date 2 both retailers decline to deal with E , they will both set retail prices equal to $r - R$, which is the relevant marginal cost under exclusivity (since exclusivity requires retailers to carry only I 's products, regardless of how much they sell). Suppose instead that E is able to convince one retailer, say $B1$, to forgo the rebate in exchange for a wholesale price of w_{E1} for λ units. If so, $B1$ faces a marginal cost of r when selling I 's products and of w_{E1} when selling E 's products, while $B2$ faces a marginal cost of $r - R$ when selling I 's units (and infinity when selling E 's products). Then, the equilibrium retail price in the non-contestable portion of the demand is r and in the contestable portion is $\max\{w_{E1}, r - R\}$, which implies that E can induce $B1$ to accept his offer as long as $\lambda(\max\{w_{E1}, r - R\} - w_{E1}) \geq 0$, since $B1$ gets nothing if she rejects E 's offer. Therefore, E will enter if and only if $\lambda(r - R - c_E) - F \geq 0$; so, to block entry, I needs to set r and R such that $r - R < c_E + F/\lambda$. But if so, I 's profit reduces to $r - R - c_I < c_E + F/\lambda - c_I < 0$.

The alternative case is when one retailer rejects I 's offer, or equivalently, when I approaches just one retailer, say $B2$, with the offer (r_2, R_2) . Notice that in this case, it is irrelevant whom E approaches, since the price he needs to offer any retailer to effectively enter the market and make positive sales must be lower than $r_2 - R_2$, given Bertrand competition downstream. Therefore, to block E 's entry, r_2 and R_2 must be such that $r_2 - R_2 < c_E + F/\lambda$. But we already saw that doing so is not profitable for I . ■

While it is true that downstream competition greatly impacts retailers' outside options, so much that they are ready to become exclusive distributors for virtually nothing, this is completely useless in the case of off-list price rebates due to their lack of ex ante commitment. This is intuitive: if the exclusivity is not contractually committed before E shows up, then I needs to set $\min\{r_i - R_i, r_j - R_j\} < c_E + F/\lambda$ to block E 's entry. Otherwise, E could always approach the retailer with the lowest $r_i - R_i$ with a slightly better offer, granting himself access to the contestable consumers at a margin large enough to cover his fixed cost F . But $\min\{r_i - R_i, r_j - R_j\} < c_E + F/\lambda$ means I would be selling below cost. In simple words, without an ex ante commitment, any attempt by I to exclude a more efficient rival using (r_i, R_i) contracts is equivalent to limit pricing, which is clearly not profitable when the rival is more efficient.

The result in Proposition 5 raises an interesting contrast with the one in Asker and Bar-Isaac (2014). In that paper, the authors show that if retailers are compensated with lump-sum rebates whenever they conform to the exclusivity and irrespective of how much they sell, then, exclusion can arise under some parameter configurations. The reason is that since entry reduces industry profits along with I 's, this latter is willing to transfer some or almost all of his profit reduction back to the retailers in the form of lump-sum rebates as a way to induce them to not facilitate entry. In other words, I uses these lump-sum rewards to make $B1$ and $B2$ internalize the effect on his profits of accommodating entry. However, and as the next proposition formally shows, for all this to work it is crucial that retailers do not internalize those rebates as reductions of their marginal costs.

PROPOSITION 6: *In the downstream-competition setup of Bertrand retailers, it is profitable for I to offer retailers a pair of discriminatory lump-sum rebates (r_i, L_i) for $i = 1, 2$, in exchange for exclusivity whenever*

$$(10) \quad \lambda(v - c_I)/2 > \lambda(c_I - c_E) - F.$$

PROOF:

Following the contracts in Asker and Bar-Isaac (2014),²⁶ suppose that on date 1, I offers each retailer $i = 1, 2$ the contract (r_i, L_i) , where $L_i > 0$ is the lump-sum amount established on date 1 but to be paid at the end of date 4, provided the retailer did not buy from E , and r_i is a price schedule with a unit-price w_{li} and a conditional fixed fee T_{li} , both left to be specified at the beginning of date 4. All retailers accept the offer since they have nothing to lose relative to their no-contract payoff of zero. Since E needs only one retailer to enter, he will, on date 2, approach the one with the lowest L_i , say $B2$, with a price offer $w_{E2} \geq c_E + F/\lambda$ that commits $B2$ to buy at least λ units at that price on date 4. One necessary condition for $B2$ to accept E 's offer is that $w_{E2} \leq c_I$, because she anticipates that on date 4, I 's equilibrium response will be to channel all his sales through $B1$ with the two-part tariff

²⁶ Although results are the same, their model differs slightly from ours in that they consider an infinitely repeated interaction between suppliers and retailers, which allows for the possibility of sustaining relational contracts that do not need court enforcement.

