Preliminary Draft

CARTEL PRICING

AND

INFORMATIONAL BARRIERS TO ENTRY

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Introduction

In environments of limited information producer cartels can exert considerable influence over consumer behavior. In particular, when consumers are relatively uninformed about firm production techniques, they will be forced to rely on market price data to determine how many resources to expend on searching out a low price; presumably such uninformed consumers will tend to search first at stores which are known to have been low price in the preceding period, and last at stores known to have been high price. This paper will demonstrate that when uninformed consumers rely on past market prices in this fashion a producer cartel can strategically manipulate the consumers and create entry barriers.

We will consider markets in which firms' costs are stochastic and serially correlated over time. Each period costs can take on two values: "low cost" and "high cost". And when a firm's costs are low cost in a particular time period, they are more likely to be low cost again in the following time period. We will focus attention on two particular cost paradyms of this type. First is the market in which the chances of a firm being low cost are small, but in which serial correlation is high, so that once a firm becomes low cost it is likely to remain low cost in the next period. Second is the market in which the chances of a firm being low cost are agin small, but in which serial correlation is low, so that firms which are low cost this period stand only a slightly better than average chance of remaining low cost next period. When the chances of being low cost are relatively high search is a relatively unimportant activity-hence we do not study this case. Our two examples correspond to the two extremes of the typical manufacturing process in which firms hire contractual labor for several periods, and purchase vintage capital which depreciates over several time periods. The first example is that of a firm possessing very long term contractual input relations which turnover only a small fraction of inputs each period, while the second example is thatof a firm possessing short term contractual input relatioons While we concentrate on cost and price differentials amongst firms. a comparable analysis for markets in which product qualities vary rather than prices can be constructed.

A producer cartel fearing entry will respond very differently depending on the cost structure of its market. If serial correlation is sufficiently high than the cartel will encourage consumer search, because any consumers who find a low cost producer will keep returning to him, and since he is likely to remain low cost, the consumer will never visit an entrant's store. However, in most cases, when serial correlation is smaller, the cartel will discourage consumer search, because the more consumers search the more likely they are to shop at an entrant's store. In fact, by discouraging search a cartel can create entry barriers often 4 or 5 times larger than those in markets with competitive prices and competitive search patterns.

Thus our reasoning suggests than an encumbent producer cartel can block entry by blocking consumer awareness of the entrant's store.

In most cases the cartel reduces consumer awareness by reducing consumer search. Typically, the cartel's simplest method of reducing search is to reduce the variance of market prices(or, in the case of differing product qualities, the variance of qualities), which reduces the returns to search. This then is the punchline: an encumbent cartel will impose price and quality standards on its members as an effective means of barring entry.

The remainder of the paper will formulate the cost structures which we have outlined above, will exhibit the sorts of barriers entrants face in markets characterized by search and serial correlation, and will prove our conjecture that cartels will generally discourage search and impose price and quality standards on their members. In addition, we will prove that the entry barriers which cartels create tend to bias the entrant against investing in research and development prior to entry. Finally, in the paper's last section we will compare our model with the received Stiglerian view that cartels standardize prices and products in order to reduce cheating.

Section 1: Model Development

This section describes a simple two period model of a market characterized by stochastic, serially correlated costs on the supply side, and consumers relatively uninformed about specific firms' production costs on the demand side. We will use this model to study the ways in which an encumbent producer cartel can create barriers to entry in period 2 through its pricing strategies in period 1.

Consider a market with n encumbent firms. We will study the market's operation over 2 time periods, indexed as t=1 and t=2. The encumbent firms produce in both time periods. There is a single entrant capable of entering the market in period 2 if he so chooses. We will assume that n is a sufficiently small number for the encumbent firms to effectively form a cartel.

All firms produce a single, identical good according to a stochastic constant marginal cost technology. In particular, in each time period a firm's marginal cost of production can be of two types: low cost, characterized as $MC=c_1$, or high cost, characterized as $MC=c_2$, with $c_1 < c_2$. In period 1, when the market opens, the probability of an encumbent firm possessing the low marginal cost technology is q, and of possessing the high marginal cost technology 1 - q. Similarly, should the entrant produce in period 2 his chances of being low cost are q, andof being high cost, 1-q.

