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EXCLUSIVE DEALING

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ABSTRACT

In this paper, we provide a conceptual framework for understanding the phenomenon of exclusive dealing, and we explore the motivations for and effects of its use. For a broad class of models, we characterize the outcome of a contracting game in which manufacturers may employ exclusive dealing provisions in their contracts. We then apply this characterization to a sequence of specialized settings. We demonstrate that exclusionary contractual provisions may be irrelevant, anticompetitive, or efficiency-enhancing, depending upon the setting. More specifically, we exhibit the potential for anticompetitive effects in *non-coincident* markets (that is, markets other than the ones in which exclusive dealing is practiced), and we explore the potential for the enhancement of efficiency in a setting where common representation gives rise to incentive conflicts. In each instance, we describe the manner in which equilibrium outcomes would be altered by a ban on exclusive dealing. We demonstrate that a ban may have surprisingly subtle and unintended effects.

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1. Introduction

A manufacturer engages in exclusive dealing when it prohibits a retailer or distributor who carries its product from selling certain other products (often, although not always, those of its direct competitors). For example, in one well-known antitrust case, Standard Fashion Co. v. Magrane-Houston Co. (1922), a leading manufacturer of dress patterns (Standard) contracted with a leading Boston retailer (Magrane-Houston) to sell its patterns on the condition that Magrane-Houston not sell the patterns of any other manufacturer.[1]

Assessments of exclusive dealing by various antitrust commentators are remarkably divergent. Throughout much of this century, the Courts have treated exclusive dealing harshly. Fearful of the foreclosure of competitors from retail outlets, the Court in the Magrane-Houston case struck down the contract, arguing that "[t]he restriction of each merchant to one pattern manufacturer must in hundreds, perhaps in thousands, of small communities amount to giving such single pattern manufacturer a monopoly of the business in such community."

At the same time, persuaded by the arguments of the Chicago School, many have come to believe that exclusive dealing cannot serve as a profitable mechanism for monopolization and that it should instead be regarded as an efficient contractual form. Commenting on the Magrane-Houston case, Bork [1978] puts the argument this way:

> "Standard can extract in the prices that it charges all that its line is worth. It cannot charge the retailer that full amount in money and then charge it again in exclusivity that the retailer does not wish to grant. To suppose that it can is to commit the error of double counting. ...Exclusivity has necessarily been purchased from it, which means that the store has balanced the inducement offered by Standard... against the disadvantage of handling only Standard's patterns... If consumers would prefer more pattern lines at higher prices, the store would not accept Standard's offer. The store's decision, made entirely in its own interest, necessarily reflects the balance of competing considerations that determine consumer welfare. Put the matter another way. If no manufacturer used exclusive dealing contracts, and if a local retail monopolist decided unilaterally to carry only Standard's patterns because the loss in product variety was more than made up in the cost saving, we would recognize that decision was in the

[1] For a summary of federal exclusive dealing cases that reached at least the appellate level, see Frasco [1991].

> consumer interest. We do not want a variety that costs more than it is worth... If Standard finds it worthwhile to purchase exclusivity..., the reason is not the barring of entry, but some more sensible goal, such as obtaining the special selling effort of the outlet." [pp. 306-7]

In contrast to many other forms of vertical restrictions (such as resale price maintenance and exclusive territories), exclusive dealing has received relatively little formal attention in the economics literature (see, for example, Katz's [1989] survey article; notable exceptions include Marvel [1982] and Mathewson and Winter [1987] which we discuss below). In this paper, we seek both to provide a conceptual framework for understanding this phenomenon and to explore more fully the motivations for and effects of its use. Central to our approach is the view that exclusive dealing is best understood by studying its costs and benefits relative to those of common representation. These settings of common representation formally involve what we have previously termed situations of "common agency" (Bernheim and Whinston [1986a, 1986b]). Exclusive dealing is an explicit choice by the retailer and a manufacturer to avoid a setting of common agency.

The remainder of the paper is organized as follows. Section 2 describes a general framework in which a single retailer may represent two manufacturers. For a broad class of models encompassing all of the specific settings considered in subsequent sections, we characterize the outcome of a contracting game in which manufacturers may employ exclusive dealing provisions in their contracts. A central implication of this characterization is that in these settings, unless common representation introduces contracting externalities that reduce the manufacturers' joint payoffs, the equilibrium outcome is necessarily supportable through non-exclusive contracts.

In section 3, we specialize to a simple setting in which the retailer buys and resells the manufacturers' products and in which the retailers' choices are perfectly observable. The model follows closely the scenario envisioned by Bork. We show that, in this setting, there are no relevant contracting externalities associated with common representation. By applying our general characterization results, we then obtain several strong conclusions supporting Bork's assertions. First, the market outcome maximizes the profits of the vertical structure as a whole -- one obtains the fully integrated solution. Second, in this equilibrium, each manufacturer earns exactly its contribution to aggregate profits. Third, although this outcome need not be first-best, banning exclusive dealing cannot raise welfare.

Despite these results, we argue that the model of section 3 may provide a poor framework for understanding the effects of the exclusionary contracts that are observed in practice. In that model, exclusionary provisions are entirely superfluous; even when the fully integrated solution would involve the sale of only one product, this outcome can be supported through non-exclusionary contracts. Indeed, in this model, there is also no reason to permit exclusive dealing.

Given that exclusivity provisions are superfluous in the model of section 3, it is natural to investigate the circumstances under which these provisions serve a meaningful purpose. Commentators have suggested a number of different motivations for the practice (see, for example, the summaries in Areeda and Kaplow [1988] and Scherer [1980]). Those who are concerned about the practice believe that it may be motivated by the desire to preempt outlets, and thereby enhance market power. A leading explanation of those who see exclusive dealing as an efficient contractual device, on the other hand, is that it may be motivated by a manufacturer's desire to secure the special selling effort of the retailer. As Scherer [1980] puts this view, "For manufacturers, exclusive dealing arrangements are often appealing, because they ensure that their products will be merchandised with maximum energy and enthusiasm." In sections 4 and 5, we show that these two explanations may indeed be given rigorous theoretical foundations by introducing suitable generalizations into the model of section 3.[1]

In section 4, we demonstrate that exclusive dealing can serve as a device for extracting rents

[1]The other leading efficiency explanation is the manufacturer-free-trading story presented in Marvel [1982]. We discuss this explanation briefly in section 5.

(conceivably by extending market power) from markets other than the ones in which they are employed. We refer to this phenomenon as a *non-coincident* market effect. In particular, we explore the role of non-coincident market effects for an illustrative model in which retail markets develop sequentially, and where important economies can be achieved only by serving more than one market. We demonstrate that, as in section 3, effective exclusion occurs in the early-developing market whenever it is jointly optimal for the manufacturers and retailer in this market. However, there are two important differences from the analysis of section 3. First, although exclusion may be optimal for the these three parties, it may not maximize vertical structure profits across the two retail markets; an externality arises because exclusion may affect the degree of competition, and hence the profits of the retailer, in the later-developing market. Second, it may be impossible to achieve the exclusionary outcome in the absence of explicitly exclusionary provisions, precisely because the existence of non-coincident effects may generate contracting externalities for the manufacturers. We derive a necessary and sufficient condition describing the circumstances under which these provisions are used. In addition, we examine the effects of banning explicit exclusion. We demonstrate that this does not always end effective exclusion. Indeed, a ban may lead to effective exclusion continuing, but through even less efficient practices such as quantity forcing or quantity discounts.[2] Thus, the welfare implications of a ban are ambiguous, even in the context of a model predicting foreclosure when exclusive dealing is permitted.

In section 5, we study the potential for exclusive dealing to arise in circumstances where common representation involves costly incentive conflicts. In particular, we imbed this conflict into

[2]In light of this result, there are some noteworthy aspects of a recent lawsuit filed by Virgin Atlantic Airways against British Airways. While British Airways apparently has not attempted to engage any travel agent in an exclusive relationship, it has offered travel agent commission override (or "TACO") programs, which grant rebates if agents purchase high quantities or high fractions of their customers' travel services from British Airways. Virgin Airways has alleged that these programs effectively amount to exclusive dealing arrangements, and that they result in market foreclosure. See the decision of U.S. District Judge Miriam Goldman Cedarbaum concerning British Airways' motion for summary judgement, memorandum of Opinion and Order, 93 Civ. 7270(MGC), December 30, 1994.

the model by assuming that the retailer takes unobservable actions that influence the manufacturers' sales, and that the retailer is risk-averse. We demonstrate that common representation may then involve inefficiencies (resulting again from contracting externalities), and that this can lead to exclusive dealing when these costs are large relative to the benefits from carrying a second product. We explore the nature of these inefficiencies, and the precise circumstances in which exclusive dealing arises. We also demonstrate that a ban on exclusive dealing may have surprisingly subtle effects. For example, a ban can reduce welfare even in cases where no exclusion would have occurred.

Section 6 contains concluding remarks. All formal proofs are contained in the appendix.

2. The Contracting Model

In this section, we describe the contracting game that we employ throughout the paper and provide an initial characterization result concerning its equilibria. The contracting game involves three players: a retailer, who is assumed to have sole access to some set of consumers, and two manufacturers $(j = A,B)$ who wish to sell their products to these consumers.

The contracting process consists of three stages:

Stage 1: Firms simultaneously announce contract offers. A contract maps observable outcomes (discussed later) to payments, which are made by the retailer to the manufacturer. Unless legally prohibited from doing so, a firm may condition its contract terms on the set of manufacturers whose products are sold by the retailer. Formally, we represent manufacturer j's offer as a contingent pair (P_j^e, P_j^c). P_j^e is an *exclusive* contract, which applies if the retailer contracts only with manufacturer j. P_j^c is a *common* contract, which applies if the retailer contracts with both manufacturers. For now we shall simply denote the set of possible exclusive and common contracts for manufacturer j by $\mathcal{P}_j^e$ and $\mathcal{P}_j^c$. We assume throughout that each set includes ϕ, the choice not to offer a contract of that type. If manufacturer j's offer is (P_j^e, ϕ) the retailer can accept j's offer only if he does not accept manufacturer -j's offer.

__Stage 2__: The retailer accepts or rejects each of the two firms' offers; accepting means accepting the contingent pair (P_j^e, P_j^c). The retailer's payoff if he rejects both firms' offers is U^0, while each manufacturer j $(j=A,B)$ then earns π_j^0.

__Stage 3__: If the retailer serves only manufacturer j, he chooses an element of the set Σ^j; if he serves both manufacturers, he chooses an action from the set Σ^c. If the retailer selects actions $\sigma^j \in \Sigma^j$ when serving only manufacturer j under contract P_j^e his payoff is $u^j(P_j^e, \sigma^j)$, manufacturer j earns $\pi_j^j(P_j^e, \sigma^j)$, and manufacturer $i \neq j$ earns $\pi_i^j(P_j^e, \sigma^j)$ (thus, we permit manufacturer i's payoff to depend on the contracting outcome between manufacturer j and the retailer). If the retailer chooses $\sigma^c \in \Sigma^c$ when serving both manufacturers, his payoff is $u^c(P_A^c, P_B^c, \sigma^c)$ and manufacturer j earns $\pi_j^c(P_A^c, P_B^c, \sigma^c)$, $j = A,B$. We denote the retailer's (possibly non-unique) optimal choices in each of these cases by $\hat{\sigma}^j(P_j^e) = \text{argmax}_{\sigma^j \in \Sigma^j} u^j(P_j^e, \sigma^j)$ and $\hat{\sigma}^c(P_A^c, P_B^c) = \text{argmax}_{\sigma^c \in \Sigma^c} u^c(P_A^c, P_B^c, \sigma^c)$. [3]

We will be much more explicit about the nature of the sets $\mathcal{P}_j^e$, $\mathcal{P}^c$, Σ^j, and Σ^c and the functions $u^j(\bullet)$, $u^c(\bullet)$, $\pi_j^j(\bullet)$, $\pi_i^j(\bullet)$, and $\pi_j^c(\bullet)$ in the sections that follow. For the purposes of the analysis in this section, however, we begin with four minimal assumptions. In stating them, we let $P_j^c + K$ denote the contract that differs from contract P_j^c only by the addition of a fixed payment K from the retailer to manufacturer j. A similar meaning applies to the contract $P_j^e + K$.

(A1) *If* $P_j^s \in \mathcal{P}_j^s$, *then* $P_j^s + K \in \mathcal{P}_j^s$ *for all* $K \in \mathbf{R}$ *and* $s = e,c$.

(A2) $u^c(P_A^c + K, P_B^c - K, \sigma^c) = u^c(P_A^c, P_B^c, \sigma^c)$ *for all* $K \in \mathbf{R}$, $(P_A^c, P_B^c, \sigma^c) \in \mathcal{P}_A^c \times \mathcal{P}_B^c \times \Sigma^c$.

(A3) $\pi_j^c(P_A^c + K, P_B^c, \sigma^c) = \pi_j^c(P_A^c, P_B^c, \sigma^c) + K$ and $\pi_j^j(P_j^e + K, \sigma^j) = \pi_j^j(P_j^e, \sigma^j) + K$ *for all* $K \in \mathbf{R}$, $(P_A^c, P_B^c, \sigma^c) \in \mathcal{P}_A^c \times \mathcal{P}_B^c \times \Sigma^c$, and $(P_j^e, \sigma^j) \in \mathcal{P}_j^e \times \Sigma^j$.

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[3]While optimal choices may not exist for all feasible contracts, this has little effect on our characterization of equilibria. Formally, there are two possible ways to proceed. First, one can impose sufficient technical restrictions on payoffs and contracts to guarantee existence. Second, one could assume that, when an optimum fails to exist, the retailer follows some arbitrary rule of thumb (e.g., he could do nothing, or could "satisfice," choosing randomly from among those contracts whose payoffs cannot be exceeded by more than some amount ϵ). The first approach rules out problematic subgames, while the second renders them irrelevant. Both approaches lead to the same results.

