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SELLING FORMATS FOR SEARCH GOODS

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The paper offers a comparative analysis of different ways to sell products (selling formats) when buyers incur evaluation costs. Since these costs are sunk at the moment of trade, buyers may refrain from incurring them for fear of later opportunism on the part of sellers. It is found that the use of many common selling formats can be explained in terms of their ability to alleviate this problem. Specifically, I explain price advertising, seller colocation, and bargaining. The theory explains much of the divergence in retail trading institutions and leads to several testable predictions.
(Game Theory; Retailing; Advertising)

1. Introduction

The marketing literature has typically been concerned with optimal actions within a given trading institution.[1] For example, given that a product is sold at an advertised price, one has asked which price to advertise. In the present paper I will conduct a comparative analysis of different trading institutions, asking some deeper questions, such as "When do you advertise price?", "When do you locate close to competitors?", "When do you use a mailorder catalog?", and "When do you bargain over price?". This endeavor helps us understand the functions of commonly used institutions.

Contrary to common belief it is not always obvious how a product should be sold. To support this, note that actual selling formats differ substantially across products and countries. Take first the case of advertised firm prices versus bargaining. In the U.S. and Japan automobile sellers generally bargain over the price while their European and Korean counterparts most often advertise firm take-it-or-leave-it offers. Consider next the use of retail showrooms (stores) versus mail order catalogs. While most products are available in stores, the shares of mailorder catalogs differ across product categories. Finally, some products are sold by a cluster of sellers who deliberately locate together and bargain, while others are sold by disperse sellers who advertise firm prices. Examples of the former practice are antique malls, farmers' markets, and "the automile on Route 1 in Norwood MA—the best place to shop and compare." I will return to these examples in §4.

I will confine the analysis to products for which prepurchase evaluation is costly for the buyer. Mental evaluation costs have a long history in the marketing literature (Bettman 1979, Shugan 1980, Hauser and Wernerfelt 1990), but I will also include transportation

[1] The stream with McGuire and Staelin (1983), and Coughlan and Wernerfelt (1989) contains many of the exceptions.

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costs if visual inspection is necessary. Consequently, I will use the term "inspection costs" to denote all disutilities incurred in prepurchase assessments of consumption utility. The presence of these costs causes a specific investment problem: since the buyer sinks these costs prior to purchase, the seller has no incentive to compensate for them. For example, you may travel 100 miles to buy a "cheap" car only to find that the "real" price is so high that you would have stayed home had you known. (But since you are there, you buy anyway.) Fearing this, the buyer may refrain from inspecting and in the end there is no trade.

The paper will provide a unified framework for analyzing three institutions which may overcome this problem.

In §2, I look at a model with a single seller. I first show that the gameform where the seller advertises a firm take-it-or-leave-it offer maximizes his expected profits.[2] I then ask how things change if this price is not advertised. It turns out that price advertising makes trade feasible for positive inspection costs. Intuitively, by advertising a price prior to the buyer's decision whether or not to inspect, the firm commits not to exploit the sunk costs.[3] As an alternative to *ex ante* inspection, I next look at unconditional warrantees, here conceived as mail-order shopping with full return rights. This gameform makes it unnecessary to inspect prior to purchase, while the costs of returning the product only have to be incurred if it is found unsatisfactory. So the specific investment problem disappears and inspection costs are replaced by expected return costs. If these are low enough, this is a more profitable gameform.

In §3, I look at a model with two sellers and consider the possibility of using competition to credibly commit not to exploit the buyer's sunk costs. In the transportation cost interpretation, if two sellers locate close together, neither of them can exploit the buyer too much. Similarly, if two competitive products are standardized, evaluation of one allows the buyer to purchase either.[4] The analysis reveals that colocation is a substitute for price advertising. I finally ask whether the competing sellers could do better by not making firm take-it-or-leave-it offers. Contrary to the analysis for one seller, this turns out to be possible under specific parameter conditions (because competing price posters subject themselves to Bertrand competition). So this suggests an explanation for the use of bargaining.

In §4 I discuss the three main empirical predictions, and §5 concludes the paper.