$\{w_{I1} = c_I, T_{I1} = (1 - \lambda)(v - c_{I1})\}$, while her equilibrium response will be to price the contestable units slightly below c_I . Since these equilibrium prices report $\lambda(c_I - w_{E2})$ to $B2$ ex post, the second condition for $B2$ to accept E 's offer is $\lambda(c_I - w_{E2}) \geq L_2$. Anticipating all this, the best contract E can offer $B2$ is $w_{E2} = c_E + F/\lambda$, which gives her $\lambda(c_I - c_E) - F - L_2$. In turn, this latter implies that to block E 's entry, I will need to offer each retailer at least $L = \lambda(c_I - c_E) - F$ on date 1. But this is worth doing only if the exclusionary profit, $v - c_I - 2L$, is greater than the profit under the no-contract benchmark, $\pi_I^{NC} = (1 - \lambda)(v - c_I)$; that is, only if condition (10) holds. ■

Proposition 5 highlights the importance of distinguishing between off-list-price and lump-sum rebates under intense downstream competition because of their distinct effects on equilibrium retail prices. The distinction is particularly evident when we see what it takes E to induce retailers to switch. As indicated in the proof of Proposition 5, it costs E virtually nothing to persuade either retailer to forgo the rebate R and buy from him because they get nothing anyway if they reject E 's offer. Conversely, it costs E exactly L to persuade a retailer to forgo the lump-sum L . And in the latter case, as condition (10) indicates, E cannot afford to pay this much if his available surplus, $\lambda(c_I - c_E) - F$, is less than the most I can offer each retailer as compensation, $\lambda(v - c_I)/2$. There is a simple intuition for these contrasting outcomes. If retailers internalize rebates as reductions of their marginal costs, then, any surplus-transfer that I uses to persuade them to become exclusive distributors gets dissipated away by downstream Bertrand competition, which, in turn, eliminates their incentives not to deal with E .²⁷

It is worth pointing out that lump-sum rebates still fall short of the anticompetitive potential of the exclusives in Proposition 4. Not surprisingly, the reason is again connected to the (lack of) ex ante commitment of discount contracts. Since (r_i, L_i) contracts, just as (r_i, R_i) contracts, do not include any ex ante commitment on the buyer side, this opens up an opportunity for E to make counteroffers. This, in turn, forces I to give significant rewards to retailers in exchange for exclusivity, as opposed to virtually none when the contractual arrangement is an exclusive dealing provision. But why is it that lump-sum rebates still have *some* exclusionary potential if they do not include an ex ante commitment? We now discuss this as well as its connection to the results in Propositions 1, 3, and 5, through the lens of what we call a *generalized Chicago critique*.

²⁷ It is important to clarify that what makes a rebate "lump-sum" is not that it is paid retroactively in a lump-sum manner, say, at the end of the accounting year, but rather that it has no effect on retail pricing at the margin because it is a fixed amount, independent of how much is actually purchased from the incumbent. According to this interpretation, the rebates in *AMD v. Intel* appear to be lump-sum while in *EU Commission v. Michelin II* they appear to be off-list-price, despite the latter's nevertheless being paid retroactively by the end of February the following year. Moreover, Michelin was paying rebates that were increasing with sales not only because they were established as percentage of the list price but also because the percentage discount was increasing as sales were crossing pre-agreed thresholds.

