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BUYER GROUPS

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Abstract

When does it pay a coalition of buyers and a coalition of sellers to by-pass a noncooperative market outcome by negotiating an alternative contract? Should these collective contracts be allowed? This paper investigates one source of the incentive for collective contracting: the failure of monopolistically competitive markets to achieve the optimal trade-off between lower costs and greater variety or availability of products. A collective contract benefits buyers inside the coalition but imposes a negative externality on buyers outside the coalition, who face higher prices and lower availability when the contract is allowed. We analyze the conditions under which the collective contracts increase total welfare. We suggest that the model represents one component of the incentives for "managed competition" in health care markets.

Key words: buyer groups; monopolistic competition; managed care; preferred provider organizations.

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1. INTRODUCTION

Consider a market with many buyers and sellers entering transactions as the outcome of some competitive or noncooperative process. When does it pay a coalition of buyers and a coalition of sellers to by-pass the competitive outcome by negotiating an alternative contract? Should such collective agreements be allowed?

These incentive issues are central to the recent policy debate on "managed competition" as an institutional arrangement for the delivery of health care services in the U.S. Acting on behalf of their clients, insurers enter into the contracts to purchase health care from physicians or drugs from pharmacists. The contracts offer a group of sellers the exclusive business of the insured customers in exchange for agreement on a set of maximum prices.[1] Paradoxically, collective contracting has not only been proposed as public policy but sometimes struck down by courts as a per se violation of the Sherman Act.[2] Courts' suspicion over collectively-negotiated prices is consistent with the conventional explanation of why a group of agents would by-pass a competitive market outcome, the cartel theory. A cartel can extract monopoly or monopsony rent from the other side of the market, but the cartel outcome is inefficient. If cartels motivate the contracts, then they should be disallowed.

Whether collective contracting *must* be due to a cartel, or whether there are efficiency explanations for the contracting, is an issue seldom addressed by industrial organization economists. This paper examines one alternative to the cartel explanation of group formation: the incentives for collective contracting that arise in monopolistically competitive markets. This represents a step towards a better understanding of managed competition in

[1] See for example Frech's (1988: 354) discussion of Preferred Provider Organizations (PPO's).

[2] Plaintiffs in the relevant cases have vacillated between arguing that the contracts have monopolistic and monopsonistic content. In some cases, public authorities have asserted that requirements contracts that allegedly cap, for example the dispensing fees of pharmacists, really set price floors and so constitute a de facto cartel arrangement among pharmacists. (For example, see *R. v. Nova Scotia Pharmaceutical Society et al* Halifax CR. No. 11486 (N.S.S.C.).) In other cases excluded suppliers (e.g., physicians who are not signatories to the contract) have brought private actions alleging that the contracts represent attempts by monopsonistic buyer groups to extract surplus from the existing suppliers (physicians who are signatories to the contract). (For example, see *Kartell v. Blue Shield of Massachusetts Inc.* 749 F.2d 922 (1984).)

markets such as health care services.[3]

We start with the proposition that monopolistically competitive equilibria can lead to excessive numbers of firms or product variety. This result is well-known, but has generated neither useful policy implications nor positive economic implications. We show that if a group of consumers in a monopolistically competitive market can, at low transactions costs, negotiate collectively with suppliers it will offer a subset of suppliers their exclusive business in exchange for a lower price. Such a contract is referred to as a requirements contracts. We interpret the exclusivity restriction at the focus of the antitrust cases as just such a contract — as a contract entered into by the insurer acting as a buying agent for the insurance purchasers, a buying group. The organization of an insurance firm allows, as a by-product, a low-transaction cost means of collectively negotiating contracts with suppliers.

The welfare analysis of this type of exclusivity contract is less straightforward than its explanation – as a response to a market inefficiency – might suggest. While consumers who are parties to the agreement are better off with the agreement, those consumers and firms outside the agreement may be worse off. Outside consumers can face higher prices and a smaller set of suppliers as a result of the agreement; outside firms can face an eroded client base. The terms of the contract do not take into account these external effects.

We offer the simplest model of collective contracting within monopolistic competition, and analyze welfare trade-offs within this model. **Section II** of the paper analyzes the impact of the agreement in a reduced form model of monopolistic competition. We establish a sufficiency condition for a positive gain to such contracts. All of the gains from trade accrue to consumers, who make take-it-or-leave-it offers to suppliers. This section of the paper then offers a specific structure for the reduced form, a spatial market, which shows that the sufficiency condition may be satisfied. It also allows an evaluation of the welfare trade-off. **Section III** expands the bargaining set to include the possibility of gains to suppliers. This both highlights the possible reduction of competition from an agreement, as

[3]We are not the first to see the relationship between the excess capacity claim of monopolistic competition and the role of buying groups. Dranove et al (1986) analyze the impact of PPO's on the health care market by using a model of monopolistic competition to predict price declines, exit of some hospitals and a reduction in the capacity of health care providers with the growth in the market share of PPO's.

excluded suppliers can be squeezed from the market, and is suggestive of the institutional facts of antitrust cases. Throughout the paper we focus on a single rationale for collective contracting under monopolistic competition. In the conclusion, we discuss additional sources for the incentive for collective contracting in health care markets and offer some remarks about the requirements for a more general theory of buying and selling groups.

2. THE BASIC MODEL

We begin the analysis with a simple reduced form model of a monopolistically competitive market. This serves to illustrate the basic forces that explain the contracts as well as to pose the basic welfare trade-off. We then adopt a particular (and conventional) structure corresponding to this reduced form model that yields stronger predictions and allows a determination of the net welfare impact of the contracts. In these settings, there are no sunk costs. Consumers dictate the terms of the contracts offered on a take-it-or-leave-it basis to firms. This has the virtue of simplicity and highlights the efficiency effects of the contracts.[4]

2.1. A Reduced Form

We consider a monopolistically competitive market in which n differentiated firms, each facing a fixed cost f and zero marginal cost, charge an identical price, P. The price that results from competition (e.g. Bertrand-Nash competition) among $N < n$ firms is denoted by $P_O(N)$. $P_O(N)$ is taken to be decreasing; as more firms enter the market, competition becomes more intense. The preferences of a representative consumer can be represented by a utility function over N and P. We abstract from income effects, assuming that utility is given by $v(N) - P$.

The total mass of consumers is taken to be 1. An exogenous proportion α of the consumers are members of an "inside group", who can at zero transactions cost make a take-it-or-leave-it offer to firms. This group represents individuals, such as the consumers of a

[4]Contested legal cases, however, involve entry with sunk costs prior to the requirements contracts as well as bargaining between consumers and firms over the terms of the contracts. In the next section, we amend our specification to incorporate these features.

particular insurance company, who are organized for some purpose outside the model and as a consequence of this organization find it easy to transact collectively with suppliers. The offer consists of the exclusive business of insiders in return for a lower price P_I .

The model is a three stage game consisting of an offer by inside consumers to $n < N$ firms; a decision by the firms to accept or reject this offer; and, the implementation of the contract. At the final stage if the n firms accept this offer, they supply both the inside and the outside groups of consumers.[5] They charge the outside group $P_O(n)$.[6] This reflects two assumptions. First, the contract with the inside consumers does not confer an ability of the firms to set a cartel price to the outside consumers; competition continues to prevail for these consumers. Second, the inside group is representative of all consumers in terms of elasticities of demand. This equilibrium price to the outsiders, $P_O(n)$, is independent of the size of the market remaining after the inside group is formed. At the second stage the n firms calculate the profits that they would earn from accepting the contract from the inside consumers. The profit earned by each of the n firms is

$$\pi(P_I, n, \alpha) = [\alpha P_I + (1-\alpha)P_O(n)]/n - f \tag{2.1}$$

At this stage these n firms compare their profits from accepting the contract with those from rejecting it, in which case the market reverts to the non-cooperative equilibrium where firms make zero profits. The number of firms adjusts when a contract is accepted by existing firms. This is because the contract offered by inside consumers supports only a reduced number of firms compared to the number in the market under the non-cooperative equilibrium. At the first stage the α inside consumers select n firms to receive the contract. The contract price $\hat{P}_I(n, \alpha)$ is the lowest price consistent with zero profits given that the price to the outside

[5] Buying groups making all-or-nothing offers to firms need to guarantee a return to these firms equivalent to their competitive alternative, i.e., a zero profit level. As participating firms receive revenues from both inside and outside firms, no firm could survive by serving only outside consumers.