2. Basic Model

In this section I look at a situation where a single seller can produce an infinite sequence of indivisible objects. The seller faces a finite sequence of heterogeneous buyers, indexed by i, and in stage i, his production cost (reservation value) is c_i. The buyers may each buy a single object and vary in terms of their initial valuations of the object. I assume that this initial valuation is confirmed only after the buyer expends s' to inspect the object. Initially, I assume that the buyer *has* to inspect before he can purchase (e.g., if s' consists of travel costs or mental evaluation costs). Thus with probability g, the final valuation equals the initial valuation, while with probability $1 - g$, the final valuation is zero. We will think of v_i as buyer i's "initial" valuation. The outcomes of the inspection process are independent across buyers and the v_i's and c_i are independently drawn from uniform distributions on $[0, 1]$. At the beginning of a stage, both players privately learn their reservation values (c_i or v_i), and all players know g and s'.

[2] Harris and Raviv (1981) and Riley and Zeckhauser (1983) show this for the case of zero inspection costs and commonly known seller costs. A similar point is known from the literature on the "Coase (1972) Conjecture," in marketing represented by Moorthy and Png (1992) and Narasimhan (1989).

[3] In Lal and Matutes (1991) and Simester (1992), advertised prices commit the firm in similar ways.

[4] See also Dudey (1990), Rotemberg and Saloner (1990), and Shepard (1987) for studies of the effect of using competition to commit oneself.

The model is intended to capture situations where buyers must physically inspect the item before determining its value to him or her and the seller can produce more items than there are potential buyers. Apparel and consumer durables may be thought of as examples. The purpose of the assumptions about timing is to make the buyers *ex ante* heterogeneous. If the buyers have identical pre-inspection priors they will either all inspect or all not inspect. This construction avoids this and the uniform distribution gives linear downward sloping demand, facilitating analysis. Although the above is quite general it is an abstraction of reality. Surely not all buyers have identical search costs, nor will the probability of finding the product to have its initial perceived value be the same for all buyers. Also most selling situations involve more than one seller. In §3, I extend the basic model to allow for multiple sellers. Perhaps more restrictive is the assumption that the after-inspection value drops to zero with probability $1 - g$. For the situation to be interesting the value of the item needs to have the possibility of dropping below the highest possible price charged. The results will be completely unchanged if the "failure" value is below the inspection costs. For intermediate values one could imagine pricing strategies to capture some sales from these buyers. This would not change the main qualitative results. What could change the results, however, is if failure is the private information of the buyer and yet does not rule out trade. This would give extra bargaining leverage to the buyer who has inspected and require us to make some assumption about the seller's ability to react to this. The fact that costs are the private information of the seller is not necessary for the results in this section. It is used because it allows a more consistent analysis of the bargaining gameform in the next section. Using it throughout ensures comparability of the results.

2a. *Firm Prices Maximize Profits*

I will use the powerful "mechanism design" technology to find the profit-maximizing selling format. Note that any selling format defines a sequence of games, where the equilibria of each game are functions of (c_i, v_i). The revelation principle (Myerson 1979) says that the results of any gameform can be mimicked by a direct and truthful mechanism. A direct mechanism is one in which each player writes (commits to) a bid (called c_i^1 or v_i^1). The bids are then plugged into an *ex ante* known allocation rule which gives the probability of trade and the expected price as functions of the bids. A mechanism is truthful if the equilibrium calls for each player to reveal his true reservation value (c_i or v_i). The procedure is now to search among all mechanisms which are piecewise differentiable functions of the bids. The revelation principle tells us that there is no loss of generality in confining attention to direct and truthful mechanisms. Once we have identified the profit-maximizing mechanism, we will look for a selling format (a gameform) which implements the same outcome.

