FORMS OF COMPETITION AND CONTRACTING IN THE PRIVATE MARKETING OF COLLECTIVE GOODS

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*I am grateful to Professors Tom Borcherding and Harold Demsetz for their clear reactions to the first draft of this paper, the main goal of which was to move towards a meeting of minds on the efficiency of the free-market provision of collective goods under various market structures. Regarding subsequently developed empirical applications in this paper, I am greatly indebted to Armen Alchian, Ben Klein, John Peterman, Steve Shmanske, and Ben Yu, each for his long hours of discussion with me on the peculiar nature of the contracts appearing in observed markets for collective goods. Research support from the Foundation for Research in Economics and Education is gratefully acknowledged.

INTRODUCTION

A. Outline of the paper. In a recent paper, Professor Thomas Borcherding claims to produce a "counterexample" that "refutes" a theorem of mine on the oversupply of privately produced collective goods under perfectly competitive conditions (1968, 1969). While his argument explicitly violates a condition of the theorem (the Cournot assumption) and therefore is not, logically speaking, a counterexample, the alternative pricing contracts that form the basis of Borcherding's critique are well worth discussing. For showing why his "complex contracts," or fixed-price commitments, by sellers of collective goods cannot arise in a perfectly competitive model, as we do in section I of this paper, requires a heretofore missing specification of the microdynamics underlying the model. Borcherding's fixed-price, Lindahl-type model is seen to imply buyer cooperation, or monopsony purchase of the collective good. Monopsonistic cooperation is similarly found in the related, also allegedly competitive, collective-goods analyses of Demsetz (1970) and Cheung. Section I ends by applying this microdynamic pricing model to the explanation of the empirical observation that long-term, fixed-price commitments arise under buyer cooperation but not under buyer competition in the wire-service industry, the observed industry that we believe most closely approximates a perfectly competitive, perishable-collective-good industry.

Section II of this paper relaxes the informational perfection assumptions of the perfectly competitive, microdynamic model. First, we allow a sequence of separate, independent sales of related, durable, collective goods over time. Here we find a quasi-competitive environment in which fixed-price commitments <u>are</u> rational contracting solutions. But the commitments serve only to reduce--they cannot eliminate--the competitive oversupply of these substitutable collective goods. This multiperiod generalization indicates a greater robustness of my original welfare results than heretofore indicated and leads us into an empirical application of the theory to the observed market for technical innovations. As in the single-period, wire-service case, fixed-price and variable-price contracts arise according to the predictions of our micro-dynamic theory, and tendencies toward the overproduction of collective-good substitutes are detected. Also, quite topically, the related, competitive underproduction of private-good complements to collective-good inputs expected to be marketed in the future translates into unqualified support for "Atari mercantilism," the subsidization of overall investment in an industry according to the industry's prospective rate of technical progress.

A second kind of weakening of the conditions of the perfectly competitive microdynamic model leading to fixed current prices to the buyers is obtained by not allowing firms to observe one another's price offers or quantities sold. This, relatively crude, Bertrand-type, market information structure also yields analogous forces toward the competitive overvaluation of collective-good substitutes: First, if, as in numerous Lindahlian models (e.g., Arrow, Foley, Mas Colell and Milleron), sellers somehow knew *a priori* each buyer's current solution marginal valuations, and somehow were lead to price at these levels, then a strictly analogous overvaluation of *current* substitutes to *future* collective goods would remain. [More basically, even in a single period world, rational prices under this perfect a *priori* information structure can never be efficient Lindahlian prices (see Section II of the Appendix.)] Second, when, as in the several existing collective-good models with imperfect price discrimination (e.g., Steiner, Owen et al., and Brito-Oakland), the more realistically informed sellers simply present all potential buyers with a single, untailored, imperfectly discriminatory, fixed-price schedule, an analogous force toward the overvaluation of all collective goods emerges in that expanding sellers of collective goods benefit from the induced changes in the *quantities* sold by the price-passive producers of related collective-goods. That the latter overproduction tendency exists in the real world is a common observation among students of broadcasting, where this generalized model most obviously applies. The model is also applied more broadly to the ubiquitous markets for the information services provided by private-goods retailers, brokers, and dealers. As in the other cases, our results serve to rationalize existing statutes providing incomplete exclusion rights to private providers of information.

A third generalization of the basic model leading to collective-good prices that are fixed to individual buyers is achieved by dropping the conventional assumption that any collective-good seller with an exclusion device is successful in winning each of his microeconomic bilateral monopolies with his several buyers. Losing sellers must create special contracting procedures such as the granting of market-restricting, exclusive distribution rights in order to obtain significantly positive prices from their winning buyers. Observed sellers do in fact grant these peculiarly restrictive rights in the only collective-goods market we could find in which buyers evidently win their bilateral monopolies, the wholesale market for mass-media entertainment and education products.

Finally, in Section III, the concluding section of the paper, our basic economic analysis is extended to worlds without collective goods. Here too, while fixed-price commitments sometimes arise to rationally reduce the private-good analogue to my various collective-good misevaluations, important, seemingly unjustifiable, statutory interventions have evolved to reduce the remaining, substantial inefficiencies.

B. Introductory example. The clarity of our discussion of perfectly competitive microdynamics in Section I will be enhanced by sometimes tying it to the following, illustrative economic environment: Suppose there are three possible wire services, each capable of delivering a continuous stream of news, a collective good. The quantity (quality) produced by the i^{th} wire service is denoted by Q_i. The sum of the real values of an additional unit of any service, say wire service #1, to all potential users, Σ MRS $(Q_1, Q_2 + Q_3)$, relative to a numeraire private good (say apples) declines with the previous quantity supplied of the service, Q_1, for any given total supply of the other wire services, $Q_2 + Q_3$, as shown in the following table.

Table 1.

Σ MRS (Q_1, $Q_2 + Q_3$)

Q_1 \ $Q_2 + Q_3$	0	1	2
0	100	90	80
1	90	80	70
2	80	70	60

The matrix is symmetric in order to reflect an assumption of interchangeability of wire-service units provided by different suppliers. The wire services are substitutes in that larger values of $Q_2 + Q_3$ uniformly reduce Σ MRS for given Q_1. (Σ MRS would increase with $Q_1 + Q_2$ for complements, which would in turn force Σ MRS to increase with Q_1 in order to maintain a symmetric matrix and interchangeability among different wire-service units.) The seller of any wire service is a natural monopolist over his unique product. So, giving him the bargaining edge over his several buyers, we can assume that he price-discriminates perfectly among his users. Thus, when $Q_2 + Q_3 = 0$, the marginal revenue function of the first wire service is Σ MRS(Q_1,0).

Say the cost of producing a single unit of a wire service to any supplier is 89 apples, while the additional cost involved in producing a second unit of that service is 91 apples. Then, in the absence of a competition, the first wire service would maximize profits by producing one unit of its service for a price-sum, P(0,0) = Σ MRS(0,0), or 100 apples. The social surplus from doing so is 11 apples. An additional apple of social surplus would be produced if another firm entered and produced one unit of wire service. And there is certainly profit to entry, as the price-sum available to an additional supplier is at least 90 apples, while his cost is only 89 apples. We say "at least" because actually he will receive much more than 90 apples. Subscribers to a unit of his wire service also gain from price reductions from the first wire service. The use-value of the first unit, which was 100 apples, is now only 90. So the discriminated-against users gain from the availability of a second wire service through price reductions on the first wire service. But since the first wire service similarly gains from the presence of the second in that subscriptions to the first wire service also serve to lower the prices paid for the second, the price-sum of the first wire service will not fall with entry by the full, 10-apple decrease in real service-value. To compute the new price-sum to the first wire service, note that it is also the price-sum to the second wire service, since they are providing interchangeable services. Therefore,

$$\begin{aligned} P(0,1) &= \Sigma\ MRS(0,1) + [P(0,0) - P(0,1)] \\ &= \Sigma\ MRS(0,1) + [\Sigma\ MRS(0,0) - P(0,1)] \\ &= \frac{\Sigma\ MRS(0,0) + \Sigma\ MRS(0,1)}{2} = 95 \text{ apples.} \end{aligned}$$

The entry of the second firm is therefore highly privately profitable, although it is barely socially profitable, generating an increased social surplus of only one apple but profit to the entrant of six apples. A further entrant is definitely not in the social interest. The marginal social value of his product, Σ MRS(0,2), would be only 80, while his costs would be 89. His entry would reduce the aggregate social surplus from the wire-service industry from 12 to 3 apples. But the price with three independent wire services is

$$\begin{aligned} P(0,2) &= \Sigma\ MRS(0,2) + 2[P(0,1)] - P(0,2)] \\ &= \Sigma\ MRS(0,2) + 2\left(\frac{\Sigma\ MRS(0,0) + \Sigma\ MRS(0,1)}{2}\right) - 2P(0,2) \\ &= \frac{\Sigma\ MRS(0,0) + \Sigma\ MRS(0,1) + \Sigma\ MRS(0,2)}{3} = 90 \text{ apples.} \end{aligned}$$

So the third independent wire service will enter, driving industry profits to a minimal, <u>competitive-equilibrium</u>, level of one apple per producer.

The source of the competitive misallocation is an internalization of pecuniary effects that appear in marketing collective goods: Since buyers always pay their demand prices to a seller of a given collective good, they receive pecuniary benefits from purchasing substitutes, benefits that come at the expense of the collective-good seller but cannot be made the basis of contractual compensation to the seller without implying a cooperative interaction, or "collusion," against the sellers of substitutes.

A strictly analogous pecuniary internality induces a competitive underpurchase of complementary collective goods. One producer's collective good then serves to <u>increase</u> the prices the buyers must pay for complementary collective goods and is therefore <u>undervalued</u> by the buyers. As emphasized in my 1968 paper, this introduces the theoretical possibility of dramatically inefficient, infant-industry traps in the competitive production of complementary collective factors. As was also pointed out, since previously purchased, <u>private-good</u> complements to collective goods are similarly undervalued while previously purchased, <u>private-good</u> substitutes are overvalued, the standard theory of value <u>between ordinary private goods</u> must be replaced once we recognize the existence of future, privately marketed, collective goods.

I. THE IRRATIONALITY OF FIXED-PRICE CONTRACTS IN THE PERFECTLY COMPETITIVE MARKETING OF COLLECTIVE GOODS

<u>A. Borcherding's argument</u>. Borcherding first notes, correctly, that my competitive overvaluation-of-collective-goods result occurs because the purchase of a given seller's unit of a

collective good lowers the prices that the buyer must pay to other sellers of the collective good. He then argues, also correctly, that the consequent overpricing of collective goods implies abnormally high buyer incentives to seek out contractual forms that will change the solution. But, given the informational limitations implied by a competitive environment, will such contractual forms be available?

Borcherding argues that they will be. In particular, he argues that each buyer can induce all of his suppliers to individually commit themselves to a fixed price, independent of the buyer's other purchases. Any such price commitment benefits the buyer in that he can use it to reduce his purchases from other sellers without suffering a price increase from the now-committed seller, increases such as this one being responsible for his initial overvaluation and overpurchase of the collective good. The fixed-price-committing sellers, Borcherding argues, are not hurt by offering these "complex" contracts, because the sellers receive essentially the same price with or without the price commitment.

B. Borcherding's error: The microdynamics of competitive pricing. However, since the buyer's purpose in obtaining these fixed-price agreements is to reduce his purchases from other, competing producers without suffering price increases from the committed producers, such agreements cannot be in the interests of a producer once we apply the Cournot assumption that he cannot influence the quantities sold of the other producers. Competitive counterbidding for the smaller market by the threatened producers would merely lower all prices and unambiguously damage the initiating producers. Therefore, given this ordinary, competitive bidding for contracts, a rational decision to offer fixed-price contracts implies an ability of the customers to induce substantial reductions in production by some of their suppliers, an ability requiring non-Cournovian, collusive, buyer agreements.

To show this in a more concrete environment, we now impose Borcherding's "complex" contracting procedure on our illustrative example. Starting from our overproduction equilibrium, suppose a wire service offered--say to a buyer with $MRS(0,2) = \frac{1}{10} \Sigma MRS(0,2)$ and therefore an initial price of 9 apples--a new, fixed-price commitment--say initially at 9 1/2 apples--regardless of the buyer's actual demand price and therefore of his quantities purchased from the second and third wire services. If neither of these other wire services responded with price commitments of their own, the buyer would accept the offer and his demand price for either one of their flexibly priced services would fall to

$$P = MRS(0,2) + \frac{MRS(0,1) + MRS(0,2)}{2} - P = 8\ 1/4 \text{ apples.}$$

An <u>additional</u> fixed-price commitment by either of these two would restore its demand price to $MRS(0,2) + [MRS(0,2) - MRS(1,2)] = 9$ apples if the third did not add a fixed-price commitment of its own, in which case the third would be left with a demand price of only $MRS(0,2) = 8$ apples. But the third would then obviously gain by undercutting its aggressive competitors with counteroffers of fixed-price commitments of its own in order to replace the competitors. With both competitors offering fixed-price commitments, the third is willing to go as low as 8 apples in order to replace one of the competitors. This would make the second offer of a fixed-price commitment strictly unprofitable. So, anticipating this rational reaction, neither the second nor the third wire service would add a fixed-price commitment to the first. It would still, however, pay both of the two victims to counteroffer with a fixed-price commitment as low as 8 1/4 apples in order to replace the first. Anticipating such rational counteroffers, the first price-committer would have to drop his fixed-price offer to a self-defeating level of at most 8 1/4 apples. (If, alternatively, the first seller offered a contract of the form: "If you will pay me a side payment of, say, an apple and a half, I will offer you a fixed-price commitment," then the others would end up countering with less burdensome side payments until the total maximum price of 8 1/4 apples to any seller initiating a fixed-price after would remain.) Therefore, in view of ensuing counteroffers, no rational firm employs fixed-price commitments.[1]

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[1] This is in stark contrast to a competitive market for private goods, where having a high-demand buyer pay out his total user surplus to a particular, perfectly discriminating seller is not an equilibrium because another seller will--for a small fixed fee--profitably offer a lower price to the customer even though the initially discriminating seller employs a successful counteroffer to retain the customers. As we have seen, a collective-good seller providing a high-demand buyer with an analogous favor is being self-destructive because the ensuing rational counteroffers by the damaged competitors correspondingly shrinks the market for (footnote continued)

Summarizing the resulting, prefectly competitive, micro-dynamic transaction process: sellers, after independently producing their distinct but interchangeable collective-good outputs, offer them up for sale through an observable sequence of flexible, recontractable, price offers, the sellers being pre-committed only to receiving the maximum possible payment from each buyer given the symmetrically determined price offers of the other sellers. Buyers then accept all such offers, conditional only upon their not receiving superior offers. Buyers of course, recognize that their refusal to deal with any subset of the sellers will result in a correspondingly higher price from the remaining, informed, recontracting sellers. An equilibrium occurs when prices are such that, sellers have no incentive to change their offers in view of the issuing, rational counteroffers.

Now, if counteroffers were somehow infeasible--say because buyers could practically precommit to a certain seller to reject more favorable counteroffers--fixed-price commitments would become profitable. In our wire service example, a favored seller would receive, say, an extra apple and a half from such a buyer, and his

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(footnote continues)

the price-cutter's own output. Thus, while commitments to narrowly irrational, predatory reactions to suppliers who offer price breaks to high-priced customers are required for perfectly discriminating, cooperative pricing of private goods (Thompson-Faith 1981), no such predatory commitments are required to effect the punishment of collective-good suppliers offering analogous price breaks. The latter suppliers are punished by the simple, uncommitted, noncooperative reactions of damaged competitors.

variable price would be down to eight apples. However, the buyer and his formed seller would jointly benefit even more from a price function whose variable component increased with his purchases of related collective goods. Such a price function would lower the prices he pays to other sellers even more than would a fixed-price contract. As the theoretically optimal price function would then be one enabling the buyer to purchase all of the other collective goods at their respective supply prices to the buyer, the existence of several such buyers would eliminate the possible surplus of all other suppliers, leaving us with a monopoly-monopsony solution. We shall discuss this case again in our empirical applications of Section II, where it will be generally realistic to rule out the counteroffers that form the basis of a perfectly competitive process.