V. A Generalized Chicago Critique

A. *The Need for an Ex Ante Commitment*

The key to assimilating the results of the three previous sections in a coherent fashion, lies in understanding how post-Chicago models work. First, notice that since exclusion of an efficient rival is in itself inefficient, if all relevant parties were to participate simultaneously in the bargaining process, and sufficiently complete contracts (e.g., nonlinear prices) are available for the parties to sign, exclusion could not arise. One may call this a generalized Chicago critique. Post-Chicago models depart from this, by letting one market participant be *momentarily* absent from the bargaining table, which opens up an opportunity for I to extract additional rents from a third party, which sometimes may require the exclusion of a more efficient entrant. In the setup of Claim 1, for instance, it is E who is initially absent, who also happens to be the target of I 's rent-extraction scheme. E is also absent in the setup of Claim 2, but this time, some retail buyers are the ones being exploited. And in Claim 3, both E and final consumers are absent, but the latter are the ones being exploited with high retail prices.²⁸

As originally-absent parties eventually take part in the bargaining process however, I can only sustain such an inefficient outcome if buyers are effectively locked-in ex ante; that is, before the absent parties show up. This explains why exclusion is always possible with exclusives but not with off-list-price rebates. The rebates' lack of ex ante commitment allows retailers to make all their decisions, most importantly whether to become I 's exclusive distributors or not, only after observing offers from all remaining parties. It is precisely this ex post flexibility on the buyer side that renders I 's first-mover advantage irrelevant, as it forces him to offer larger rewards to keep buyers aligned with the inefficient outcome ex post, making any anticompetitive scheme unprofitable to begin with.

This intuition is similar in spirit to the reasoning behind why exclusives lose their exclusionary grip altogether when buyers are local monopolies, and liquidated damages must satisfy efficient breach (Masten and Snyder 1989; Simpson and Wickelgren 2007). Because foreclosing an efficient rival leads to a deadweight loss, all parties understand that the entrant will have enough surplus ex post to persuade buyers to switch, when they only need to pay expected damages. And since this renders any ex ante commitment irrelevant, these exclusives are, for exclusionary purposes, analogous to rebate contracts.

The need for an ex ante commitment is also present in the tying model of Whinston (1990). Foreclosure in that model requires the incumbent to *irreversibly* tie two unrelated products ex ante, one from the market where he faces the entry threat and one from a market where he is a monopolist, to credibly pre-commit to be aggressive ex post and deter entry. This, in turn, allows him to fully exploit the (single) buyer that is present. If tying is not irreversible however, then this strategy loses its exclusionary potential, since the entrant anticipates that in case of entry

²⁸Strictly speaking, final consumers are also absent in the rent-shifting and naked-exclusion settings. They are not, however, relevant parties in these models since they always end up paying v , irrespective of whether contracts are in place or not.

the incumbent will reverse the tying arrangement, as this strategy gives him lower profits than selling both goods separately.²⁹

Is there anything *I* can do to restore the anticompetitive potential of rebate contracts in all these settings? The previous discussion about the importance of an ex ante commitment gives us a hint: to add a clause in the rebate contract that commits retailers to make an unconditional transfer in exchange for a generous reward ex post.³⁰ Whether the transfer is made up-front or later is not important, as long as retailers commit to it regardless of their later actions, even if they do not buy from *I* at all. The reason unconditional transfers act as an ex ante commitment device is because they restrict the buyer's flexibility ex post by forcing her to take an action before observing all offers. Interestingly, however, these transfers have never been mentioned nor documented in any of the antitrust cases listed above.

Applying these intuitions to the first two claims is straightforward. In both cases, *I* finds himself unable to exploit the situation to his advantage with either off-list-price or lump-sum rebates that do not include unconditional transfers, as they fail to lock up buyers ex ante. Things are slightly more involved when retailers compete downstream, because one of the two relevant parties that is originally absent, final consumers, never directly participate in the bargaining process. Intense competition in the retail market, however, implicitly transforms retailers into agents of final consumers, which indirectly brings them to the bargaining table. *I* can again avoid this intermediation by (i) locking up retailers ex ante with an unconditional transfer, something that is possible because *E* is also initially absent; or alternatively, by (ii) softening downstream competition, which reduces the indirect influence of final consumers in the bargaining outcome, and works even if *E* is already present making offers. This explains why (r_i, R_i) contracts are no longer equivalent for exclusionary purposes to (r_i, L_i) ones: only the latter mute downstream competition.

While unconditional transfers are essential for writing anticompetitive (off-list-price) rebates in any of the post-Chicago models, they are not necessary for writing rebates that preclude inefficient outcomes, for example, that deter inefficient entry. An ex ante commitment is also absent in some exclusionary bundling models. We elaborate on both cases below to better appreciate the scope of the generalized Chicago critique.