(A4) $u^j(P^c_j + K, \sigma^j)$ *is a continuous, strictly increasing function of* K *that is unbounded above and below.*

(A1) says that it is always possible to alter a feasible contract by demanding a larger (or smaller) fixed payment from the retailer. (A2) says that the retailer does not care about the source of his monetary earnings. It implies that $\hat{\sigma}^c(P^c_A + K, P^c_B - K) = \hat{\sigma}^c(P^c_A, P^c_B)$ for all $K \in \mathbf{R}$ and $(P^c_A, P^c_B) \in \mathcal{P}^c_A \times \mathcal{P}^c_B$. (A3) says that a manufacturer's payoff increases dollar-for-dollar in his monetary earnings. (A4) implies that by altering P^c_j by a fixed payment K it is possible to give the retailer any desired level of utility.

In general, the model outlined above gives rise to multiple equilibria. We refine the set of equilibria by focusing on those that are Pareto undominated for the manufacturers (the first-movers) within the set of equilibria.[4] As a general matter, we can classify equilibria according to whether they are *exclusive* (involve the retailer contracting with only one manufacturer) or *common* (involve the retailer contracting with both manufacturers).

Consider, first, exclusive equilibria. If each manufacturer j sets $P^c_j = \phi$, then bidding is reduced to competition to obtain an exclusive relationship with the retailer. The outcome of this (Bertrand-like) bidding game is that the exclusive relationship is obtained by the manufacturer who can profitably offer the retailer the highest payoff level. Formally, define for $U \geq U^0$ the function

$$\begin{aligned} \Pi^j_j(U) = &\max_{P^e_j \in \mathcal{P}^e_j,\ \sigma^j} \pi^j_j(P^e_j, \sigma^j) \\ &\text{s.t. (i) } \sigma^j \in \hat{\sigma}^j(P^e_j) \\ &\quad\ \ \text{(ii) } u^j(P^e_j, \sigma^j) \geq U. \end{aligned} \tag{1}$$

$\Pi^j_j(U)$ is the highest payoff level obtainable by manufacturer j in an exclusive relationship with the

[4]This is equivalent to requiring that equilibria be perfectly coalition-proof (see Bernheim, Peleg, and Whinston [1987]).

retailer when the retailer has reservation utility level U. It is necessarily non-increasing in U. We can also define $\Pi^{ej}_i(U) = \max\{\pi^j_i(P^e_j,\sigma^j) \mid (P^e_j,\sigma^j) \text{ solves } (1)\}$ to be the maximal payoff of manufacturer $i \neq j$ when j has such an exclusive relationship. We then denote by $\Pi^{ej}(U) = \Pi^{ej}_j(U) + \Pi^{ej}_i(U)$ the maximal level of aggregate manufacturer profits when manufacturer j has an optimal exclusive contract with a retailer who has reservation utility level U.

If $\Pi^{ej}_j(U)$ and $\Pi^{ej}_i(U)$ are continuous for $j = A,B$, $i \neq j$ (as we assume below), then exclusive equilibria always exist. In any exclusive equilibrium in which the retailer contracts with manufacturer j, the retailer's equilibrium payoff $\tilde{U}$ must be such that $\Pi^{ej}_j(\tilde{U}) - \Pi^{ei}_j(\tilde{U}) \geq 0 \geq \Pi^{ej}_i(\tilde{U}) - \Pi^{ei}_i(\tilde{U})$ (where $i \neq j$), or equivalently, $\Pi^{ej}(\tilde{U}) \geq \Pi^{ei}_i(\tilde{U}) + \Pi^{ej}_j(\tilde{U}) \geq \Pi^{ei}(\tilde{U})$. The best exclusive equilibrium (for manufacturers) gives the retailer the payoff $U^e = \min\{U: \Pi^{ej}_i(U) - \Pi^{ei}_i(U) \leq 0$ for some i and $j \neq i\}$, and has profits of $\Pi^{ej}_j(U^e)$ for the manufacturer who is served, and $\Pi^{ej}_i(U^e)$ for the excluded manufacturer.[5]

Now consider common equilibria (i.e., equilibria in which both manufacturers' offers are accepted). Lemma A.1 in the appendix characterizes these equilibria in terms of an associated *intrinsic common agency* game, which is the game that would arise were the agent only able to serve both manufacturers or none at all (see Bernheim and Whinston [1986b]). Formally, one obtains this game by imposing the restriction that $\mathcal{P}^e_j = \phi$ for $j = A,B$, and by assuming that the manufacturers receive arbitrarily large negative payoffs if the retailer rejects both offers. Henceforth, we let $\hat{\Pi}^c(U)$ denote the highest *aggregate* payoff earned by the two manufacturers in any equilibrium of an intrinsic common agency game with retailer reservation utility U. We also denote by $\hat{E}^c(U) \subset \mathcal{P}^c_A \times \mathcal{P}^c_B \times \Sigma^c$ the subset of equilibria of the intrinsic common agency game with reservation utility level U that generate aggregate profits for the manufacturers of $\hat{\Pi}^c(U)$. Assumptions (A1) - (A4) imply that if $(P^c_A, P^c_B, \sigma^c) \in \hat{E}^c(U)$ then $(P^c_A + K, P^c_B - K, \sigma^c) \in \hat{E}^c(U)$.

[5]In any such undominated equilibrium each manufacturer offers a contract that solves problem (1) when $U = U^e$.

The models studied in Sections 3-5 share a feature that makes identification of undominated equilibrium outcomes particularly simple. We introduce this condition as our fifth assumption:

(A5) *There exist constants* $(\hat{\Pi}^c, \Pi^A_A, \Pi^B_A, \Pi^B_B, \Pi^A_B)$ *and a strictly increasing function* $g(U)$ *with* $g(U^0) = 0$ *such that, for all* $U \geq U^0$, $\hat{\Pi}^c(U) = \hat{\Pi}^c - g(U)$, $\Pi^j_j(U) = \Pi^j_j - g(U)$ *for* $j = A,B$, *and* $\Pi^j_i(U) = \Pi^j_i$ *for* $j = A,B$, $i \neq j$.

Given (A5), for $j = A,B$ we can also write $\Pi^j(U) = \Pi^j - g(U)$ where $\Pi^j = \Pi^j_j + \Pi^j_i$. The levels $\hat{\Pi}^c$, Π^A, and Π^B are the maximal aggregate manufacturer profits that can be generated in common and exclusive relationships, respectively, with a retailer who has a reservation utility level of $U = U^0$. Assumption (A5) says that the differences between the maximal aggregate manufacturer profit levels in these types of relationships are independent of U.

The models in Sections 3-5 satisfy two further conditions that help us characterize equilibria.

(A6) $\Pi^j_j > \pi^0_j$ *for some j, and* $\Pi^A_A + \Pi^B_B - \max\{\Pi^A, \Pi^B, \hat{\Pi}^c\} \geq 0$.

(A7) *For* $j = A, B$ *and* $i \neq j$, $\Pi^j_i \leq \min\{\pi^0_i, \pi^j_i(P^e_j, \sigma^j)\}$ *for all* (P^e_j, σ^j).

The first part of condition (A6) says that some manufacturer earns greater profits in an exclusive relationship with a retailer having reservation utility U^0 than in the no-contracting outcome. This rules out the existence of a no-contracting equilibrium. The second part of (A6) implies that the retailer's reservation utility constraint does not bind in a contracting equilibrium (see the expression for the retailer's payoff in proposition 2.1). Condition (A7) says that each manufacturer earns weakly less when its rival has an optimal exclusive relationship than in any other circumstance where its contract is rejected. This condition is automatically satisfied whenever a manufacturer earns the same payoff (e.g. zero) in any circumstance where its contract is rejected.

The following result characterizes the undominated equilibria of our contracting game:

Proposition 2.1: *Suppose that* (A1) - (A6) hold. *In any undominated equilibrium of the contracting model, manufacturer* j (j = A,B) *earns* $\max\{\hat{\Pi}^c, \Pi^A, \Pi^B\} - \Pi^i_i$ (*where* $i \neq j$) *and the retailer receives a payoff of* $g^{-1}(\Pi^A_A + \Pi^B_B - \max\{\hat{\Pi}^c, \Pi^A, \Pi^B\})$.

(i) If $\max\{\Pi^A, \Pi^B\} > \hat{\Pi}^c$, *then any undominated equilibrium involves the retailer contracting with only one manufacturer* j, with $\Pi^j = \max\{\Pi^A, \Pi^B\}$. *The equilibrium contract and retailer action* (P^e_j, σ^j) *solve* (1) *for* $U = g^{-1}(\Pi^j_j - \Pi^j_j)$. *Moreover, if (A7) holds, then no common equilibria exist in this case.*

(ii) *If* $\hat{\Pi}^c > \max\{\Pi^A, \Pi^B\}$, *then all undominated equilibria are common equilibria. The equilibrium contracts and retailer action choice* (P^c_A, P^c_B, σ^c) *are elements of the set* $\hat{E}^c(g^{-1}(\Pi^A_A + \Pi^B_B - \hat{\Pi}^c))$.

(iii) *If* $\hat{\Pi}^c = \max\{\Pi^A, \Pi^B\}$, *then both types of equilibria described in* (i) *and* (ii) *arise as undominated equilibria.*

Proposition 2.1 tells us that the contracting outcome in any undominated equilibrium of a model satisfying (A1) - (A6) must correspond to the contracting structure that maximizes aggregate manufacturer payoffs for any given level of retailer utility. Note that in the case in which utility is transferable, so that $g(U) = U$ for all $U \geq 0$, the equilibrium structure is therefore also the one that maximizes the aggregate payoff of the manufacturers and the retailer. Each manufacturer's payoff in this equilibrium is the difference between the aggregate manufacturer profit generated by this structure and the profit that can be generated by the *other* manufacturer in an exclusive relationship.

Finally, suppose we define $\bar{\Pi}^c(U) = \bar{\Pi}^c - g(U)$ to be the maximized joint profit in an intrinsic common agency game with reservation utility U if the two manufacturers *cooperated* in their choice of contracts (P^c_A, P^c_B). In many settings (including all of those considered in sections 3 through 5), it is the case that $\bar{\Pi}^c \geq \text{Max}\{\Pi^A, \Pi^B\}$ (e.g. as long as cooperating manufacturers can replicate an exclusive outcome by having one manufacturer offer a prohibitively high price per unit). When this is so, Proposition 2.1 tells us that a *necessary* condition for exclusive dealing to arise (uniquely) in an undominated equilibrium is that $\hat{\Pi}^c < \bar{\Pi}^c$: there must be some loss to the manufacturers arising from externalities associated with the noncooperative offering of non-exclusive contracts.

3. The Simplest Model

We begin our analysis by studying the potential for exclusive dealing in the simplest possible setting in which it might arise. The model corresponds closely to the environment envisioned by Bork. In particular, we assume that the retailer directly controls the level of retail sales for each manufacturer j, henceforth denoted x_j. Thus, $\sigma^j = x_j$, $\Sigma^j = \mathbf{R}_+, \sigma^c = (x_A, x_B)$, and $\Sigma^c = \mathbf{R}^2_+$. Manufacturer j can observe and verify x_j, as well as the nature of j's relation with the retailer (exclusive or non-exclusive); however, j is unable either to observe or to verify the level of retail sales made on behalf of manufacturer -j (x_{-j}). Thus, each manufacturer can offer a contract that ties monetary payments to its own sales, as well as to the nature of its relationship with the retailer, but cannot tie payments to sales of another manufacturer's product.[6] It follows that the payment functions map sales to monetary transfers, $P_j^s : \mathbf{R}_+ \to \mathbf{R}$, s = c,e.

Having chosen the levels of retail sales $x = (x_A, x_B)$, the retailer receives revenues $R(x_A, x_B)$ (for convenience, we sometimes write $R(x_j, x_{-j})$). Each manufacturer incurs production costs of $c_j(x_j)$. Thus, $\pi_j^c(P_A^c, P_B^c, x^c) = P_j^c(x_j^c) - c_j(x_j^c)$, $\pi_j^j(P_j^e, x_j^e) = P_j^e(x_j^e) - c_j(x_j^e)$, $u^c(P_A^c, P_B^c, x^c) = R(x_A^c, x_B^c) - P_A^c(x_A^c) - P_B^c(x_B^c)$, and $u^j(P_j^e, x_j^e) = R(x_j^e, 0) - P_j^e(x_j^e)$. It is easy to check that this version of the general model satisfies (A1) through (A4). In addition, a manufacturer earns zero if the retailer rejects its offer, and the retailer earns zero if it rejects both manufacturers' offers. Hence π_A^0

[6] As shown in a previous version of this paper (Bernheim and Whinston, 1992), our analysis is essentially unchanged when one permits manufacturers to condition payments on each others' sales. The central difference is that, under this alternative assumption, manufacturers can always write nominally non-exclusive contracts that are equivalent to exclusive contracts (e.g. by permitting the retailer to serve other manufacturers, while penalizing the retailer heavily whenever the sales of another manufacturer are positive). Thus, the alternative assumption obscures the formal distinction between exclusive and non-exclusive contracts without adding to the substantive content of the problem.

$= \pi_B^0 = U^0 = 0$, and $\pi_j^i(P_i^e, \sigma^i) = 0$ for all (P_i^e, σ^i), $i \neq j$ and $j = A,B$.