Taking this a step further, if each of many, independent, collective-good buyers could practically establish a complete, prior, bargaining commitment over a given seller, the seller would not have entered the industry. A viable producer-seller of collective goods must make prior bargaining commitments when there are a large number of independent buyers; without such commitments, the sellers would receive no substantial revenue. A plausible model exists to determine when the sellers will win their contacts with the buyers to make prior bargaining commitments: Suppose the total sales of every collective-good producer-seller exceeded the total collective-good purchases of each of his buyers. Then, each seller's return to devoting the overhead resources necessary to make a prior commitment to charging his buyers their demand prices would exceed the return to any buyer to incurring the overhead cost necessary to make a prior commitment to pay only the producers' supply prices to him, and a simple bargaining model (e.g., Thompson-Faith 1979) would have each producer-seller of a collective good large enough to win his bargaining contest with every one of his individual buyers. Therefore, given such a bargaining model, as long as there are many independent buyers, the number of active, competitive sellers can always be reduced to where each will find it profitable to establish a prior bargaining commitment and generate our competitive equilibrium.

However, when there are only a few, independent, pre-established buyers purchasing from a comparatively large number of competing sellers, the above bargaining discussion would lead us to assume that the buyers would win their separate, microeconomic, bilateral monopolies with their collective-good suppliers. An analysis of rational seller responses to such a situation is developed in section IID.

C. An alternative one-period microstructure. The Lindahlian models of collective-goods allocation of several mathematical economists (e.g., Arrow, Foley, Mas Colell, and Milleron) implicitly give sellers no ability to observe the actual price offers or sales of the other sellers but still, somehow, perfect *a priori* knowledge of each buyer's solution marginal value. Such worlds--which obviously violate the condition for perfect competition allowing sellers to directly observe the price offers and sales of rival sellers--have price offers that are necessarily invariant to the buyer's actual behavior. So a fixed-price, Lindahlian solution would be conceptually admissible.[2] However, the Lindahlian ideal is still not generally possible as a rational decentralized, pricing solution: regarding factor markets, fixed prices for collective-good inputs obviously create uniformly decreasing average costs to the firms in a standard, neoclassical, production envirnonment; and tying collective-good-input prices to the marginal products of these inputs creates analogous problems in all but rare technologies (Thompson 1968, pp. 9-10.) More generally, no pure-strategy collective-good pricing solution can ever exist when the completely informed, simultaneously price-setting sellers set their prices in a rational, perfectly discriminatory fashion rather than according to arbitrary, Lindahlian rules. (See Sec. II of the appendix below). Fortunately, these severe existence problems are empirically irrelevant because the underlying information structure is wholly inappropriate to decentralized market analysis. If everyone knew the efficient-use-values a priori (i.e., without inferring them from the offers

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and transactions of others), there would be no point to a market mechanism or exclusion rights in the first place! Although we might want to admit such an extreme degree of informational perfection at only occasional points in time, we shall see that a temporal sequence of fixed-price equilibria--coinciding with the sequence we will derive in Section IIA-B under an assumption that the counteroffers used in the above microdynamic analysis are infeasible because future producers are not active in current markets--generates the same kind of overproduction of collective-good substitutes that arises in the one-period, perfectly competitive model. Restricting the environment to a single period, the realistically imperfect price-discrimination resulting from the inability of sellers to observe one another's behavior will be seen in Section IIC and the appendix to lead to an alternative force toward the unambiguous overproduction of collective-goods. For the remainder of Section I, we continue to assume perfect competition so that all sellers can observe and respond to one another's price offers.

D. The collusion implicit in Borcherding's type of Lindahlian equilibrium. Returning now to the assumption that the transactions of other sellers are observable, let us also adopt Borcherding's fixed-price contracts a priori, together with his conclusion that such pricing leads to an optimal, Lindahlian equilibrium under constant costs. So each customer pays a contractually fixed, collective-good price to each seller equal to his marginal use value for the good. Does the resulting

Lindahlian equilibrium pass any of the familiar, Stiglerian tests for the presence of a competitive, noncollusive interaction? First: If collusion were absent, a sanction-avoiding producer-seller and some buyers would not jointly gain by having the producer expand to above-equilibrium output levels. But in Borcherding's hypothesized Lindahlian equilibrium, an early seller and his customers would all gain by having the seller expand his output, selling the extra collective good at market prices plus small separate fees, because the lower the marginal use-values would enable the customers to pay correspondingly lower prices to later-transacting producers. Other producers would do the same, and an over-production equilibrium would emerge. But since we are maintaining Borcherding's hypothesized equilibrium, the side deals must be detectable <u>and</u> each consumer must be precommitted to refuse all such temptations. Such agreements require the same, extreme, enforcement conditions of effective cartels in that each party in a given trade, having an incentive to transact with <u>numerous third parties</u> in ways that vitiate the agreement, must have his outside transactions observed and disciplined.

A second Stiglerian test for the presence of a competitive equilibrium is the absence of any incentive toward noncontractual price changes. Borcherding's hypothesized equilibrium also fails this test. Each producer in his world gains by raising somewhat the noncontracted price of his product. That is, while Borcherding's buyers all have contracts assuring them of given nominal prices from the sellers, each seller has an incentive to threaten to cut off any buyer that refuses to pay a higher effective price. For if the buyer were cut off, he would have a higher marginal use-value for the collective good and therefore producer have to face still higher effective prices from all of the other sellers.

Summarizing, while perfectly competitive equilibria imply the absence of incentives toward production increases with side-deals and noncontractual price changes, the substitute, Lindahlian equilibrium described by Borcherding implies both of these incentives. Alternatively, relating the discussion back to our earlier, competitive-type assumption that the outputs of third parties are given, allowing conditional contracts so as to affect these outputs means dropping this basic Cournot assumption. The problem with Borcherding's attempt at an alternative model is that, having dropped my Cournot assumption, he did not replace it with an explicit, alternative interaction assumption and therefore did not see the collusive interaction implicit in his Lindahlian conclusion.[3]

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[3] Borcherding's failure to see that his price-function analysis was incomplete is apparently based on his implicit acceptance of a traditional economic methodology that argues, without any apparent theoretical discipline, what "competitive price functions should look like." While I was overly indirect in indicating the need for a model determining competitive price functions for collective goods, all of the alternative derivations of my competitive-overproduction result of which I an aware [viz., those of Auster, Compton, and Heiner] have collective-good price functions that are developed from fairly well-specified interaction assumptions. Borcherding was apparently not aware of any of these interesting theoretical studies.

I agree with Borcherding's position that institutions such as his implicily cooperative one empirically evolve to amoliorate the inefficiences appearing in my competitive model. In fact, I used this hypothesis in my 1968 paper to rationalize governmental restrictions on the duration of patent rights. While we may disagree on how such cooperation usually works (in that I think it usually works through coercive, political processes, while he apparently believes that it works through voluntaristic, private behavior), my only objection to his theoretical argument is that he represents his private, voluntaristic behavior as competitive even though it implies the extreme informational conditions of a model with costless monopsonistic cooperation.[4]

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[4] A question remains as to how Borcherding--who recognized that he was not using a Cournot assumption and that his buyer-seller contracts implied incentives toward the monopsonistic under-purchase of inputs into the production of collective goods in the increasing-cost case--was able to convince himself that his contracting was of a competitive variety. My best answer is that he felt that while his world might not be thoroughly competitive, my world was <u>even less</u> competitive than his. Evidence for this hypothesis is that his critique emphasizes my 1969 restatement and generalization of the model, in which I analyzed the micro-economics of the buyer-seller relationship for collective goods as a bilateral monopoly relationship. But he fails to note that this microeconomic bilateral monopoly is a natural one that necessarily applies to <u>any</u> world--including his own--in which collective goods are privately sold and that the familiar competition-versus-collusion distinction arises at a less microeconomic level, where the issue is whether or not there are many contractually independent transactors on each side of the market. Additional evidence that Borcherding felt that my model was not competitive is his erroneous remark that the model "describes the behavior of an open but perfectly price discriminating cartel." While discriminatory pricing for a <u>private good</u> requires suppliers of the good to form a cartel, discriminatory pricing for a <u>collective good</u> does not; the price-discriminating suppliers of a <u>collective good</u> may be independent competitors. Subsequent comments by Professor Borcherding have confirmed the above conjectures on his initial views of my model.

Others have made the same slip.

E. The Demsetz-Borcherding-Cheung model. Professor Demsetz' argument for price constancy for collective goods (1970) is essentially that "competition-for-a-market" (Demsetz 1968) applies at all subequilibrium outputs of a collective good, so that homogeneous producers must sell all subequilibrium outputs at prices that yield them zero profits. While (as argued in my 1973 "Comment") such a procedure implies indeterminate competitive outputs, the indeterminacy obviously disappears under cooperative, monopsonistic purchasing of the collective good. Moreover--and I had not recognized this in writing my comment--any "competition-for-the-market" argument requires cooperative, monopsonistic purchasing. All buyers must agree on a contract before a supplier enters the industry under "competition for a market." Buyer cooperation is implicit. That is, a private-supply contract allowing Demsetz' "competition for a market" is conditional on the transactions of third parties, as it in essence reads: "I will supply you the collective good at the specified price if all other buyers agree to buy at their specified prices." The buying group thus becomes a unanimity-based, monopsonistic cooperative. Borcherding accepts this part of Demsetz' analysis, giving further evidence of his willingness to label a collusive buying arrangement "competitive."[5]

There is a parallel to the work of Borcherding and Demsetz in a recent paper by Cheung, who imposes a "competition-for-the-market," constant-cost paradigm in a model of the competitive supply of technical innovations without noting that buyer collusion is implied. Section II of this paper will outline a more competitive model of the observed market for technical innovations.

What has led so many of our best-trained price theorists to illogically use perfect Lindahlian pricing to represent "competitive" solutions is probably their strong a priori belief that perfectly competitive, private-property institutions always yield Pareto-optimal solutions. However, as pointed out in footnote 2 above, even if its underlying price constancies were justifiable, the Lindahlian "ideal" would inevitably yield decreasing costs and a breakdown of competition once we attempt to apply this

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[5] He criticizes Demsetz only for adopting a Lindahlian price distribution between the buyers without recognizing the general indeterminacy of the price distribution under "competition-for-the-market." The same criticism also works against Borcherding's own, general case, which includes increasing costs. In this case, Borcherding jumps to contracts that allow different prices to different producers and joint cooperation between all producers and consumers in order to avoid monopsony underpurchase. In this framework, his price functions also become indeterminate and his differences with Demsetz amount to a mere family squabble. They both represent a somewhat indeterminate form of cooperation as a "competitive" institution and differ only in the contracts that they impose in order to secure cooperation.

"ideal" pricing system to collective-good input markets. Moreover, once a sequence of trading dates and some degree of intertemporal substitutability between the purchases at different dates is permitted, the Lindahlian buyers of Borcherding, Demsetz, and Cheung (like those of Arrow, Foley, Mas Colell, and Milleron) would still pay more than their current use-values for the good because more current usage lowers future use-values, and therefore future prices, for the collective good.

Before going on to develop the latter point in the more general environment of section II, we should illustrate how the central theoretical analysis developed in this section applies to a real-world collective-good market.

F. An empirical application. The industry probably best approximating the conditions employed in the above, one-period model is the actual wire-service industry. Only here do we find both perishable outputs (so that single-period analysis suffices) and many buyers facing individually tailored, personally discriminatory prices. Also, since most major media distributors purchase from essentially all wire services and the number of wire services is small compared to the number of these purchasers (Sobel-Emery), wire services can be expected to win each of their microeonomic bilateral monopolies with the individual media distributors. Now, corresponding to our theoretical results, almost every real-world wire service is marketed through flexible pricing rather than through long-term, fixed-price commitments. And lower demand-prices via lower circulation or a greater availability of substitute news-sources commonly lower the prices that a distributor pays to a wire service (Rosewater, pp. 170-80, 328; Grambling, Morris, and Shmanske). The notable exception since the early 1900's has been the largest wire-service producer, the Associated Press (AP), which bases its prices to newspapers on a formula that fixes long-term charges independently of actual circulation and the amounts of competing wire services purchased. The AP price to a given newspaper, being based solely on an estimate of the paper's potential, rather than actual, news demand, is unique in not inefficiently inducing the purchasing newspaper to reduce its prior operating scale and expand its purchases of substitute news-sources so as to lower its payments to the wire service. Since the AP is also unique in that it is a monopsonistic association of existing newspaper publishers, a possible explanation for these fixed-price contracts is Borcherding's prevention of my collective-good over-valuation incentives. However, as noted above, if the buying newspapers were using a prior price commitment simply to lower the prices of related wire services, the newspapers and committing wire service would jointly benefit even more from a price function that increased as a newspapers's use of other news-sources, and therefore its circulation, increased. Other motivations must be present to explain the AP's fixed-price commitment. We have also noted that fixed-price contracts set up an artificial, anticompetitive, economy of scale. This independently benefits established newspapers by helping them to discourage entry and maintain their local monopolies. The AP's fixed-price contracts can apparently can be rationalized only by recognizing this special advantage to the established newspapers of a fixed, overhead charge for using their wire service.[6]

Besides the historical evidence that one of the chief advantages of purchases of extra wire services is the reduction in the prices the newspaper has to pay to competing, non-AP, wire services, relatively direct overvaluation evidence exists in the form of an abnormal stockpiling of regularly purchased, but never-used, news services by both TV broadcasters and newspapers. (See, respectively, Epstein, pp. 138 and 185, Rosewater, p. 180 and Villard.) Correspondingly, on the retail level, we find

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[6] Prior to 1945, the AP could, at some cost, collect discriminatory fees from new members and thereby partially collect for their losses in local monopoly power when admitting new, sufficiently-lower-cost, members. However, since the Supreme Court decision in U.S. v. A.P., 326, U.S. 1, 1945, new members have had to be admitted on the same terms as the old ones. The rational response of the AP, a cost-sharing, nonprofit cooperative, has been to disproportionately increase its fixed fee for its relatively inelastically demanded, morning news, thereby inducing local morning-news monopolies where previously they had admitted a few, sufficiently-low-cost, competitors by charging discriminatory entry fees. In effect then, ever since the development of the AP's fixed-price function in the early 1900's (Rosewater, pp. 320-27), there has been an artificially high incentive to establish locally monopolistic market structures even when more competitive structures are somewhat more efficient. Correspondingly, the dramatic post-World-War I trend toward regional newspaper monopolies (Rosse, Owen, and Dertouzos), and the post-World-War II trend toward morning monopolization, may well be the result of the above-described changes in AP pricing, as other sources of scale economies have probably been gradually diminishing due to a secularly decreasing cost of sharing overhead services (Owen).

graphic evidence of a much lower use-value of an incremental TV news program relative to other programs (analyzed in Section IIC below) in the relative similarities between the concurrent news program relative to other programs (analyzed in Section IIC below) in the relative similarities between the concurrent news broadcasts of the various TV stations (Lemert) as well as in the abnormally high degree to which the popularity of a typical TV news program is determined by the popularity of a typical TV news program is determined by the popularity of the preceding TV program (Epstein, pp. 94-95).