[6] In the context of health services markets, for example, Frech (1988: 364) points out that when a physician, for example, is put on the list for a PPO, the physician "need not, and generally does not, reduce his prices to his other patients, who have traditional third-party insurance."

consumers is determined by noncooperative competition.[7] This price is given by setting (1) to zero, which yields

$$\hat{P}_I(n, \alpha) = [nf - (1-\alpha)P_O(n)]/\alpha \tag{2.2}$$

Figure 1 illustrates the relevant relationships in (n, P) space. First, the noncooperative price function $P_O(n)$ is depicted as downward sloping. Next, the combinations of n and P_I when all consumers ($\alpha = 1$) pay P_I and firms break even are labelled $\hat{P}_I(n, 1)$. This curve, which is upward sloping, represents feasible price-product choice pairs subject to a break-even condition for firms when all consumers pay P_I.

There are two points of interest on $\hat{P}_I(n, 1)$. The first is the intersection of the two curves $P_O(n)$ and $\hat{P}_I(n, 1)$ denoted by point C. Point C gives the equilibrium price P_C and number of firms n_C that prevail under noncooperative exchange with open entry. The second is the consumers' preferred point on $\hat{P}_I(n, 1)$, that is, the optimum subject to a break-even constraint for firms. This optimum is given by the tangency between the indifference curves of the representative consumer[8] (with utility $v(n) - P$), and $\hat{P}_I(n, 1)$ and is denoted by $S = (P^*, n^*)$. Predictions in this model turn on the relative location of C and S. In **Figure 1**, S is shown lying to the left of C.[9]

Finally, fix α at some value less than 1. Consider the function $\hat{P}_I(n, \alpha)$, which depends upon $P_O(n)$ through equation (2). It lies below $\hat{P}_I(n, 1)$ and is steeper than $\hat{P}_I(n, 1)$. This curve goes through C because at n_C, the price P_C is the only price to insiders consistent with zero profits. The contract offered by an inside group of size $\alpha = a_0$ is shown as $E = (n^E, P_I^E)$ in the **Figure 2**.

Figures 1 - 3 summarize the following propositions, which are proved in **Appendix A.**

[7] The assumption that inside consumers make a take-it-or-leave-it offer is clearly most reasonable when α is large. We discuss below the effect of relaxing this assumption.

[8] The indifference curves are vertically parallel as a consequence of our assumption of separability (a zero income effect).

[9] In general, S can lie to the right or left of C. If S lies to the right of C, there is no incentive for buyer groups of the type observed.

Proposition 1 *If $n^* < n_C$, then an inside group of any size gains from an exclusivity contract.*

Proposition 2 *An exclusivity contract has the effect of decreasing both P_I and n, relative to the noncooperative equilibrium. If $\alpha < 1$, the outsiders' price, P_O, increases.*

Corollary *The exclusivity contract increases the welfare of inside consumers and decreases the welfare of outside consumers.*

Proposition 3 *For α sufficiently small, a requirements contract has $P_I =$ marginal cost and $n_I < n_C$. In this region, n_I decreases as α increases. For α sufficiently large, requirements contracts have $P_I >$ marginal cost, $n_I < n_C$, and, if $v(n)$ and $P_0(n)$ are concave, then P_I and n_I are increasing in α. P_I and n_I converge to the optimum S as α approaches* 1.

At the noncooperative equilibrium C in **Figure 1**, the indifference curve cuts the zero-profit curve from above: consumers would prefer fewer firms and lower prices. The optimum contract defined by S lies to the left of C. This provides the incentive for the market to offer private contracts to realize the attendant gains from trade (**Proposition 1**). As there are fixed costs to contracting, we expect that it is those settings where S lies considerably to the left of C where private contracts will emerge to correct the market failure.

The contract moves prices and product choice in the direction of the optimum *for the inside group.* The outside group faces higher prices with a more limited product choice (**Proposition 2**). This is illustrated in **Figure 2**. Hence the tension in the welfare effects of the contract (**Corollary**).

To understand the impact of the contracts (**Proposition 3**), start with $\alpha = 1$. In this case, the contract moves the market from C to S as illustrated in **Figure 3**. As α declines from 1 to α_1 to α_0, the feasible contract sets $\left(\hat{P}_I(n, \alpha)\right)$ rotate through C. Since the indifference curves are vertically parallel (because of the absence of income effects), the tangency determining the contract moves to the left. Both P_I and n_I decline. At some point, as α declines further, a corner solution is established. P_I is equal to zero for all corner solutions. In this region, as α declines, n_I now *increases*. Fewer inside consumers means more outside consumers. Inside consumers pay a price equal to marginal cost ($P_I = 0$) and enhanced numbers of outside consumers represent a larger pool of resources to sustain product choice (n_I increases). The corresponding α-expansion path is illustrated in **Figure 3**.

The ability of inside consumers to extract greater rents from outside consumers as α declines depends upon the assumption of constant power of insiders to make take-it-or-leave-it offers. But in reality a declining α likely results in a diminished power of insiders to extract the full private gains from contracting. The extension allowing suppliers to capture some of the gains appears in **Section III**.

The predictions from this model accord with an observation from Frech's (1988) study of Preferred Provider Organizations. Frech finds that even when the proportion of the population in the inside group (seeking price concessions through preferred provider organizations in medicine) is relatively small, significant price concessions are forthcoming through these medical requirements contracts.[10] In terms of the approach above, for α sufficiently small, the price facing the inside group relative to that price prevailing in markets without such an organization would fall from the Bertrand-Nash level to marginal cost.

The welfare evaluation of these contracts involves the trade-off between the gains to the inside consumer group with the losses to the outside consumers. With open entry, all suppliers earning competitive rates of return remain unaffected by the implementation of the

[10]Frech (1986: 364) maintains that "the provider can expect a large increase in volume from offering competitive prices to a PPO...Even a case in which the PPO is small or includes so many providers that the potential volume increase is small, does not constitute a serious drawback for the provider. Since the price reduction applies only to the PPO patients, the cost to the provider (in the form of lower, more competitive prices) is small when the gain (in the form of additional business) is small. That explains why small PPOs with no monopsony power over physicians or hospitals nevertheless succeed in obtaining substantial discounts."

contracts. It is clear that as α increases, there is an increase in the likelihood that the contract is welfare improving. Statements on net welfare beyond this require parameterization.

2.2. A Spatial Structure

The reduced form model above establishes (in **Proposition 1**) conditions under which there will be private gains to an exclusivity agreement. This raises the question of whether these sufficiency conditions are normally or ever satisfied in models of monopolistic competition. In such models, the results can be ambiguous, yielding too little or too much product variety. Our model predicts that the exclusivity agreements are profitable in the case where the noncooperative equilibrium has excessive product variety. In this section, we use a standard specification to illustrate this result.

This specification also allows us to address the second open question: what is the *net* welfare effect of the agreements? This is critical to an assessment of these contracts.

In this structure, consumers are uniformly distributed around a circle of unit circumference. Each consumer purchases at most one unit of the good, values the purchase at a gross surplus of v, and pays the price plus the transportation cost of t per unit distance. Firms face a fixed entry cost of f and have no variable costs. All other assumptions from the reduced form model continue in effect.

The noncooperative equilibrium under these conditions is well-known; it is developed in Tirole (1988: 282-285). The marginal consumer is located at a distance x from the representative outlets; with symmetry in price $x = 1/(2n)$; t measures the per unit transportation cost common to each consumer. Under these conditions, with zero marginal cost, the noncooperative, zero-profit price and number of firms are given by $\left(\sqrt{tf}, \sqrt{t/f}\right)$; the average transportation cost is $.25\sqrt{tf}$ which gives an average delivered price of $1.25\sqrt{tf}$.