In this setting, a fully integrated vertical structure would choose to produce and sell

$$x^{**} = (x_A^{**}, x_B^{**}) \equiv \operatorname{argmax}_{x_A, x_B} R(x_A, x_B) - \sum_{j=A,B} c_j(x_j) , \tag{3}$$

which, for convenience only, we assume to be unique. On the other hand, were only product j available, a vertically integrated firm consisting of the retailer and firm j would select

$$x_j^* = \operatorname{argmax}_{x_j} R(x_j, 0) - c_j(x_j) . \tag{4}$$

We assume that

(B1) $\quad R(x_A^*, 0) - c_A(x_A^*) > R(0, x_B^*) - c_B(x_B^*) > 0,$

so that product A is the more profitable of the two products if only one of them can be sold.[7] In addition, we assume that the two products are substitutes, in the following sense:

(B2) $\quad R(x^{**}) - c_A(x_A^{**}) - c_B(x_B^{**}) < \sum_{j=A,B} [R(x_j^*, 0) - c_j(x_j^*)].$

Assumption (B2) implies that product j contributes less in incremental profits when product -j is also sold than it does when it is the only product sold in the market.

A. Analysis of equilibria

To apply the results of section 2, we must first characterize the functions $\Pi^j(U)$ and $\hat{\Pi}^c(U)$. Recall that x_j^* maximizes the joint profits attainable in an exclusive relationship between the retailer and manufacturer j. Moreover, in an intrinsically exclusive setting, manufacturer j could extract all of the economic surplus associated with this choice by writing a "forcing contract." The contract would

[7] If the first inequality in (B1) holds with equality, all of our results continue to hold, but there are also exclusive equilibrium (possibly dominated) in which B is served; see proposition 2.1.

require the retailer to choose x_j^*, and would specify a level of compensation such that the retailer's participation constraint just binds. Since $\Pi_i^j = 0$, it follows that

$$\Pi^j(U) = \Pi_j^j(U) = R(x_j^*, 0) - c_j(x_j^*) - U \ . \tag{5}$$

Now consider an intrinsic common agency game with retailer utility U. Recall that x^{**} maximizes the joint profits attainable when the retailer represents both manufacturers. Thus, $\hat{\Pi}^c(U) \leq R(x^{**}) - c_A(x_A^{**}) - c_B(x_B^{**}) - U \equiv \bar{\Pi}^c$. In fact, there exist equilibria that achieve this upper bound on $\hat{\Pi}^c(U)$; that is, for this simple model, *there are no relevant contracting externalities for the manufacturers*. One such equilibrium involves forcing contracts: the payments to A and B are set at a level that provides the retailer with reservation utility U conditional upon choosing x^{**}, and each firm j demands an infinite payment for any $x_j^c \neq x_j^{**}$. Another involves "sell-out" contracts of the form $P_j^c(x_j) = F_j + c_j(x_j)$, which essentially transfer to the retailer the full marginal returns from the sale of each product j in return for fixed payments F_j. It follows that:

$$\hat{\Pi}^c(U) = R(x^{**}) - c_A(x_A^{**}) - c_B(x_B^{**}) - U \ . \tag{6}$$

In light of equations (5) and (6), it is evident that (A5) is satisfied; simply take $g(U) = U$, $\Pi^j = \Pi_j^j = R(x_j^*, 0) - c_j(x_j^*)$, and $\hat{\Pi}^c = R(x^{**}) - c_A(x_A^{**}) - c_B(x_B^{**})$. Moreover, (B1) and (B2) imply that (A6) is satisfied, and (A7) holds because a manufacturer whose contract is rejected always earns zero. Thus, Proposition 2.1 holds. It follows immediately that undominated equilibria always yield the outcome that maximizes the joint payoffs for the entire vertical structure (consisting of the retailer and both manufacturers): the parties behave as if they were a single integrated firm.

Can exclusion arise in this context? Expressions (3), (4), and (B1) imply $\hat{\Pi}^c \geq \Pi^A > \Pi^B$. If $x^{**} \neq x^A$, then $\hat{\Pi}^c > \Pi^A$ and the equilibrium outcome necessarily entails positive sales on behalf of both manufacturers (proposition 2.1, part (ii)). If $x^{**} = x^A$, then $\hat{\Pi}^c = \Pi^A$ and manufacturer B makes no sales in equilibrium. However, in that case, even a fully integrated firm would find it optimal to refrain from selling B's product. Moreover, this outcome can be sustained in a common equilibrium (Proposition 2.1 part (iii)); formal contractual exclusion of manufacturer B is superfluous.

We summarize the implications of proposition 2.1 in the following result:

Proposition 3.1: *In any undominated equilibrium, the retailer chooses* x^{**}, *manufacturer* j *earns its marginal contribution to joint profits,* $\left[R(x^{**}) - c_A(x_A^{**}) - c_B(x_B^{**})\right] - \left[R(0, x_{-j}^{*}) - c_{-j}(x_{-j}^{*})\right]$, *and the retailer earns* $\sum_{j=A,B}\left[R(x_j^{*}, 0) - c_j(x_j^{*})\right] - \left[R(x^{**}) - c_A(x_A^{**}) - c_B(x_B^{**})\right]$. *There is always a common equilibrium yielding this undominated outcome.*

Thus, undominated equilibria always maximize the joint payoffs of the retailer and both manufacturers. Moreover, even when an undominated equilibrium outcome entails no sales for manufacturer B, this outcome can always be achieved through non-exclusionary contracts.

B. Policy implications

For the simple model considered in this section, our analysis substantially corroborates Bork's [1978] argument (quoted in the introduction) that exclusive dealing cannot be used profitably to foreclose a rival from a market. Because each manufacturer must effectively compensate the retailer to attract him to an exclusive dealing contract, manufacturers internalize the retailer's cost from the loss in product variety arising under exclusivity. As a result, the market outcome is exactly that which would arise with a fully integrated vertical structure. Indeed, just as Bork asserts, in equilibrium each manufacturer extracts a profit exactly equal to the incremental value of its product.

In light of our results, it is surprising that, using a model similar to ours in many respects, Mathewson and Winter [1987] obtain strikingly different results. In their model, producers offer wholesale contracts to the retailer on a take-it-or-leave-it basis. These contracts specify a wholesale price and possibly an exclusive dealing requirement. In Mathewson and Winter's model, exclusive dealing arises as the unique equilibrium outcome for a range of parameter values (when it does arise, exclusive dealing may either raise or lower welfare relative to the non-exclusive outcome).

The key difference between our model and that of Mathewson-Winter concerns the set of feasible contracts.[8] In our notation, Mathewson and Winter only allow contracts of the form $P_j^e(x_j) = w_j^e x_j$ and $P_j^c(x_j) = w_j^c x_j$ for constants w_j^e and w_j^c. These restrictions create contracting externalities for the manufacturers, and largely account for the differences between our findings. Even the flexibility to charge fixed fees would, in a broad range of circumstances, restore our results. The importance of fixed fees is easily understood in the context of Bork's argument. If a manufacturer insists on exclusivity, it must compensate the retailer for the loss of surplus associated with selling other products. If a fixed fee is not available, then the manufacturer can only compensate the retailer by reducing its wholesale price. However, this form of compensation alters the retailer's incentives on the quantity margin; its value to the retailer is therefore less than its cost to the manufacturer.

Proposition 3.1 implies that the retailer and manufacturers act as an integrated unit. However, in contrast to Bork's assertion, it does not follow that the equilibrium maximizes social surplus unless the retailer is able to extract all of consumer surplus (say, through perfect price discrimination). From a social perspective, the fully integrated solution can involve the production of either too many or too few products and inefficient retail pricing.[9] Nevertheless, in this model, Bork is correct in asserting that a ban on exclusive dealing cannot promote social welfare. Formally, we model this prohibition as the restriction that $P_j^c(x_j) = P_j^e(x_j)$, so that manufacturer j is prevented from conditioning compensation on the retailer's decision to serve -j. The following result demonstrates that a

[8]There are also some differences in the timing of decisions. In Mathewson and Winter, both firms first decide whether to insist on exclusivity; if either does, then both compete in the offering of exclusive contracts (otherwise, the retailer sells the products of both manufacturers). However, if we were to change the timing of contract offers in our model while retaining flexibility in the form of the contracts, the basic conclusions of our analysis would be unaltered.

[9]For example, consider the case where demand for the products is almost completely independent. If a monopolist can only offer simple per unit prices to consumers, then it has too little incentive to carry each product individually. In contrast, if the monopolist can bundle multiple products, introducing a second product may increase profits by more than the consumer surplus it generates (this would certainly be true if by bundling it could fully extract consumer surplus). See Tirole [1988, pp. 104-5].

prohibition on exclusionary contracts leaves the equilibrium outcome unaffected.[10]

Proposition 3.2: Suppose that manufacturers are restricted to offer contracts satisfying $P_j^c(x_j) = P_j^e(x_j)$. *Then there is an equilibrium in which the retailer accepts both manufacturers' contracts, chooses* x^{**}, *and payoffs are exactly as in proposition 3.1. Furthermore, this equilibrium weakly dominates (for the manufacturers) any other equilibrium of this game.*[11]

Although propositions 3.1 and 3.2 appear to confirm much of Bork's reasoning, in one important sense they fail to do so: exclusionary provisions are superfluous in this model. Whether exclusionary provisions are permissible has no effect on undominated equilibrium outcomes, which are always achievable through non-exclusionary contracts, even when one manufacturer is effectively excluded (i.e. makes no sales). Hence, in this model, there is no reason either to ban or not to ban these arrangements. Thus, the present model may provide a poor framework for understanding the effects of the exclusionary contracts that are observed in practice. In the next two sections, we turn our attention to models in which exclusionary provisions serve a meaningful purpose.

4. Exclusive dealing with non-coincident market effects

One frequently cited motive for exclusive dealing is the desire to create or enhance market power. Yet in the model of section 3, no such effect could occur: The equilibrium market outcome always maximized the total profits of the vertical structure, and it achieved effective exclusivity (where jointly efficient) without any explicit exclusionary provisions.

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[10]Proposition 3.2 does not follow directly from proposition 3.1, despite the fact that undominated equilibria need never employ exclusive contracts. As a formal matter, the prohibition on exclusionary contracts changes the nature of manufacturers' strategies, and could in principle subtly alter their incentives.

[11]O'Brien and Shaffer [1991] analyze a model that is equivalent to this restricted game. They show that in any equilibrium of this restricted game, the quantities chosen by the retailer (x_A^*, x_B^*) must satisfy $x_j^* = \text{argmax}_{x_j}\left[R(x_j, x_{-j}^*) - c_j(x_j) - c_{-j}(x_{-j}^*)\right]$ for $j = A,B$. Thus, if integrated profits are strictly concave, all equilibria result in x^{**} being chosen.

Thus far, however, we have confined our attention to a single set of vertically related parties, considered in isolation. Commentators have also expressed concern that the exclusion of competitors from one market might enhance a firm's power in other markets. In this section, we show that the concern over what we shall call *non-coincident* market effects does indeed have a valid theoretical foundation: When such effects are introduced into the model of section 3, exclusive dealing may arise in an undominated equilibrium precisely because of its ability to enhance market power.

We explore the role of non-coincident market effects for an illustrative model in which two retail markets develop sequentially, and where important economies can be achieved only by serving more than one market.[12] As in section 3, effective exclusion occurs whenever it is jointly optimal for the manufacturers and the retailer in the first market. Unlike section 3, however, exclusion may be jointly optimal for these parties precisely because it reduces competition in the later-developing retail market. Moreover, when exclusion is optimal for these parties it may be impossible to achieve this outcome in the absence of explicit exclusionary provisions. In addition, we examine the effects of banning explicit exclusion. We demonstrate that this does not always end effective exclusion. Indeed, in the presence of a ban, effective exclusion may be achieved through even less efficient practices.

A. The model

We suppose that initially there is a single retail market (market 1), served by a single retailer (retailer 1). With time, however, another retail market (market 2), again served by a single retailer (retailer 2), becomes viable. Manufacturers and retailers can enter into long-term contracts. Thus, prior to the emergence of market 2, manufacturers can enter into contracts with retailer 1 that govern sales made after the emergence of market 2. Manufacturers cannot, however, contract with retailer 2 for sales in market 2 until this second market emerges. The important feature of this setting is that the

[12]Similar non-coincident market effects can arise in other contexts, for example when an exclusive contract between a manufacturer and a retailer reduces competition for the manufacturer's inputs.

manufacturers can contract with retailer 1 for future sales before retailer 2 comes on the scene. To isolate this effect, we suppress all sales in market 1 that occur prior to the emergence of market 2 (one can easily make earlier sales explicit at the expense of some additional notation).

Competition between the two manufacturers unfolds in three phases. In phase 1, they engage in a contracting game with retailer 1. As in section 3, the manufacturers offer contracts, and the retailer then chooses contracts and quantities. Production, however, does not occur until phase 3.[13] Retailer 1's has a continuous revenue function $R_1(x_{A1},x_{B1})$, where x_{jn} denotes manufacturer j's sales to retailer n. In phase 2, each manufacturer j has the opportunity to make invest of fixed sum (K_j) in cost reduction. If the investment is made, j produces output at a unit cost of c_j. If j forgoes this investment, unit costs are instead $c_j + \delta_j$, where $\delta_j \geq 0$. In phase 3, having observed each other's investment decisions, the two manufacturers engage in a contracting game with retailer 2 (as in section 3). Retailer 2's revenue function is $R_2(x_{A2},x_{B2})$. Finally, production is carried out and the retailers make the payments required by their contracts. As in section 3, a retailer earns zero if it accepts no contracts, and a manufacturer earns zero in any market where the retailer rejects its contract.

For the sake of simplicity, we focus on the case where $K_A = \delta_A = 0$, and $\delta_B = +\infty$. In other words, we assume that manufacturer A has no further opportunities to reduce cost, and that manufacturer B cannot produce at all unless the investment is undertaken. These assumptions imply that A may be able to eliminate competition from B in market 2 by excluding B from market 1. However, B does not have a symmetric incentive to exclude A from market 1.