II. GENERALIZATIONS

A. The effect of sequential, independent marketing. Suppose now that durable collective goods are marketed at substantially different points in time. Then the convenient interchangeability assumption no longer applies. All we have is a set of related collective goods sequentially marketed by independent, perfectly discriminating monopolists. A succession of technical improvements, each sold in sequence by their independent inventors to all of the firms in a given industry, would be an empirical example of this case.

The assumption of independent, sequential marketing eliminates the competitive, offer-counteroffer interaction between the various sellers and thereby completely reverses our argument against price commitments.

Assume initially that the sucessively marketed collective goods are substitutes. Then, recalling the analysis of Section I.A., a buyer is better-off with a fixed-price commitment from a current seller in that it reduces his demand prices--and therefore his actual prices--for the outputs of other sellers. While any current seller offering a fixed-price commitment would end up worse-off under the perfectly competitive conditions described in section I.B. because of the induced counteroffers of his injured competitors, now the injured rivals, being future sellers, cannot respond with competing offers. Competitive bidding is now absent. So the current seller, being unchallanged by rival offers, can now receive higher prices from his buyers by offering them fixed-price commitments. Thus, permanent rights to use disembodied technical improvements are typically sold for single, current lump-sums, thereby eliminating the inefficient incentive of customers to overpurchase future substitutes in order to drive down the would-be payments to current innovators.[7] Although an additional improvement in the current seller's revenue is theoretically

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[7] While most real-world innovations are provided by salaried employees, who sell their disembodied innovation services to firms that retain, without further licensing, exclusive patent rights to their inventions, it should not be inferred that most innovations are not marketed as collective goods to many other firms. Many important innovations are diffused by having the original innovators or their associates move from firm to firm, spreading the technology by innovating around the previous patents. As the original innovators have a substantial comparative advantage at such activities, the previous patents provide them with a method of collecting close to the aggregate value of their innovation without being harrassed by duplicating imitators and without
(footnote continued)

achieveable through a price function that increases with the buyer's purchases of the future technologies of others, the extra transaction costs, including legal costs in view of U.S. v. United Shoe Machinery Corp. (U.S. Dist. Ct., 1953, 110 F Supp. 295), of such a monopolizing contract evidently seldom justify the return in the case of disembodied innovations.

The overvaluation of currently produced, substitutable collective-goods remains despite the presence of fixed-price commitments. The current producer-seller is still able to sell at a real price in excess of the buyer's real use-value of his product because having an extra current unit of the good will lower the buyer's future use-values, and thereby lower his future purchase prices, from all future sellers of substitutable collective goods. The same is true for the second seller, except

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(footnote continues)

involving the firms in expensive patent-right negotiations. This contrasts with the usual, Shumpeterian, free-rider theory designed to explain the widely observed diffusion of most major innovations despite the absence of patent license agreements in marketing these innovations (Mansfield et al.).

After selling his services to one firm, an innovator may or may not find it profitable to successively sell his idea to others. Since the innovator's potential charge to the first firm's competitors would be merely an overhead cost, diffusion would significantly reduce output prices. So the first firm is willing to pay a positive price to the innovator for staying and keeping his idea from spreading. However, assume a sufficiently minor innovation or sufficiently important firm-specific factors of the competitors that the aggregate output of the competitors would exceed the output of the first firm at post-diffusion output prices even if the competitors did not employ the new technology. Then, familiar Marshallian curves tell us that it would pay the innovators to reject the offer of the first firm and, in keeping with our competitive model, diffuse the innovation.

that the first seller has already made his deal, so that this particular price is not reduced. This continues until the last seller, if one exists, just receives the buyer's real use-values for the good. Thus, the firms to which any innovator sells are willing to pay too much for his innovation to the extent that having it lowers the sum of the prices that they will have to pay to subsequent innovators. This is perhaps empirically evinced by the observed buildup of unused patent inventories to the point that the observed excess capacity of unused patent rights is ordinarily many times larger than the excess capacity of other inputs (Gharrity and Taylor-Silberston).[8]

When the successively marketed collective goods are complements rather than substitutes, a buyer's current purchase of a fixed-price collective good will increase the prices he will have to pay to the suppliers of future, complementary collective goods. The buyer will, of course, pass on the future, pecuniary loss to the current seller, resulting in a tendency to undervalue currently produced complements to expected, future, collective-good outputs. However, the complex-contracting argument for fixed-price commitments does not extend to complements because

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[8] An obvious alternative hypothesis which may explain the inordinately large accumulation of "sleeping patents" is that the patents serve to preempt entry into monopolistic industries. However, such monopolizing accumulations are clearly illegal (e.g., Kobe, Inc. vs. Dempsey Pump 344 U.S. 837) and various empirical studies have shown that monopolization motives can explain at most only a small fraction of the observed accumulation of "sleeping patents (Gilbert).

fixed-price commitments from the current seller would generally induce buyers to pay higher prices to the future sellers of complements than they would without such a commitment. That is, since the noncommitted prices of the future services of a currently marketed, durable good would generally rise on the sale of later-marketed complements, a fixed-price commitment would generally rob the current buyer and seller of their implicit tax on the sales of future sellers. Nevertheless, a variable-price commitment serving to increase prices with the introduction of future complements, a commitment which ideally would give the initial traders the entire potential surplus from the sequence of collective-good outputs, remains privately superior to a variable, noncommitted price, which would now induce even higher future transaction costs because of the prospective multilateral bargaining problem arising under complementarity in the absence of a prior price commitment. Empirically, near-term, future complementarities occur mainly when the primary innovation must be embodied in new, durable, capital equipment. For such innovations, substitute innovations in the near future will not immediately lower the marginal physical product of the initial idea (substitute innovations serve only to hasten the obsolescence of the original machine) while complementary innovations (in the form of improvements on the original machine) will immediately raise the productivity of the initial idea. Correspondingly, for innovations embodied in new capital equipment, we commonly observe, rather than fixed-price commitments, patent license agreements in which royalty payments vary directly with the gross outputs of the new machinery. Contract payments thus, appropriately, increase as future improvements come along to increase the marginal product of the original idea, thereby serving the originally contracting parties by suitably lowering the expected prices that the buyer must pay to subsequent innovators.[9] And, as obsolescence nears and the productivity of the entire technology falls, royalty rates should fall, an effect reflected in the near-universality of regressive royalty rates (Joelson). Since each subsequent innovator in a sequence of complementary innovations has his product taxed by the initial innovator under these imperfectly monopolistic, royalty-as-a-percentage-of-output,

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[9] Innovators unable to costlessly convince customers of the usefulness of their inventions might also want to offer contracts making their royalty incomes dependent upon their customers' utilization rates in order to partially guarantee their technoglogies. Such inventors might want to offer such contracts even when future inventions are expected to be net substitutes for the technologies. Standard historical examples tied purchases of ordinary salt to patented salt machines, ink to patented mimeograph machines, motion picture film to patented cameras and computer cards to patented computers (Areeda). The usual rationale given for these "tie-in" sales (Burstein) is that they "meter" demand and hence facilitate price discrimination. However, without the inventor-incentive problem, tying royalties to <u>total buyer outputs</u> rather than complementary inputs would provide a privately superior, metered, pricing system in that the prices paid to future innovators of substitutes as well as complements would be reduced under these alternative contracts.

Under Section 3 of the Clayton Act, the above, "tie-in" sales are illegal. The rationale offered here, of course, is that tie-in sales contracts intensify the incentive to overproduce substitutable collective goods while the alternative contracts--which set royalties equal to fixed percentages of total outputs--appropriately reduce the incentives of potential inventors of substitute technologies but not of potential inventors of complementary technologies.

contracts, an undervaluation of some (viz., future) collective-good complements again appears. (The more complex issue of the efficiency of the valuation of initial complements is considered in the next subsection.) An obvious policy to prevent wholesale undervaluations of groups of subsequently produced, complementary collective goods is to suspend the antitrust laws and allow patent-pooling among the owners of the complementary patents. Such a policy is actually observed in the United States (Ellis).[10] (Unfortunately, the antitrust exemption is often extended to users of the technologies, whose collective incentive to improve is insignificant because of their competitive output interaction and who correspondingly write cross-licensing contracts containing

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[10] Besides patent pooling for complementary innovations, there is a second kind of collusive interaction between innovators that is frequently observed and seldom discouraged by Government anti-monopoly policy: Innovating firms will often "stake out" an area of research or development and punish would-be competitors by a predatory "raiding" of their companies for top technical personnel to prevent competition in the same line of research or development. While such commitments to respond to the actions of others are of the same logical form as collusive contracts, they deal only with current and near-future interactions among small subsets of the set of all innovators, and the welfare implications of such collusive-reaction commitments are much different than for private goods. In the absence of such commitments, because there are no governmentally preassigned rights to produce prespecified types of innovations in the real world and rights to an idea are obtained by producing it before anyone else does, there would be an inefficient "rush-to-invent" (Barzel) and duplication of research effort under simultaneous, Nash-Cournot, innovator interactions. By allowing innovators to stake out certain research areas with predatory reaction functions, the Government allows for the removal of the substantial inventor losses from their jointly excessive impatience in the development of an idea. That is, such cooperative behavior serves to efficiently establish property rights to innovations in given sub-fields and thereby permits us to use our above, property-rights models.

clauses that force the parties to freely share their improvements with other members of the pool, thereby all but eliminating each firm's individual incentive to improve the initial technology.)

Regardless of the complementarity or substitutability relationship between successive innovations, firms will underpurchase ordinary private-good-inputs to the extent that additional quantities of such inputs increase the sum of the prices that the firms will have to pay for future innovations. (The strict dominance of complementarity between private- and collective-good inputs under neoclassical production conditions is shown in Thompson 1968, Part II.) Aggregative time-series evidence for the resulting, theoretically unambiguous excess of social over private marginal products of private-good inputs is developed elsewhere (Thompson, 1975).

B. Replacing the Cournot assumption. We have, mainly for analytical convenience, been retaining our original, Cournot-on-outputs assumption that no current seller's output affects the outputs of future sellers. This is not particularly reasonable. A current seller's output, by altering the demand curves and prices charged by future producer-sellers, generally will alter the outputs of these future sellers. Replacing the Cournot-on-outputs assumption with a more appropriate, Stackelberg-on-outputs, assumption, we now allow current producer-sellers to recognize their effects on the outputs of succeeding producer-sellers. The interaction is still noncooperative in that it still excludes commitments contingent on the behavior of others. Each successive producer merely picks an output that maximizes his profit, given the previously produced outputs and the predictable, similarly selected, subsequent output choices of future producers.[11] Now, when a current collective-good producer expands his output, he realizes that the demand decrease for future collective-good substitutes will generate lower outputs of these substitutes. While this cushions the induced fall in the prices of future collective-good substitutes and thereby reduces the redistributive, future-price-reduction component of each buyer's current demand price, it simultaneously creates a positive, redistributive, future-quantity-change, component! For the induced output decreases of future substitutes increases the values of his current output to his existing customers. The reduction in the redistributional, future-price-benefit component of the demand for the current producer's output is approximately offset by the new, redistributional component of current demand stemming from the induced reduction in the outputs of future producers of substitutes. So the more appropriate, Stackelberg-on-outputs, assumption leads to the same qualitative results as the simplifying Cournot assumption when the successively produced collective goods are substitutes.

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[11] That a Stackelberg-on-output interaction in an all-private-goods economy yields competitive-type results while an interaction permitting the communication of committed reactions to the outputs of others leads to a cooperative-type result (monopoly) is demonstrated in Thompson-Faith (1979).

However, when the successively produced collective goods are complements, the increases in <u>outputs</u> of future complements induced by an expanding current producer will serve to <u>increase</u> the demand prices for his currently produced collective good and therefore to work <u>against</u> his undervaluation incentive based upon the positive effect of his expansion on his buyers' prices for future collective goods. In effect, the investment coordination afforded by sequential, perfect-information, Stackelberg interaction eliminates the severe underinvestment trap possible under the uncoordinated, simultaneous investment decisions of a Cournot interaction. A roughly optimal innovation policy thus subsidizes the initial innovation in a sequence of complements only as it does net unrelated innovations: Viz., the optimal policy subsidizes these innovations only to compensate for various non-appropriabilities, such as those implied by limited producer information or bargaining power or by Government-imposed restrictions on patent lives.

Finally, such policies, while working toward the marginal productivity pricing of collective-good inputs, still fail to cure the net undervaluation of private-good inputs. Buying firms still have an unambiguous incentive to shrink their capital stocks so as to reduce the marginal productivities, and hence prices, of future innovations to their firms. Heavy investment subsidies to industries with rapid prospective innovation rates (i.e., the policies of "Atari Mercantilism") are therefore still required for a Pareto optimum.

C. Bertrand interaction. A pure form of the above internalization of benefits from inducing changes in the marketed quantities of other collective-good sellers occurs when sellers cannot adjust their prices at all in responding to another seller's expansion decision. This Bertrand-type interaction occurs (as pointed out in section I.C.) when one seller cannot observe the others' prices in the relevant market period. Here, following the analysis of the above subsection, there is an overvaluation of both complementary and substitutable collective goods in that an expanding collective-good producer can charge higher prices both because he induces the sales of future complements to expand and the sales of future substitutes to contract.[12]

A fairly realistic example of this Bertrand-type interaction occurs in the retail marketing of mass-media outputs by competing broadcasters. Owing to the the large numbers of final information consumers in the various broadcasting markets, these retail distribution specialists, who buy, package, and resell the basic product, rather than attempting to tailor prices to the individual demand prices of particular consumers, employ imperfectly discriminatory pricing formulas in which each consumer is presented

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12 While this unambiguous overvaluation incentive, a formal proof of which will be sent on request, has apparently gone unnoticed in the empirically oriented literature on imperfectly marketed collective goods, the empirical examples discussed below concentrate on the case of substitute collective goods because the Bertrand assumption is only an approximation and the overvaluation-of-complements result does not extend to the Stackelberg or Cournot cases.

with fixed, parametric prices.[13] The inevitable imperfection of these fixed-price schedules leads to the familiar artificial exclusion of many potential buyers of a given seller's output and an underpricing to all but the marginal customers of any given seller (Brito-Oakland). Since all but the marginal customers of a given broadcaster's rivals pay less than their demand prices, an output expansion by this broadcaster will not induce any of his several rivals to substantially lower their prices. For the rivals will still be able to sell their individual outputs to almost all of their previous customers if they merely maintain their prices and surrender their marginal customers. The

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[13] Although purely pecuniary pricing (e.g., pay TV) is sometimes observed, advertising is the predominant technique for pricing these collective goods. Since wealthier consumers typically have higher demand prices for the distributor's collective good and have correspondingly higher time-costs, advertising achieves a discriminatory system of consumer charges. To allow the distributors to collect benefits in proportion to the charges, we assume that wealthier consumers make correspondingly more valuable advertising targets. Then, once the distributor has chosen his optimal mix between advertising and direct, equally discriminatory, pecuniary pricing, the last dollar of time costs imposed on a viewer generates the same revenue as a direct-dollar charge--a dollar. To make marginal advertising <u>socially</u> equivalent to pecuniary charges, we also assume that the only effect of advertising on consumers is to increase their utilities for, and correspondingly their prices of, the products of the advertiser. An additional dollar of time costs imposed on a viewer then gives him a dollar's increase in utility from consumption, and there is no net effect on his utility other than through his transfer of a dollar to the advertiser.