2.2.1. Sufficiency Condition For Private Gains

The sufficiency conditions (of **Propositions 1 and 3)** for the non-market coalitions to yield consumer benefits are that the socially efficient number of firms be less than the number determined by private competition. Are these sufficiency conditions satisfied in this spatial structure? The answer is yes. The corresponding socially optimal, zero-profit price and number of firms is given by half the corresponding equilibrium values given above.[11] In equilibrium, the average transportation cost is twice as high as at the social optimum; the average delivered price is now 20% lower.

2.2.2. Welfare Impact

Analyzing the welfare impact of exclusivity requires us to determine the exclusive contracts that prevail in this simple circle model.[12] Consistent with our description of the game, the following defines the maximization problem where inside consumers choose the contract that minimizes their total delivered price, subject to zero profits for firms (individual rationality) and Bertrand-Nash prices (equilibrium constraint) for outside consumers:

$$\min_n \left[\alpha\left(P_I + t(2n\int_0^{\frac{1}{2n}} x dx)\right)\right] = \min_n \left[\alpha\left(P_I + \frac{t}{4n}\right)\right] \tag{2.3}$$

subject to individual rationality:

$$\pi = [\alpha P_I + (1-\alpha)P_O] \cdot 2x - f = 0 \tag{2.4}$$

and an equilibrium constraint:

$$P_O = \frac{t}{n} \tag{2.5}$$

The discontinuity along the α-expansion path occurs at $\alpha = .89$. When $\alpha < .89$, there is a corner solution where the inside price equals the marginal cost. The inside consumers make no contribution to overheads and supplier density is determined completely by the contribution of the outside consumers. The optimal contract involves prices and numbers of firms given by

$$\left(0, \sqrt{\frac{(1-\alpha)\,t}{f}}\right) \tag{2.6}$$

[11]The surplus of firms in the noncooperative solution follows from the pecuniary externality (trade diversion effect) associated with Nash conjectures.

[12]The solution details appear in Appendix B.

When $\alpha > .89$, there is an interior solution where the inside price exceeds the marginal cost. The optimal contract involves prices and numbers of firms given by

$$\left(\sqrt{\frac{tf}{5\alpha-4}} \cdot \frac{(9\alpha-8)}{2\alpha}, .5\sqrt{\frac{(5\alpha-4)t}{f}}\right) \tag{2.7}$$

As α approaches .89, the outside group becomes very small. At this point, the inside group's welfare is improved through an enhanced density of firms. Accomplishing this requires the inside group to pay a price above marginal cost. [13]

In the presence of rectangular demand, welfare is measured as the sum of the fixed plus transportation costs. Price changes do not affect welfare in this case as demand is perfectly inelastic at one unit for each consumer (up to a reservation value); prices simply transfer surplus between buyers and sellers. Welfare is enhanced from the requirements contract if these costs are lowered. As **Figure 3** illustrates, we need to evaluate welfare over the two regions corresponding to the critical values of α. In the noncooperative, open-entry equilibrium, total costs are defined by $W^C \equiv 5/4 \cdot \sqrt{tf}$. For $0 < \alpha < .89$, total costs are $W^{1*} \equiv \left[(5\alpha-3)\sqrt{tf}\right] / \left[2\sqrt{5\alpha-4}\right]$. For $.89 < \alpha < 1$, total costs are $W^{2*} \equiv \left[(5\alpha-3)\sqrt{tf}\right] / \left[4\sqrt{1-\alpha}\right]$.

The (positive) change in welfare between the noncooperative and exclusive contract alternatives is defined by $\triangle W \equiv W^C - W^{i*}$ $(i = 1, 2)$ and is evaluated in each of the regions as:

$0 < \alpha < .89$:

$$\triangle W = \frac{\sqrt{tf}\left[5\sqrt{1-\alpha} - (5-4\alpha)\right]}{4\sqrt{1-\alpha}} > 0, \text{ and}$$

$.89 < \alpha < 1$:

$$\triangle W = \frac{\sqrt{tf}\left[5\sqrt{5\alpha-4} - 2\,(5\alpha-3)\right]}{4\sqrt{5\alpha-4}} > 0.$$

[13] In particular, there are two values of α that lead to the socially optimal density of outlets, $\alpha = 1$ and $\alpha = .75$. As the proportion of the inside group rises above .75 of the population, the number of suppliers falls below the optimal level. To sustain a zero (marginal costs) price for itself, the inside group free rides on the payments from the outside group, gaining a price advantage at the expense of a socially inefficient network of suppliers.

This leads to the following:

Proposition 4 *For the circle model, total fixed and transportation costs are always reduced with the implementation of requirements contracts and thus welfare is always improved.*

One interpretation of this result is that inside groups free ride on the capacity investment paid for by outside consumers. But as the noncooperative equilibrium had too many firms with prices that were too high, schemes that facilitate free rides will thin-out the number of firms and reduce total costs. As a result, the free-rides in these market arrangements are efficiency-enhancing.

3. A GENERAL SUPPLIER COALITION

In the model of the previous section, consumers are all-powerful in two senses: they capture all of the gains from contracting and they effectively choose the size of the supply network (n). In this section we consider the possibility that the particular *supplier* group that can feasibly contract with the buyer coalition is exogenously given rather than determined by the insider buyers.

This extension is motivated in part by observations about collective contracts in health care markets. Many of these schemes are partly or wholly organized by suppliers. For example, physicians are frequently shareholders in the schemes that organize and manage exclusive arrangements such as Preferred Provider Organizations (as in *Maricopa* [14]); as shareholders, they appoint members to the Boards of Directors. This suggests that physicians themselves share in the gains associated with the formation of the coalitions.[15] Just as consumer groups are determined by exogenous factors such as employment contracts, supplier groups can exist for external reasons such as the prior formation of group practices or working coalitions for physicians or professional and trade associations in general. This means that

[14] *Arizona v. Maricopa County Medical Society, 457 U.S. 332 (1982).*

[15] In our model with inelastic demand, the distribution of these contractual gains is irrelevant. What does matter is the number of physicians in the contract.

consumers will not have complete control over the size of the inside supplier group in the contract.

Both the consumer group and the supplier group are now exogenous. That is, we examine the private and social gains to contracts for given coalitions. Among other issues, we address the following question: Does participation by enhanced numbers of providers increase or reduce the likelihood that the coalition is efficient? (In health care markets, for example, some analysts of PPO's are suspicious of plans that involve increased numbers of providers, because of the cartel theory.[16])

We examine the gains from trade and the welfare effects in three settings: in the short run in which the number of firms remains at the pre-contractual level; in the long run in which no firms can be sustained outside of the exogenous selling group; and in the long run in which some outside firms can be sustained.

3.1. Private Gains to the Exclusivity Contract

3.1.1. Short-Run

To extend the analysis to exogenous supplier groups, we return to our reduced form specification and amend it slightly. We continue to define n_C as the number of suppliers established in the noncooperative, open entry equilibrium. Each of these firms has entered the industry and does not, in this short-run analysis, anticipate the development of requirements contracts. These suppliers are taken as established at the outset. An exogenous proportion k of the n_C firms comprise "the inside group of firms". As before, a proportion α of consumers are the inside group of consumers. We consider the private and social gains to an exclusivity contract between these two exogenous, inside groups.

We imagine now a two-stage process. At the first stage, the two groups negotiate a contract with exclusivity and price caps. At the second stage, the market clears: the contracts are fulfilled and outside consumers make their purchase decisions. In this second stage,

[16]For example, at one point the U.S. Department of Justice suggested that any PPO with less than 35 percent of the providers would not come under its competition scrutiny. This was later amended to suggesting that the appropriate framework for any competition analysis of size in PPO's should be the Department's Merger Guidelines (as reported in R.J. Enders (1992)).

outside firms sell only to outside consumers; inside firms sell to both inside and outside consumers but at two different prices.