So the assumption is that the seller, prior to the buyers' inspection decisions, can precommit to any gameform, here represented by a piecewise differentiable mechanism. Specifically, we let the mechanism be characterized by the probability of sale (to a specific buyer) $Q(v^1)$ and the expected price (if there is a sale), $p(v^1)$, given that a buyer's response is v^1. Define the utility to a buyer, if he has inspected the product and likes it (finds that his reservation value is v), as

$$u(v, v^1) = Q(v^1)(v - p(v^1)). \tag{1}$$

In the following we will drop the subscript i and use v to indicate the value of v_i for a specific buyer. Since the buyers only will inspect if they expect to get at least $s \equiv s'/g$, we can use the revelation principle (Myerson 1979) and define $\underline{v}$, the lowest tentative valuation for which the buyer will participate, by

$$u(\underline{v}, \underline{v}) = s. \tag{2}$$

Using the differentiability of Q and p we can express $u(v, v)$ (for $v > \underline{v}$) as

$$u(v, v) = \int_{\underline{v}}^{v} \frac{du}{dw}(w, w)dw + u(\underline{v}, \underline{v})$$

$$= \int_{\underline{v}}^{v} \frac{\partial u}{\partial v}\bigg|_{v=v^1} dx + \int_{\underline{v}}^{v} \frac{\partial u}{\partial v^1}\bigg|_{v=v^1} dx + s = \int_{\underline{v}}^{v} Q(x)dx + s, \tag{3}$$

where $\partial u/\partial v^1|_{v=v^1} = 0$ follows from the revelation principle (which tells us that it is optimal for the buyer to announce his true tentative valuation). The seller's expected profit per buyer is

$$g\int_{\underline{v}}^{1} Q(v)(p(v) - c_i)dv = g\int_{\underline{v}}^{1} Q(v)[v - c_i - (v - p(v))]dv. \tag{4}$$

Substituting (1), we can get rid of $p(v)$ and write this as

$$g\int_{\underline{v}}^{1} Q(v)(v - c_i)dv - g\int_{\underline{v}}^{1} u(v, v)dv. \tag{5}$$

Substituting (3) and integrating by parts gives

$$g\int_{\underline{v}}^{1} Q(v)(v - c_i)dv + g\int_{\underline{v}}^{1} Q(v)(v - \underline{v})dv - g\int_{\underline{v}}^{1} Q(v)(1 - \underline{v})dv - g\int_{\underline{v}}^{1} sdv. \tag{6}$$

The optimal mechanism is given by a $Q(v)$ which maximizes (6) given that $\underline{v}$ equals $s/Q(\underline{v}) + p(\underline{v})$. Since the profit maximizing strategy is to minimize $\underline{v}$, $Q(\underline{v}) = 1$. As it never can pay off to sell $\underline{v}$ but not $v > \underline{v}$, $Q(v) = 1$ for $v > \underline{v}$. So we can substitute $Q(v) = 1$ into the last integral in (6) and get expected profit per buyer as

$$g\int_{\underline{v}}^{1} Q(v)2\left(v - \frac{1 + c_i + s}{2}\right)dv. \tag{7}$$

Obviously this is maximized by setting $Q(v) = 0$ if $v < v_i^*$, and $Q(v) = 1$ if $v > v_i^*$, where $v_i^* = (1 + c_i + s)/2$. Since the expected cost of inspection is s, this is exactly the outcome which is implemented if the seller commits to a firm take-it-or-leave-it offer to sell at the price $p^*(c_i) = (1 + c_i - s)/2$. Advertising a price creates such a (legal) commitment. So *the seller cannot commit to any mechanism which will do better for him than price advertising*.[5] I will use A to denote this game form.

The expected profits in A are found by noting that the buyer will inspect iff $(v_i - p)g > s'$. So if $c_i > 1 - s$ there is no possibility of gains from trade and if $c_i \leq 1 - s$, gains from trade go unrealized when

$$c_i + s < v < (1 + c_i + s)/2.$$

For future reference we find expected profits per buyer as

$$\Pi^A(c_i) = (p^*(c_i) - c_i)(1 - p^*(c_i) - s)g = g\frac{(1 - s - c_i)^2}{4} \quad \text{and} \tag{8}$$

$$E\Pi^A = \int_0^{1-s} \Pi^A(c_i)dc = g\frac{(1 - s)^3}{12}. \tag{9}$$

[5] This result generalizes the findings of Harris and Raviv (1981) and Riley and Zeckhauser (1983) to the case where $s > 0$, c_i is timevarying, and c_i is the seller's private knowledge. As shown in the former paper, the result depends critically on the absence of a capacity constraint. If the seller has fewer objects than buyers, an auction mechanism does better. Chen and Rosenthal (1993, 1994) look at an intermediate case where an impatient seller with fixed capacity faces a sequence of slowly arriving buyers. They find that the optimal mechanism involves a ceiling price.