The fact that advertising is used so extensively to collect for the provision of collective consumer goods but almost never to collect for the provision of private goods indicates that advertising is, in fact, substantially discriminatory. The fact that nondiscriminatory pecuniary pricing is also sometimes observed in marketing collective consumer goods indicates that advertising is a highly imperfect collection device.

resulting tendency toward passive, Bertrand-type, price responses is reinforced by the difficulty that broadcasters face in attempting to distinguish reductions in their sales due to changes in the public's volatile preferences between programs from reductions due to the relatively minor, not directly observable, alterations in the prices or qualities of rival programs. In fact, we commonly observe very popular and unpopular radio and TV programs imposing similar advertising costs on their audiences; the improvement of a radio or TV program typically leads to a substantial contraction in the quantities purchased of substitutes (Steiner, Owen et al.). In private-good markets, it is strictly efficiency-enhancing to have firms respond to the expansions of their rivals by maintaining their prices and qualities, while absorbing simple reductions in their quantities sold. If Ford produced one fewer car whenever GM produced one more, making GM a price-taker, the social value of GM's supplying another car would be Ford's marginal resource cost of producing a car, a number equaling the price of a car as long as GM similarly contracted when Ford expanded. The social value of GM's production then equals its private value. Bertrand interaction for private goods represents a socially efficient, purely competitive interaction. But when CBS surrenders some audience to a quality-expanding NBC without cutting its effective program price, no resources are freed to society. And while the social value of NBC's improvement may be insignificant, its private value, being equal to the revenues received from its new audience, is not insignificant. Thus, as in the previous sub-section, there is an excess of private-over-social value of a collective-good-supplier's expansion to the extent that the expansion reduces the quantities sold by fixed-price competitors, the corresponding sales declines now representing an internalized redistribution away from the shrinking competitors with no matching savings in society's resources.

Since quality-expanding broadcasters may well be unable to collect the total values of their improvements from their intra-marginal customers, a tax on the outputs of established broadcasters is not unambiguously justified. Nevertheless, collective-good substitutes are again overvalued relative to unrelated collective goods. And again the misevaluation occurs because buyers, and therefore sellers, internalize a purely pecuniary transfer away from sellers of other, existing outputs. This implies, of course, the widely publicized "vast wasteland" of highly substitutable programs relative to unique, unrelated programs (Steiner, Owen et. al., and Noll et. al.).

A second application is to brokers and information-supplying retailers of private goods. The value added by these sellers is largely from their production of information that is collective to all of their customers. These ubiquitous sellers cannot estimate, a priori, the highly variable, true demand prices among the various potential customers for their information. A retailer or real estate broker typically cannot distinguish, a priori, a serious customer with a buying probability of 1/2 from a browser with a buying probability of 1/200. And a stockbroker cannot tell, a priori, whether a particular buyer is ready to purchase 100 or 1,000 shares of a touted stock. To rationally price-discriminate between high- and low-value information demanders, information-providing retailers and brokers almost universally charge for their information by committing themselves to uniform, nondiscriminatory overcharges for complementary private goods, thereby approximating a fixed-price, Lindahlian system.[14] As above, with passive, Bertrand-type interactions inappropriately rewarding quality-expanding brokers and retailers with the marginal customers of their many rivals, there is an overproduction of the kind of information that substitutes for the information produced by rivals relative to unique, unrelated information and a possible

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14 To protect their margins from the free-riding of private-good sellers who do not supply the complementary collective good, collective-good sellers enlist the support of government or their own, private-good suppliers. Thus, security and real estate brokers have obtained the legal right to collectively impose common, industrywide commission rates, thereby increasing the service costs to free-riding brokers to prohibitive levels. Wholesale brokers distributing to various retailers have Section 2C of the Robinson-Patman Act to eliminate the free-riding of manufacturers, farmers, or growers who would otherwise make direct sales to retailers as well as indirect sales through their customer-finding brokers. It is widely recognized (cf. Schwartz-Eisenstadt) that information-providing retailers have used resale-price-maintenance laws or agreements, exclusive territories, or vertical ties in order to deter free-riding discounters and also that such exclusion devices are often restricted by the Government in the same way that patent rights are restricted, thereby inducing some free-riding. Using our models, such seemingly perverse policies may enhance economic efficiency by working against the tendency of free markets to overproduce collective goods or their substitutes and to underproduce competitively supplied, private-good complements.

overproduction of total information produced by brokers and retailers relative to the private-good numeraire. As there is also an unambiguous underproduction of the over-priced, private-good complements to the collective-good (relative to the private-good numeraire), we find efficiency results for these substitutable collective goods that are qualitatively identical to the welfare results that arose from a Cournot or Stackelberg output interaction.

D. Exclusive-use contracting and the few-buyer, many-seller case. The media distributors discussed above ordinarily purchase their basic "entertainment" (i.e., non-news) inputs by obtaining "exclusive-use" contracts from these collective-good suppliers (Grossman). Such contracts prevent suppliers from selling to more than one distributor in a given market. But why would a primary collective-good supplier so restrict the market for his product? If he sold to all retail distributors in a given market, and he were able to obtain their demand prices, he would receive more--sometimes much more--than he receives from his exclusive purchaser.[15] The answer must be that primary suppliers obtain

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15 This is because each distributor is willing to pay not only for the value of the input in attracting new customers to the industry but also for its value in attracting customers away from its fixed-price competitors. Say a given comic strip is worth $5 in total to the newspapers in an area (in terms of the induced increase in total readership) but $18 to a single newspaper, because of its ability to attract $15 worth of readers away from its competitor and $3 worth of additional total readership. The strip could be sold for a total of $36 if the seller could obtain the buyers' demand prices, whereas exclusive rights to the to the strip can be sold for at most $18.

much closer to true demand prices by committing themselves to selling to only one retailer in a given market. This occurs because an exclusive-use commitment by a seller converts the independent buyers from simultaneous users, with the usual, collective-good bargaining incentives to under-reveal and under-pay, into alternative users, who have the same demand-revealing incentives as buyers of an ordinary private good.

Regarding under-revelation incentives, with exclusive-use contracts, each of the possible broadcasters of a given seller's program--knowing that he stands to capture close to the entire market demand for the program--reveals this concentrated value in competing for the sole distribution right as long as the value is the same for all bidders. With broadcasters having about equal capacity to supply the relevant retail market, the winning bidder, who must pay at least the value to the next-highest bidder, has no significant incentive to engage in demand-hiding behavior. The seller's commitment to exclusive contracting thus eliminates his own costs of discovering the market values of his product to the various buyers. The above explanation for exclusive-use contracts helps rationalize the unusual, equality-of-size restriction the U.S. Government has imposed on our three national over-the-air broadcasting networks (Owen, et. al.) Also, with an approximately equal capacity to supply the national market, these networks will bid similar amounts for any given program and therefore have no significant incentive to reduce their own demand prices for the program. As independent local broadcasters have an analogous problem, an analogous argument supports governmental attempts to equalize the broadcast range of competing local stations.

But the above, demand-revelation through demand-concentration, argument is wholly insufficient to explain the near-universality of exclusive-use contracts in selling entertainment features to newspapers. Newspapers face a much higher cost of concentrating the distribution of a primary media input in the hands of a single distributor; many more potential buyers are lost by exclusively distributing a newspaper feature than a radio or TV program. Also, being protected by First Amendment guarantees, the newspapers in a given market area have a much less equal size distribution than the broadcasters. However, the naturally small number of potential buyers in each local market, together with the large number of small, primary-entertainment suppliers, requires us to drop our basic assumption that each of the informed collective-good sellers wins his bilateral monopolies with the buyers.[16]

To protect himself from receiving only his insignificant supply price to a given local market, the basic supplier changes the nature of his marketed product by selling exclusive-use

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16 Also, newspapers typically have been organized prior to the sellers of the basic entertainment products from whom they buy, thereby facilitating the making of prior, organizational commitments to pay only supply-prices to their suppliers of primary-entertainment inputs. While the same can be said for the large oligopolists among the innovation buyers discussed in the previous subsection, any such organizational commitment on their part would invite entry by the innovators--a situation probably inferior to simply paying out their demand prices to the innovators.

rights, thereby setting up a private-goods type of competition in order to assure himself of prices equal to at least the values to the second-highest demanders in each of the local markets.[17] (And, to acquire the input, potential purchasers must commit themselves not to sell rights to share the entertaiment input with competitors in order to widen the inputs' circulation; for if the input supplier permitted such transactions, one potential purchaser would, for an appropriate initial fee from his rival(s), let the latter use the input at an insignificant price, thereby cutting all bid prices down to insignificance and totally undermining the competitive bidding environment required by the supplier). This argument applies to broadcasters and book publishers as well as to newspapers. But it is only for newspapers that the buyers obtaining exclusive-use rights do not distribute the basic good to close to the entire potential market. So only for newspapers can we <u>infer</u>, from the adoption of exclusive-use contracts, that the sellers of primary collective-good inputs are losing their bilateral monopolies.

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17 Corresponding to this theory, my interviews with newspaper purchasing agents have revealed a reliance on exclusive-use contracts for all entertainment inputs except some highly unique inputs (e.g., certain popular columnists), toward which inputs their usual aggressive bargaining attitude switches to one of almost passive submission.

III. CONCLUSION

A. Summary of the contracting results. Price commitments by sellers of collective goods are irrational under perfectly competitive conditions. However, price commitments become rational when: (1) collective-good sellers or buyers are, respectively, monopolistic or monopsonistic cooperatives; (2) buyers monopolize their collective-good-using industries by establishing an artificial overhead cost to deter potential entrants, in which case a simple, fixed-price commitment may suffice, (3) the outputs of other collective-good sellers are marketed only at future dates so that competitive bidding is absent, fixed-price commitments being advantageous only when the successively produced collective goods are substitutes; or (4) individually tailored, personal price discrimination is prohibitively costly. Close correlates to these rational contracting solutions exist in commonly observed collective-good markets. There is also some, albeit indirect, evidence for the theoretical, overproduction-of-collective-good results emerging under each one of our alternative information structures. Finally, where collective-good buyers are large enough to win their microeconomic bilateral monopolies with each of the various sellers, the sellers should--and do--switch to selling exclusive-use contracts, cutting their losses by marketing the collective good as if it were a private good.

We summarize the basic welfare argument of the paper by applying it to a prospective, perfectly discriminating, private-goods monopolist. (As noted in my 1969 paper, it is the failure of economists to recognize the inefficiency inherent in standard, perfect ["first degree"] price discrimination that makes my extreme-overproduction result appear surprising).

B. The welfare analysis applied to a perfectly discriminating, private-good monopolist. The prospective customers of a future, perfectly discriminating monopolist both overpurchase current substitutes and underpurchase current, competitively supplied complements in order to benefit from socially valueless redistributions away from the discriminator. And the potential welfare loss from these investments in demand reduction--being equal to the entire potential consumer and producer surplus from the monopolist's output--greatly exceeds any of the welfare losses appearing in the received theory of monopoly. Suppose, for example, your local electric utility company were going to be allowed to price-discriminate at will, paying a lump sum for the privilege. The utility, once it finally received permission to discriminate, would charge a tremendously high flat rate to capture your consumer surplus from home electricity. Your rational response to this prospect would be to quickly develop substitutes. You might add a gas-driven electricity generator to your home at substantial real cost, sell several convenient electric appliances, etc. These are obvious inefficiencies; you are devoting substantial resources to gaining a simple transfer of wealth away from the future price-discriminator.[18]

The relatively familiar deadweight welfare loss that a monopolist may create in working to impose discriminatory prices (e.g., Posner, Williamson) is only the excess of a discriminator's over a nondiscriminator's profit while our potential welfare loss from price discrimination is the discriminator's entire profit. Thus, for example, the prospect of our loss may easily reduce the value of imposing discriminatory prices to negative levels! This is because discriminatory prices induce buyers to reduce their demands for the seller's goods--possibly all the way down to the seller's supply price--while a non-discriminatory monopoly price

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18 Perhaps economists have been ignoring these large inefficiencies because they have been making a tacit assumption that a first-degree price-discriminator can either: (1) anticipate all customer preferences and precommit to requiring total payments from each buyer equal to the buyer's prior potential surplus from the good in a joint optimum, or (2) observe the prior decisions of his customers and costlessly contract with them regarding these choices. However, the former alternative, as argued in section I.B., is both generally empirically unreasonable and inappropriate to decentralized market analysis, in that the market would be a socially pointless institution if such information existed. And the latter alternative, as argued in section I.C., implies contracting as a complete buyer-seller cooperative rather than a simple discriminating monopoly. Besides, both conditions are entirely empirically unreasonable when there are several buyers.

Nevertheless, we could assume that the discriminators imperfectly estimate buyer demand prices to the point that they do not adjust their prices to variations in the actual demands of their customers. In this case, as discussed in section II.C., the tendency of buyers to over-demand substitutes is replaced by a tendency of sellers to over-supply them because of the now-overly-passive sales responses of the discriminators. This corresponds to the familiar text-book result that buyers are induced to overpurchase competitively in supplied substitutes to the outputs of a fixed-price monopolist.

induces no such deleterious effects. So sellers of normal, differentiated, manufactured goods normally work to establish fixed, nondiscriminatory, price systems, thereby eliminating the incentive of their customers to reduce their own demand prices for the differentiated product. The sellers do this by committing themselves to receiving constant prices over significant intervals of time even though the expected market demands for their individual products are bound to shift so as to make their fixed prices obsolete and apparently irrational. But without such a "rigid" price pattern, these sellers could alter prices over short intervals of time in order to personally price-discriminate between their various customers, a possibility that could easily <u>lower</u> the sellers' average price by inducing their customers to overbuy substitutes and underbuy competitively supplied complements. Nevertheless, when the potential returns from discrimination are very high, it is likely that the net returns from a discriminatory price system will exceed the net returns from any of the above fixed-price systems despite the rash of demand-reducing investments that discrimination invites.

The failure of economists to recognize the potentially large inefficiencies resulting from prospective, first-degree price discrimination has led some to inappropriately criticize our main anti-price-discrimination laws, the Robinson-Patman Act (Secs. 2(a), 2(b), and 2(f)) and the Hepburn Act of 1906, the latter being the culmination of a 35-year evolution of legislation aimed at achieving nondiscriminatory railway rates (Locklin). While examples of wasteful investments by railway users in order to lower the prices they had to pay to price-discriminating railroads can be readily found in the contemporary intellectual arguments supporting anti-price-discrimination laws (e.g., Hendrick), economists writing on these discriminatory systems (e.g., Oi, Locklin, Machlup, Friedman) have ignored these losses.

Similarly, the failure of economists to recognize the potentially large welfare losses from prospective, first-degree price discrimination has left them no rational theory to explain the popularity of the widespread governmental policies that coarsely break-apart or crudely price-regulate observed monopolies. Standard economic theory argues against such policies. It argues instead for allowing monopolies to form at will, subsidizing their outputs to the extent that they underproduce because of an inability to perfectly price-discriminate and taxing them lump-sum to eliminate their over-devotion of resources to monopolization and price discrimination (Tullock, Posner). Economists, unable to explain why their first-best, "optimal" policy is politically infeasible, have consequently been of little help in formulating an optimal antimonopoly policy. The suggestion here is that an "optimally" taxed, unregulated monopoly would be tempted to substantially price-discriminate, and this in turn would induce substantial inefficiencies, real social losses that governmental policy cannot eliminate without either regulating prices and quantities or creating sufficient private-goods competition that it no longer pays to price discriminate.

REFERENCES

Areeda, Phillip, Antitrust Analysis, Little, Brown & Co., Boston, 1981, Ch. 5, Section B.

Arrow, Kenneth J., "The Organization of Economic Activity" in Public Expenditures and Policy Analysis, R. H. Haveman and J. Margolis, Eds.

Auster, R. D., "Private Markets in Public Goods," QJE, August 1977, pp. 419-430.

Bazel, Y., "The Optimal Timing of Innovations," Rev. Econ & Stat., August 1968, pp. 348-355.

Borcherding, T. E., "Competition Exclusion, and the Optimal Supply of Public Goods," J. Law & Econ., April 1978.

Brito, D. L. and Oakland, W. H., "On the Monopolistic Provision of Excludable Public Goods," Amer. Econ. Rev. 70, September 1980, esp. pp. 691-694.