It is convenient to define for each market $n = 1,2$ the profit levels

$$\hat{\Pi}_n^c \equiv \max_x \left\{ R_n(x) - c_A x_A - c_B x_B \right\},$$

and

[13]The retailer's choice of quantities can also be delayed without affecting the conclusions, but the game is somewhat easier to solve if this decision is made immediately.

$$\Pi^j_n = \Pi^j_{jn} \equiv \max_{x_j}\left\{R_n(x_j,0) - c_j x_j\right\}.$$

As in section 3, these would be the joint payoffs from common and exclusive outcomes, were only market n to exist. In parallel to our notation in section 3, we denote the (unique) solutions to these maximizations by $(x^{**}_{An}, x^{**}_{Bn})$, and x^*_{jn} $(j = A,B)$ respectively, and assume that these quantities are strictly positive. We also assume that (B2) holds in each market, so $\Pi^A_n + \Pi^B_n > \hat{\Pi}^c_n$ for $n = 1, 2$.

To focus attention on the cases of greatest interest, we define the following conditions:

(C1)
$$0 < \hat{\Pi}^c_2 - \Pi^A_2 < K_B$$

(C2)
$$\Pi^A_1 + \Pi^A_2 > \hat{\Pi}^c_1 + \sum_j\left(\hat{\Pi}^c_2 - \Pi^j_2\right) - K_B$$

(C3)
$$\hat{\Pi}^c_1 + \hat{\Pi}^c_2 - \Pi^A_1 - \Pi^A_2 - K_B > 0$$

These conditions are easily interpreted. Condition (C1) states that manufacturer B's contribution to total profit in market 2 is positive, but strictly less than B's required investment. Since B's profits in market 2 (gross of K_B and conditional upon having invested in phase 2) are given by the middle term in expression (C1) (see proposition 3.1), this condition implies that, if excluded from market 1, B will neither invest in phase 2 nor compete against A in market 2 during phase 3; thus, (C1) creates the potential for a non-coincident market effect. Condition (C2) states that the joint payoffs for retailer 1 and the two manufacturers are higher if B is excluded from market 1 (given B's subsequent decision not to participate in market 2), than if B makes sales to retailer 1. The intuition developed in section 3 suggests that this condition is required to generate effectively exclusive outcomes in market 1. Condition (C3) indicates that, if retailer 2's profits are also considered, aggregate profits are maximized when B participates. To the extent the retailers practice perfect price discrimination, this implies that B's participation is socially desirable, and that B's exclusion from market 1 is inefficient. (B2) implies that if (C2) is violated then (C3) holds, but the converse is not true.

We assume throughout that (C1) and (C3) are satisfied, and we investigate the properties of equilibria contingent upon whether (C2) holds.

B. Equilibrium exclusion

To solve for equilibria, we begin with phase 3. If B has chosen to invest in phase 2, then phase 3 payoffs for manufacturer j are given by $\hat{\Pi}_2^c - \Pi_2^i$, $i \neq j$ (see part (ii) of proposition 2.1). If B has chosen not to invest, then manufacturer A faces no competition in market 2. In that case, A extracts all of the potential rents from retailer 2, earning Π_2^A.

Next consider the phase 2 investment decision of manufacturer B. If retailer 1 has chosen a positive quantity for B ($x_{B1} > 0$), manufacturer B certainly invests (otherwise B would incur infinite losses since its contract would require it to produce x_{B1} at infinite costs). If retailer 1 has an exclusive relationship with A or has simply chosen $x_{B1} = 0$, then B chooses not to invest (given (C1) and part (ii) of proposition 2.1).

Finally, consider the phase 1 contract offers by manufacturers A and B to retailer 1. Note that the phase 1 problem can be treated as the type of game considered in section 2, provided that we define payoffs appropriately to reflect outcomes on the equilibrium continuation paths. In particular, we can solve the phase 1 contracting problem with retailer 1 by studying an equivalent single market model, in which the costs of manufacturers A and B are given by

$$c_A(x_{A1}, x_{B1}) = c_A x_{A1} - \Pi_2^A - I(x_{B1} > 0)(\hat{\Pi}_2^c - \Pi_2^B - \Pi_2^A)$$

and

$$c_B(x_{B1}) = c_B x_{B1} - I(x_{B1} > 0)(\hat{\Pi}_2^c - \Pi_2^A - K_B) ,$$

where the indicator function $I(x_{B1} > 0)$ equals unity when $x_{B1} > 0$, and zero otherwise.

Note that this equivalent single market model differs from the class considered in section 3 in one important respect: A's implicit "costs" depend upon B's production, as well as A's production.

However, this model satisfies the assumptions needed to apply Proposition 2.1 ((A1)-(A7)), with

$U^0 = 0$, $\pi_A^0 = \Pi_2^A$, $\pi_B^0 = 0$,

$$\Pi_A^A \equiv \Pi_1^A + \Pi_2^A, \qquad \Pi_B^A \equiv 0, \qquad \Pi^A \equiv \Pi_1^A + \Pi_2^A,$$
$$\Pi_B^B \equiv \Pi_1^B + (\hat{\Pi}_2^c - \Pi_2^A) - K_B, \quad \Pi_A^B \equiv (\hat{\Pi}_2^c - \Pi_2^B), \quad \Pi^B \equiv \Pi_1^B + \sum_j (\hat{\Pi}_2^c - \Pi_2^j) - K_B$$

and

$$\hat{\Pi}^c \leq \max\left\{\hat{\Pi}_1^c + \sum_j (\hat{\Pi}_2^c - \Pi_2^j) - K_B, \Pi^A\right\} \equiv \bar{\Pi}^c. \text{ [14]}$$

The last inequality above reflects the fact that the cooperative common outcome in this setting depends on whether (C2) is satisfied. When (C2) holds, it involves quantities of $(x_{A1}^*, 0)$ in market 1 and a joint payoff to the manufacturers of $\Pi^A = \Pi_1^A + \Pi_2^A$, while when (C2) is reversed (strictly), the cooperative common outcome involves quantities of $(x_{A1}^{**}, x_{B1}^{**})$ in market 1 and a joint payoff to the manufacturers of $\hat{\Pi}_1^c + \sum_j (\hat{\Pi}_2^c - \Pi_2^j) - K_B$. The maximal level of joint profits in a noncooperative equilibrium of this intrinsic common agency game, $\hat{\Pi}^c$, is bounded above by $\bar{\Pi}^c$.

Note that when (C2) holds we have $\Pi^A = \bar{\Pi}^c \geq \hat{\Pi}^c$, and the cooperative common outcome in market 1 involves quantities of $(x_{A1}^*, 0)$. Hence, by Proposition 2.1, any undominated equilibrium of the contracting game must involve quantities in market 1 of $(x_{A1}^*, 0)$ (i.e. an undominated equilibrium must either be exclusive, or be a common equilibrium that implements $(x_{A1}^*, 0)$). Exclusion of manufacturer B from market 1 is jointly efficient for retailer 1 and the two manufacturers because the joint loss in market 1 from reduced variety, $(\hat{\Pi}_1^c - \Pi_1^A)$, is more than made up by the joint gain arising from reduced competition in market 2, $\left[\Pi_2^A - \sum_j (\hat{\Pi}_2^c - \Pi_2^j) - K_B\right]$. These gains reflect the more effective expropriation of rents from retailer 2, who loses $(\Pi_2^A + \Pi_2^B - \hat{\Pi}_2^c)$. Thus, exclusion

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[14] These values reflect our simplifying assumption that retailer 1 has only one opportunity to contract with the manufacturers. If, instead, rejection of both the manufacturers' offers in phase 1 results in another contracting opportunity for retailer 1 in phase 3, then the values of π_A^0, π_B^0, and U^0 would be altered, but our conclusions would be unaltered.

can be attractive in this model precisely because of anticompetitive effects in a non-coincident market.

In contrast, if (C2) is reversed (strictly), then $\bar{\Pi}^c > \Pi^A$ and the cooperative common outcome involves quantities of $(x_{A1}^{**}, x_{B1}^{**}) \neq (x_{A1}^{*},0)$. Moreover, it can be verified that $(x_{A1}^{**}, x_{B1}^{**})$ is sustainable in this case as an intrinsic common agency game equilibrium outcome through forcing contracts, and so $\hat{\Pi}^c = \bar{\Pi}^c$. Proposition 2.1 therefore implies that any undominated equilibrium of the contracting model in this case is a common equilibrium with quantities in market 1 of $(x_{A1}^{**}, x_{B1}^{**})$.

We summarize these conclusions in the following proposition:

Proposition 4.1: *When (C2) holds, all undominated equilibria involve effective exclusion of manufacturer B from market 1 (i.e.* $x_{B1} = 0$). *When the inequality in (C2) is (strictly) reversed, no undominated equilibrium involves effective exclusion of manufacturer B from market 1.*

Of course, as we have emphasized in section 3, there is an important distinction between effective exclusion and explicit exclusion. Indeed, for the single market setting of section 3, we found that explicit exclusionary provisions were superfluous: whenever exclusion was jointly optimal for the retailer and the two manufacturers, this could be achieved through a common equilibrium. However, the logic of that finding depended critically on the assumption that A's costs are independent of B's sales. This assumption permitted the firms to support $(x_A^*,0)$ using "sell out" contracts that transferred all residual variation in profits, without violating the restriction that a common contract cannot condition compensation on the sales of a rival. In the current context, A's implicit "costs" $(c_A(x_{A1},x_{B1}))$ do depend upon B's sales; thus, absent an ability to condition compensation on B's sales, A cannot transfer all residual profit variation to retailer 1. This implies that contracts between retailer 1 and B may impose externalities on A.

In particular, when (C2) holds, a deviation from the jointly efficient outcome, $(x_{A1}^*,0)$, may benefit retailer 1 and manufacturer B precisely because positive sales for B impose a negative externality on A. When will this externality be of sufficient size to justify the deviation? To answer this question, we define the following set:

$$D \equiv \left\{ x_{A1} \mid \max_{x_{B1}} \left[R_1(x_{A1}, x_{B1}) - c_B x_{B1} + I(x_{B1} > 0)(\hat{\Pi}_2^c - \Pi_2^A - K_B) \right] \leq R_1(x_{A1}, 0) \right\} .$$

In other words, $\mathbf{x}_{A1} \in \mathbf{D}$ if and only if retailer 1 and manufacturer B cannot jointly benefit by arranging a deviation from $(x_{A1},0)$ to (x_{A1},x_{B1}) for any $x_{B1} > 0$. Henceforth, we will refer to D as the *deterrence set*. One would expect to observe explicit exclusionary practices whenever $\mathbf{x}_{A1}^* \notin \mathbf{D}$, since in this case $\hat{\Pi}^c < \bar{\Pi}^c = \Pi^A$. This intuition is confirmed in the following result:

Proposition 4.2: *When (C2) holds, undominated equilibria necessarily involve an explicit exclusive dealing provision if and only if* $\mathbf{x}_{A1}^* \notin \mathbf{D}$.

Note the implications of this result: when (C2) holds and $\mathbf{x}_{A1}^* \notin \mathbf{D}$, retailer 1 agrees to an explicitly exclusive arrangement with manufacturer A in order to enhance A's market power in a non-coincident market. The retailer is willing to enter into this arrangement because the exclusive contract provides the retailer with a sufficiently large share of the incremental surplus extracted in the non-coincident market. Given (C3), this outcome is inefficient, in the sense that it fails to maximize total retailer and producer surplus. Even under the assumption that retailers can perfectly price discriminate (which, as explained in the last section, is implicit in Bork's analysis), exclusive dealing depresses social welfare.[15] Our analysis therefore provides a theoretical foundation for the concern

[15]Ironically, in the absence of perfect price discrimination by retailers, it is at least conceivable that exclusive dealing could raise social welfare through indirect effects on consumer surplus.

that market foreclosure through exclusive dealing can be anticompetitive.[16]

C. The effects of banning exclusive dealing

The preceding section raises the possibility that, under certain circumstances, exclusive dealing can be characterized as an anticompetitive practice with adverse consequences for social welfare. This observation suggests a potential role for antitrust policy. One possibility would be to impose a ban on exclusive dealing, which we model as in section 3. However, as we now show, when an inefficient market outcome arises that involves exclusive dealing, the welfare effects of such a ban are ambiguous; it may make things even worse.

To develop intuition, we begin by assuming that (C2) holds. Thus, in the absence of a ban on exclusionary practices, the equilibrium necessarily involves effective exclusion. If, in addition, $\mathbf{x}_{A1}^{*} \in \mathbf{D}$, then it is possible to achieve effective exclusion without an explicit contractual restriction. For this case, it is natural to conjecture that a ban an explicit exclusionary practices would be irrelevant. Of greater interest is the case where $\mathbf{x}_{A1}^{*} \notin \mathbf{D}$. Without a ban, equilibrium involves explicit exclusion. However, it does not necessarily follow that the imposition of a ban would end effective exclusion of manufacturer B. Although it is impossible in this case to sustain an effectively exclusive equilibrium wherein A produces $\mathbf{x}_{A1}^{*}$ it may nevertheless be possible to achieve an exclusionary outcome through the use of a contract that induces retailer 1 to choose some $\mathbf{x}_{A1} \in \mathbf{D}$. Based on the intuition developed in the preceding sections, one might expect to obtain such an outcome as long as the joint profits for retailer 1, manufacturer A, and manufacturer B exceed the joint profits received by these parties when B makes strictly positive sales in market 1.