In equilibrium, with the total number of suppliers unchanged by the exclusivity contract, the price to outside consumers remains unchanged. Therefore outside consumers are unaffected by the contract. Effectively, the inside consumers and firms will conspire to extract surplus from the outside suppliers.

We do not specify the outcome of the bargaining process over the division of the private gains. Instead, we characterize the total gains to inside consumers and suppliers, and then describe the feasible distribution of the gains between the parties (the bargaining set).

Under our assumption on utility, before the inside consumers sign the exclusivity contracts, their utility (under noncooperative exchange) is given by

$$v(n_C) - P_C \tag{3.1}$$

Under an exclusivity contract parametrized by price P_I, their utility is

$$v(kn_C) - P_I \tag{3.2}$$

The corresponding change in welfare for insider consumers is therefore

$$\Delta V \equiv \alpha \left[v(kn_C) - v(n_C) - (P_I - P_C)\right] \tag{3.3}$$

For the inside firms, the change in total profits is the difference between what these firms earn agreeing to the contract and what they would have earned under noncooperative exchange. This change in profit aggregated over all the inside firms is

$$\begin{aligned} \Delta\pi &\equiv \left[\alpha P_I + (1-\alpha)\, kP_C\right] - kP_C \\ &= \alpha \left[P_I - kP_C\right] \end{aligned} \tag{3.4}$$

The total gains from trade are the sum of these potential increments in surplus to the two groups of players. This is

$$G \equiv \Delta V + \Delta\pi \equiv \alpha \left[v(kn_C) - v(n_C) + (1-k)P_C\right] \tag{3.5}$$

Substitution from the noncooperative open-entry condition ($P_C/n_C = f$) yields

$$G \equiv \alpha \left[v(kn_C) - v(n_C) + (1-k)n_C f \right] \tag{3.6}$$

The condition $G \geq 0$ defines values of (k, α) where the corresponding groups of consumers and firms have an incentive to sign a contract. In this case, α inside consumers agree to purchase exclusively all of their requirements from kn_C firms. The exact price P_I governing this exchange is determined by the relative bargaining powers of the two groups, and under our assumptions on demand, affects the division of but not the size of the gains from trade.

Inspection of equation (13) reveals that since $\alpha > 0$,

$$sign\ G = sign\ \left[v(kn_C) - v(n_C) + (1-k)n_C f \right]$$

We proceed to consider the values of the size of the supply coalition k over which the gains from trade are positive. Consider the effect of a change in k on G. The appropriate derivatives are

$$\frac{\partial G}{\partial k} = \alpha \left[v'(kn_C) \cdot n_C - n_C f \right] = \alpha \left[v'(kn_C) \cdot n_C - P_C \right] \tag{3.7}$$

$$\frac{\partial^2 G}{\partial k^2} = \alpha v''(n_C)^2 < 0$$

G is concave. At $k = 0$, $G = -\alpha \left[v(n_C) - P_C \right]$ which is negative. At $k = 1$, $G = 0$. Also, $\partial G / \partial k$ is positive at $k = 0$ and negative at $k = 1$. Therefore, there is a minimum k_1 such that $\forall\ k > k_1, G > 0$.

In general, this tells us that when the potential number of firms in the inside supply group is small (below k_1), requirements contracts do not yield positive gains from trade — there is no feasible contract price which will cause firms voluntarily to abandon their noncooperative profits and consumers voluntarily to restrict themselves to a choice over a very limited set of product variety. As k increases, the potential gains from trade increase as well. As k grows 'sufficiently' large (above k_1), consumers continue to value enhanced choice but they will voluntarily restrict their choice for lower prices. Firms will find the enhanced volume from exclusivity to be profit maximizing even though the profit per customer under noncooperative terms of trade is higher. Inside firms sacrifice margin for volume.[17] In general, as G rises in response to increasing k, G will eventually be maximized at the socially optimal network of suppliers (menu of product variety). This occurs at S in **Figure 1** when $v' = P_C/n_C$ (see equation (14) above). While this yields the maximum benefits from implementing requirements contracts, we do not explore the mechanism that would generate these maximum gains.

In sum, between exogenous coalitions on both sides of the market, there may or may not be gains to contracting in the short run. The critical requirement is a sufficiently large supplier group.

3.1.2. Long Run

Now consider the case where fixed costs f are *not* sunk. Existing firms will exit the market if their expected revenue flow is insufficient to cover all costs, including fixed costs. Buying group contracts that alter the expected revenue stream of firms alter the number of firms in the market. Adjusting the number of firms and the degree of competition facing outside consumers, therefore, permits the coalition of inside firms and consumers to behave strategically against outside consumers (to extract rents by increasing the prices that these consumers face). In the previous case considered, the short-run, insiders were extracting quasi-rents from outside firms. Now two possibilities need to be considered: (1) only inside firms serve the market; (2) both inside and outside firms serve their respective markets. The critical condition for the presence of any outside firms in the market is that the revenue – from outside consumers alone – exceed the firm's fixed cost. This condition can be used to define a minimum inside group $\overline{\alpha}$ to render an outside firm just solvent; $\overline{\alpha}$ is defined by

$$(1-\overline{\alpha})\,\frac{P_O(kn_C)}{kn_C} - f = 0 \tag{3.8}$$

Equation (15) partitions (k, α) space into the regions where there is and is not room for

[17] The trade-off of margin for volume is prominent in the discussion of these contracts. Frech (1988: 365) discusses the trade-offs for a physician deciding on the wisdom of alternative pricing strategies.

outside firms in the market once the contract is struck between inside consumers and inside firms.

No Outside Firms Consider the region where there are no outside firms. As before, the aggregate private gains to inside consumers and firms from forming the coalition are given by the sums of surpluses to consumers and firms. The gains to inside consumers continue to be given by equation (10). The gains to inside firms are given by the following:

$$\Delta\pi = \alpha P_I + (1-\alpha)P_0(kn_C) - kP_C$$

Using the open-entry condition under competition and adding these surpluses yields the total private gains with no outside firms in the market:

$$\hat{G} = \alpha\left[v(kn_C) - (v(n_C) - n_C f)\right] + (1-\alpha)P_O(kn_C) - kn_C f \tag{3.9}$$

The interpretation of this equation is as follows: When the revenues from outside consumers are insufficient to support outside firms, they will also be insufficient to cover the fixed costs of inside firms (who sell to outside consumers). In this case, inside consumers pay a price above marginal cost so that inside firms at least break even (that is $\alpha P_I \geq kn_C f - (1-\alpha)P_O(kn_C) > 0$). The gains to forming a buying group are non-negative when the resulting net surplus given by $[\alpha v(kn_C) + ((1-\alpha)P_O(kn_C) - kn_C f)]$ is no less than that net surplus to insiders under competition without groups $\alpha\,(v(n_C) - n_C f)$.

The private incentives for group formation, and subsequently our analysis of welfare, in this region are further enhanced if we substitute the short-run gains G from equation (13) into equation (16) to obtain:

$$\hat{G} = G + Z \tag{3.10}$$

where $Z \equiv (1-\alpha)\left[P_0(kn_C) - kn_C f\right] > 0$, and $\partial Z/\partial k < 0$. At $k = 0$, $Z = (1-\alpha)\,P_0(0) > 0$. At $k = 1$, $Z = 0$.

In this setting, the total private gains are equal to the short-run gains (G), adjusted by the additional net surplus extracted from outside consumers (Z). This surplus adjustment equals the revenues paid by the outside consumers ($(1-\alpha)P_0(kn_C)$) less the fixed costs attributed to these outside consumer for the firms remaining in the market $((1-\alpha)kn_C f)$. As k grows, this surplus adjustment declines and in the limit shrinks to zero. This additional net gain could be sufficiently large when k is small, however, that buyers groups would form even when the product choice to inside consumers is very limited and would not generate buying groups in the short run, i.e., $\hat{G}$ could be non-negative for $k_1 \geq k > 0$, where G is negative.