B. Inefficient Entry

Building on the model of Section I, consider again the case of a single buyer *B* and known entry costs, but suppose instead that *E*'s entry is inefficient, i.e., $c_I < c_E + F/\lambda < v$. In the absence of contracts, there will be too much entry in equilibrium. In fact, if *I* does not offer a contract to *B* on date 1 and *E* does not enter on date 3, *B* gets charged v for every unit. Anticipating this, *E* and *B* have all

²⁹Notice that the single buyer is the party being exploited here, which is why writing an exclusive contract is useless to foreclose entry as opposed to tying: the incumbent needs to commit himself, rather than locking up the buyer, to exploit a third party (here the same buyer). The fact that tying works but exclusives do not explains why this model is not regarded as a post-Chicago model, even though its logic connects well with the generalized Chicago critique.

³⁰The complete analysis of the anticompetitive effects of rebates with unconditional transfers for Claims 1 to 3 can be found in the online Appendix.

the incentives to write a contract on date 2, in which the latter commits to buy λ units from the former at a unit price $w_E \in (c_E + F/\lambda, v)$, leading to inefficient entry.³¹ The exact value of w_E will split the entry surplus $\lambda(v - c_E) - F$ between B and E according to their bargaining powers. This is equivalent to having B subsidize a fraction of E 's fixed cost F , so as to increase competition in the spot market.

Notice that even though (r, R) contracts were never profitable to foreclose an efficient rival, here I can use them to block E 's inefficient entry as he is the residual claimant of the increase in social surplus generated by eliminating this distortion. I would offer B a rebate scheme with a list price $r = v$ and a discount R resulting in an effective price $x = v - R/\lambda$ such that $\lambda(v - x) = \lambda(v - c_E) - F$; that is, an effective price low enough to prevent E from making an offer that B might accept. Under this rebate contract, I gets

$$\pi_I = (1 - \lambda)(v - c_I) + \lambda\left(c_E + \frac{F}{\lambda} - c_I\right),$$

which is greater than $(1 - \lambda)(v - c_I)$, the payoff he would get otherwise. This again can be viewed through the lens of the generalized Chicago critique: since rebates eliminate a distortion, there is no need to lock up retailers ex ante with unconditional transfers for these rebate contracts to be profitable.

Interestingly, this form of using rebates to deter (inefficient) entry/expansion conforms well to the developments in *Barry Wright v. ITT Grinnell*.³² As documented by Kobayashi (2005), ITT Grinnell, a manufacturer of pipe systems for nuclear power plants, agreed to contribute to Barry Wright's cost to develop a full line of mechanical snubbers, an essential component in pipe systems, presumably to improve its negotiation power with Pacific, the existing dominant supplier of mechanical snubbers. Pacific reacted to Grinnell's deal with Barry Wright with a rebate contract offer that Grinnell could not resist: it included discounts of 30–25 percent off list price if Grinnell would agree to purchase virtually everything from Pacific.

C. Exclusionary Bundling

The need for an ex ante commitment is also absent in some exclusionary bundling models (e.g., Nalebuff 2004, 2005; Greenlee, Reitman, and Sibley 2008)³³ that analyze bundled discounts for otherwise completely unrelated products; say, products A and B , where the incumbent is a monopolist in market A and faces competition in market B from a more efficient rival.³⁴ Despite the similarity to our non-contestable and contestable segments, our theory is different in that the exclusionary mechanism

³¹ This model of inefficient entry is originally due to Innes and Sexton (1994). Notice, however, that this is not the only way to generate inefficient entry. A contestable demand $\lambda < 1$ will produce similar inefficiencies if manufacturers are restricted to offering linear prices in the spot, or if they supply to Bertrand retailers who, in turn, are restricted to offering linear prices. See the previous version of the paper for more details.

³² See *Barry Wright Corp. v. ITT Grinnell Corp.*, 724 F.2d 227 (1st Cir. 1983).

³³ The same is true with the exclusives in Calzolari and Denicolo (2015).