[16]The inefficiency of the equilibrium outcome raises the possibility that renegotiation would alter our central results. Imagine, for example, that all retailers and manufacturers can jointly renegotiate phase 1 contracts at the beginning of phase 3, and that after retailer 1 and manufacturer A have entered into an exclusive relation in phase 1, B has nevertheless invested in phase 2. Retailer 1 and manufacturer A should be willing to renegotiate their contract to permit sales by B. However, B will typically share the surplus gained through renegotiation with these parties. If B's share is sufficiently small, even the anticipation of renegotiation will fail to justify investment by manufacturer B once A has consummated an exclusive contract with retailer 1. Thus, as long as B's bargaining power is not too great, exclusive dealing emerges exactly as in proposition 4.2.

Following this intuition, we define:

$$\tilde{x}_{A1} \equiv \operatorname{argmax}_{x_{A1} \in D}\left[R_1(x_{A1},0) - c_A x_{A1}\right]$$

Retailer 1 and manufacturer A receive higher joint profits in market 1 from $\tilde{x}_{A1}$ than from any other output level in the deterrence set D. Effective exclusion of B through selection of $\tilde{x}_{A1}$ maximizes the total profits of retailer 1 and *both* manufacturers whenever

$$\text{(C4)} \qquad \left[R_1(\tilde{x}_{A1},0) - c_A\tilde{x}_{A1}\right] + \Pi_2^A > \hat{\Pi}_1^c + \sum_j (\hat{\Pi}_2^c - \Pi_2^j) - K_B.$$

Note that when $x_{A1}^* \in D$, we have $\tilde{x}_{A1} = x_{A1}^*$, which implies that (C4) and (C2) are equivalent. When $x_{A1}^* \notin D$, condition (C4) is more demanding than (C2).

With one additional technical assumption,[17] it is possible to prove the following result:

Proposition 4.3: *When (C4) holds and exclusive dealing is banned, there is an effectively exclusive equilibrium with sales in market 1 of* $(\tilde{x}_{A1},0)$. *Furthermore, this is the only equilibrium satisfying* $P_{B1}(x_{B1}) \geq c_B x_{B1} - I(x_{B1} > 0)(\hat{\Pi}_2^c - \Pi_2^A - K_B)$ *for all* x_{B1}.

The second half of proposition 4.3 requires clarification. For previous results, we have refined the set of equilibria by applying a payoff-dominance criterion. Unfortunately, this criterion does not isolate a unique outcome in the current instance.[18] However, according to the proposition, any such equilibrium necessarily has the feature that, for some out-of-equilibrium level(s) of x_{B1}, manufacturer B's offer, $P_{B1}(x_{B1})$, fails to cover the true incremental costs that B incurs in producing x_{B1}. In such cases, B's equilibrium contract offer is weakly dominated by another contract that covers

[17]Specifically, define D^+ analogously to D, replacing $\leq$ with $<$. Assume that $D = \text{clos}(D^+)$.

[18]While effectively exclusive equilibria are Pareto ranked (with first period sales of $(\tilde{x}_{A1},0)$ generating the dominant result), we believe it is possible in some instances to construct common equilibria that give manufacturer B positive payoffs in market 1, in which case the payoff-dominance criterion cannot rule out some non-exclusive equilibria.

incremental costs in all instances. The exclusive equilibrium does not suffer from this problem.

Note the implications of proposition 4.3. Suppose that condition (C2) is satisfied, and that $x_{A1}^{*} \in D$. Proposition 4.2 tells us that, when exclusive dealing is permitted, $(x_{A1}^{*},0)$ is in fact sustainable without explicit exclusion. By proposition 4.3, the same outcome is sustainable once exclusive dealing is banned (recall that $x_{A1}^{*} \in D$ implies $\tilde{x}_{A1} = x_{A1}^{*}$, which in turn -- given (C2) -- implies (C4)). Thus, as one would expect, a ban on exclusive dealing does not deter non-explicit exclusion. Next, suppose that (C2) is satisfied, but that $x_{A1}^{*} \notin D$. Proposition 4.2 tells us that, when exclusive dealing is permitted $(x_{A1}^{*},0)$ will be sustained through explicitly exclusionary provisions. In such cases, (C4) may or may not hold. Proposition 4.3 tells us that, when (C4) does not hold, the ban on exclusive dealing fails to end B's exclusion. Rather, it induces A to engage in non-explicit exclusion by inducing retailer 1 to purchase enough output from A to render B's participation unprofitable. That is, explicit exclusion is replaced by implicit exclusion through quantity forcing or quantity discounts. The welfare consequences of this response are ambiguous. If retailer 1 practices perfect price discrimination (as assumed implicitly by Bork), social welfare declines. If retailer 1 is instead a conventional non-discriminating monopolist, the increase in A's output may enhance welfare (unless deterrence of B requires A's output to be sufficiently excessive from a social perspective).

Proposition 4.3 does not imply that a ban on explicit exclusion is always ineffective. Indeed, the following result identifies conditions under which the intended effect materializes.

Proposition 4.4: *When the inequality in (C4) is (strictly) reversed and exclusive dealing is banned, there is an equilibrium in which both manufacturers' contracts are accepted, and sales in market 1 are* $(x_{A1}^{**},x_{B1}^{**}) > 0$. *Furthermore, all undominated equilibria have* $x_{B1} > 0$.

Note that, in this case, the payoff-dominance criterion isolates equilibria in which manufacturer B is not excluded from market 1. We have not established that this criterion uniquely selects $(x^{**}_{A1}, x^{**}_{B1})$. However, if one assumes that joint payoffs in market 1 are strictly concave in (x_{A1}, x_{B1}) when $x_{B1} > 0$, it is easy to verify that this is the unique undominated equilibrium outcome.

To understand the implications of proposition 4.4, begin by assuming that (C2) holds, but that (C4) does not (this requires $x^{*}_{A1} \notin D$). According to proposition 4.2, explicit exclusion will emerge when exclusive dealing is permitted. Proposition 4.4 implies that the imposition of a ban ends effective exclusion, as intended. Since (C4) implies (C2), proposition 4.4 also indicates that, in the presence of a ban on exclusive dealing, non-exclusionary outcomes will emerge when (C2) fails. This is not very surprising, since the failure of (C2) leads to non-exclusive outcomes in the absence of a ban (see proposition 4.1). However, this does not mean that the ban is irrelevant in such cases. Indeed, in the course of proving proposition 4.4, we isolate a condition under which the imposition of a ban on exclusive dealing shifts payoffs from retailer 1 to manufacturer B (see the appendix for details). In essence, the impossibility of explicit exclusion may improve B's ability to extract rents from retailer 1, even in cases where the original equilibrium does not involve exclusion.

Our findings can be summarized as follows. If outcomes are non-exclusive when exclusive dealing is permitted, they remain non-exclusive once a ban is imposed. However, payoffs may shift from retailer 1 to manufacturer B. If non-explicit exclusion arises when exclusive dealing is permitted, it will also emerge when a ban is imposed. Finally, if explicit exclusion occurs when exclusive dealing is permitted, a ban can lead to either of two results. In some cases, it ends exclusivity, as intended. But in other cases, explicit exclusion is replaced by implicit exclusion, achieved through a contract that induces the retailer to sell so much of A's output that B's participation is rendered unprofitable. In these cases, a ban on exclusive dealing may raise or lower social welfare.

5. Exclusive Dealing as a Consequence of Incentive Conflicts

In Section 4 we saw how introducing non-coincident market effects into the model of Section 3 could produce exclusive dealing in equilibrium. A commonly expressed alternative view of exclusive dealing, however, is that it arises in response to a manufacturer's fear that common representation would subject the retailer to conflicting incentives. In this section, we show how exclusive dealing can indeed arise when problems of incentive provision are introduced into the model of Section 3.

A. The model

We focus here on one possible form of incentive conflict at the retail level by considering a situation in which the retailer chooses non-verifiable prices for each of the products he carries.[19] We denote the retail price of product j by p_j for $j = A,B$. When both products are carried by the retailer, price choices of (p_A, p_B) lead to a stochastic realization of demand for each product j, given by $x_j = \theta q_j(p_A, p_B)$, where $\theta \in \mathbf{R}_+$ is a non-negative random variable with distribution function $\Phi(\bullet)$. We adopt the normalization that $E(\theta) = 1$, so that $q_j(p_A, p_B)$ represents manufacturer j's expected sales level given retail prices (p_A, p_B). When only firm j is carried by the retailer and its retail price is p_j, its sales are $x_j = \theta q_j(p_j, \infty)$. Manufacturer j's production costs are c_j per unit, and for simplicity we assume that the retailer's only costs are the costs of acquiring products from the manufacturers. We also assume that $q_j(c_j, \infty) > 0$ for $j = A,B$.

As before, each manufacturer j is restricted to offer contracts that condition compensation on sales of manufacturer j's product, but not on sales for manufacturer $-j$ or on the retailer's chosen prices. Moreover, we restrict these payments to be linear in own sales (actual incentive contracts often have this relatively simple structure; for one formal justification, see Rey-Tirole [1986]). Thus,

$$\mathcal{P}_j^c = \mathcal{P}_j^e = \{P_j(\bullet): \text{ There exist } F_j \text{ and } \beta_j \text{ such that } P_j(x_j) = F_j + \beta_j x_j \text{ for all } x_j \geq 0\}.$$

We assume also that the retailer maximizes expected utility and has a Bernoulli utility function

[19]For example, the true price charged by a new car dealer is often unverifiable because of trade-ins. The retailer's price choice in this model could also be interpreted as the choice of a non-observable level of service that has a monetary value to customers equal to its cost of provision. In any case, the basic points developed below hold for much more general kinds of non-observable marketing choices.

of the constant absolute risk-aversion form, $u(w) = 1 - e^{-aw}$, where $a > 0$. The constant absolute risk aversion assumption makes the model conform to assumption (A5).[20] The assumption of positive risk-aversion ($a > 0$) causes the provision of incentives to be costly in the model (i.e., the first-best is not attainable) and thereby introduces the possibility of externalities in incentive provision across manufacturers. Finally, as in section 3, a manufacturer earns zero if his contract is not accepted, and the retailer earns zero if he rejects both manufacturers' offers. With this assumption, the model satisfies (A6) and (A7) ($q_j(c_j,\infty) > 0$ implies $\Pi_j^j > 0$).

Before proceeding, we should stress that although we focus on a model of moral hazard with risk-aversion here, similar points could be established in other types of models involving costly incentive provision. For example, Marvel's [1982] (informal) explanation for exclusive dealing in terms of protecting manufacturer quasi-rents can be viewed formally as an example of double moral hazard (manufacturers advertise, while the risk-neutral retailer can switch consumers among brands). Like our model of moral hazard with risk-aversion, the double moral hazard model involves costly incentive provision and can be shown to generate similar results.[21, 22]

In our model, if the retailer accepts both manufacturers' contracts and faces contract terms (F_A^c, β_A^c) and (F_B^c, β_B^c), it chooses retail prices to solve

$$\max_{p_A, p_B} \int_0^\infty u\left(\sum_{j=A,B} (p_j - \beta_j^c)\,\theta q_j(p_A, p_B) - \sum_{j=A,B} F_j^c\right) d\Phi(\theta).$$

Hence, its optimal price choices maximize $\sum_{j=A,B} (p_j - \beta_j^c) q_j(p_A, p_B)$. Letting $[P_A(q_A, q_B), P_B(q_A, q_B)]$ denote the inverse of the function $[q_A(p_A, p_B), q_B(p_A, p_B)]$, we can equivalently think of the retailer as

[20] Specifically, we have $g(U) = -(1/a)\ln(1 - U)$.

[21] Similar effects also arise in settings in which the retailer possesses hidden information and faces either an interim individual rationality constraint or is risk-averse. See Martimort [forthcoming] and Stole [1990].

[22] Given this fact and the results below, it is surprising that Marvel [1982, pp. 3-4] argues against the view that exclusive dealing is a device to obtain increased dealer promotional effort.

choosing the mean sales levels of the two goods, q_A and q_B (recall that $E(\theta) = 1$) to maximize the function $R(q_A, q_B; \beta_A^c, \beta_B^c) = \sum_{j=A,B} [P_j(q_A, q_B) - \beta_j^c]\, q_j$ on the set $Q = \{(\bar{q}_A, \bar{q}_B) \mid$ There exist (p_A, p_B) such that $q_j(p_A, p_B) = \bar{q}_j$ for $j = A,B\}$. For technical simplicity, we assume that $Q = \mathbf{R}_+^2$ (e.g., there exist retail prices (p_A, p_B) that generate zero sales for either product, or both, with certainty). We make the following standard assumption:

(D1) $R(\bullet)$ *is twice continuously differentiable and strictly concave in* (q_A, q_B), *and* $\partial R(\bullet)/\partial q_A\, \partial q_B < 0$ *at all* $(q_A, q_B) \geq 0$.

Under (D1), the mean sales levels induced by contract terms $[(F_A^c, \beta_A^c), (F_B^c, \beta_B^c)]$ are given by some continuously differentiable functions $q_j^c(\beta_j^c, \beta_{-j}^c)$, $j = A,B$, which are nonincreasing in β_j^c and nondecreasing in β_{-j}^c, and strictly so at any (β_A^c, β_B^c) such that $[q_A^c(\beta_A^c, \beta_B^c), q_B^c(\beta_A^c, \beta_B^c)] >> 0$.

If, instead, the retailer accepts only manufacturer j's contract (F_j^e, β_j^e), similar logic implies that it chooses q_j to maximize $R(q_j, 0; \beta_j^e, 0)$. Given (D1), the solution is a non-increasing, continuously differentiable function $q_j^e(\beta_j^e)$ that is strictly decreasing at any β_j^e at which $q_j^e(\beta_j^e) > 0$.