As an aside we note that an important limitation of the above analysis is the assumption that s' has to be incurred before purchase. If we move away from the transportation cost interpretation, thinking of s' as information cost, we can make its incurrence a matter of choice. So, in the terminology of Nelson (1970), *it may be an endogenous matter whether the product is a search or an experience good*. If allowed to, the buyer will purchase without inspection if $p < s'(1-g)^{-1} \equiv \underline{p}$, because then the expected loss due to purchase of a worthless item is less than the cost of inspection. The optimal strategy is then to price at $(1+c_i)/2$ as long as $(\underline{p}-c_i)(1-\underline{p}) > \Pi^A(c_i)$, and to price at $p^*(c_i)$ for higher levels of c_i. *So for a product to be a search good it is not enough that search is feasible*; *the price must be sufficiently high relative to the search costs*. This suggests that products are more likely to be experience goods if they are cheap to make, and are hard to evaluate.

2b. *Price Advertising Induces Inspection Investments*

To see what drives the above result, we suppose next that the seller does not advertise his price but instead makes a firm take-it-or-leave-it offer once a buyer arrives. I will use O to denote this gameform. I assume that the buyers understand the game sufficiently well that they have rational expectations. So if $p^O(c_i)$ is the price charged, the expected price is $Ep^O(c_i)$. As before buyers will refrain from inspecting if the expected price $Ep^O(c_i)$ is such that $(v_i - Ep^O(c_i))g < s'$. So a buyer will inspect iff $v_i \geq Ep^O(c_i) + s \equiv \underline{v}$. However, if the seller knows this, he will never charge below $\underline{v}$ and therefore $Ep^O(c_i) \geq \underline{v}$ whenever $s' > 0$. This gameform has no equilibrium when inspection costs are positive.[6] I interpret this as showing that *expenditures on price advertising may be justified by the resulting commitment not to exploit buyers after they have sunk inspection costs*.

2c. *Return Rights Solve the Inspection Problem*

As a third variation, suppose that the seller allows buyers the unconditional right to return any product they bought. Let the (time) costs of returning the product be r and use f to denote the refund the buyer will receive iff he returns the object.[7] I denote this gameform by R. The optimal strategy is given by noting that the buyer will return if $v = 0$ and $f(c_i) \geq r$. Further, the buyer will purchase if

$$gv + (1-g)\max\{0, f-r\} > p.$$

Because the players are risk-neutral, only expected payments matter. So for a range of prices one can find a set of (price, refund) pairs such that both players are indifferent between the pairs. Tedious but trivial calculation reveals that if $f \geq r$, profits are maximized by any (price, refund) pair for which expected outlay

$$p - (1-g)f = \frac{1}{2}g\left(1 + \frac{c_i}{g} + r\right) - \frac{1}{2}r.$$

For example if $f = r$, the optimal price, $p^R(c_i)$, equals

$$\frac{1}{2}g\left(1 + \frac{c_i}{g}\right) + \frac{1}{2}(1-g)r$$

and the maximal expected profits per buyer are

[6] In §3 we will see how competition modifies this result.

[7] See Crémer and Khalil (1992) for an analysis of a somewhat similar problem.

$$\Pi^R(c_i) = [p^R(c_i) - c_i - (1-g)r]\left[1 - \frac{p^R(c_i)}{g}\right]$$

$$= g\frac{(1-(1-g)r/g - c_i/g)^2}{4} \quad \text{and} \tag{10}$$

$$E\Pi^R = g\frac{(1-(1-g)r/g)^3}{12}. \tag{11}$$

Similarly if

$$p_i = f_i = \frac{1}{2}\left(1 + \frac{c_i}{g} - \frac{1-g}{g}r\right),$$

expected profits are, of course, given by the same expressions. Comparison of $E\Pi^A$ and $E\Pi^R$ reveals that $(1-g)r/g$ plays the same role as s in the model without returns. *So return rights are a substitute for quality inspection and iff expected return costs, $(1-g)r$, are smaller than required inspection costs, s', it is better to offer returns.*

In a more realistic model the seller incurs costs to lower s and r. By providing disperse retail showrooms, sales assistance, etc., firms make it cheaper to evaluate their products. Similarly, mailorder firms avoid these costs but invest in systems to reduce return costs. (I realize that most stores also have a return policy, but this must be because some of their products have experience attributes. For pure search goods, they have no need for it.)