³⁴ The ex ante commitment is also absent in the models of Ordover and Shaffer (2013) and Chao and Tan (2014). This is not entirely surprising because both models depart from the standard assumptions in the literature of exclusive dealings and foreclosure. Ordover and Shaffer (2013) is more of a predatory pricing story with multiple periods, financially constrained firms, and switching costs. Chao and Tan (2014), on the other hand, is much closer to the literature on strategic investment in oligopoly. The incumbent uses all-unit rebates to soften price

underlying these bundling models is more closely related to a price-discrimination argument than to the post-Chicago ones behind Claims 1, 2, and 3.

To put things in context, while post-Chicago models overcome the generalized Chicago critique by departing from the simultaneous bargaining assumption, models in this price-discrimination theory of foreclosure do likewise by restricting the set of available contracts parties can sign, usually to linear prices. Contract incompleteness then prevents the incumbent from appropriating the entire surplus in market *A*. As a result, exclusion arises as the incumbent has no other way than to use market *B* to price discriminate and extract additional surplus in market *A*. So exclusion in these models is not driven by a standard leverage argument of extending monopoly power from market *A* to market *B*, but quite the opposite, by the use of an otherwise competitive market to extract additional surplus in a monopoly market.

While this incomplete surplus-extraction assumption may be reasonable when the incumbent is dealing with a group of final consumers that have different valuations for the two products, as in Nalebuff (2004, 2005), it has less support in wholesale markets where parties are free to sign contracts with nonlinear schedules, which guarantees nearly full surplus extraction in the monopoly (i.e., non-contestable) segment. This notion of how wholesale markets operate is particularly stressed in Innes and Sexton (1994), but it is also adopted in many other post-Chicago models (e.g., Aghion and Bolton 1987; Whinston 1990; Spector 2011; Asker and Bar-Isaac 2014, etc.). Our unit demand assumption captures the same idea in the simplest possible way. Alternatively, we could have worked with a downward sloping demand; but as we show in the online Appendix, none of our results change as long as the incumbent is free to use nonlinear prices (e.g., two-part tariffs). Therefore, in order to make the case that a discount contract without unconditional transfers is anticompetitive, one necessarily requires incomplete surplus extraction in the non-contestable segment, an issue totally absent in Claims 1, 2, and 3.

Contrasting our theory to these bundling models also helps us highlight an additional insight: the irrelevance of the relative size of the contestable demand, λ , in our results. Unlike what has been argued in some antitrust cases, a larger non-contestable segment does not make exclusion with rebates any easier in any of the post-Chicago settings, provided they also lack an *ex ante* commitment. This has important implications for antitrust policy. Any exclusionary theory that builds upon the idea that the size of the contestable segment matters ($\lambda < 1$) must necessarily rely on a price-discrimination (and contract incompleteness) argument of foreclosure.

VI. Final Remarks

We opened the Introduction with the following question: How can the antitrust authority be sure that a rebate contract is not offered to monopolize the market? We have shown that a rebate contract under which an incumbent manufacturer promises a retail buyer a percentage off-list-price on all units purchased, provided she buys exclusively from him, cannot be used to block an efficient competitor. This

competition, so while it is true that the entrant operates below full capacity, his profits are actually higher, a fact at odds with all antitrust cases involving foreclosure.

non-exclusionary result is general enough as it applies to all three post-Chicago settings where exclusion has been shown to emerge with exclusives; namely, the rent-shifting setting of uncertainty about the entrant's cost, the naked-exclusion setting of scale economies, and the downstream-competition setting of Bertrand competitors.

Our goal has been to provide antitrust authorities with some logical consistency checks to better assess monopolization claims involving rebates. In that regard, our analysis suggests that not only market conditions, such as degree of dominance, extent of scale economies, or intensity of competition downstream, are important, but also how these conditions interact with some specific features of the discount contract in question. Thus, when it comes to revising some important recent cases, our results indicate that rebate contracts documented and discussed in, for instance, *EU Commission v. Michelin II* and *EU Commission v. British Airways*, could not have been used to block a more efficient competitor. We base our conclusion on the fact that these rebate schemes do not include unconditional transfers from buyers to dominant suppliers, and were based on off-list-price discounts. According to our theory, the reason these contracts are observed in the first place cannot rest on exclusion, but presumably on the need to support relationship-specific investments, exclude otherwise inefficient entry, and/or stimulate retail effort, to name a few.³⁵