B. Equilibrium behavior

Since the model described above satisfies (A1) - (A7), Proposition 2.1 once again applies. Recall from our discussion in Section 2 that $\hat{\Pi}^c < \bar{\Pi}^c$ is a necessary condition for exclusive dealing to arise in all undominated equilibria: equilibria in the intrinsic common agency game must involve some inefficiency. The next result shows that, under assumption (D1), this condition *always* holds when the cooperative outcome involves positive expected sales levels of both products.

Proposition 5.1: *Suppose that* (D1) *holds and that* $[(F_A^*, \beta_A^*), (F_B^*, \beta_B^*)]$ *maximizes the manufacturers' joint profits in the intrinsic common agency setting with retailer reservation utility*

$U = 0$. *Then, if* $[q^c_A(\beta^*_A, \beta^*_B), q^c_B(\beta^*_A, \beta^*_B)] >> 0$, $[(F^*_A, \beta^*_A), (F^*_B, \beta^*_B)]$ *is not a Nash equilibrium of the intrinsic common agency game. Hence, if all cooperative contracts involve positive expected sales for both manufacturers, then* $\hat{\Pi}^c < \bar{\Pi}^c$.

Proposition 5.1 follows because the presence of retailer risk-aversion makes incentive provision costly and leads the cooperative contracts to involve some risk-sharing between the retailer and each manufacturer j; that is, to have $(\beta_j^* - c_j) > 0$. But, as a result of the fact that $(\beta_j^* - c_j) > 0$, contracting externalities are present across the manufacturers; if manufacturer -j lowers β_{-j}, this causes the retailer to reduce q_j and lowers manufacturer j's expected profits.[23]

The fact that $\hat{\Pi}^c < \bar{\Pi}^c$ creates the possibility for exclusive dealing to arise in equilibrium. Indeed, recall from Proposition 2.1 that whenever $\hat{\Pi}^c < \max\{\Pi^A, \Pi^B\}$ no common equilibria exist--all equilibria are exclusive. Thus, if $\max\{\Pi^A, \Pi^B\}$ is close to $\bar{\Pi}^c$ we can expect exclusive dealing to arise; intuitively, the gain from having both products available were the manufacturers to cooperate in incentive provision is small relative to the loss due to incentive conflicts.

To see this more concretely, consider the limiting case in which products A and B are perfect substitutes with identical costs $c_A = c_B = c$. It is evident that in this case $\Pi^A = \Pi^B = \bar{\Pi}^c$. Hence, as long as $\hat{\Pi}^c < \bar{\Pi}^c$, exclusive dealing must arise in this case. We cannot use Proposition 5.1 directly here because (D1) is violated in the limiting case of perfect substitutes. However, the following result identifies general conditions under which exclusion prevails.

Proposition 5.2: *Consider the case of perfect substitutes with identical costs of production. Assume that* $R(q_j, 0; \beta_j, 0)$ *is twice continuously differentiable and strictly concave in* q_j *at all* $q_j \geq 0$. *Then in any exclusive equilibrium (as well as in the jointly optimal common contract)* $\beta^e >$

[23]When the retailer is risk-neutral, the derivations in the proof of proposition 5.1 (see the appendix), can be used to show that $(\beta_j^* - c_j) = 0$ for $j = A,B$. Hence, the cooperative contracts are sell-out contracts, which create no externalities across manufacturers. In this case, we would have $\hat{\Pi}^c = \bar{\Pi}^c$.

c, *while in any equilibrium of the associated intrinsic common agency game* $\min\{\beta_A^c, \beta_B^c\} \leq c$. *Thus,* $\hat{\Pi}^c < \bar{\Pi}^c = \Pi^A$, *and all equilibria are exclusive.*

Proposition 5.2 indicates that an optimal exclusive contract and the jointly optimal common contract have $\beta^e > c$. This result is the standard consequence of the tradeoff between risk bearing and incentives. In contrast, in an equilibrium of the intrinsic common agency game, competition between manufacturers drives wholesale prices (β) to (or below) marginal cost.

An interesting contrast to this case arises in the opposite limiting case in which products A and B are independent in demand. In that case, we can write $P_j(q_A, q_B) = \tilde{P}_j(q_j)$ for $j = A,B$ where $\tilde{P}_j(0) > c_j$ (since $q_j(c_j, \infty) > 0$). As a result, the retailer's optimal choice $q_j^c(\beta_j, \beta_{-j})$ depends only on β_j. Letting $q_j(\beta_j)$ denote this optimal choice, contracts $[(F_A^*, \beta_A^*), (F_B^*, \beta_B^*)]$ maximize the manufacturers' joint profits in the intrinsic common agency setting with retailer reservation utility level $U = 0$ if they solve

$$\max_{F_A, F_B, \beta_A, \beta_B} (\beta_A - c_A) q_A(\beta_A) + (\beta_B - c_B) q_B(\beta_B)$$
$$\text{s.t. } \int_0^\infty u(\theta \sum_{j=A,B} [(\tilde{P}_j(q_j(\beta_j)) - \beta_j) q_j(\beta_j)] - F_A - F_B) d\Phi(\theta) = 0.$$

However, since there are no contracting externalities, any such pair of contracts must also be a Nash equilibrium of the intrinsic common agency game. Hence, $\hat{\Pi}^c = \bar{\Pi}^c$. Moreover, under our assumptions $(q_A, q_B) >> 0$ in any cooperative common outcome (the argument follows from the fact that $\tilde{P}_j(0) > c_j$). Hence, $\Pi^j < \bar{\Pi}^c$ for $j = A,B$. Thus, we have the following result:

Proposition 5.3: *Suppose that products* A *and* B *are independent in demand. Then any undominated equilibrium is a common equilibrium.*

C. The effects of banning exclusive dealing

We now consider the effect of banning exclusive dealing. For the case of perfect substitutes with identical costs of production, the next proposition demonstrates that a ban always leads to an inefficient outcome (recall from proposition 5.2 that, for efficient incentive schemes, $\beta > c$).

Proposition 5.4: Consider the case of perfect substitutes with identical costs of production, and let β^* *denote the lowest* β_j *among accepted contracts. If exclusive dealing is banned, then* $\beta^* = c$ *and* $F_j = 0$ *in any contract accepted by the retailer.*

In this case, the welfare consequences of a ban are simple. Consumers benefit from the ban because lower wholesale price (β) leads to lower retail prices. Manufacturers' profits are unaffected, since they always earn zero. The negative consequences of inefficient incentive provision are borne entirely by the retailer, whose payoff falls as a result of the ban.

The second case considered in the previous subsection might at first seem entirely straightforward. Since exclusion does not occur with independent demand, one might well expect a ban to be inconsequential. Caution is warranted, however; recall that in section 4.C, a ban on exclusive dealing could alter equilibrium payoffs even if the retailer initially chose to represent both manufacturers. In the current instance, the effect of a ban is even more surprising:

Proposition 5.5: Suppose that products A *and* B *are independent in demand. If exclusive dealing is banned, no pure strategy equilibrium exists.*

Although we have not verified the existence of mixed strategy equilibria, we suspect that this is generally assured. However, as long as the manufacturers' joint maximization problem is strictly concave, mixed strategy equilibria are not second-best efficient. In that case, a ban on exclusive dealing cannot yield a Pareto improvement, and may even reduce the payoff to all participants in the market. Thus, by altering the structure of strategic incentives, a ban on exclusive dealing can reduce the efficiency of economic activity even in cases where no exclusion occurs.

6. Conclusions

In this paper, we have attempted both to provide a conceptual framework for analyzing the phenomenon of exclusive dealing and to explore the motivations for and effects of its use. In our simplest model, our analysis corroborates some of the intuitive arguments concerning exclusive dealing advanced by Robert Bork. In that simple setting, exclusive dealing arises only when it is efficient (abstracting from issues concerning imperfect extraction of consumer surplus). However, in that model, explicit exclusionary provisions are also superfluous - banning them is inconsequential.

By introducing additional features, however, we generate models in which these provisions serve meaningful functions. As has been asserted by commentators opposed to the practice, these provisions may be adopted as a means for increasing market power (through non-coincident market effects). However, they may also be adopted to ameliorate the incentive conflicts that can arise when a retailer handles the products of more than one manufacturer, as defenders of exclusive dealing have argued. These formal models also offer the advantage that they allow us to study explicitly the implications of a ban on the practice. In either case, the welfare consequences of a ban are complex. Indeed, even when exclusive dealing is used to augment market power, a ban on explicit exclusion may simply lead to even less efficient forms of non-explicit exclusion.

The models considered here do not exhaust the set of possible motivations for exclusive dealing; indeed, many others have been suggested. However, our framework should be useful for studying the conditions under which other motivations are operable, as well as their consequences for behavior. We have already suggested, for example, that Marvel's [1982] explanation for exclusive dealing (concerning the prevention of manufacturer free-riding) could be captured in our framework.

In any particular practical setting, it can be difficult to determine what motivates the use of exclusive dealing. For example, in his discussion of the Standard Fashion case, Marvel [1982] argues that Standard's use of the practice was motivated by a desire to prevent competitors from copying patterns that had proven to be popular, and thereby free-riding on Standard's investments in pattern development. (As Frasco [1991] notes, this argument depends on the absence of a competitive retail sector, since exclusive dealing would not prevent copying to any appreciable extent otherwise). Yet the facts described by Marvel are also suggestive of the two motivations that we have modelled here. For example, Marvel notes that Standard fared poorly after the decision. He attributes this to a competitor's new innovation and new entry, without acknowledging that both of these developments may have been stimulated by the court's ban on exclusive dealing (as modelled in section 4). At the same time, Marvel also notes that the wholesale prices charged by Standard for patterns were significantly above the manufacturers' marginal costs prior to the decision, which is consistent with our model of retailer risk-aversion. Moreover, he cites evidence indicating that, following the ban on exclusive dealing, manufacturers increased the fixed fee component of their charges (by charging for display equipment and catalogs), as our model would predict. It appears that there is insufficient evidence to resolve precisely what motivated Standard's use of these provisions.

Our models have two notable limitations. First, we have assumed throughout that all manufacturers are active bidders for contracts with retailers. This seems to reflect reality in many, although not all, settings. Some recent papers studying the use of exclusivity provisions (or their cousin, stipulated damage provisions) when one manufacturer has a first mover contracting advantage are Aghion and Bolton [1987] and Rasmusen, Ramseyer, and Wiley [1991]. Second, and perhaps more importantly, we have restricted our focus here to markets served by a single retailer. This is an unrealistic assumption for many markets. Exclusive dealing rarely precludes rival manufacturers completely from reaching consumers in a market. An important area for future research is the extension of our analysis to such circumstances. Recent papers that make a start in this direction include Besanko and Perry [1993, 1994] (who follow Mathewson and Winter [1987] in restricting attention to the simple wholesale price contracts) and Martimort [forthcoming].

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Appendix

For the sake of brevity, many of the following proofs have been abbreviated through the omission of some details. A more detailed version is available from the authors on request.

Lemma A.1: *Suppose (A.1) - (A.4) hold. Then, for any* $(P_A^c, P_B^c\ \sigma^c)$, *there exists* (P_A^e, P_B^e) *such that* $[(P_A^e, P_A^c), (P_B^e, P_B^c), \sigma^c]$ *is a common equilibrium of the contracting game only if:*

(a) $u^c(P_A^c, P_B^c, \sigma^c) \geq U^0$

(b) (P_A^c, P_B^c, σ^c) *is an equilibrium of the associated intrinsic common agency game in which the retailer has reservation utility* $u^c(P_A^c, P_B^c, \sigma^c)$,

(c) $\pi_j^c(P_A^c, P_B^c, \sigma^c) \geq \Pi_j^j(u^c(P_A^c, P_B^c, \sigma^c))$ *for* $j = A,B$.

If (a) - (c) *hold and we also have* (d) $\pi_j^c(P_A^c, P_B^c, \sigma^c) \geq \Pi_j^i(u^c(P_A^c, P_B^c, \sigma^c))$, *then such a* (P_A^e, P_B^e) *exists.*

Proof of Lemma A.1: Necessity is easily verified. For sufficiency, we argue that if (a) - (d) hold for some (P_A^c, P_B^c, σ^c), then there is a common equilibrium of the form $[(\hat{P}_A^e, P_A^c), (\hat{P}_B^e, P_B^c), \sigma^c]$ in which $\max_{\sigma^j \in \Sigma} u^j(\hat{P}_j^e, \sigma^j) = u^c(P_A^c, P_B^c, \sigma^c)$ for $j = A,B$. Note, first, that (A4) implies that exclusive contracts exist that satisfy this equality. Now, if (a) is satisfied, the retailer is willing to accept both manufacturers' offers. Moreover, with exclusive contract $\hat{P}_{-j}^e$ being offered, any deviation by manufacturer j that results in the retailer continuing to accept manufacturer j's offer must give the retailer a payoff of at least $u^c(P_A^c, P_B^c, \sigma^c)$. Condition (b) therefore implies that there is no profitable deviation for j that has the retailer accept *both* manufacturers' offers, while (c) implies that there is no profitable deviation for j that has the retailer accept *only* manufacturer j's offer. Finally, (d) implies that no deviation that results in the retailer rejecting manufacturer j's offer can raise j's payoff either (since the retailer would then accept $i \neq j$'s offer). QED

Proof of Proposition 2.1: The first part of (A6) rules out no-contracting equilibria. The second part of (A6) implies that $g^{-1}(\Pi_A^A + \Pi_B^B - \max\{\hat{\Pi}^c, \Pi^A, \Pi^B\}) > U^0$, i.e. that the retailer's equilibrium payoff (as given in the statement of the proposition) exceeds its reservation utility.