With Outside Firms Over the range of parameters where outside firms will enter, we may derive the corresponding gains to the contracting parties as

$$\tilde{G} = \alpha\left[v(kn_C) - (v(n_C) - n_C f)\right] \tag{3.11}$$

The interpretation of this equation is as follows: When the revenues from outside consumers are sufficiently large to support outside firms, they are also large enough to pay the fixed costs incurred by inside firms (who, once again, sell to the outside consumers). In this case, inside consumers need not pay a price above marginal cost (which is zero by assumption in this model). The gains to forming a buying group are non-negative when the resulting surplus given by $\alpha v(kn_C)$ is no less than that surplus accruing to consumers under competition in the absence of such groups, $\alpha\left(v(n_C) - n_C f\right)$.

Where outside firms are feasible, it is possible, similar to the previous case, to express the long-run gain in terms of the short-run gain. Upon the substitution of G in equation (16), the expression for $\tilde{G}$ becomes

$$\tilde{G} = G + \alpha k n_C f \tag{3.12}$$

The long-run private gains equal those realized in the short run enhanced by the additional contribution from the outside group of the fixed resource cost otherwise attributable to inside consumers.

$\tilde{G}$ is increasing in k. At $k = 0$, $\tilde{G} = G = -\alpha\left[v(n_C) - P_C\right]$ which is negative. At k_1, $\tilde{G} = \alpha(k_1 n_C f) > 0$. At $k = 1$, $\tilde{G} = \alpha P_C$ which is positive. Also, $\partial\tilde{G}/\partial k = \alpha v' n_C > 0$. We may define a minimum $\tilde{k}_1$ such that $\forall k > \tilde{k}_1$, $\tilde{G} > 0$. It is clear that $\tilde{k}_1 < k_1$. Equation

(19) reveals that in the long run even with outside firms present in the market, there is an incentive for buying groups to form for smaller values of k than those that render buying groups profitable in the short run.

Inspection of equations (16) and (18) reveals that a general expression for the long run private gains (defined by Γ) may be written as

$$\Gamma = \min\left\{\hat{G}, \tilde{G}\right\} = \tilde{G} + \min\left\{(1-\alpha)P_0(kn_C) - kn_C f, 0\right\}$$

This expression assists interpretation. The presence of outside firms $[(1-\alpha)P_0(kn_C) - kn_C f = 0]$ signals that even inside firms can earn sufficient revenues from outside consumers to cover their fixed costs. As a result, inside consumers need not pay a price above the marginal cost associated with their demands. But even when outside firms are absent, buying groups are wealth enhancing provided the net surplus from the restricted product choice presented to consumers exceeds the net surplus to the inside group under competition with no buying groups. Our interests is the private incentives for the formation of buying groups; as such, we do not explore the division of the gains between inside consumers and firms.

Missing in the private evaluation is any measure of the impact of buying groups on the welfare of outside consumers and firms. In general, insiders seek to extract surplus from outsiders, whether those outsiders be consumers (consumer surplus) or firms (quasi-rents from firms already in the market). We expand our inquiry into the long-run impact of coalitions to ask whether the private incentives translate into social gains, as the do in the case of an endogenous supply coalition (**Section II B**).[18]

[18]These private gains from trade will be altered under two relevant market conditions which amount to endogenizing k. When these contracts are repeated, inside consumers may wish to exclude some suppliers from initial coalitions in order to extract more of the private gains from implementing the contracts: inside consumers can threaten to strike contracts with excluded suppliers to minimize the gains captured by the initial inside suppliers. At the same time, excluded suppliers offer an enhanced opportunity for competing organizers of consumer coalitions to form rival networks of suppliers and consumers. This yields a tension between exclusion and inclusion of existing suppliers at the time of initiation of the contracts.

3.2. Welfare Impact of Exclusivity

3.2.1. Short Run

Our welfare analysis mirrors our analysis of private incentives. We begin with the short run. The welfare analysis is simple but peculiar: Buying groups are welfare reducing in the short run. The savings from buying groups are the cost savings from the reduction in the number of firms. These savings in fixed costs raise consumer welfare through the potential for a lower negotiated price P_I. In the short run, there is no saving in fixed cost. All outside consumers continue to enjoy the same product choice at the original noncooperative level of prices. Buying groups with exclusivity are motivated by the capture of quasi-rents from excluded firms. There is, however, restricted product choice for inside consumers. This means that even though there is a private incentive for buying groups, they are welfare reducing, a peculiar result. The problem is that with fixed costs sunk, there is no opportunity to offset reductions on product choice with savings on fixed costs. The more interesting welfare question, therefore, is in the long run where these fixed costs are not sunk.

In the long-run, we find that welfare may rise or fall with the contract, depending on the model's parameters, in particular the initial sizes of the buyer and supplier coalitions.

3.2.2. Long Run

No Outside Firms Under the contract with no outside firms, welfare is given by

$$\hat{W} = v\left(kn_C\right) - kn_C f$$

while prior to the contract welfare is given by

$$W = v(n_C) - n_C f$$

The corresponding welfare change is

$$\begin{aligned} \triangle\hat{W} &\equiv \hat{W} - W \\ &= \left[v\left(kn_C\right) - kn_C f\right] - \left[v(n_C) - n_C f\right] \end{aligned} \tag{3.13}$$

If we substitute G from equation (13), this change in welfare is

$$\triangle\hat{W} = G/\alpha \tag{3.14}$$

or by substituting from equation (17)

$$\triangle\hat{W} = (\hat{G} - Z)/\alpha$$

In the absence of outside firms, the private and social gains (to inside consumers alone $\alpha\triangle\hat{W}$) deviate by Z, the revenues paid by the outside consumers $((1-\alpha)P_0(kn_C))$ less the fixed costs attributed to these outside consumer for the firms remaining in the market $((1-\alpha)kn_C f)$.

With Outside Firms Define n_O to be the equilibrium number of outside firms in the market (serving only outside consumers). This equilibrium number is determined by the zero profit condition

$$(1-\alpha)\frac{P_O(kn_C + n_O)}{kn_C + n_O} - f = 0$$

which defines implicitly a function

$$n_O = N_O(k, \alpha) \tag{3.15}$$

Under the contract with outside firms, constrained by equation (22), welfare is given by

$$\tilde{W} = \alpha v(kn_C) + (1-\alpha)v(kn_C + n_0) - (kn_C + n_0)f$$

The corresponding welfare change is

$$\triangle\tilde{W} \equiv \tilde{W} - W$$

$$= [\alpha v(kn_C) + (1-\alpha)v(kn_C + n_0) - (kn_C + n_0)f] - [v(n_C) - n_C f]$$

If we substitute $\hat{G}$ from equation (18), subject to equation (22), this change in welfare is

$$\triangle\tilde{W} = \tilde{G} - \tilde{E} \tag{3.16}$$

where $\tilde{E}$ is

$$\tilde{E} \equiv (1-\alpha)\left\{[v(n_C) - P_C] - [v(kn_C + n_O) - P_O(kn_C + n_O)]\right\}$$

where $\tilde{E}$ is the third-party externality associated with the contract when there are outside firms; that is, the loss in surplus to outside consumers calculated as the difference in the net surplus to these consumers before and after the contract. Notice that the post-contractual choice is enhanced for outside consumers by the presence of outside firms (n_O).

Figure 4 illustrates the regions where welfare increases and falls with the establishment of the exclusivity contract. Curve B is this figure (defined from equation (15)) partitions the parameters into sets where outside firms will and will not be sustained.

Consider first the section above curve B (no outside firms). Our analysis above indicates that buying groups are welfare enhancing for $k \geq k_1$ but that there is a private incentive to form buying groups for some $k < k_1$, as illustrated in the figure. This shows that inclusion of more suppliers in the coalition can improve the efficiency of private exclusivity contracting.