Our results do not allow us to be this conclusive for other cases, however. From reading *ZF Meritor v. Eaton* (US Court of Appeals for the Third Circuit Nos. 11-3301 and 11-3426, pp. 8–12), for example, it is not entirely clear whether the rebates offered by Eaton, the dominant supplier of heavy-duty (HD) truck transmissions in the North American market, to the four truck manufacturers buying these transmissions, were off-list-price or lump-sum. According to our theory, the distinction would be immaterial if truck manufacturers were selling their products to final consumers in completely separated markets, or if HD transmissions were not that large a component in the production of a truck for the rebate to affect its retail pricing at the margin. If pricing is not affected, and given that the only transfers documented were from Eaton to the HD transmission buyers, our theory would provide little support to Meritor's anticompetitive claim. This changes, however, when analyzing *AMD v. Intel*, and its European counterpart, *EU Commission v. Intel*. Though no unconditional transfers from OEMs to Intel are documented, the rebates used by Intel were apparently lump-sum, downstream competition was intense, and microprocessors are a considerable fraction of the total cost of a computer, possibly affecting its retail price. This makes these rebate practices potentially exclusionary.

³⁵ For example, in *EU Commission v. Michelin II*, in addition to the rebate schemes, Michelin engaged in a series of transfers to "club members," to contribute directly to the investment and training of dealers and others of know-how, including priority access to training courses.

APPENDIX

A. No-Contract Benchmark in Downstream Competition

If retailers are downstream competitors that buy from I and E in the spot, then

LEMMA 1: *There is an equilibrium in which I offers the schedules $\{w_{I1} = c_I, T_{I1} = (1 - \lambda)(v - c_I)\}$ and $\{w_{I2} = v, T_{I2} = 0\}$ while E offers $w_{E1} = w_{E2} = c_I$ with no fixed fee, which leads to retail prices $p_{1,1-\lambda} = p_{2,1-\lambda} = v$ and $p_{1,\lambda} = p_{2,\lambda} = c_I$.*

PROOF:

Suppose that I offers the following pair of schedules to $B1$ and $B2$: $\{w_{I1}, T_{I1} = (1 - \lambda)(w_{I2} - w_{I1})\}$ and $w_{I2} \geq w_{I1}$, respectively. Regardless of E 's offers, both buyers are ready to sell I 's products because they anticipate that at least they will be selling non-contestable units at price $p_{1,1-\lambda} = p_{2,1-\lambda} = w_{I2}$ for nonnegative profits. If $w_{I1} \geq c_E$, E 's optimal reaction to I 's offers is to set $w_{E1} = w_{E2} = w_{I1}$ (without loss of generality we can restrict attention to E offering linear prices), so retailers will be selling E 's units in the contestable segment at price $p_{1,\lambda} = p_{2,\lambda} = w_{I1}$ (obviously, if $w_{I1} < c_E + F/\lambda$, E 's optimal reaction is to sell nothing). Consider now E 's offers $c_I \geq w_{E2} \geq w_{E1}$ (offers above c_I can be ruled out since I can always undercut them with a pair of offers $\{w_{I1} = c_I, T_{I1} = (1 - \lambda)(w_{I2} - w_{I1}) + \lambda(w_{E1} - c_I)\}$ and $w_{I2} \geq w_{I1}$ that induces $B1$ to charge $p_{1,\lambda} = w_{E1}$ for the contestable units, so he can pocket an extra $\lambda(w_{E1} - c_I)$). Since Bertrand competition ensures retail prices in the contestable segment be equal to w_{E2} , I 's optimal reaction is to "abandon" the contestable segment and set $\{w_{I1} = c_I, T_{I1} = (1 - \lambda)(v - w_{I1})\}$ and $w_{I2} = v$. This latter together with E 's optimal reaction completes the proof. ■

B. Alternative Retail-Price Discrimination

We work here with the alternative assumption that retailers can set different prices for I 's and E 's products, as opposed to different prices across segments of demand. We will denote by p_{ji} the retail price that retailer $j = 1, 2$ charges for I 's products and by $p_{jE} \leq p_{ji}$ the price she charges for E 's products. We explore the effects of this alternative price discrimination assumption on three results: (i) the no-contract benchmark that is in Appendix A, (ii) Proposition 4, and (iii) Proposition 5.