(i) $\max\{\Pi^A, \Pi^B\} > \hat{\Pi}^c$. The discussion in the text implies that, if manufacturer j's contract is accepted in an exclusive equilibrium, then $\Pi^j = \max\{\Pi^A, \Pi^B\}$. Moreover, in the best exclusive equilibrium (for the manufacturers) the retailer earns U^e such that $\Pi_i^i - g(U^e) - \Pi_i^j = 0$ $(i \neq j)$, so $U^e = g^{-1}(\Pi_i^i - \Pi_i^j) = g^{-1}(\Pi_j^j + \Pi_i^i - \Pi^j)$, manufacturer j earns $\Pi_j^j - g(U^e) = \Pi^j - \Pi_i^i$, and manufacturer i earns $\Pi_i^j = \Pi^j - \Pi_j^j$. Part (c) of Lemma A.1, however, implies that manufacturer k's payoff $(k = A,B)$ in a common equilibrium with a retailer who earns U is bounded above by $\hat{\Pi}^c(U) - \Pi_m^m(U) = \hat{\Pi}^c - \Pi_m^m$, where $m \neq k$. Since $\hat{\Pi}^c < \Pi^j$, both manufacturers must do strictly worse in any common equilibrium than in the best exclusive equilibrium.

Note, moreover, that when (A7) holds, then in any common equilibrium $\pi_i^c(P_A^c, P_B^c, \sigma^c) \geq \Pi_i^j$ for $i = A,B$ and $j \neq i$ (otherwise i could be assured of raising its payoff by offering no contracts). Since in any common equilibrium in which the retailer earns U we must have $\pi_j^c(P_A^c, P_B^c, \sigma^c) \geq \Pi_j^j - g(U)$, this implies that in any such equilibrium $\hat{\Pi}^c - g(U) \geq \Pi_j^j + \Pi_i^j - g(U) = \Pi^j - g(U)$; this cannot hold for both manufacturers when $\max\{\Pi^A, \Pi^B\} > \hat{\Pi}^c$.

(ii) $\hat{\Pi}^c > \max\{\Pi^A, \Pi^B\}$. From part (i) we know that each manufacturer j's payoff in any common equilibrium is bounded above by $\hat{\Pi}^c - \Pi_i^i$ for $i \neq j$. When $\hat{\Pi}^c > \max\{\Pi^A, \Pi^B\}$ this amount dominates j's payoff (for $j = A,B$) in the best exclusive equilibrium (see part (i)). Thus, we establish the result by showing that common equilibria exist that achieve this upper bound for both manufacturers. Define $U^c \equiv g^{-1}(\Pi_A^A + \Pi_B^B - \hat{\Pi}^c) > U^0$ and consider any $(P_A^c, P_B^c, \sigma^c) \in \hat{E}^c(U^c)$. This generates an aggregate manufacturer payoff of $\hat{\Pi}^c(U^c) = \hat{\Pi}^c - g(g^{-1}(\Pi_A^A + \Pi_B^B - \hat{\Pi}^c)) = 2\hat{\Pi}^c - \Pi_A^A - \Pi_B^B$. Assumptions (A1) - (A4) imply that there is a level of $K \in \mathbf{R}$ such that $(P_A^c + K, P_B^c - K, \sigma^c) \in \hat{E}^c(U^c)$ and $\pi_j^c(P_A^c + K, P_B^c - K, \sigma^c) = \hat{\Pi}^c - \Pi_i^i$ $(i \neq j)$ for $j = A,B$. Since $\hat{\Pi}^c > \max\{\Pi^A, \Pi^B\}$ implies $\hat{\Pi}^c - \Pi_i^i > \Pi_j^i$ for $j = A,B$, $i \neq j$, condition (d) of Lemma A.1 holds for the common contracts and action choice $(P_A^c + K, P_B^c - K, \sigma^c)$. Since conditions (a) - (c) hold as well (for (a), we have $U^c \geq$

U^0; for (c), we have $\hat{\Pi}^c - \Pi^i_i \geq \Pi^i_j$ -- these both follow from (A6)), Lemma A.1 tells us that there exist exclusive contracts (P^e_A, P^e_B) such that $[(P^e_A, P^c_B + K), (P^e_B, P^c_B - K), \sigma^c]$ is a common equilibrium of the contracting game. Note, finally, that any common equilibrium yielding these manufacturer payoffs must give the retailer exactly U^c.

(iii) $\hat{\Pi}^c = \Pi^A$. Immediate from parts (i) and (ii). QED

Proof of Proposition 3.2: Let (Π^*_A, Π^*_B, U^*) be the undominated equilibrium payoff defined in proposition 3.1. It is straightforward to verify that $[(\tilde{P}^e_A, \tilde{P}^c_A), (\tilde{P}^e_B, \tilde{P}^c_B), x^{**}]$ with $\tilde{P}^c_j(x_j) = \tilde{P}^e_j(x_j) = \Pi^*_j + c_j(x_j)$ is an undominated common equilibrium. Since this equilibrium satisfies the constraint that $P^c_j(x_j) = P^e_j(x_j)$, it continues to be an equilibrium in the restricted game. Suppose that there is some other equilibrium of the restricted game that generates profits (Π_A, Π_B) for the manufacturers, such that for some manufacturer j, $\Pi_j > \Pi^*_j$. Then it can be verified that manufacturer -j has a profitable deviation to the contract $P_{-j}(x_j) = (\Pi_{-j} + \epsilon) + c_{-j}(x_{-j})$ -- a contradiction. Thus, no other equilibrium of the restricted game generates higher payoffs for either manufacturer. QED

Proof of Proposition 4.2: The proof consists of two steps. (i) *If* $x^*_{A1} \notin D$, *all undominated equilibria are explicitly exclusive.* By Proposition 2.1, we establish the result by showing that $\hat{\Pi}^c < \bar{\Pi}^c$ (recall that $\bar{\Pi}^c = \Pi^A$ under (C2)). Suppose $\hat{\Pi}^c = \bar{\Pi}^c$. Then there is an equilibrium of the intrinsic common agency game with retailer reservation utility 0 in which retailer 1 chooses $(x^*_{A1}, 0)$. Suppose this retailer accepts (P^c_{A1}, P^c_{B1}). Then one can verify that, for sufficiently small $\epsilon > 0$, B has a profitable deviation to $\hat{P}^c_{B1}(x_{B1}) = P^c_{B1}(0) + \epsilon + c_B x_{B1} - I(x_{B1} > 0)(\hat{\Pi}^c_2 - \Pi^A_2 - K_B)$ -- a contradiction.

(ii) *If* $x^*_{A1} \in D$, *for any explicitly exclusionary undominated equilibrium, there is an equivalent equilibrium without explicit exclusion.* By Proposition 2.1, we establish the result by showing that $\hat{\Pi}^c = \bar{\Pi}^c$. It can be verified that the following are equilibrium offers in the intrinsic common agency game with retailer reservation utility of 0, and induce the retailer to choose $(x^*_{A1}, 0)$:

$$P_{A1}^{c}(x_{A1}) = \begin{cases} R_1(x_{A1}^{*},0) \text{ for } x_{A1} = x_{A1}^{*} \\ \infty \text{ otherwise} \end{cases}$$

$$P_{B1}^{c}(x_{B1}) = c_B x_{B1} - I(x_{B1} > 0)(\hat{\Pi}_2^{c} - \Pi_2^{A} - K_B). \qquad \text{QED}$$

Proof of Proposition 4.3: The proof consists of three steps. (i) *If* (C4) *holds and exclusive dealing is banned, there is an effectively exclusive equilibrium with first period sales of* $(\tilde{x}_{A1}, 0)$. One can verify that the following contracts and the choice $(\tilde{x}_{A1}, 0)$ for retailer 1 constitute an equilibrium:

$$P_{A1}(x_{A1}) = \begin{cases} R(\tilde{x}_{A1},0) - [\Pi_1^{B} + (\hat{\Pi}_2^{c} - \Pi_2^{A} - K_B)] \text{ if } x_{A1} = \tilde{x}_{A1} \\ \infty \text{ otherwise} \end{cases}$$

$$P_{B1}(x_{B1}) = c_{B1} x_{B1} - I(x_{B1} > 0)(\hat{\Pi}_2^{c} - \Pi_2^{A} - K_B)$$

(ii) *If* (C4) *holds and exclusive dealing is banned,* $(\hat{x}_{A1}, 0)$ *is sustainable as an equilibrium outcome through contracts satisfying* $P_{B1}(x_{B1}) \geq c_B x_{B1} - I(x_{B1} > 0)(\hat{\Pi}_2^{c} - \Pi_2^{A} - K_B)$ *only if* $\hat{x}_{A1} = \tilde{x}_{A1}$. Suppose not, and let (P_{A1}, P_{B1}) be the equilibrium contract offers for market 1. Then it is easy to verify that $\hat{x}_{A1} \in D$ (otherwise B has a profitable deviation). Recall that D^{+} is defined analogously to D, with $\leq$ replacing $<$. Since (by assumption) $\mathrm{clos}(D^{+}) = D$ and since $R_1(\bullet)$ is continuous, for any $\delta > 0$ one can find $x_{A1}(\delta) \in D^{+}$ such that $(R(\tilde{x}_{A1}, 0) - c_A\tilde{x}_{A1}) - (R(x_{A1}(\delta), 0) - c_A x_{A1}(\delta)) < \delta$. It can be verified that, for sufficiently small $(\delta,\epsilon) >> 0$, A has a profitable deviation to

$$\tilde{P}_{A1}(x_{A1}) = \begin{cases} R_1(x_{A1}(\delta)) - (U^{c} + \epsilon) \text{ if } x_{A1} = x_{A1}(\delta) \\ \infty \text{ otherwise,} \end{cases}$$

where $U^{c} \equiv R_1(\hat{x}_{A1},0) - P_{A1}(\hat{x}_{A1})$ -- a contradiction.

(iii) *If* (C4) *holds and exclusive dealing is banned, no* (x_{A1}^{c}, x_{B1}^{c}) *with* $x_{B1}^{c} > 0$ *is sustainable through contracts satisfying* $P_{B1}(x_{B1}) \geq c_B x_{B1} - I(x_{B1} > 0)(\hat{\Pi}_2^{c} - \Pi_2^{A} - K_B)$. Suppose not, and let (P_{A1}, P_{B1}) be the contracts supporting (x_{A1}^{c}, x_{B1}^{c}). Then, defining $x_{A1}(\delta)$ as defined as above and letting $U^{c} = R_1(x_{A1}^{c}, x_{B1}^{c}) - P_{A1}(x_{A1}^{c}) - P_{B1}(x_{B1}^{c})$, for sufficiently small $(\delta,\epsilon) >> 0$, A has a profitable deviation to

$$\tilde{P}_{A1}(x_{A1}) = \begin{cases} R_1(x_{A1}(\delta),0) - U^c - \epsilon \text{ if } x_{A1} = x_{A1}(\delta) \\ \infty \text{ otherwise.} \end{cases}$$

QED

Proof of Proposition 4.4: The proof of this result has two parts. (i) *When the inequality in* (C4) *is (strictly) reversed and exclusive dealing is banned, there* is *an equilibrium in which both manufacturers' contracts are accepted and sales in market 1 are* $(x_{A1}^{**}, x_{B1}^{**})$. We construct this equilibrium as follows. Define, for $\alpha \geq 0$,

$$D(\alpha) \equiv \{x_{A1} \mid \max_{x_{B1}}[R_1(x_{A1},x_{B1}) - c_B x_{B1} + I(x_{B1} > 0)(\hat{\Pi}_2^c - \Pi_2^A - K_B) - \alpha] \leq R_1(x_{A1},0)\} .$$

Note that $D = D(0)$ and $D(\alpha) \subseteq D(\alpha')$ for $\alpha' > \alpha$. We require one additional technical assumption (strengthening $D = \text{clos}(D^+)$): $D(\alpha) = \text{clos}(D^+(\alpha))$, where $D^+(\alpha)$ is defined analogously to $D(\alpha)$ with $<$ replacing $\leq$. This implies that $D(\alpha)$ is a continuous correspondence. Next, define $\bar{\alpha}_B$ as the solution to

$$\hat{\Pi}_1^c + \sum_j (\hat{\Pi}_2^c - \Pi_2^j) - K_B - \bar{\alpha}_B = \max\{\Pi_1^A + \hat{\Pi}_2^c - \Pi_2^B, \max_{x_{A1} \epsilon D(\bar{\alpha}_B)} [R_1(x_{A1},0) - c_A x_{A1}] + \Pi_2^A\}$$

Under our assumptions, $\bar{\alpha}_B$ exists and is strictly positive. It can be demonstrated that the following strategies give rise to an equilibrium supporting $(x_{A1}^{**}, x_{B1}^{**})$:

$$P_{A1}(x_{A1}) = \begin{cases} \alpha_A + c_A x_{A1} - (\hat{\Pi}_2^c - \Pi_2^B) \text{ if } x_{A1} \notin D(\bar{\alpha}_B) \\ \alpha_A + c_A x_{A1} - \Pi_2^A \text{ if } x_{A1} \epsilon D(\bar{\alpha}_B) \end{cases}$$

$$P_B(x_{B1}) = \bar{\alpha}_B + c_B x_{B1} - I(x_{B1} > 0)(\hat{\Pi}_2^c - \Pi_2^A - K_B)$$

where $\alpha_A = (\hat{\Pi}_1^c - \Pi_1^B) + (\hat{\Pi}_2^c - \Pi_2^B) > 0$.