Consider next the section below curve B (where outside firms survive). For $k > \tilde{k}_1$, the private gain is positive while, conditional on the size of the externality $\tilde{E}$, welfare may increase or decrease with the implementation of the contract. The private gains are increasing in k. We may define a curve C in this figure such that below this curve welfare increases and above it, but below B, welfare decreases. (The derivation of C appears in **Appendix C**.) In **Figure 4,** the curve C starts on the horizontal axis at $\tilde{k}_1$ because for $\alpha = 0$, there are no recipients of the externality. The curve C intersects the curve B at k_1 as $\lim_{n_O \to 0} \triangle\tilde{W} = \triangle\hat{W}$. Welfare decreases to the left of C because for any α, the welfare loss attributed to the outside consumers is not offset by the saving in fixed costs flowing from the implementation of the contracts: the inside coalition of consumers and firms is too small for an improvement in efficiency. This shows that with outside firms sustainable, more suppliers in the coalition improve the efficiency of private exclusivity contracting *provided* there is a critical minimum of inside consumers. This critical minimum is given by the solution to $\Delta\tilde{W}(\alpha, k) = 0$ for each k where $\Delta\tilde{W}(\alpha, k)$ is defined in equation (23) subject to equation (22). (Details for the derivation of **Figure 4** appear in **Appendix C**.)

This is summarized in the following proposition:

Proposition 5
(i) In the short run: a supplier coalition beyond some minimum size (k_1) permits the realization of private gains from exclusivity contracts.
(ii) In the long run: (a) buyer/supplier coalitions that leave no outside firms in the market are welfare improving if the supplier coalition is larger than k_1; (b) buyer/supplier coalitions that leave outside firms sustainable in the market are welfare improving if the suppliers coalition is larger than $\tilde{k}_1$ or the buyer coalition is sufficiently small.

Conventionally, courts view coalitions with suspicion as they may represent cartel arrangements that stifle competition and reduce outputs to inefficient levels. The greater the participation in the coalition, the more inefficient are cartel arrangements.

We find the opposite. More participation in the coalitions enhances the welfare effect from the contracts. More included consumers and suppliers reduce the likelihood that the contract is driven purely by strategic motives associated with surplus extraction from excluded third parties.

4. CONCLUSIONS

Economic discussions of the incentive for collective contracting, the decision by a group of agents on one side of a market to by-pass the noncooperative market outcome by contracting collectively with a group on the other side, rarely depart from the cartel theories. Here we propose an efficiency explanation: the tendency of a monopolistically competitive market to yield an inefficient trade-off between product variety or availability and lower prices. Where a market would yield too many firms, buyer groups can gain by offering exclusivity contracts to a subset of potential sellers in exchange for a lower price.

The immediate question raised by this argument is of course: What other non-cartel explanations for collective contracting are possible? In monopolistic competitive markets, and markets for health-care services in particular, there are several. First, the frictions that give rise to the monopolistically competitive market structure may be represented as search costs, in a model of consumer search, rather than travel costs. This hypothesis would yield even stronger efficiency conclusions: The savings in lower prices or total fixed costs under exclusivity do not come at the cost of less product variety in a search theory. And the externality imposed on outside consumers could be positive, instead of negative: To the extent that marginal costs are declining, the higher volumes for individual sellers promoted by the agreements can lower prices faced even by the outsiders. In this sense, our positive welfare conclusions are conservative.

Second, in the health care markets where buyer groups are often organized through group insurance, collective contracting may serve as a means of reducing moral hazard problems. One particular moral hazard problem is that an insured consumer does not care about the price paid for medical services and therefore searches inefficiently (if at all) for lower prices. Where the insurance firm itself searches, or vertically integrates into the provision of services, the moral hazard problem is resolved (Frech 1988).

Third, collective contracting in insurance markets – group insurance in general – can be an efficient response to hidden information, or adverse selection. An insurance market that would "unravel" in a noncooperative equilibrium may be sustained if buyers offer a collective contract.

The buyer cartel hypothesis is that the buyer group is exerting monopsony power, to extract short-run quasi-rents or long-run rents from suppliers. This hypothesis can be difficult to distinguish from ours. In an important case (*Kartell* —see fn.2 *infra),* however, J. Breyer (now a member of the U.S. Supreme Court) ruled out this monopsony-cartel hypothesis. This case involved the health care buying group organized in Massachusetts by Blue Cross and Blue Shield. Part of the claim was that Blue Shield exercised monopsony power when it negotiated physicians fees for its clients below those paid by other patients not in the plan and forbid physicians to charge directly Blue Shield subscribers for any difference. J. Breyer cited the district court's finding that the supply of doctors in Massachusetts had "increased steadily during the past decade."[19] While our hypothesis alters the price/product-choice mix, it is consistent with growing numbers of physicians as population and wealth increases and medical technology changes through time.

[19] *Kartell*, 749 F2d, p. 927

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APPENDIX A

Proofs of Propositions

Proof of Proposition 1:

Refer to **Figure 1**. Any point on the $\hat{P}_I(n,1)$ line to the left of C can be implemented with an exclusivity contract. If $n^* < n_C$, then S is such a point. By definition, S is preferred to C.

Proof of Proposition 2:

Obvious from **Figure 1**.

Proof of Proposition 3:

"*For α 'sufficiently small,' requirements contract have $P_I =$ marginal cost and $n_I < n_C$*" (a corner solution).

Define $u^C = v(n_C) - P_C$. At $C \equiv (n_C, P_C)$, we know that:

$$\frac{dP}{dn}_{|u^C} = v'(n_C)$$

and

$$\frac{dP}{dn}_{|\pi=0} = f$$

As illustrated in **Figure 1**, at C,

$$v'(n_C) < f$$

Consider a requirements contract where the inside group is arbitrarily small, i.e., $\alpha = \epsilon > 0$. We know that

$$\frac{d\hat{P}_I}{dn} = \frac{1}{\epsilon}\left[f - (1-\epsilon)P_O'(n)\right]$$

At n_C and $P_I = 0$,

$$\frac{d\hat{P}_I}{dn}_{|P_I=0,\ n_C} = \frac{1}{\epsilon}\left[f - (1-\epsilon)P_O'(n_C)\right]$$

The requirements contract for ϵ sufficiently small is given by the 'corner condition'

$$\frac{dP}{dn}_{|u^C} = v'(n_C) < f < \frac{1}{\epsilon}\left[f - (1-\epsilon)P_O'(n_C)\right] = \frac{d\hat{P}_I}{dn}_{|P_I=0,\ n_C}$$

The requirements contract for ϵ sufficiently small is $(n_C, 0)$.

The requirements contract for $n_I = n^*$ has P_I =marginal cost. Consider the following: At S, by definition, we know that

$$v'(n^*) = f$$

At n^* and $P_I = 0$ and with zero profits, we know that

$$\frac{d\hat{P}_I}{dn}_{|P_I=0,\ n^*} = \frac{1}{\alpha}\left[f - (1-\epsilon)P_O'(n^*)\right]$$

so that the requirements contract continues to yield a corner condition given by

$$\frac{dP}{dn}_{|u^*} = v'(n^*) = f < \frac{1}{\alpha}\left[f - (1-\epsilon)P_O'(n^*)\right]$$

where $u^* = v(n^*) - P^*$.

"*For α sufficiently large, requirements contracts have $P_I >$ marginal cost and $n_I < n_C$.*" To the left of S at the intersection of the zero profit constraint and the indifference curve corresponding to a level of utility $u^1 < u^*$,

$$\frac{dP}{dn}_{|u^1} = v'(n) > f$$

From the second order conditions, this implies that we can define a minimal $\underline{\alpha}$ so that the requirements contracts involve $P_I > 0$. The corresponding minimal size of the retail network is given by $\underline{n}$. That is for $\underline{\alpha}$

$$\frac{dP}{dn}_{|u^1} = v'(\underline{n}) = \frac{1}{\underline{\alpha}}\left[f - (1-\epsilon)P_O'(\underline{n})\right]$$

In sum, for $\alpha \ \epsilon\ (0, \underline{\alpha})$, requirements contracts are defined by

$$P_I = 0$$

and

$$nf = (1-\alpha)P_O(n)$$

This yields: "*In this region, n_I decreases as α increases.*"

$$\frac{dn}{d\alpha} = \frac{-P_O(n)}{f-(1-\alpha)P_O'(n)} < 0$$

This demonstrates that over the relevant portion of the α-expansion path, as α increases, P_I remains unchanged and n decreases.