Retail Prices in the No-Contract Benchmark.—

LEMMA 2: *There is an equilibrium for the no-contract benchmark game in which I offers the schedules $\{w_{I1} = c_I, T_{I1} = (1 - \lambda)(v - c_I)\}$ to $B1$ and the linear schedule $\{w_{I2} = v, T_{I2} = 0\}$ to $B2$ while E charges the same linear schedule $\{w_{Ej} = \hat{c}, T_{Ej} = 0\}$ to both retailers, where*

$$\hat{c} \equiv c_I + (1 - \lambda)(v - c_I).$$

This leads to retail prices $p_{1I} = p_{2I} = v$ and $p_{1E} = p_{2E} = \hat{c}$.

PROOF:

Given the schedules in the lemma, Bertrand retailers will set equilibrium prices $p_{1I} = p_{2I} = v$ and $p_{1E} = p_{2E} = \hat{c}$, which implies that $B1$ will carry both I 's and E 's products, and $B2$ will carry only E 's products. The only deviation we need to check is whether $B1$ would like to price I 's products not at v , but slightly below $\hat{c}$, and serve the entire demand; clearly, he would not like to do that because $(1 - \lambda)(v - c_I) - T_{1I} = \hat{c} - c_I - T_{1I}$. Notice that these retail prices result in retailers' profits being equal to $\pi_{B1} = \pi_{B2} = 0$ and suppliers' profits being equal to $\pi_I = (1 - \lambda)(v - c_I)$ and $\pi_E = \lambda(\hat{c} - c_E) - F$. As for deviation incentives in the upstream market (anticipating any effect in the downstream market), notice first there are no profitable deviations for E . Pricing above $w_{Ej} = \hat{c}$ leads to no sales because retailer $B1$ will sell I 's units slightly below any price above $\hat{c}$ (which, in turn, will be captured by I with an increase in T_{1I}), and pricing below $w_{Ej} = \hat{c}$ only decreases his profit. I 's incentives to deviate are also null because any effort to compete for the last λ units would require him to lower the price slightly below $\hat{c}$ not only on those units, but also on the first $1 - \lambda$ non-contestable units, which we just saw is not profitable. ■

Exclusive Dealing Contracts.—

LEMMA 3: *Under this alternative price discrimination assumption, there exist non-exclusionary equilibria, even when considering an exclusive dealing provision.*

PROOF:

Consider the exclusives of Proposition 4. Suppose that I offers $B1$ and $B2$ payments t_1 and t_2 , respectively, in exchange for exclusivity. If both retailers accept the offers, then, each gets exactly t_i , no more (in the absence of entry, I can extract all surplus ex post). If, on the other hand, both reject their offers, then, each gets zero, the no-contract benchmark payoff. The interesting case arises when one retailer, say $B2$, accepts her offer and the other one rejects it.

We will first argue that the subgame with a free retailer ($B1$) and a captive retailer ($B2$) accepts an equilibrium where I offers

$$\{w_{1I} = c_I, T_{1I} = (1 - \lambda)(v - c_I)\} \quad \text{and} \quad \{w_{12} = v, T_{12} = 0\}$$

to $B1$ and $B2$, respectively. While E offers $\{w_{E1} \leq c_I, T_{E1} = \lambda(c_I - w_{E1})\}$ to $B1$ (and nothing to $B2$ by construction). Given these offers, the equilibrium downstream results in prices $p_{1I} = p_{12} = p_{E1} = v$, $B2$ making no sales, and $B1$ selling $1 - \lambda$ and λ units of I 's and E 's products. To show that this is indeed an equilibrium, notice, on the one hand, that since $B1$ is just indifferent between purchasing $1 - \lambda$ and λ units from I and E , and purchasing one unit from I , any attempt by E of extracting more rents from $B1$ will lead him to earn zero profits. Hence, E has no incentives to change his offer. On the other hand, conditional on the contract offered to $B2$, I has no incentives to change his offer to $B1$, since any attempt to undercut E 's offer will give him less than $(1 - \lambda)(v - c_I)$, as $B1$ is already getting $\lambda(v - c_I)$

from selling E 's units. Hence, the only possible deviation left to consider involves the following simultaneous deviations in $B1$ and $B2$'s offers: $\{w_{I1} = v, T_{I1} = 0\}$ and $\{w_{I2} < v, T_{I2} \geq 0\}$.