Burstein, Meyer L., "The Economies of Tie-in Sales," Rev. of Econ. & Stat., February 1960.

Cheung, S., "Property Rights and Inventions: An Economic Inquiry," monograph, University of Washington, May 1977, p. 60.

Compton, G. R., "The Economics of Discretionary Collective Goods," UCLA Ph.D. dissertation, 1976.

Demsetz, H., "Why Regulate Utilities," J. Law & Econ., April 1968.

________, "The Private Production of Public Goods," J. Law & Econ., October 1970.

Ellis, Ridsdale, Patent Licenses, (New York, Boka, Voorhis & Co., 1958) sections 522, 523.

Epstein, Edward J., News From Nowhere: Television and the News, Random House, New York, 1973.

Foley, Duncan K., "Lindahl's Solution and the Core of an Economy with Collective Goods," 38, Econometrica (1970), pp. 66-72.

Friedman, David, D., "In Defense of Long-haul/Short-haul Discrimination," Bell Journal, Autumn 1979, (10), pp. 706-709.

Gharrity, N. J., "The Use and Non-use and Non-use of Patented Innovations," Ph.D. dissertation, John Hopkins University, 1965, esp. p. 265.

Gilbert, Richard J., "Patents, Sleeping Patents and Entry Deterrence" in Strategy, Predation, and Antitrust Analysis, Steve Salop Ed., F.T.C., 1981, pp. 205-269.

Grambling, O., AP: The Story of News, Farrar and Rinehart, New York, 1940, pp. 300-361.

Grossman, Michael, "Network Development and Production Deals - The Network Business Affairs Viewpoint," in Business and Legal Aspects of Development, Financing, and Syndicating Television Productions, 1978, School of Law Third Annual Entertainment Symposium, UCLA, esp. pp. 81-92.

Heiner, R. A., "The Exchange of Collective Goods and the Existence of Generalized Competitive Equilibrium," UCLA Ph.D. dissertation, 1975.

Hendrick, Burton J., The Life of Andrew Carnegie, Vol. 2, Garden City, New York, 1932, pp. 25-26.

Joelson, M., "U.S. Law and the Proposed Code of Conduct on the Transfer of Technology," Antitrust Bulletin, U.S. Department of Commerce, Washington, D.C., 1981.

Lemert, James, B., "Content Duplication by the Networks in Competing Evening Newscasts," Journalism Quarterly, 51, Summer, 1974, pp. 238-244.

Locklin, P. D., Economics of Transportation, 7th ed., Richard D. Irwin, Homewood, Ill., 1972, Chs. 8-11.

Machlup, F., "Charactistics and Types of Price Discrimination," NBER, Business Concentration and Price Policy, Princeton N.J., Princeton U. Press, 1955, pp. 397-435.

Mansfield, E., et al., The Production and Application of New Industrial Technology, New York, Norton, 1977, Ch. 6.

Mas-Colell, Andrew, "Efficiency and Decentralization in the Pure Theory of Public Goods," QJE, June 1980 (no. 4), pp. 625-41.

Milleron, J. C., "Theory of Value with Public Goods, A Survey Article," JET (5), 1972, pp. 419-479.

Morris, J. A., Deadline Every Day: The Story of United Press, Doubleday, New York, 1957, pp. 76-108.

Noll, R., Peck, M., and McGowan, J., Economic Aspects of Television Regulation (Washington, D. C., Brookings, 1973).

Oi, W. Y., "A Disneyland Dilemma: Two Part Tariffs for a Mickey Mouse Monopoly," QJE, Feb. 1971, pp. 77-96.

Owen, B. M., Economics and Freedom of Expression, Ballinger, 1975.

________, Beebe, J., and Manning, W., Television Economics (Lexington: D.C. Heath, 1974).

Posner, R. A., Antitrust Law, V of Chicago Press, Ch. 1 and pp. 62-65.

Rosewater, V., History of Cooperative News-Gathering in the United States, D. Appleton, New York, 1930.

Rosse, J. N., Owen, Bruce M., and Dertouzos, J., "Trends in the Daily Newspper Industry, 1923-1973," Studies in Industry Economics, No. 57, Stanford, Cal., 1975.

Shmanske, S., "The Utilization of Public Goods: Extensions of Traditional Theory and Application to the Wire Service Industry," UCLA, Ph.D. dissertation, 1982, Ch X.

Schumpter, J. A., Business Cycles, (New York: McGraw-Hill, 1939).

Schwartz, M., and Eisenstadt, D., "Vertical Restraints," Economic Policy Office Discussion Paper, U.S. Department of Justice, December 1982, 96 pages.

Sobel, J., and Emery, E., "U.S. Dailies' Competition in Relation to Circulation Size: A Newspaper Data Update," Journalism Quarterly, 55, Spring 1978, pp. 145-149.

Steiner, P., "Program Patterns and Preferences ad the Workability of Competition in Ration Broadcasting," Quarterly Journal of Economics, LXVI (May 1954), pp. 194-223.

Stigler, G. J., "A Theory of Oligopoly," J. Pol. Econ., February 1964, pp. 44-61.

Taylor, C. T. and Silberston, Z. A., The Economic Impact of the Patent System, London, 1973.

Thompson, E. A., "The Perfectly Competitive Production of Collective Goods," Rev. Econ. & Stat., 50 February 1968, pp. 1-12.

________, "The Perfectly Competitive Production of Collective Goods, Replies," Rev. Econ. & Stat., 51, November 1969, pp. 479-482.

________, "The Private Production of Public Goods: A Comment," J. Law & Econ., October 1973, pp. 407-412.

________, "The Aggregate Rate of Return to Technical Innovation," Working Paper, UCLA, 1975.

Thompson, E. A., and Faith, R. L., "A Model of Rational Noncompetititive Interdependence," UCLA Working Paper # 86, 1979.

________, "A Pure Theory of Strategic Interaction and Social Institutions," American Economic Review, June 1981, pp. 366-380.

Tullock, G., "The Welfare Costs of Tariffs, Monopoly, and Theft," Western Economic Journal, 224, 1967.

Villard, O. G., The Disappearing Daily, Knopf, New York, 1944 p. 174.

Williamson, O., Market and Hierarchies, McMillan, London, 1975, pp. 10-13.

APPENDIX: THE TENDENCY OF RETAILERS TO OVERPRODUCE OVERHEAD SERVICES

Introduction

Traditional, monopolistically competitive, theories of retailing assume that a firm's overhead, "selling" services are duplicative rather than distinct and naturally monopolistic. This assumed absence of "product differentiation" is, for example, crucial to obtaining most widely discussed result of monopolistic-competition theory, Chamberlain's too-many-firms conclusion. The standard theories also assume that the retailer's many customers, although located at distinct points within a geographical region, all pay the same price to the seller. It is easy to see, however, that rational, price-setting sellers of a non-differentiated product would, in general, first charge different classes of customers different, lump-sum, "cover" charges reflecting the transportation costs of such customers' switching to the nearest competitor and then sell their private goods at marginal production costs. For example, given the economic environment underlying traditional theories, retailers should compete their total prices down to marginal costs to those customers who are indifferent between buying from two or more monopolistic competitors; but the theories do not allow this to occur. (For the general argument, see Thompson, 1967.) Rather than carefully deriving the rational, multi-part, price system suitable to the underlying economic environment, authors in the field of monopolistic-competition simply impose single-price systems on their models.

At least two unfortunate consequences have followed from the theoretically unjustifiable assumption of price uniformity. First, as already emphasized in the conclusion of the text above, economists have failed to notice the large social losses that generally result from the profitability of personal price discrimination under spatially monopolistic market conditions and laissez faire economic policy.

Second, and more pertinent to the analysis of the ubiquitous economic activity commonly referred to as "retailing", authors of the traditional theories have failed to see that the reliance on uniform mark-up, single-part price-systems by most observed, rationally competing, retailers contradicts the conventional assumption that the overhead services provided by these retailers are duplicative. Evidently, observed retailers provide substantially distinct collective-good services. Indeed, single-part price-systems furnish suppliers of unique overhead services with exactly what they want -- viz., a powerful method of preference-based, personal price discrimination -- because it leads high-level collective-goods-demanders, who are also relatively high-probability purchasers of private-good complements, to make expected payments to the retailers that are many times higher than low-level collective-good-demanders.

Admitting distinct, or non-duplicative, overhead services both eliminates Chamberlain's too-many-firms argument and, under realistically imperfect price discrimination, leads immediately to the conclusion that laissez faire may easily result in too few firms because of each firm's inability to collect for its unique, collective-good, service. Consequently, a simple, quantity-enhancing subsidy to the private-good quantities sold by these retailers, rather than exacerbating the Chamberlainian too-many-firms problem, could easily move the equilibrium number of firms towards efficiency.

This appendix develops a new, distinct-overhead-service, collective-goods, model of retailing serving to rationalize the entire set of observed, private-good subsidies to real-world retailers. Moreover, it will also show that there is an unambiguous overproduction of the quality of any given firm's collective-good service once the optimal private-good subsidies are in place.

The latter result rationalizes existing laws restricting the appropriability of relatively high-quality retailers (laws restricting resale price maintenance and related vertical arrangements) similar to the way in which our other models have rationalized existing laws restricting the appropriability of sellers of some other kinds of collective-goods.

I. The Physical Environment

We consider a world composed of: (1) a fixed number, R, of retailers, each supplying a distinct, variable quality, Q_i, $i = 1,\ldots,R$, of overhead services to its variable number of customers, N_i, and (2) a numeraire private-good output, Z, which is unrelated in both consumption and production to the retailers' Q_i outputs. A social optimum, $\{Q_i^o, N_i^o, Z^o\}$, is determined by maximizing a collective utility function:

$$U(Q_1 f_1(N_1),\ldots,Q_R\, f_R(N_R)) + A\ \ Z;$$

where A is a positive constant, the first derivatives, U_i, are uniformly positive while the second derivatives, U_{ii}, are uniformly negative, $N_i^o > 1$, and $f_i(0) = 0$, $f_i(1) = 1$, and $f_i(N_i^o) > 1$; subject to the social transformation constraint, $C_1(Q_1) + \ldots + C_R(Q_R) + Z = 0$, where $C_i' > 0$ and $C_i'' > 0$ for all Q_i.[1]

Each $f_i(N_i)$-function changes with unit expansions in N_i by amounts equal to the fraction of the highest-use-value-consumer's MRS represented by the additional consumer's MRS, where consumers of Q_i are added in

[1]The reason for the linearity-on-Z assumptions is that our subsequent model of market equilibrium will not make standard, Walras-Lindahl, price-taking assumptions and therefore will require these assumptions, which embody conventional, Marshallian, small-industry assumptions, to insure that our retailers do not influence the real prices or costs of other retailers merely by inducing alterations in the values or costs of producing the numeraire.

descending order of their MRS's so that the function's discrete "derivative", $f_i'(N_i)$, decreases as N_i expands. Our assumption that $f_i(1) = 1$ is merely made to have a simple expression, i.e., U_i/A, for the MRS of the highest-use-value consumer. The pure-collective-good property of the retailers' outputs is apparent from the fact that all consumers of Q_i gain (or lose) simultaneously from expansions in Q_i, there being no technology with which to redistribute a given level of Q_i among the members of a given set of N_i users.

Consumers implicitly bear the resource cost of obtaining any given retailer's overhead service. The presence of these utilization costs means that the social optimum generally has $N_i^o < N$, the total population. Assuming that this is always the case, and that there is, for each Q_i, a consumer with a zero MRS in the optimum, the first-order marginal conditions for a solution to the above-described social optimization problem are:

(1) $$f_i'(N_i^o) = 0 \text{ and}$$

(2) $$U_i f_i(N_i^o)/A = C_i' \text{ for all } i.$$

We assume that there is only one such solution for a given distribution of Z between the consumers and thus a given collective utility function. The first condition means that consumers are added to the i^{th} retailer until an additional consumer would have a zero real value for the i^{th} retailer's overhead service. The second is the familiar Lindahl-Samuelson condition that the sum of the individual marginal real values for Q_i to the existing N_i users is equal to the real marginal cost of Q_i.

Real-world retailers also supply private goods that are complementary in consumption with their collective-good services. We could include such private goods in our model without altering our simple conclusions here by following the text in assuming that retailers effectively price discriminate between high and low level information demanders through a uniform surcharge to each customer's first private-good purchase, rationally selling additional private-good complements at marginal production costs via an appropriate quantity discount.[2] We would also assume that the underlying transportation costs, real and psychological, between retailers is sufficient to prevent buyers from "free-riding" on the services of high-quality retailers by acquiring the overhead services of a high-quality retailer and then buying all of their private-good complements from a low-quality retailer.

To avoid the notational complications of adding this level of realism to the model, we simply assume that each retailer is physically able to raise all of his discriminatory flat-rate prices so as to fully capture the additional real value of any improvement in his overhead services to his existing customers. When, and only when, retailers also know each of the solution demand-prices, price discrimination will be perfect. We shall evaluate the allocational consequences of both perfect and imperfect price discrimination in the analysis that follows.

We assume throughout that our R overhead services are so perishable, or the numbers of customers so large, that it pays suppliers to observe neither the effective price-offers of other suppliers nor the quantities purchased of their customers from these suppliers. The resulting, simultaneous-marketing,

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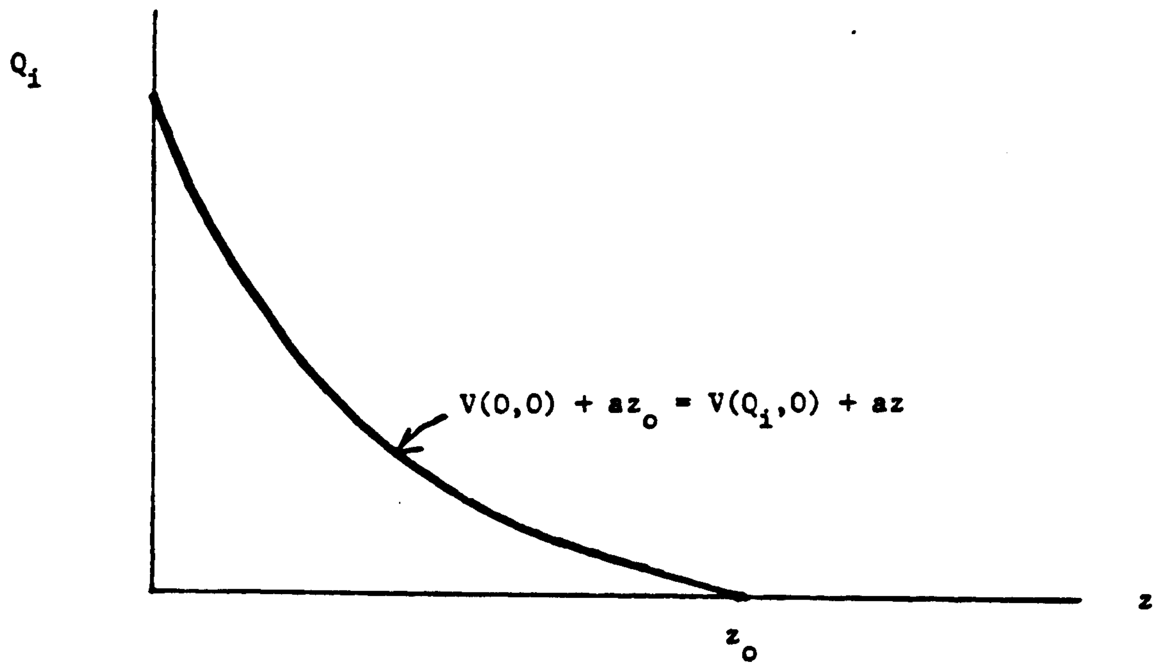
[2]The assumption, however, would not be entirely realistic. This, we believe, is mainly because some high-demand-price buyers are observed to have -- rather than the high purchase probabilities discussed in the text -- relatively high quantity demands for the retailer's private-good complements, in which case above-marginal-cost surcharges on private-good quantities beyond the first units purchased would provide the retailer with a substitute method of price discrimination in collecting for its overhead service. The resulting tendency to underproduce private-good-complements nicely extends our earlier results.