For $\alpha \; \epsilon \; (\underline{\alpha}, 1]$, requirements contracts have $P_I > 0$. "*With concavity of $v(n)$ and $P_0(n)$, as α increases in this region, both P_I and n_I increase.*" To see this, consider the following: Substitute equation (2) into the utility function for inside consumers to derive:

$$\max_n \qquad \alpha v(n) - nf + (1-\alpha)\, P_O(n) \tag{4.1}$$

The first order condition is given by:

$$\alpha v' - f + (1-\alpha)\, P_O' = 0$$

With concavity of $v(n)$ and $P_0(n)$, comparative statics yields:

$$\frac{dn}{d\alpha} = \frac{-v' + P_O'}{\alpha v'' + (1-\alpha)\, P_O''} > 0$$

Differentiating equation (2) leads to:

$$\frac{d\hat{P}_I}{d\alpha} = \frac{1}{\alpha}\left\{ f\frac{dn}{d\alpha} + \left[P_O(n) - \hat{P}_I\right] - (1-\alpha)\, P_O' \frac{dn}{d\alpha} \right\} > 0$$

as $P_O(n) - \hat{P}_I > 0$ by virtue of the nature of the cross subsidy in the requirements equilibrium.

Finally, "t*he contractual P_I and n_I converge to the optimum S as α approaches* 1." Obvious from **Figure 3**.

APPENDIX B

Spatial Model: No Sunk Costs, Only Consumers Gain

Feasible Prices to the Inside Group

Under symmetry of firm location and open entry, the lowest feasible price for the inside group is the marginal cost of production (zero in this model). Solving equations (4) and (5) means that P_I is set according to:

$$P_I = \max\left\{\frac{nf - (1-\alpha)t/n}{\alpha}, 0\right\} \tag{4.2}$$

This maximum condition allows an interpretation. The first element represents the difference between total overheads for all retail outlets and the contribution by outsiders. If this is positive, the inside group must make some contribution to achiveve the desired level of retail outlets. This contribution permits the inside group to dictate actively the number of retail outlets. The second element represents the marginal costs of production and it is operative when the contribution from the outside group completely covers the overheads of the desired retail outlets. When this is so, the inside group bargains for a price equal to the marginal production costs associated with their consumption and accepts the density of retail outlets dictated by the size of the outside group, the ability of the retailers to set profit-maximizing prices against the outside group and the openness of entry. From equation (19), $P_I > 0 \Leftrightarrow n > \sqrt{1-\alpha} \cdot \sqrt{t/f}$.

Inside Consumer Maximization

To proceed, invoke the condition that $\hat{P}_I > 0$ and substitute $\hat{P}_I = nf/\alpha - [(1-\alpha)\,t/\,(\alpha n)]$ into the consumers' per unit surplus function. This yields the following problem for the inside consumer group:

$$\min_n \left[nf - (1-\alpha)\frac{t}{n} + \frac{\alpha t}{4n}\right]$$

$$= \min_n \left[nf + \frac{t(5\alpha - 4)}{4n} \right] \tag{4.3}$$

whose solution yields:

$$\hat{n} = .5\sqrt{\frac{(5\alpha - 4)t}{f}} \tag{4.4}$$

Inspection of the solution value $\hat{n}$ reveals that $\hat{n}$ is real provided $\alpha > .8$. The next question is to ascertain the condition under which the solution value $\hat{n}$ yields $\hat{P}_I > 0$. Substitution of $\hat{n}$ into the (residual) expression for P_I yields:

$$\hat{P}_I = \sqrt{\frac{tf}{5\alpha - 4}} \cdot \frac{(9\alpha - 8)}{2\alpha} > 0 \Leftrightarrow \alpha > \frac{8}{9} = .89 \tag{4.5}$$

These results may be summarized as follows: When $\alpha > .89 (> .8)$, the solution pair is $(\hat{P}_I, \hat{n})$.

When $\alpha < .89$, the inside group makes no contribution to overheads and therefore must accept whatever retail density is dictated by the contributions to the retail sector of the outside group. The relevant solution pair then is $(P_I^\star, n^\star)$, where

$$P_I^\star = 0 \tag{4.6}$$

and

$$n^\star = \sqrt{\frac{(1 - \alpha)\, t}{f}} \tag{4.7}$$

Inspection of equations (21) and (24) reveals that $\partial \hat{n} / \partial \alpha > 0$, $\partial^2 \hat{n} / \partial \alpha^2 < 0$, $\partial n^* / \partial \alpha < 0$, and $\partial^2 n^* / \partial \alpha^2 > 0$. These results confirm the α-expansion path illustrated in **Figure 3.**

APPENDIX C
WELFARE EFFECTS OF CONTRACTS

1. Slope of B

From equation (15), the slope of the curve B is given by

$$\frac{d\overline{\alpha}}{dk} = (1-\overline{\alpha})\left(\frac{kP_O'}{P_O\,(kn_C)} - 1\right) < 0$$

2. Section of Figure 4 above the curve B (no outside firms):

This is solved in the text.

3. Section of Figure 4 below the curve B (outside firms):

The equilibrium number of outside firms is determined by the zero profit condition (euqation (15) in the text).

$$(1-\alpha)\,\frac{P_O(kn_C+n_O)}{kn_C+n_O} - f = 0$$

We may solve this for the equilibrium number of firms

$$n_O = N_O\,(k,\alpha)$$

where

$$\frac{\partial n_O}{\partial k} = -n_C < 0 \text{ and } \frac{\partial n_O}{\partial \alpha} < 0$$

From equation (22), set $\triangle\tilde{W} = 0$ and solve for the curve C. Setting $\triangle\tilde{W} = 0$ yields at $n_0 = N_O\,(k,\alpha)$

$$av(kn_C) + (1-\alpha)\,v(kn_C+n_O) - v(n_C) = f(kn_C+n_O-n_C)$$

The slope of the curve is given by

$$\frac{d\alpha}{dk}_{|C} = \frac{-\alpha v'(kn_C)n_C}{[v(kn_C) - v(kn_C+n_O] + [(1-\alpha)\,v'(kn_C+n_O) - f]\,\partial n_O/\partial\alpha}$$

The first term in square brackets in the denominator is the direct effect: the inside consumer group's product variety is less than that of the outside group as the outside group can purchase from outside firms and so this term is negative. The second term is the indirect effect: as the inside group increases in size, the number of outside firms falls $(\partial n_O/\partial\alpha < 0)$ and the net impact to maintain welfare indifference is weighted by the difference between the outside groups' marginal loss of product variety less the savings in fixed costs from fewer outside firms $\left[(1-\alpha)\, v'(kn_C + n_O) - f\right]$. Whatever the impact of the indirect effect, it is reasonable to assert that direct effect dominates and so the curve C is shown as upward sloping in **Figure 4**. As α increases, enhancing the ranks of those with restricted product choice, welfare indifference requires that a higher proportion of firms be included in the inside group to enhance product variety. The indirect effect says that as α grows, the zero-profit condition will restrict further the enhanced product variety available to outside consumers. In **Figure 4,** the C curve starts on the horizontal axis at $\tilde{k}_1$ because when $\alpha = 0$, there are no private beneficiaries from the externality.