Computing I 's payoff from such simultaneous deviations is not straightforward because there does not exist an equilibrium in pure strategies in the downstream market. We can nevertheless show that I is not strictly better off following such deviation. Assume that I 's offer to $B1$ is still $\{w_{I1} = v, T_{I1} = 0\}$ but that I 's offer to $B2$ is not longer $\{w_{I2} < v, T_{I2} \geq 0\}$ because I and $B2$ are now vertically integrated. Since E 's offer to $B1$ is fixed, there are no benefits from strategic separation à la Bonanno and Vickers (1988), so from I 's perspective the vertical-integration outcome is weakly preferred to a two-part tariff offer to an otherwise captive retailer. Consider then, the downstream pricing game between the vertically integrated firm $I - B2$, who can serve the entire market at marginal cost c_I , and retailer $B1$, who sells at most λ units at cost w_{E1} each. As formally shown in the online Appendix, the equilibrium is in mixed strategies with the vertically-integrated firm getting $(1 - \lambda)(v - c_I)$, its residual monopoly profit. More importantly, this is the payoff I gets in our proposed pure-strategy equilibrium, hence, the simultaneous deviation is not profitable.

From the above, it follows immediately that there exists a non-exclusionary equilibrium. Since equilibrium payoffs in this ensuing subgame (i.e., omitting the exclusivity payments) are $\pi_I = (1 - \lambda)(v - c_I)$, $\pi_E = \lambda(c_I - c_E) - F > 0$, $\pi_{B1} = \lambda(v - c_I)$, and $\pi_{B2} = 0$, exclusion cannot arise as it requires I to offer each retailer $t_i > \lambda(v - c_I)$, which leads to an overall payoff of $v - c_I - t_1 - t_2$ which is less than $\pi_I^{NC} = (1 - \lambda)(v - c_I)$. ■

It is important to highlight that the above argument does not allow us to conclude that every equilibrium is non-exclusionary. The key to exclusion with an exclusive dealing contract is retailers' equilibrium profits in the subgame with one free retailer. Without completely characterizing such equilibrium set, it is not possible to discard an equilibrium (in mixed strategies) where I gets $(1 - \lambda)(v - c_I)$, but the free retailer, say $B1$, gets $\pi_{B1} = \bar{\pi}_B < \lambda(v - c_I)/2$. In that case, exclusion would arise. Both retailers would be ready to accept offers $t_1 = t_2 = \bar{\pi}_B$ in exchange for the exclusivity, with I pocketing $v - c_I - 2\bar{\pi}_B > (1 - \lambda)(v - c_I) = \pi_I^{NC}$.

Off-List-Price Rebates.—

LEMMA 4: *Under this price discrimination assumption, it is never profitable for I to offer a pair of discriminatory rebate contracts (r_i, R_i) for $i = 1, 2$, to deter E 's entry.*

PROOF:

Suppose that there exists an exclusionary equilibrium with exclusives under this alternative price discrimination assumption (see previous section), we now prove that even under this scenario rebates cannot be anticompetitive, which implies that our result in Proposition 5 remains unchanged under this alternative price discrimination assumption. Following the proof of Proposition 5, suppose that I offers both retailers the same rebate (r, R) , which both accept. To enter, E will approach one

of them, say $B1$, if at all, with an offer of w_{E1} for λ units. Therefore, an additional condition to block E 's entry is that $B2$ must find it profitable to price I 's products slightly below w_{E1} , even if w_{E1} is as low as $c_E + F/\lambda$. $B2$'s payoff of doing so is $c_E + F/\lambda - r + R$, while of not doing so is $(1 - \lambda)R$. This latter is the result of selling $1 - \lambda$ units at price r , which is the marginal cost faced by $B1$ when selling I 's units. Thus, the new entry-deterrence condition reduces to $r - \lambda R \leq c_E + F/\lambda$. But since I 's profit is

$$\pi_I^R = r - R - c_I < r - \lambda R - c_I < c_E + F/\lambda - c_I < 0,$$

exclusion will not arise. The case of discriminatory rebates is straightforward. ■

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