Since most markets are not monopolies, it is important to introduce competition into the model. This turns out to change a number of the results, yielding additional insights about what drives them. Similarly, with competition, sellers have available another way to reduce the adverse consequences of inspection costs. Specifically, they can make it cheap for buyers to inspect competitive products once they have inspected their own, thereby committing themselves to "fair" prices. A problem with this solution is, however, that margins are eroded "too much" if the market is very competitive. In such cases, bargaining may be better. To look at this, I add an extra seller.

3. Two Sellers

The model is as before except that each buyer faces two sellers. The sellers 1 and 2 have identical costs, and the buyer's tentative valuations of their objects are denoted v_{i1} and v_{i2}, respectively. Both final valuations equal zero with probability $1-g$ and else the tentative valuations. With probability ρ we are in the "correlated" state and $v_{i1} = v_{i2}$, and with probability $1-\rho$ we are in the "uncorrelated" state and v_{i1} and v_{i2} are independent. This construction allows me to use ρ as an index of the competitiveness of the market.

The model is intended to capture situations where both products and tastes are differentiated. The sellers do not know how the tastes of a given buyer match their products. If the products are more similar, more buyers match equally well with both of them, but some buyers have strong preferences for one over the other.

In the present section I do not find the optimal selling format; rather, I compare three commonly observed formats and show how the intuition from the monopoly model is modified by competition.

3a. *With Colocation, Price Competition May Not Maximize Profits*

Here I will compare the duopoly versions of A and O. In the duopoly version of A, called AA, the buyer first observes (v_{i1}, v_{i2}) and the sellers observe c_i. The sellers then advertise prices p_{i1}^{AA}, p_{i2}^{AA} and thus legally commit to charging at most these prices. The buyer decides whether to inspect, and if he likes the products he buys one of them. In the uncorrelated state he pays p_{ij}^{AA} for product $j \in \{1, 2\}$, and in the correlated state he bargains price down to c_i.

Given this extensive form, the advertised prices are set on the assumption that the uncorrelated state obtains. The buyer will inspect if the prices are sufficiently low relative to valuations and will buy the object with the largest $v_{ij} - p_{ij}^{AA}$; so, expected sales of seller 1 in the uncorrelated state are

$$(1-\rho)g\int_{p_{i1}+s}^{1}\int_{0}^{v_{i1}-p_{i1}+p_{i2}} dv_{i2}dv_{i1}$$

$$= \left[\frac{1}{2}p_{i1}^2 - p_{i1}(1+p_{i2}) + p_{i2}(1-s) + \frac{1}{2}(1-s^2)\right](1-\rho)g. \quad (12)$$

Given the profit margin $p_{i1} - c_i$, the equilibrium prices are

$$p_{ij}^{AA} = -(1+s) + \sqrt{2}(1+s+c_i)^{1/2}, \quad (13)$$

and profits are

$$\Pi_{ij}^{AA}(c_i) = (1-\rho)g[\sqrt{2}(1+s+c_i)^{1/2} - (1+s+c_i)]^2 \quad (14)$$

such that

$$E\Pi^{AA} = \left[\frac{4}{15} - (1+s)^2 - \frac{1}{3}(1+s)^3 + \frac{4\sqrt{2}}{5}(1+s)^{5/2}\right](1-\rho)g. \quad (15)$$