Bertrand interaction, although contrasting sharply with the sequential marketing interaction described in our introductory example and in Section I of the text, will, reinforcing the relatively informal discussion in Section IIC of the text, be shown to generate an analogous tendancy toward collective-good overproduction unless price discrimination is, unjustifiably, perfect. While this tendency applies to all such Bertrand-type collective-good suppliers, it is only a logical necessity when the suppliers are subsidized so as to remove the familiar over-exclusion effects appearing in the price equilibria under imperfectly informed selling. Subsidizing any Bertrand-type collective-good supplier so as to remove such effects qualifies him as a "retailer", according to our complete theoretical definition of the term.

II. The Impossibility of a Socially Optimal Equilibrium Under Perfect Price Discrimination

We first consider the unjustifiable and unrealistic case in which retailers have complete a priori knowledge of consumer preferences and retailer costs and therefore perfectly price discriminate. Consumers therefore surrender essentially all of their economic surplus from the product of a given retailer to that retailer. The i^{th} retailer will obviously find it profitable to add customers until $f_i'(N_i) = 0$, trivially satisfying the first social optimality condition in the hypothetical, perfectly discriminatory solution. However, in attempting to have retailers satisfy the second optimality condition, the condition describing the optimal Q_i-choices, a basic logical problem inevitably appears, one precluding any Bertrand-type, pure-strategy solution to the problem. We develop the point by constructing a sequence of graphs. To start, we construct a graph (Fig. 1) depicting the initial indifference curve of the highest-demand-price customer of retailer i when he buys none of the outputs of the other retailers and has a numeraire

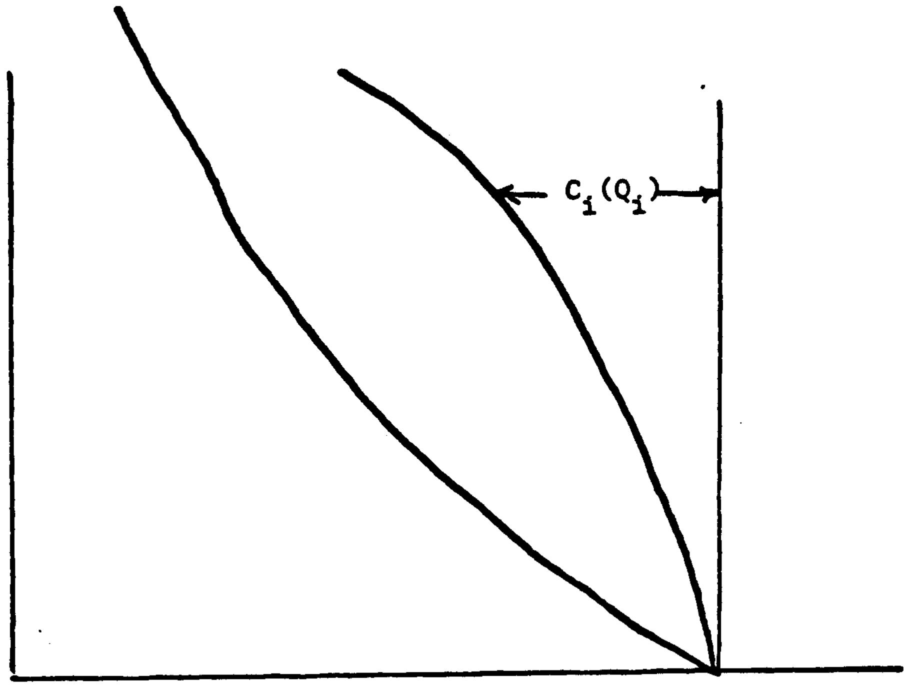
Figure 1



endowment of z_o. The consumer's utility level is therefore given by $V(0,0) + az_o = V(Q_i,0) + az$ where the vector zero term, 0, represents the initial values of the vector, $Q_{-i} = Q_1,\ldots,Q_{i-1},Q_{i+1},\ldots,Q_R$, and the function, $V(Q_i,Q_{-i}) + az$, represents the consumer's general utility function for Q_i, Q_{-i}, and z, his part of the total numeraire output, Z. The slope of the indifference curve is given by a/V_{Q_i}, where a is the consumer's constant marginal utility for z. Summing the analogous indifference curves of the successively lower-demand-price customers, we obtain the generally much-flatter indifference curve of Figure 2. The slope of the curve at a given Q_i is the slope of the original curve, a/V_{Q_i}, times $1/f_i(N_i)$. (For example, if i had 2 customers, the better one having an MRS twice that of the other so that $f(2) = 3/2$, the slope of the Figure 2 iso-utilities function facing the retailer would be:

$$1 \;/\; \left(\frac{V_{Q_i}}{a}\right) + \frac{1}{2}\left(\frac{V_{Q_i}}{a}\right) = (2/3)\;(a/V_{Q_i}).$$

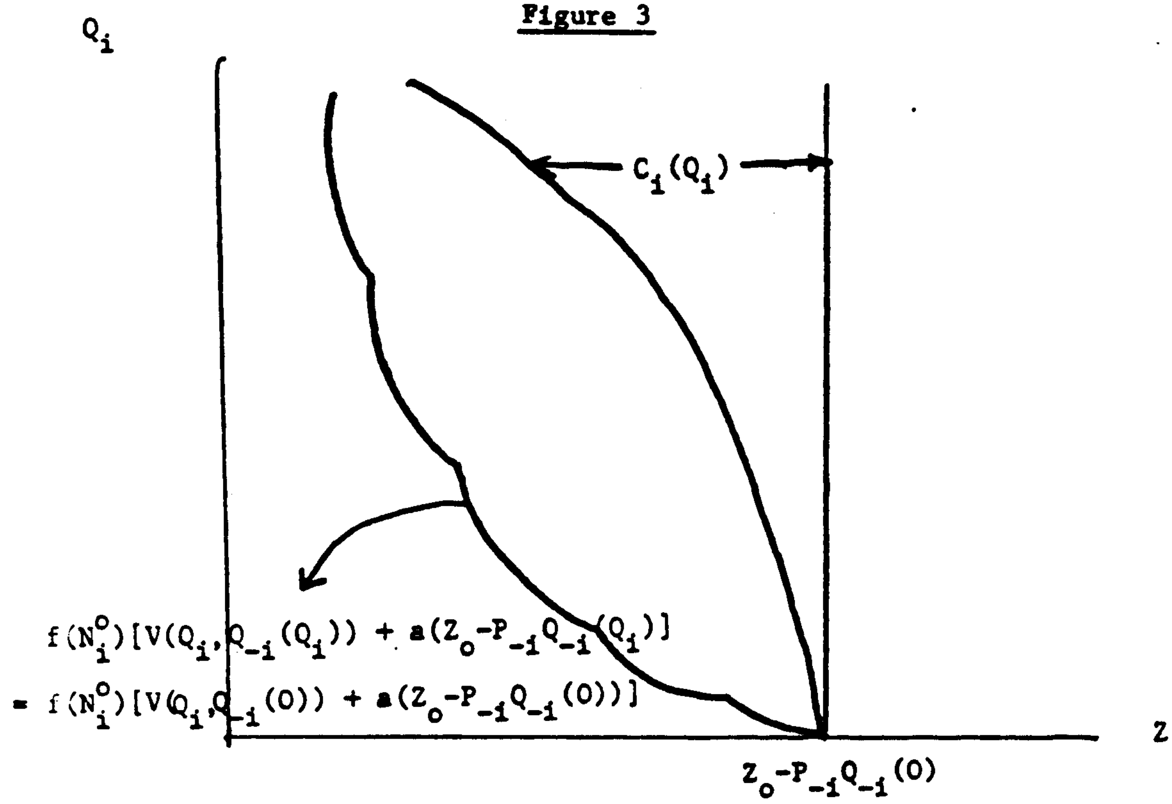
Figure 2



Since this slope is also the reciprocal of the sum of the N_i individual MRS's, it is also the reciprocal of the marginal social value appearing in equation (2). That is, $U_i f_i(N_i)/A = V_{Q_i} f_i(N_i)/a$. With $Q_{-i} = 0$, we can superimpose i's cost function, $C_i(Q_i)$, on Figure 2 by simply drawing a vertical line up from Z_o and then noting that $C_i(Q_i)$ is $Z_o - Z(Q)$, the amount of numeraire that must be sacrificed to produce Q_i units of i. The slope of this curve is obviously $1/C_i'(Q_i)$. The producer's optimum for a given N_i occurs at a Q_i such that the slopes of the two curves in Figure 2 are equal, i.e., where $C_i'(Q_i) = V_{Q_i} f_i(N_i)/a = U_i f_i(N_i)/A$. While the same condition obviously holds for any positive — but fixed — Q_{-i} purchased by i's customers, we cannot infer that the social optimality condition given in equation (2) is satisfied by this laissez faire calculation because retailers can affect the Q_{-i} choices of their customers, and this in turn affects the retailers' returns to altering their Q_i levels.

Allowing now the Q_{-i}-vector to be positive and noting that the i^{th} retailer cannot affect the qualities produced or prices asked by the retailers under Bertrand interaction, we can immediately see that the i^{th} retailer can affect other retailers only by influencing his customers' decisions on whether or not to accept the given price-quality offers of the other retailers. We assume, of course, that consumers observe all retailers' price-quality decisions prior to making any of their consumption purchases. Denoting P_{-i} as the vector of unit prices charged by the other retailers to i's highest-demand-price customer and $Q_{-i}(Q_i)$ as the corresponding vector of quantities purchased of the other retailers overhead services by this consumer, the point $Z_o - P_{-i}Q_{-i}(0)$ on the horizontal axis of Figure 3 represents the quantity of numeraire possessed by the consumers once they have made their privately optimal expenditures on other retailers' goods given that retailer i has produced a zero output. The highest-demand-price consumer's utility level at $Q_i = 0$, $V(0,Q_{-i}(0)) + a(z_o - P_{-i}Q_{-i}(0))$, is constant along all points on the scalloped iso-utility curve drawn up from $Z_o - P_{-i}Q_{-i}(0)$ on the horizontal axis. The scallop points represent the effect of the consumer's dropping-off substitutes or adding-on complements as Q_i expands. Utility remains unchanged at these switch points because changes in Q_{-i} are matched by changes in consumer expenditures of the numeraire at these points. We omit these changes from the figure because we wish to represent, as we did in Figure 2, the i^{th} retailer's total revenue as the distance between an iso-utility curve and a vertical line drawn up from a point on the horizontal axis (in this case, the point $Z_o - P_{-i}Q_{-i}(0)$). The iso-utility curve is therefore a total-benefit-from-Q_i curve rather than a more familiar, Q_{-i}-constant iso-utility curve. Thus, as Q_i increases from zero, we follow up the

Figure 3



consumer's ordinary, $Q_{-i}(0)$-constant, indifference curve until the consumer is just willing to change his initial set of purchases from other retailers, $Q_{-i}(0)$. At that point, as we have said, consumer utility does not change in that any would-be utility jump is matched by a utility-maintaining expenditure jump, the continuity of $V(.)$ assuring us that there utility does not jump merely because of the changes in Q_i. Since the prices and qualities of the other retailers are given to the i^{th} retailer, reaching the switch point induces the consumer to discretely increase his purchases of Q_i-complements or decrease his purchases of Q_i-substitutes. In either case, the marginal value of Q_i jumps to higher levels at the switch point, thereby decreasing the absolute value of the slope of the new Q_i-constant indifference curve above the switch point and producing the scalloped iso-utility curve of Figure 3. We also represent $C_i(Q_i)$ by the leftward distance from the vertical line drawn up from $Z_o - P_{-i}Q_{-i}$ on Figure 3. The horizontal distance between this curve and our iso-utility curve is thus the i^{th} retailer's profit at different Q_i-levels.

The graphs can now be used to demonstrate the impossibility of achieving the social optimum and, for that matter, any pure strategy equilibrium, with more than one active retailer selling related services to a given set of customers under perfect price discrimination. First, a profit-maximizing Q_i, labelled Q_i^*, obviously occurs only at the interior of a scallop. At an end point of a scallop, the firm can obviously increase profits by either expanding or contracting its Q_i-level. But a contradiction immediately arises. If there are other retailers selling related services to i's customers at positive prices that lead the i^{th} retailer to choose an interior point on a scallop, some of these retailers have set too low a price for their given services! Active sellers of complements, which are necessarily switched-into at Q_i outputs less than Q_i^*, could charge i's customers higher prices without losing these customers because the hypothesized level of Q_i, being greater than the switch-point level, implies a higher value of Q_i-complements than exists at the lower switch point. Similarly, active retailers of neighboring Q_i-substitutes, which are necessarily switched-away-from only at Q_i-levels discretely above Q_i^*, are under-pricing their services because somewhat higher prices to i's customers would not cause these buyers to quit buying these services. Since producers of complements will obviously not choose a price with a switch point above Q_i^* while producers of substitutes would similarly not pick prices generating switch points below Q_i^*, rational pricing by any active supplier of a related retail service would generate a switch point at Q_i^*, directly contradicting i's maximization requirement that Q_i^* be an interior rather than a switch point.

Note that if we did not allow the Q_{-i} sellers to adjust their prices to the expected Q_i-choice of the i^{th} retailer, simply assigning price a la Lindahl, the above non-existence argument would fail. We could assign lump-sum price components to the retailers so that the switch-points do not even appear. Each firm's profit-maximizing Q_i-choice would then obviously satisfy the second optimality condition and a Lindahlian optimum would be achieved. However, as we have been arguing, this is mere calculation. Lindahl pricing is not privately rational and should not be the expected outcome of private, decentralized, pricing decisions.

Our impossibility results should not cause alarm. As emphasized in the text, if the complete information required to achieve a Bertrand-type, perfectly discriminating solution were available to the producers, a market system would be unnecessary. A centrally planned solution would suffice. So all the results say is that a market system cannot achieve an optimum when the system is, at best, redundant. Analogous impossibility results hold for all-private-goods economies in which Bertrand suppliers have increasing marginal costs.[3] The general idea, then, is that market competition cannot be the

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[3]Our proof of the inability of increasing-cost Bertrand rivals to achieve a social optimum, a straightforward generalization of the arguments of course, Kahn and Alger, is a one-liner. Consider a fixed group of increasing-cost, Bertrand-interacting suppliers of a homogeneous private good: If prices were all at the efficient, Walrasian level, any seller would gain by raising his price to the inefficient, monopoly price to the demanders who are left unsatisfied by the other sellers, thereby upsetting the Walrasian solution.

Also, completing the analogy to our above collective-good result, any Bertrand-type, pure strategy solution under increasing costs is strictly impossible when the sellers have complete information. Our proof is by contradiction: suppose that a given set of prices by the sellers describes an equilibrium solution. First, some price differences must exist: If all prices were the same, the common price would have to be higher-than-Walrasian because we have just seen that it cannot be equal to the Walrasian price and because any seller would obviously raise his price if the common price were sub-Walrasian. But, at a higher-than-Walrasian common price, it pays a supplier to shade the price and produce at marginal cost instead of a socially optimal institution represented by economists when it is a simultaneous, i.e., Bertrand-type, pricing process. Even the mere existence of an equilibrium in a simultaneous-pricing environment requires us to introduce special, hopefully realistic, informational imperfections into the discussion. Since the assumption that consumer demands are somehow known *a priori* by Bertrand-type sellers is both unrealistic and inappropriate to the evaluation of a market system, it is the most natural assumption for us to drop. Fortunately, dropping this assumption will substantially remove the above existence problem, at least for our collective goods suppliers. The point is developed in the following section.