(ii) *When the inequality in* (C4) *is reversed and exclusive dealing is banned, all undominated equilibria have* $x_{B1} > 0$. Since B earns 0 if $x_{B1} = 0$, B's payoff is strictly higher in the non-exclusive equilibrium described above since (since $\bar{\alpha}_B > 0$). Now consider A. In any equilibrium with $x_{B1} = 0$, $x_{A1} \epsilon D$, and the retailer's payoff must be at <u>least</u> $\Pi_1^B + \hat{\Pi}_2^c - \Pi_2^A - K_B$ (otherwise B would have a profitable deviation to a "sell-out" contract). Thus, A can earn at most

$$\left\{\max_{x_{A1}\in D}[R_1(x_{A1},0)-c_A x_{A1}]+\Pi_2^A\right\}-[\Pi_1^B+(\hat{\Pi}_2^c-\Pi_2^A-K_B)]$$
$$<\left\{\hat{\Pi}_1^c+\sum_j(\hat{\Pi}_2^c-\Pi_2^j)-K_B\right\}-[\Pi_1^B+(\hat{\Pi}_2^c-\Pi_2^A-K_B)]$$
$$=(\hat{\Pi}_1^c-\Pi_1^B)+(\hat{\Pi}_2^c-\Pi_2^B)=\alpha_A,$$

where the inequality follows from the fact that (C4) is strictly reversed. QED

Remark: As claimed in the text, banning exclusive dealing may increase B's payoff, even if the outcome is non-exclusive both with and without the ban. B's payoff in a non-exclusive equilibrium without a ban is $\hat{\Pi}_1^c+\sum_j(\hat{\Pi}_2^c-\Pi_2^j)-K_B-(\Pi_1^A+\Pi_2^A)$ (this is precisely $(\hat{\Pi}^c-\Pi^A)$, in accordance with Proposition 2.1). With a ban, A's payoff is unchanged, and B's payoff is

$$\bar{\alpha}_B=\hat{\Pi}_1^c+\sum_j(\hat{\Pi}_2^c-\Pi_2^j)-K_B-\max\left\{\Pi_1^A+\hat{\Pi}_2^c-\Pi_2^B,\ \max_{x_{A1}\in D(\bar{\alpha}_B)}[R_1(x_{A1},0)-c_A x_{A1}]+\Pi_2^A\right\}$$

Thus, if $x_{A1}^*\in D(\bar{\alpha}_B)$, the ban leaves B's payoff unchanged (a sufficient condition is $x_{A1}^*\in D$). If $x_{A1}^*\notin D(\bar{\alpha}_B)$, the ban strictly increases B's payoff (recall that $\Pi_2^A>\hat{\Pi}_2^c-\Pi_2^B$).

Proof of Proposition 5.1: Suppose that $[(F_A^*,\beta_A^*),(F_B^*,\beta_B^*)]$ maximize the manufacturers' joint profits in an intrinsic common agency game with $U=0$ and that they also constitute a Nash equilibrium of this game. Consider a deviation by j to the contract $(F_j(\beta_j),\beta_j)$ such that

$$\max_{(q_A,q_B)\ge 0}\int_0^\infty u(\theta R(q_A,q_B;\beta_j,\beta_{-j}^*)-F_j(\beta_j)-F_{-j}^*)d\Phi(\theta)=0.$$ [24]

Manufacturer j's expected profit with this change is $\pi_j(\beta_j)=(\beta_j-c_j)q_j^c(\beta_j,\beta_j^*)+F_j(\beta_j)$, while manufacturer -j earns $\pi_{-j}(\beta_j)=(\beta_{-j}^*-c_{-j})q_{-j}^c(\beta_j,\beta_{-j}^*)+F_{-j}^*$. If $[(F_A^*,\beta_A^*),(F_B^*,\beta_B^*)]$ maximizes the

[24] Note that with constant absolute risk-aversion, the retailer's reservation utility constraint always binds at $[(F_A^*,\beta_A^*),(F_B^*,\beta_B^*)]$. Thus, $F_j(\beta_j^*)=F_j^*$.

manufacturers' joint profits then $\pi_j'(\beta_j^*) + \pi_{-j}'(\beta_j^*) = 0$ $(j = A,B)$, while $[(F_A^*, \beta_A^*), (F_B^*, \beta_B^*)]$ is a Nash equilibrium only if $\pi_j'(\beta_j^*) = 0$ $(j = A,B)$. Hence, it must be that

$\pi_{-j}'(\beta_j^*) = (\beta_{-j}^* - c_{-j})\partial q_{-j}^c(\beta_j^*, \beta_{-j}^*)/\partial\beta_j = 0$ $(j = A,B)$, which by (D1) requires $\beta_A^* = c_A$ and $\beta_B^* = c_B$. But, letting $\beta^* = (\beta_A^*, \beta_B^*)$, $q^* \equiv (q_A^c(\beta^*), q_B^c(\beta^*))$, and computing $F_j'(\beta_j^*)$ using the implicit function theorem, we can write $\pi_j'(\beta_j^*) + \pi_{-j}'(\beta_j^*) = 0$ $(j = A,B)$ as

$$\sum_{k=A,B} (\beta_k^* - c_k)\frac{\partial q_k^c(\beta^*)}{\partial \beta_j} + q_j^c(\beta^*) \left[1 - \frac{\int_0^\infty u'(\theta R(q^*;\beta^*) - F_A^* - F_B^*)\theta d\Phi(\theta)}{\int_0^\infty u'(\theta R(q^*;\beta^*) - F_A^* - F_B^*)d\Phi(\theta)} \right] = 0,$$

where the term in brackets is strictly positive (θ and $u'(\bullet)$ are perfectly negatively correlated). Using (D1) again, it follows that $(\beta_j^* - c_j) \neq 0$ for some j. (In fact, one can show that $(\beta_j^* - c_j) >> 0$ for $j = A, B$.) Hence, $[(F_A^*, \beta_A^*), (F_B^*, \beta_B^*)]$ cannot be a Nash equilibrium. QED

Proof of Proposition 5.2: Consider first the outcome of an exclusive arrangement between the retailer and manufacturer j, where the retailer's reservation level is 0. An argument that parallels that for Proposition 5.1 shows that, if (F^e, β^e) is manufacturer j's optimal contract, then since $q_j^e(\beta^e) > 0$ (which follows from $q_j(c_j, \infty) > 0$), we have $\beta^e > c$. Since A and B are perfect substitutes, any pair of contracts $[(F_A^c, \beta_A^c), (F_B^c, \beta_B^c)]$ that maximize the joint payoff of the two manufacturers in an intrinsic common agency setting must satisfy $\min\{\beta_A^c, \beta_B^c\} = \beta^e$ and $F_A^c + F_B^c = F^e$ for some optimal exclusive contract (F^e, β^e). Hence, $\bar{\Pi}^c = \Pi^A$. However, if $[(F_A^c, \beta_A^c), (F_B^c, \beta_B^c)]$ is a Nash equilibrium of this game, then $\min\{\beta_A^c, \beta_B^c\} \leq c$ (otherwise some manufacturer j can increase his expected profit by deviating to contract $(F_j^c, \beta_{-j}^c - \epsilon)$ for some $\epsilon > 0$). This implies that $\hat{\Pi}^c < \bar{\Pi}^c = \Pi^A$. By Proposition 2.1, all contracting equilibria are exclusive. QED

Proof of Proposition 5.4: One can verify that there exists an equilibrium where $(F_j, \beta_j) = (0,c)$ for $j = A,B$, and the retailer accepts at least one manufacturer's offer. We now argue that, in any equilibrium, $\beta^* = c$. First, suppose that $\beta^* < c$. Without loss of generality, suppose that $\beta_{-j} = \beta^*$, and that the retailer accepts -j's offer. Then j must earn zero profits (the retailer would not accept any contract that gives j positive profits). It can be verified that j has a profitable deviation to $(\hat{F}_j, c)$ where $\hat{F}_j = F_{-j} + (\beta^* - c)q^e(\beta^*) + \epsilon$ for some small $\epsilon > 0$ -- a contradiction. Second, suppose that $\beta^* > c$. If the retailer accepts both contracts and $\beta_A = \beta_B = \beta^*$, then it can be verified that some j can profit by deviating to $(F_j, \beta^* - \epsilon)$ for some small $\epsilon > 0$. For all other cases, it can be verified that some j, who earns zero, can profitably deviate to $(F_j, \beta_j) = (0, \beta')$ for some $\beta' \in (c, \min\{P(0), \beta^*\})$. This contradicts $\beta^* > c$.

Finally, we argue that $F_j = 0$ for any accepted contract. This is immediate if $\beta_j > \beta^*$. If $\beta_j = \beta^* = c$, one must have $F_j \geq 0$; otherwise, j's payoff would be negative. If $F_j > 0$, then -j's payoff must be zero (either -j's offer is not accepted, or $\beta_{-j} = c$ and $F_{-j} = 0$, or $\beta_{-j} > c$, $F_{-j} = 0$, and $q_{-j} = 0$); hence, -j would gain by deviating to $(F_j - \epsilon, c)$ for some small $\epsilon > 0$. QED

Proof of Proposition 5.5: The proof consists of four steps. (i) *In any equilibrium, both contracts are accepted and* $U^A = U^B = U^{AB} > 0$ *(where* U^j *and* U^{AB} *are, respectively, the retailer's utility if only j's contract is accepted, and if both contracts are accepted).* Suppose on the contrary that j's contract is rejected. Then one can verify that j has a profitable deviation to $(F_j, \beta_j) = (\epsilon, c)$ for sufficiently small $\epsilon > 0$ -- a contradiction. A similar argument implies that $\beta_j < P_j(0)$ for j = A,B. Now suppose that $U^{AB} = 0$. Let $R_j = [P_j(q_j(\beta_j)) - \beta_j]q_j(\beta_j)$. Since $\beta_j < P_j(0)$, $R_j > 0$. Thus

$$(1 - U^A)(1 - U^B) = e^{aF_A} e^{aF_B} \left[\int_0^\infty e^{-a\theta R_A} d\Phi(\theta) \right] \left[\int_0^\infty e^{-a\theta R_B} d\Phi(\theta) \right]$$

$$< e^{eF_A} e^{aF_B} \left[\int_0^\infty e^{-a\theta R_A} e^{-a\theta R_B} d\Phi(\theta) \right] = (1 - U^{AB}) = 1.$$

But this can hold only if $U^j > 0$ for some j, in which case the retailer would not accept both offers -- a contradiction. Hence, $U^{AB} > 0$. Finally, if $U^{-j} < U^{AB}$, then j has a profitable deviation involving a small increase in the value of F_j -- a contradiction. Hence, $U^A = U^B = U^{AB}$.

(ii) *In any equilibrium,* $\beta_j = \beta_j^*$, *where* β_j^* *is defined as the optimal choice of* β_j *in an exclusive relation between* j *and the retailer.* Define $F_j^e(\beta_j,U)$ to be the level of F_j that gives the retailer expected utility U when offered slope parameter β_j in an exclusive with j. Now suppose $\beta_j \neq \beta_j^*$, and let U^* denote the retailer's expected utility in equilibrium. One can verify that j has a profitable deviation to $[F_j^e(\beta_j^*,U^*) - \epsilon, \beta_j^*]$ for some small $\epsilon > 0$ -- a contradiction.

(iii) *In any equilibrium,* $\beta_j = \beta_j^{**}(\beta_{-j})$, *where* $\beta_j^{**}(\beta_{-j})$ *denotes j's optimal slope parameter given any contract of the form* (F_{-j},β_{-j}) *in a setting with intrinsic common agency.* Define $F_j^c(\beta_j,U \mid \beta_{-j},F_{-j})$ analogously to $F_j^e(\beta_j,U)$ in step (ii). Suppose $\beta_j \neq \beta_j^{**}(\beta_{-j})$. One can verify that j has a profitable deviation to $[F_j^c(\beta_j^{**}(\beta_{-j}),U^* \mid \beta_{-j},F_{-j}) - \epsilon, \beta_j^{**}(\beta_{-j})]$ for some small $\epsilon > 0$ -- a contradiction.

(iv) $\beta_j^* \neq \beta_j^{**}(\beta_{-j}^*)$. β_j^* and $\beta_j^{**}(\beta_{-j})$ must satisfy the following first-order conditions:

$$(\beta_j^* - c_j)\frac{\partial q_j(\beta_j^*)}{\partial \beta_j} + q_j(\beta_j^*)\left[1 - \zeta(R_j^*)\right] = 0$$

and

$$(\beta_j^{**}(\beta_{-j}) - c_j)\frac{\partial q_j(\beta_j^{**}(\beta_{-j}))}{\partial \beta_j} + q_j(\beta_j^*(\beta_{-j}))\left[1 - \zeta(R_A^{**}(\beta_B) + R_B^{**}(\beta_A))\right] = 0$$

where $\zeta(R) = \int_0^\infty e^{-a\theta R}\theta\, d\phi(\theta) / \int_0^\infty e^{-a\theta R} d\phi(\theta)$, $R_j^* = (\tilde{P}_j(q_j(\beta_j^*)) - \beta_j^*)q_j(\beta_j^*)$, and $R_j^{**}(\beta_{-j}^*) = \left(\tilde{P}_j(q_j(\beta_j^{**}(\beta_{-j})) - \beta_j^{**}(\beta_{-j}))\right)q_j(\beta_j^{**}(\beta_{-j}))$. If $\beta_j^* = \beta_j^{**}(\beta_{-j}^*)$, then $R_j^{**}(\beta_{-j}^*) = R_j^* > 0$ (where the sign of this term follows from $P_j(0) > c$). Consequently, since both first-order conditions must be satisfied, we have $\zeta(R_j^*) = \zeta(R_A^* + R_B^*)$ for $j = A,B$. Using the Cauchy-Schwarz inequality for the variables $x = (e^{-a\theta R})^{1/2}$ and $y = (e^{-a\theta R})^{1/2}\theta$, it is possible to show that $\zeta'(R) < 0$. But then, since $R_A^* + R_B^* > R_j^*$ $(j \equiv A,B)$, we have $\zeta(R_j^*) > \zeta(R_A^* + R_B^*)$ -- a contradiction.

Since step (iv) contradicts steps (ii) and (iii), no pure strategy equilibrium exists. QED