In the duopoly version of O, called OO, the buyers decide whether to inspect with no information on prices. Once the buyer has inspected, sellers compete on prices until the lowest valued object is offered at c_i. If only one object j is valued above costs, the seller in question charges v_{ij}. So the buyer may purchase at min $\{|v_{i1} - v_{i2}| + c_i, v_{ij}\}$ in the uncorrelated state and at c_i in the correlated state. Given this, the correlated state again has zero profits. In the uncorrelated state, the buyer's expected gains from inspecting when $v_{i1} > v_{i2}$ are

$$g\int_0^{v_{i2}}(v_{i2} - c_i)dc_i + \int_{v_{i2}}^{v_{i1}} 0dc_i + \int_{v_{i1}}^{1} 0dc_i - s' = g\frac{1}{2}v_{i2}^2 - s'. \quad (16)$$

So the buyer will inspect if min $\{v_{i1}, v_{i2}\} \geq \sqrt{2s}$, and expected profits depend on the sign of $c_i - \sqrt{2s}$: If $c_i \geq \sqrt{2s}$:

$$\Pi_{ij}^{OO}(c_i) = (1-\rho)g\int_{c_i}^{1}\left[\int_{c_i}^{v_{i1}}(v_{i1} - v_{i2})dv_{i2} + \int_{\sqrt{2s}}^{c_i}(v_{i1} - c_i)dv_{i2}\right]dv_{i1}$$

$$= (1-\rho)g\left[\frac{1}{3}c_i^3 - \frac{1}{2}c_i^2(1+\sqrt{2s}) + c_i\sqrt{2s} + \frac{1}{6} - \frac{1}{2}\sqrt{2s}\right], \quad (17)$$

and if $c_i \leq \sqrt{2s}$

$$\Pi_{ij}^{OO}(c_i) = (1-\rho)g\int_{\sqrt{2s}}^{1}\int_{\sqrt{2s}}^{v_{i1}}(v_{i1} - v_{i2})dv_{i2}dv_{i1}$$

$$= (1-\rho)g\left[s\left(1 - \frac{1}{3}\sqrt{2s}\right) + \frac{1}{6} - \frac{1}{2}\sqrt{2s}\right]. \quad (18)$$

So expected profits are

$$E\Pi_{ij}^{OO}(c_i) = (1-\rho)g\left[\int_{\sqrt{2s}}^{1}\left(\frac{1}{3}c_i^3 - \frac{1}{2}c_i^2[1+\sqrt{2s}] + c_i\sqrt{2s} + \frac{1}{6} - \frac{1}{2}\sqrt{2s}\right)dc_i + \int_0^{\sqrt{2s}}\left(s\left[1-\frac{1}{3}\sqrt{2s}\right] + \frac{1}{6} - \frac{1}{2}\sqrt{2s}\right)dc_i\right]$$

$$= (1-\rho)g\frac{1}{12}[1 + 4s\sqrt{2s} - 2\sqrt{2s} - 4s^2]. \tag{19}$$

Comparing $E\Pi^{AA}$ and $E\Pi^{OO}$ we see that profits are helped by advertising when s is high. As in the monopoly models, advertising facilitates investing s by assuring the outcome. On the other hand if s is not too big, profits are higher without advertising for lower values of s. For example, if $s \approx 0$, $E\Pi^{AA} < E\Pi^{OO}$. So price advertising is no longer always optimal. This result contrasts with that found in the monopoly models and is due to the fact the *OO* brings in more buyers for low s because they hope to find low c_i's. So with two sellers, *colocation alone may be more attractive than price advertising and colocation*.

3b. *With Competition, Bargaining May Be Profit Maximizing*

As a final twist I consider a gameform in which the sellers bargain with individual buyers.[8] For simplicity I assume that the sellers are located so far away that each buyer only can bargain with one seller, and that this seller is chosen randomly. I call this gameform *BB*. This allows the sellers to avoid (for them) costly Bertrand competition and makes it possible to take account of individual v_i's in trading prices. While one can argue for an infinity of different bargaining mechanisms, I will illustrate my point by assuming that the bargainers use the *ex ante* most efficient bargaining mechanisms as characterized by Myerson and Satterthwaite (1983).