III. The Tendency of Retailers To Overproduce Overhead Services Under Realistically Imperfect Information

When Bertrand retailers do not have sufficient information to perfectly price discriminate, they must gamble on their potential customers' true demand prices, which are, to them, random variables. Let $\Pi_i^\alpha(P_i^\alpha;Q_i,EQ_{-i}^\alpha(Q_i))$ represent the i^{th} retailer's subjective probability that the α^{th} consumer will buy his given Q_i at a price of P_i^α, where $EQ_{-i}^\alpha(Q_i)$ is the i^{th} retailer's expectations of the vector of α's purchases of other, available overhead services. We assume that $\Pi_i^\alpha(.)$ is differentiable with $\partial\Pi_i^\alpha/\partial P_i^\alpha < 0$ and that the retailer's expected revenue from customer α, $Q_i P_i^\alpha \Pi_i^\alpha(P_i^\alpha;Q_i,EQ_{-i}$

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rationed-back level of output. So price differences must characterize the hypothesized equilibrium set of prices. Now a lowest-price seller cannot be rationed-back; he sells an output at which price equals marginal cost because he could always sell to the customers of the high-priced sellers if he wished to do so. Therefore, a price increase by any given lowest-price seller would *not* force the seller to lose customers to other lowest-price sellers. Consequently, this seller could compensate himself for any loss in sales to his existing, positive-surplus customers by increasing his sales to the customers of higher-priced sellers. Since it always pays sellers to change their prices from the hypothesized equilibrium set of prices, the hypothesis is contradicted.

(Q_i)), reaches a maximum at a unique value of $P_i^{\alpha*}$ and thus $\Pi_i^{\alpha*}$ for each customer i, given Q_i. (This occurs where the price elasticity of Π_i^{α} is -1.) Any such $P_i^{\alpha*}$ solution must obviously exceed zero.

Note that a fixed subsidy to the purchase of the retailer's private-good complement would, by adding $s_i^{\alpha} \Pi_i^{\alpha}$ to the retailer's expected revenue, always increase $\Pi_i^{\alpha*}$ and lower P_i^* for a given Q_i in the same way that a fixed per-unit subsidy to a classical monopolist increases the monopolist's output and lowers his price for a given quality of his output. And, similarly, sufficiently high subsidy rates would induce the seller to charge negative prices as he would be induced to pay negative use-value customers to use his services in order to increase his subsidy revenue. Of particular interest will be the subsidy rate, $s_i^{\alpha o}$, that makes the retailer's optimal price to the consumer zero. (This rate is easily seen to be equal to $\Pi_i^{\alpha}/\Pi_i^{\alpha'} - 1$.)

Now the expected number of customers under laissez faire, $N_i^* = \sum_{\alpha} \Pi_i^{\alpha*}$, is obviously less than our socially optimal number, N_i^o, because some potential customers with positive marginal values are excluded while no customer with a negative marginal value is included in i's consuming group. An optimal subsidy system assures that any buyer with a positive use-value purchases the retailer's overhead service and a potential buyer with a negative use-value does not. The commonly mentioned government policy achieving this result is the forcing of all retailers to charge zero prices to all buyers, heavily subsidizing the retailers-turned-government-suppliers according to the qualities of their overhead services. However, this policy creates administrative difficulties in monitoring prices and qualities, making this "governmental provision" system more socially expensive, we assume, than a market-oriented alternative in which the government cheaply achieves an efficient N_i-subsidy by exploiting the discriminatory, demand-revealing process utilized by private retailers in marketing their overhead services. As discussed above, a simple form of this free-market exclusion process has retailers charging uniform, positive markups on certain, complementary, private goods. An optimal N_i-subsidy would, correspondingly, subsidize the quantities sold of these private-good complements, acting as the s_i^α -subsidy discussed above. Relatively high use-value consumers of the overhead services of a given retailer — who are much more likely to buy the retailer's private-good-complement than are low-use-value consumers — are thereby subsidized at much higher rates than low use-value consumers. And a sufficiently high subsidy level would induce the retailer to offer an effectively zero price to every class of consumer.

We shall argue, in Section IV below, that U.S. retailers typically are subsidized in just this way.

The fixed, socially optimal, subsidy rates, denoted $s_i^{\alpha o}$, in order to do their job in inducing firms to offer their overhead services to consumers at effectively zero prices, must anticipate the retailers' quality decisions.

To determine the firm's privately optimal quality choice, Q_i, which we also want to compare with the socially optimal Q_i described in equation (2), we simply have the firm vary its Q_i so as to maximize its expected profit,

$$\sum_\alpha (P_i^\alpha Q_i + s_i^{\alpha o})\ \Pi_i^{\alpha *}(P_i^\alpha, Q_i; EQ_{-i}^\alpha(Q_i)) - C_i(Q_i),$$

holding each Π_i^α constant at its privately optimal level by suitably varying P_i^α with Q_i. This generates the following first order condition for Q_i:

$$\sum_\alpha (P_i^\alpha + Q_i \left.\frac{dP_i^\alpha}{dQ_i}\right|_{\Pi_i^\alpha\ \text{con}})\quad \Pi_i^{\alpha *} = C_i'(Q_i),$$

or, since s_i^α, and thus P_i^α and Π_i^α, are at socially optimal levels, simply

(3) $$Q_i \sum_\alpha \Pi_i^{\alpha o} \cdot \left.\frac{dP_i^\alpha}{dQ_i}\right|_{\Pi_i^\alpha \text{ con}} = C_i'(Q_i).$$

Each derivative in the sum on the left side of (3) is easily determined by solving the equation defining it; viz.:

$$0 = \frac{d\Pi_i^\alpha}{dQ_i} = \frac{\partial \Pi_i^\alpha}{\partial P_i}\frac{dP_i^\alpha}{dQ_i} + \frac{\partial \Pi_i^\alpha}{\partial Q_i} + \sum_{j \neq i} \frac{\partial \Pi_i^\alpha}{\partial EQ_j^\alpha}\frac{dEQ_j^\alpha}{dQ_i}.$$

I.e.,

(4) $$\left.\frac{dP_i^\alpha}{dQ_i}\right|_{\Pi_i^\alpha \text{ con}} = -\frac{\frac{\partial \Pi_i^\alpha}{\partial Q_i}}{\frac{\partial \Pi^\alpha}{\partial P_i}} - \frac{\frac{\partial \Pi_i^\alpha}{\partial EQ_{-i}} \cdot \frac{dEQ_{-i}}{dQ_i}}{\frac{\partial \Pi^\alpha}{\partial P_i}}$$

$$= \left.\frac{dP_i}{dQ_i}\right|_{\substack{\Pi_i^\alpha \text{ con} \\ Q_{-i} \text{ con}}} + \left.\frac{dP_i}{dEQ_{-i}}\right|_{\substack{\Pi_i^\alpha \text{ con} \\ Q_i \text{ con}}} \cdot \frac{dEQ_{-i}}{dQ_i}.$$

By holding Π_i^α constant, we are holding constant the utility that the i^{th} retailer expects he is providing the α^{th} customer. Thus, using the previous section's notation to express (4) in terms of individual utility functions, the retailer's expected marginal revenue from Q_i expressed in (3) is:

(5) $$\sum_\alpha \Pi_i^\alpha \left.\frac{Q_i dP^\alpha}{dQ_i}\right|_{\Pi_i^\alpha \text{ con}} = \sum_\alpha \Pi_i^\alpha \left[\frac{\hat{V}_{Q_i}^\alpha}{a^\alpha} + \frac{\hat{V}_{Q_i Q_{-i}}^\alpha}{a^\alpha} \cdot \frac{dEQ_{-i}^\alpha}{dQ_i}\right],$$

where $\frac{\hat{V}_Q^\alpha}{a^\alpha}$ represents i's estimate of α's MRS for his service quality.

It is plausible to assume that the retailer <u>knows</u> this solution marginal revenue with certainty through past experiments with small changes in Q_i

because such changes are of negligible cost to the retailer. Assuming further that each consumer's actual MRS is an unbiased estimate of the producer's expectation of this MRS, the expected marginal revenue in (5) can be written:

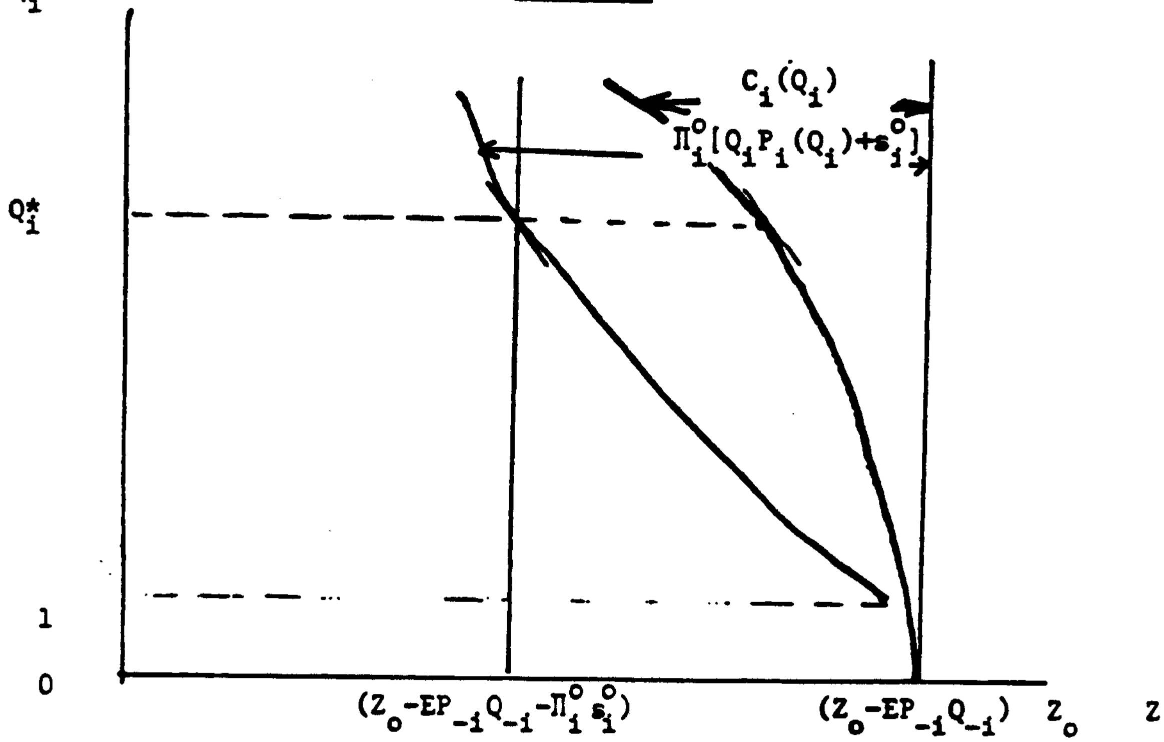
$$(6) \qquad \sum_{\alpha} \Pi_i^{\alpha} Q_i \left. \frac{dP_i^{\alpha}}{dQ_i} \right|_{\Pi_i^{\alpha} \text{ con}} = \sum_{\alpha \epsilon \{N_i^o\}} Q_i \left. \frac{dP_i}{dQ_i} \right|_{\Pi_i^{\alpha} \text{ con}} = \sum_{\alpha \epsilon \{N_i^o\}} \frac{V_{Q_i}^{\alpha}}{a^{\alpha}} + \frac{V_{Q_i Q_{-i}}^{\alpha}}{a^{\alpha}} \frac{dEQ_{-i}^{\alpha}}{dQ_i} ,$$

where $\{N_i^o\}$ denotes the equilibrium set of actual customers of the i^{th} retailer.

To further compare this problem to the perfect information case, Figure 4 displays the retailer's Q_i-optimization problem on a $Q_i - Z$ graph analogous to Figure 3, where the retailer's total revenue curve again has each P_i^{α} vary with Q_i so as to maintain the producer's expectation of the solution levels of utility generated by his service. Beginning the fixed subsidy, $s_i^{\alpha o}$, at $Q_i = 1$, expected revenues now begin at $Q_i = 1$, being $(P_i(1) + s_i^o)\Pi_i^*$ at that point, where P_i is the set of prices for all consumers, $\alpha = 1,\ldots,N$, and s_i^o and Π_i^o are, respectively, the set of optimal N_i-subsidies and correspondingly optimal retailer use-probabilities for all consumers. (Because $P_i(Q_i)$ increases with Q_i and is zero in the equilibrium, $P_i(1)$ must be strictly negative.) Since this total revenue curve, and in particular the $P_i(Q_i)$-function, is constructed so as to leave Π_i — and thus the producer's expectation of the consumers' utilities — constant, it is also a kind of iso-utilities curve. The equilibrium, $P_i^{\alpha} = 0$, slope of this iso-utilities curve is given in equation (6).

Two important differences appear between Figure 4 and the iso-utilities curve of Figure 3. First, the switch points are gone. When Q_i increases, the i^{th} retailer, who now never knows for sure whether a given consumer is going to buy <u>any</u> seller's output, alters only his prior probabilities, Π_{-i}, that consumers are going to buy the related services offered by other

Figure 4



retailers. The source of the existence problem — viz., the desire of other retailers to raise prices until other retailers border on switch points — is removed by smoothing out the effects of such anticipated price increases on the expected sales of the other retailers. At the same time, the effect of changes in Q_i on the expected levels of Q_{-i}^{α} and thus on the demand price for Q_i becomes a continuous effect relevant to the retailer's computation of his private marginal value of Q_i. Thus, as described in equations (4) through (6), the retailer's expected revenue from a quality improvement contains an extra term beyond the consumer's ordinary MRS, a term expressing the expected increase in the consumer's demand-price for Q_i caused by alterations in the probabilities of his purchases from other retailers induced i's unit increase in Q_i.

The second important difference between the two iso-utilities curves is that Figure 4 is simply the producer's expectation of the combination of Q_i -

Z points that will, under his pricing scheme, leave his customers indifferent. It has taken rational expectations assumptions to connect these expectations to the underlying reality in order to evaluate the social efficiency of the retailer's equilibrium Q_i-choices. In particular, regarding the level of the expected revenue function, recall that whatever the firm's subjective Π_i -levels, the optimal subsidy induces the seller to charge an efficient, zero price to each consumer. (Empirically, as long as observed subsidy rates paid directly to the consumers approximate the observed, retailer/discounter price differential, this is a realistic assumption.) Similarly, regarding the slope of the function, we have assumed — fairly realistically we have argued — that the retailer: (1) knows the actual near-equilibrium revenue from a small quality change when his prices increase so as to leave his potential customers' expected purchases from him unaltered and (2) has an unbiased estimate of each customer's near-equilibrium marginal real use-value for his service.

The marginal overvaluation and resulting overproduction of Q_i follows immediately upon substituting equation (6) into equation (3) and recalling that each term in the vector product, $\frac{V^{\alpha}_{Q_i Q_{-i}}}{a^{\alpha}} \cdot \frac{dEQ^{\alpha}_{-i}}{dQ_i}$, is nonnegative, being positive for related services and zero for unrelated services. Thus, the quality-expanding retailer, whether "rent-seeking" by reducing the expected sales of substitute-producing retailers or "free-riding" by gaining from the expanded sales of complementary retailers, sees too large a private return from his expansion.