FIGURE 1
THE NONCOOPERATIVE EQUILIBRIUM MAY INVOLVE
TOO MANY FIRMS

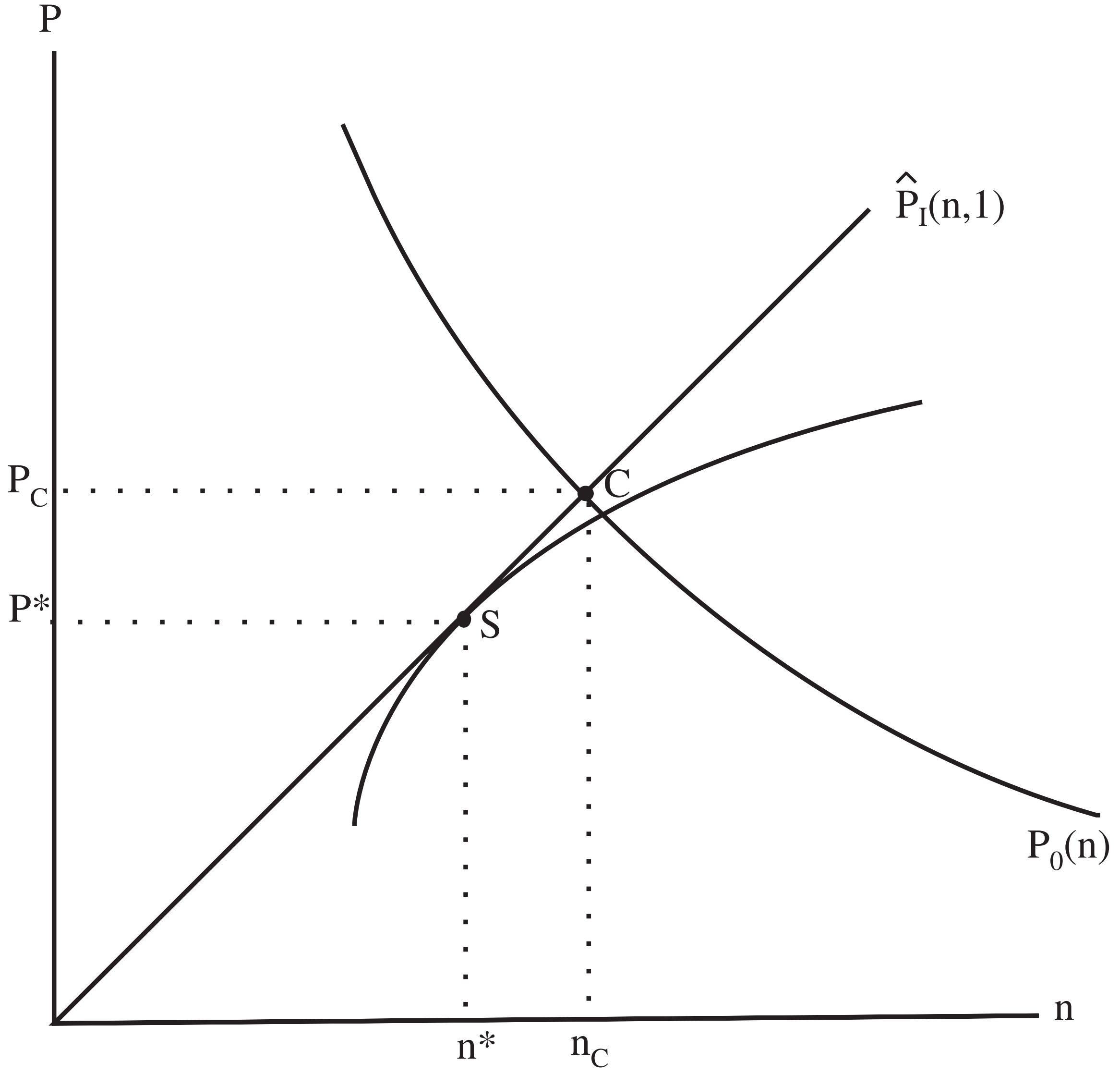

FIGURE 2
THE OPTIMAL CONTRACT WHEN $\alpha < 1$

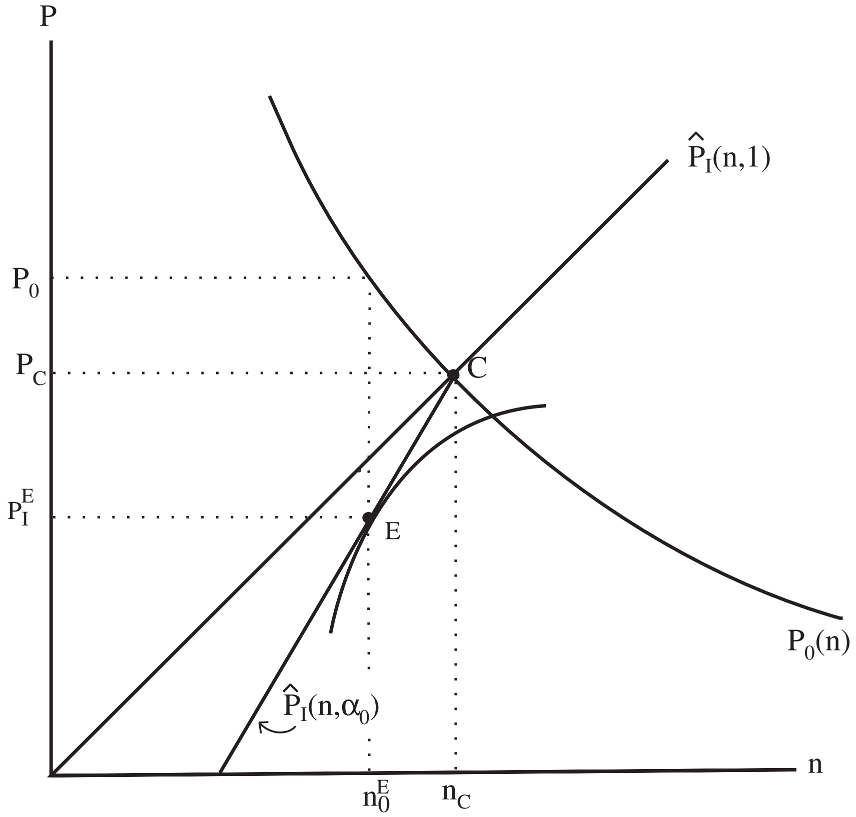

FIGURE 3
OPTIMAL CONTRACTS AS α INCREASES

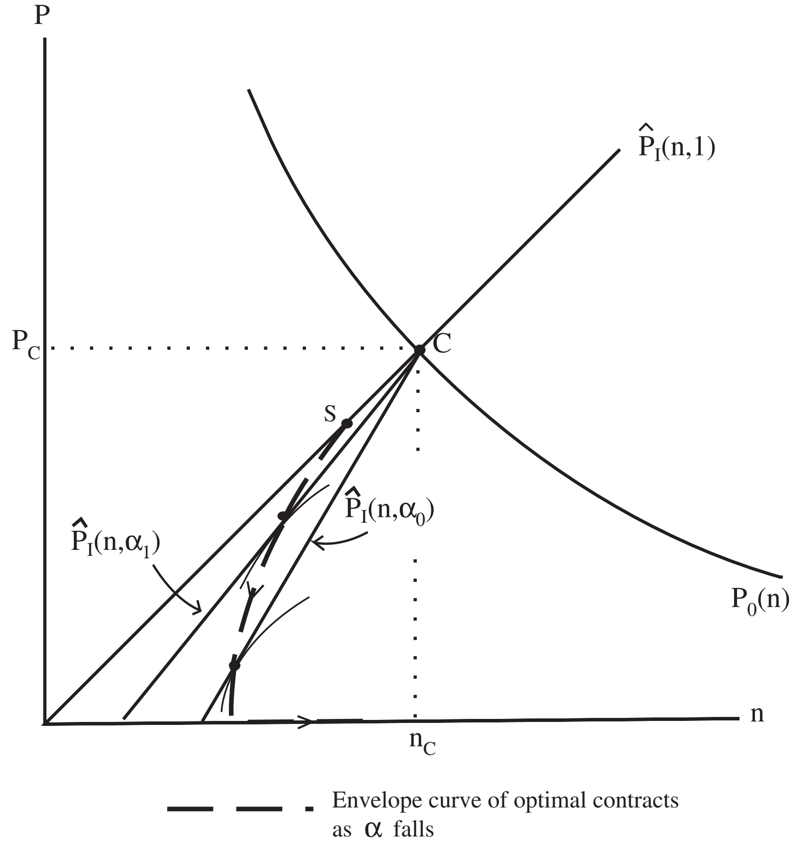

FIGURE 4
THE WELFARE EFFECTS OF COLLECTIVE CONTRACTS
WITH EXOGENOUS BUYER AND SELLER COALITIONS