In the extreme case where $s = 0$, we know from Chatterjee and Samuelson (1983) that this mechanism can be implemented as a split-the-difference double auction where the price equals $(c_i + v_i)/3 + 1/6$. In equilibrium there is trade iff $v_{ij} - c_i \geq 1/4$. A given seller, say 1, is chosen for bargaining with probability 1/2, so expected profits per buyer are

$$E\Pi^{BB} = \frac{g}{2}\int_0^{3/4}\int_{c_{i1+1/4}}^{1}\left(\frac{v_{ij}}{3} + \frac{1}{6} - \frac{2c_i}{3}\right)dv_{ij}dc_i = \frac{9g}{256}. \tag{20}$$

As s grows, the seller has relatively better information because the buyer's arrival reveals that his valuation is high. If we let $p(v_{ij}, c_i, s)$ denote the price in the optimal mechanism, we can apply Theorem 2 in Myerson and Satterthwaite (1983) to show that the parties will trade if $v_i - c_i > \beta$, where β is given by

$$(1-\underline{v})^{-1}\int_{\underline{v}}^{1}\int_0^{v_{ij}-\beta}[2v_{ij} - 1 - 2c_i]dc_i dv_{ij} = 0 \tag{21}$$

and $\underline{v}$ is given by

$$U^B(\underline{v}, \beta) = -s' + g\int_0^{\underline{v}-\beta}[\underline{v} - p(\underline{v}, c_i, s)]dc_i = 0. \tag{22}$$

Intuitively, (21) is the sum of the expected surplus accruing to the weakest types in any incentive compatible mechanism. For maximum efficiency this has to be zero. Similarly,

[8] Spier (1990) looks at a large market where some sellers advertise while others bargain.

(22) defines $\underline{v}$ as the buyer value for which expected *ex ante* surplus is just zero. These conditions reveal that $\underline{v}$ is increasing in s, while β is decreasing. For smooth distributions, such as the uniform, p is continuous in s, such that

$$\lim_{s \to 0} E\Pi^{BB} = \frac{9g}{256} . \tag{23}$$

Comparison with $E\Pi^{AA}$ and $E\Pi^{OO}$ reveals that for small values of s and high values of ρ, bargaining gives higher expected profits. For example both $E\Pi^{AA}$ and $E\Pi^{OO}$ go to zero as $\rho \to 1$, while $E\Pi^{BB}$ remains positive. So *bargaining may be attractive because it shields the sellers from Bertrand competition*. On the other hand, for sufficiently large s, bargaining yields zero profits because $\underline{v} = 1$. This, for example, is the case for $s = 1/4$, a value at which both $E\Pi^{OO}$ and $E\Pi^{AA}$ are positive.

It should be noted that the comparison between Π^{AA} and Π^{OO} on one side and Π^{BB} on the other is confounded by different assumptions about both location and price setting mechanisms. In an earlier version of this paper (Wernerfelt 1992), I looked at the combination of colocation *and* bargaining and showed how it can help bring more buyers in while still preserving more profit. However, for sufficiently high values of s, that gameform also fails to attract buyers and thus yields zero profits.

4. Implications

Let me now look at the three main empirical implications of the model and offer consistent, albeit casual, evidence.

(1) *Advertising of firm prices is attractive, unless there is too much competition.*

J. D. Power and Associates (1992, 1993) have published two big reports on their ongoing study of "one price selling" in the U.S. automobile market. The following are some selected quotes from these reports. The sample contains sellers who have not tried one price selling, sellers who have tried and abandoned it, and sellers who have switched to it.

(a) On the attractiveness of firm prices:

> About half [of dealers switching to one price selling] said new car grosses rose, while 25% experienced a decrease (1993, p. 22).
>
> New vehicle sales volume went up for 72% of the dealers (1993, p. 21).

(b) On the rationale:

> One price selling defines a "fair" price for the customer and can save shopping time (1992, p. 12).

(c) On the problems created by competition:

> The underlying fear is simple—customers will shop the price and better it at a competitor (1992, p. 45).
>
> The biggest problem is the stupid prices other dealers advertise (1992, p. 118).

As an additional piece of evidence at least 87.6% of the Korean automobile market is served by vertically integrated retailers owned by the "big three" Korean manufacturers (*Automotive News*, February 8, 1993, p. 100). Since this reduces price competition it is not surprising that the Koreans can advertise firm prices.

I hasten to admit that there are alternative explanations for these claims, but at least they are not inconsistent with the logic of the model.