The following, illustrative special case may aid our understanding of the above, rather abstract, uncertainty model. Let consumer α's total real use-value for the i^{th} retailer's output be given by

$$V_i^\alpha = K^\alpha + V_i(Q_i;Q_{-i}),$$

where K^α ranges from a high of H to a low of L, a^α being set equal to unity for all consumers. This defines maximum and minimum values of V^α for given Q's,

$$\bar{V}_i(Q_i;Q_{-i}) = H + V_i(Q_i,Q_{-i}) \text{ and}$$

$$\underline{V}_i(Q_i;Q_{-i}) = L + V_i(Q_i;Q_{-i}),$$

respectively. To guarantee that the optimal number of customers is always less than the total population, N, we assume that $\underline{V}_i < 0$ for all feasible values of Q_i and Q_{-i}. The percentage of consumers with total use values above a given, nonnegative value, say G, is given by

$$(\frac{\bar{V}_i - G}{\bar{V}_i - \underline{V}_i})^2.$$

Retailers know this cumulative frequency distribution but do not know the individual values of the various consumers. The best a retailer can do is therefore to set a single, nondiscriminatory total price, $G_i = P_iQ_i$ for his overhead service, given Q_i, the quality of his overhead service, and Q_{-i}, his correct expectation of the total services that his customer will be buying from other retailers. With the proportion of consumers having use values above this price given by the above distribution function, we can express the retailer's profit in (3) as

$$(G_i + s_i)\, N \cdot (\frac{\bar{V}_i - G_i}{\bar{V}_i - \underline{V}_i})^2 - C_i(Q_i), \tag{3'}$$

Setting the price derivative of (3') equal to zero, we find its profit maximizing level to be:

$$G_i^* = \frac{\bar{V}_i - 2s_i}{3}.$$

with $s_i = 0$, $G_i^* = \bar{V}_i/3$. Since this value is positive, inefficient overexclusion exists with $s_i = 0$. Setting s_i so that $G_i^* = 0$ solves the above equation, we see that $s_i = s_i^o = \bar{V}_i/2$. While this subsidy generates socially optimal utilization of i's overhead services, it rewards him too much for being in business. For the social value of his product, the average of the positive marginal values for his service, is less than $\frac{\bar{V}_i}{2}$ because of the disproportionate number of low-valued users under our assumed distribution. (This expected social value is easily calculated to be $\bar{V}_i/3$.) While license or entry fees can be introduced to solve this problem, we are avoiding the problem here by simply assuming a fixed number of retailers, R. While our N_i-subsidized solutions generally create this too-many-firms characteristic, our eventual tax on the firm's quality works to eliminate the characteristic. Also, our solutions for the more-conventionally discussed case in which $s_i = 0$ can <u>never</u> possess this too-many-firm property, even for the given, suboptimal, numbers of customers present when $s_i = 0$. Thus, in our example, the i^{th} retailer's per-customer unit profit, $\frac{\bar{V}_i}{3}$, is far less than his chosen customers' <u>average</u> value for his unique product, the <u>lowest</u> of which is $\frac{\bar{V}_i}{3}$.

The above, subsidy-influenced choice of G_i determines a socially optimal utilization rate, $N_i^o = N(\bar{V} \mid \bar{V} - \underline{V})^2$, of the i^{th} overhead service. Regarding the retailer's choice to be of a fixed utilization rate, achieved by suitably varying its price, allows us to directly compare the firm's privately optimal choice of Q_i with the socially optimal choice, described earlier in equation (2). Thus, keeping utilization constant at N_i^o, the Q_i-derivative of the retailer's profit is zero when

(4')
$$N_i^o \left.\frac{dG_i}{dQ_i}\right|_{\frac{\bar{V}_i - G_i}{\bar{V}_i - \underline{V}_i} \text{con}} = C_i'(Q_i)$$

$$N_i^o \left.\frac{dG_i}{dQ_i}\right|_{\substack{\frac{\bar{V}_i - G_i}{H-L} \text{ con} \\ Q_{-i} \text{ con}}} + \left.\frac{dG_i}{dQ_{-i}} \frac{dQ_{-i}}{dQ_i}\right|_{\substack{\frac{\bar{V}_i - G_i}{H-L} \text{ con} \\ Q_i \text{ con}}} = C_i'(Q_i)$$

(6')
$$N_i^o \left[\frac{\partial V_i(Q_i, EQ_{-i})}{\partial Q_i} + \frac{\partial V_i}{\partial Q_{-i}} \frac{dQ_{-i}}{dQ_i}\right] = C'(Q_i)$$

Since $a^{\alpha} = 1$, the first term on the left is the marginal social value of Q_i described in (2). So again, the second term in the bracket on the left, which is always positive as long as some other retailer's overhead service is related in consumption to i's, again describes an unambiguous private overvaluation of Q_i.

IV. N_i-subsidies in the Real World

Since the private overvaluation of the quality of the overhead services provided by retailers is unambiguous only when socially optimal N_i-subsidies are in place, we will be unable to evaluate observed economic policies systematically attentuating the property rights of relatively high quality retailers unless we can find a set of such N_i-subsidies in the real world, at least for certain types of retailers.

It will be helpful to separate all private-good complements sold by retailers into three mutually exclusive and exhaustive categories: (1) Goods consumed while outside the consumers' body; (2) Goods consumed while on the surface of the consumer's body, and (3) Goods consumed entirely inside his body. This seemingly irrelevant taxonomy will help us isolate various kinds of real-world externalities.

Goods consumed outside a person's body (e.g., appliances, autos, houses, etc.) are "coveted"; then can be taken by foreign aggressors and hence generate a negative defense externality. The greater the stock of such goods, the greater the national defense effort required to provide a given level of national security. But these goods are not taxed to reflect this externality! Consumer durables offer a unique exception in the U.S. tax system, which efficiently taxes all other forms of coveted capital at approximately the same rate (Thompson, 1974). With consumer durables uniquely relieved of their national defense tax liabilities, we have the implicit subsidy we are seeking.[4] Moreover, the average, point-of-sale, U.S. capital tax, about 15%, roughly approximates our casual estimate of the typical retail mark-up over and above the cost of ancillary private-good services (such as inventory services, flattery and related psychological services, and "free-trial" services). Expensive items, in particular houses and cars, have directly observable dealer-mark-ups and brokerage commissions. These mark-ups, being only about 5% to 10%, appear to make the 15% implicit subsidy too large. However, since these expensive items are typically resold through dealers and

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[4]While this tax-relief represents a subsidy to the purchase of complementary private goods beyond the first unit purchased, recall from footnote #2 above that observed, rationally discriminatory, price systems frequently have retailers charging in excess of marginal cost for private-good-complements beyond the first unit bought by a given customer in order to effectively price discrimination between high and low service demand customers. In this case, uniform subsidies to the purchases of private-good complements may be superior to apparently optimal flat-rate subsidies to particular buyers (i.e., flat-rate subsidies that induce purchases of a retailer's overhead service when and only when the expected value of the service is positive).

brokers, 15% may be a reasonable estimate of the present value of the sequence of apparent over-markups on a typical, expensive, consumer durable good by information sellers using this private-good complement to collect for their information.[5]

Our second kind of private-good complement, being consumed on the physical surfaces of individuals, are highly tailored to the individuals and not significantly coveted by foreign aggressors. These goods -- like clothes, cosmetics, haircuts, etc. — serve, however, as "adornments" in our society in that they are consumed largely to make the consumer more "attractive" to others. While the benefits created for his friends are largely internalized by the consumers of these goods, the costs imposed on others — though the numerous decreases in the utilities of the friends of the now-relatively-less-attractive individuals — are not internalized.

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[5]One might regard positive mark-ups on used goods as providing original purchasers with too little resale incentive. However, the ubiquitous over-incentive to transact to current sellers who believe that future market prices will be less than the prices expected by current buyers (Thompson, 1966, Hirshleifer, 1971) rationalizes the traditional on governmental support of resale contracts allowing brokers positive mark-ups on complementary private goods rather than fixed service fees.

The same holds, of course, for resales of rights to durable producer assets (e.g., common stocks), where observed governmental policies induce security as well as real estate brokers to charge ad valorem commissions rather than flat service fees. (How common-stock transaction taxes fit into an optimal capital tax system is discussed in Thompson, 1974.) At the same time, governmental policies allow those brokers to collectively fix their nominal commission rates at common levels, thereby facilitating exclusion by these information-providers in the same way that private-resale-price-maintenance contracts allow retailers selling newly manufactured goods to protect themselves from free-riders. Moreover, the policy-analogy is complete once we recognize that the observed policies towards brokers also restrict the appropriability of relatively high-quality information-providers in that they leave some room for free-riding discounters, especially in the case of securities brokers, where the implicit subsidy to the private-good complement (i.e., the transaction) is particularly obvious because of the large speculative component of the typical transaction.

I call such decreases in utility, resulting as they do from simple increases in the quality of the services consumed by <u>other</u> consumers, "relative quality externalities" (see Thompson-Canes). They are not Veblen effects. "Veblen, and later Galbraith, argued that the elaborate consumer durables found in many houses and vehicles were <u>too</u> elaborate because of the effect of quality improvements of such goods on the utilities of other individuals. These authors, however, failed to distinguish "pecuniary" externalities from direct, "technological" externalities. As houses, autos, and yachts are typically shared with one's friends, an increase in the quality of such possessions serves to increase the owner's ability to attract quality friends and thereby injures neighboring suppliers by making it more expensive for them to maintain their previous supplies of friendly associations. Because such a loss is only "pecuniary" in that it implies a corresponding gain to quality friends, there is no net external effect of these quality improvements on economic welfare. Thus, economists have been wrong in automatically accepting the "keeping-up-with-the-Jones'" effect as a real externality. The long-term trend toward increasingly elaborate consumer durables relative to per capita income is simply a reflection of our steadily increasing scarcity of friends relative to manufactured products and therefore a steadily increasing real price of friends.

While we have yet to devise a general method of quantifying the relative quality externality in order to see if actual retail mark-ups on "adornments" match the corresponding external diseconomies, the one empirical study we have done so far (Thompson-Canes) does suggest a remarkable ability of governments to devise an optimal response to this problem. In view of this, and in the absence of any evidence to the contrary, we merely assume that the relative quality externality for typical adornments approximates the typical retail mark-up on the good.

This rough approximation allows us to empirically apply our unambiguous overvaluation result, which implies the optimality of economic policies limiting the appropriability of high-quality retailers of private-good complements falling into one of our first two categories. For either kind of good, there should be policies restricting the appropriability of high-quality retailers.

Remarkably, such restrictions are quite common throughout the developed world. In the U.S., we have laws preventing resale price maintenance contracts, whose main purpose is obviously to insure retailers against the free-riding discounts of retailers. Similarly we have a whole complex of anomolous laws [e.g., laws restricting exclusive dealerships, exclusive territories, price discrimination across retailers, etc. (see Schwartz-Eisenstadt)], serving society only by limiting the appropriability of high-quality retailers. Also, with certain important exceptions described below.[6] England shares the same kind of policy.

The only era of widespread, legalized, resale price maintenance in the U.S. began in the late 1930's, after "cut-rate" depression discounters began to allow the increasingly mobile consumers to substantially "free-ride" on the services of relatively high-quality retailers (Overstreet). The absence of implicit national-defense and subsidies the lesser significance of adornment

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[6]An important caveat is that current laws may also work to prevent resale price maintenance and exclusive distribution agreements when they would be employed to achieve other socially desirable, private goals. In particular, resale price maintenance may be used to provide small retailers with a means of making price commitments to protect their margins against overshopping, specific-service-receiving customers and exclusive distribution may be used as part of a labeling service provided by high-quality, high-rent-district retailers.

externalities during this early period meant that policies encouraging the complete appropriability of retailer-provided benefits could be desirable (in a second-best sense) through their positive effects on the numbers of retailers. An argument partially rationalizing the continuation of our resale-price-maintaining, "Fair Trade" laws throughout the 50's and 60's — after our national-defense subsidies and adornment externalities grew to significance — will be supplied only after we have considered our third, and final, type of private-good complement.

Private-goods safely consumed entirely within the body — like food, pharmaceutical drugs, and popular books and periodicals — being neither coveted by foreign aggressors nor capable of making other individuals look less attractive, generate no obvious external diseconomies and therefore receive no indirect subsidy from the U.S.'s laissez-faire policy toward safe consumer goods.[7] However, goods in this third category that are also "perishable", or short-lived in their influence on the body, call for very little in the way of retailer provision of collective-good information. Such goods are simple, nondurable, "experience goods" in the terms of Nelson and can be individually evaluated by each consumer through a simple, inexpensive sampling of the goods. Hence, food "retailers" provide essentially no information regarding the qualities of their various goods and correspondingly charge no noticeable mark-ups over their private-good costs, the cost of inventory-holding and contracting. In contrast, goods in this category that are durable in that they may easily have a relatively long-term influence on

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[7]Goods that present the consumer with a risk of loss of bodily function or death are overpurchased in that the consumer does not have to, and typically does not, compensate friends and relatives when he incurs such a loss. This "death externality" rationalizes the myriad of safety regulations we see throughout the developed world (Thompson, 1979.)

the body create a special problem. The only goods we could find in this category (see Nelson's list of "experience-goods") are pharmaceutical drugs and books and periodicals. Here, we find a singular exception to the above pattern in that while retailers should generally supply consumers with significant amounts of information concerning the durable-effects of such private goods, consumers receive no apparent subsidy for purchasing the goods.

Summarizing to now, we have, with only one exception, found significant implicit subsidization of private-good-complements where such subsidization is efficient. The exception is an absence of subsidization of effectively durable goods consumed entirely within the body, the only apparent examples in this category being pharmaceutical drugs and popular books and periodicals. Correspondingly, our theoretical overvaluation results tell us that we should attenuate the property rights of all high-quality retailers except information-providing druggists and sellers of books and periodicals.

In fact, U.S. druggists and book sellers were the chief political forces behind the establishment and maintenance of the U.S. Fair Trade laws from the 1930s through the 1960s (Overstreet). These laws, which gave quality retailers the ability to prevent free riding by discounters were only recently eliminated only after druggists and booksellers lost much of their usefulness as relatively informed suppliers of information to their customers. Still more remarkably, in England, where booksellers and druggists have succeeded in maintaining their traditional role as informed advisors, Fair Trade protection is afforded only to booksellers and druggists!

References

Alger, Dan, "Markets Where Firms Select Both Prices and Quantities," Northwestern University Ph.D. dissertation, 1979.

Chamberlain E.V., Theory of Monopolistic Competition, Harvard University Press, Cambridge, Mass., 6th ed. (1963).

Coase, R.H., "The Problem of Duopoly Reconsidered," Review of Economic Studies, Feb. 1935, pp. 137-43, esp. 138-9.

Galbraith, J.V., The Affluent Society, Houghton Mifflin, Boston, (1985).

Hirshleifer, J., "The Private and Social Value of Information and the Reward to Inventive Activity," American Economic Review, (September 1971), pp. 561-574.

Kahn, R.F., "The Problem of Dupoly," Economic Journal, (March 1937), pp. 1-20, esp. p. 8.

Nelson, Phillip, "Advertising as Information," Journal of Political Economics, (July/August 1974), pp. 729-755, esp. p. 739.

Overstreet, Tom, "Resale Price Maintenance: Economic Theory and Empirical Violence: Staff Report," Federal Trade Commission, (1984).

Thompson E.A. and Michael E. Cane, "Contradual Arrangements in the Spectator Sports Industry," Unpublished paper, UCLA, (1969).

__________, "A Pareto Optimal Group Decision Process," in Papers in Non-Market Decision Making, Charlottsville, (1966), pp. 133-140, esp. from 5.

__________, "An Economic Basis for the National Defense Argument for Protecting Certain Industries," Journal of Political Economics, (February 1979), pp. 1-36, esp. from 7.

__________, "Taxation and National Defense," Journal of Political Economy, 82, (July/Aug. 1974), 755-83.

Veblen, Thornstein, Theory of the Leisure Class, McMillan, New York, (1899).