(2) *Mailorder is an attractive format when inspection costs are very high.*

One example of this, due to a referee, is plant seeds. Inspection costs are in some sense infinite because one generally has to plant the seeds and wait several weeks before their quality is revealed. For a buyer who does not need detailed advice, the only search attributes are the picture of the plants as well as directions for care, planting, etc. All this can be done as well in a catalog as in a store. According to the *Statistical Factbook* (1990/1991) of the Direct Marketing Association, five of the top fifty catalogs in the U.S. sell primarily plant seeds.

A slightly different example is gifts, where one could conjecture that inspection yields noisy assessment of (the receiver's) utility. The above mentioned source lists gifts as the primary business of eight of the top fifty catalogs.

Yet another example with which I have personal experience is extra-wide shoes. Given the small size of the market, well-stocked retail stores would have to be quite disperse, making inspection costly. In fact, this market is served by a couple of old and successful catalogs.

If we accept the additional premise that storefront retailing is costlier than mailorder retailing, we can suggest that better-informed customers, who expect to make fewer returns, will use mailorder to a disproportionate degree. In an attempt to test this for a couple of durables, a survey by Kim (1992) offers data that second-time buyers are much more likely to use mailorder. Specifically, 4.9% of first-time buyers of video cameras bought them through mailorder, versus 9.6% for second-time buyers. For personal computers, the corresponding numbers are 5% and 28%.

(3) *Some sellers may deliberately colocate without advertising prices.*

Antique malls, bazaars, farmers' markets, etc., appear to feature much more colocation than that which customer concentration reasonably could explain. Furthermore, these sellers very rarely advertise prices. (As an aside, note that the products often are slightly differentiated, blunting price competition.)[9] I realize that travel costs could explain part of this, but if so it is not clear why we see agglomerations of small sellers rather than individual big sellers. What is "surprising" and needs explanation is that these sellers expose themselves to competition. The present model provides at least one explanation for this.

The above are obviously not satisfactory as "tests" of the model; they are only indicative. Similarly, the model has other more specific implications which also could be tested.

5. Conclusion

While most earlier work has focused on explaining *magnitudes*, the present paper contains a first cut at explaining the *structure* of common trading institutions. In general, the strength of the argument lies in the explicitly comparative approach which allows us to evaluate the relative, rather than the absolute, attractiveness of alternative solutions to the marketing problem. My specific results pertain to price advertising, return policies, and colocation. Concerning price advertising, I have argued that it maximizes monopoly profits and can serve as a commitment device, inducing buyers to make inspection investments. In comparing the monopoly and duopoly results, I noted that competitive price advertising erodes profits while bargaining, although it induces less inspection, still may be more profitable. Looking at return policies (and mailorder catalogs), I have made more precise the way in which they substitute for other solutions to the information problem. Specifically, one has to compare expected return costs with inspection costs, taking into account the costs of providing inspections opportunities and return acceptance systems. Finally, I showed how sellers may maximize profits by deliberately exposing themselves to competition by colocating. Although I will not pursue it here, this argument

[9] Another factor, which is not incorporated into the model, is that many of these products display wide variations in quality. If buyers inspected sellers based on advertised price, they would end up looking at mostly low quality products (Bester 1993). Colocation prevents this.

could also apply to nongeographical attribute spaces and explain certain incidents of standardization.

As a byproduct of the analysis, new light is thrown on a couple of classical theoretical issues. First, I indicated a way to endogenize the distinction between search and experience goods. The analysis suggests that a market could change from a search to an experience mode, and that this depends on the relative magnitudes of inspection costs and prices. Secondly, there is the question of why a local monopolist does not increase his price once a buyer has come to him. The analysis suggests that anticipation of such renegotiation will cause the buyer to stay away.

On the theoretical side, three extensions appear important. First, to consider asymptotic properties in "large" markets. Secondly, to look for optimal game forms in a more general model than that analyzed here. It would be particularly nice to compare with the bonding and signaling mechanisms associated with the sale of experience goods. A third extension is to endogenize ways in which the seller can reduce s, selecting levels of investment in retail space, sales assistance, and advertising. On the empirical side, a cross-sectional (or cross-cultural or historical) study of some of the predictions from the theory would be most interesting.[10]

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