A particular firm's costs are serially correlated. Specifically, if an encumbent firm's technology is low MC in period 1, its probability of possessing a low MC technology again in period 2 is f, with $f > q$. If an encumbent firm is high MC in period 1, its probability of being low MC in period 2 is g, with $g < q$. Were the market to run more than 2 periods, the period 2 entrant would have serially correlated costs as well as the incumbents, since he possesses the same technology. Note that the costs are Markov in that the chances of a firm's costs being low in any period t depend only on the firm's costs in the preceding period t-1, and not on its costs in the earlier periods t-2, t-3,etc.... We impose the condition of stationarity on the cost structure, which states that that prior to period 1 an encumbent firm's probability of being low cost in period 1 must be equal to its probability of being low cost in period 2:

$$qf + (1-q)g = q \tag{1}$$

Without condition (1) the market would be subject to drift, with firms becoming either more and more likely, or less and less likely, to be low cost in future periods. Such a structure might be useful in capturing the effects of research and development on costs, but is otherwise unstable.

Within our cost structure the low probability of being low cost-high serial correlation market paradyme(LH) is represented by a low q value and a high f value(near 1). The low probability of being low cost-low serial correlation paradyme(LL) is represented by a low q value and a low f value(still above q).* In fact our setup is also applicable to the problem of quality variability if one interprets c_1 and c_2 as representing high and low quality goods, each produced at equal cost.

The consumers in our market are relatively uninformed when compared with the producers. Specifically, consumers know the underlying cost parameters (q,f), but do not know which stores are low cost and which high cost in any particular period. Instead, consumers must draw upon their knowledge of firms' past costs to infer which stores are likely to be inexpensive in the present period. Thus, in period 1 consumers will have no information about encumbents' prices and will visit producer stores in a random order. However, in period 2 each consumer will divide producers into 3 categories:

1) Producer stores which the consumer visited in period 1 which were low cost.

2) Producer stores which the consumer visited in period 1 which were high cost.

and 3) Producer stores which the consumer has not visited. The entrant will always be included in category 3.

A consumer will order the stores he visits so that he first plans to visit stores in category 1, which each have a probability f of being low cost; next he will plan to visit stores in category 3 which, from the point of view of the consumer, each have a probability q of being low cost; and finally he will plan to visit stores in category 2, which have only a probability g of being low cost. Notice that although every encumbent firm must have either a probability f or a probability g of being low cost in period 2, any consumer who has not visited a particular encumbent will evaluate his chances of being low cost in period 2 as:

$$qf + (1-q)g = q \quad \text{by (1)}$$

Thus because the consumer's information set is smaller than the firm's, he is unable to categorize the firm as precisely as would be the case if he were well-informed about its period 1 performance.

Each consumer-type j is characterized by a cost of search d_j, which represents the utility foregone in visiting a store. In addition, we assume that each consumer purchases an amount of the good determined by the demand function D(p), $D' < 0$. We assume that every consumer must puchase a positive amount of the good each period, so consumers remain in the market in both periods.

j-type consumer with search costs d_j will not always find it advantageous to search for a low price supplier. To determine when a j-type consumer will search we assume: 1) that consumers' marginal utility remains constant over the relevant price range; as a result the consumer surplus from search simply equals the area under the demand curve between the prices p_1, which is charged by low cost suppliers, and p_2, charged by high cost suppliers; and 2) that consumers know the distribution of prices (p_1, p_2) on which they base their calculation of whether or not to search. We then have:

Lemma: The cutoff value d_j such that consumers with search cost less than d_j search is:

i) Increasing in p_2; continuous in p_2

ii) Decreasing in p_1; continuous in p_1.

The proof of the lemma follows directly from the geometry of consumer surplus theory.

In the Lemma above and what follows we always assume that p_1 is below p_2, so that low cost suppliers are always cheaper.

Since consumers' expectations of the distribution of prices

(p_1, p_2) in period 2 is based on the actual period 1 distribution of prices , an encumbent firm cartel will be able to use its period 1 prices to affect consumers' period 2 search decisions. For consistency, we will also require that the cartel does in fact use the same distribution of prices in both periods.

Section II: Theoretical Results on Entry Barriers

In this section we prove our first main result, which states that an encumbent firm cartel can manipulate consumers' search patterns to create entry barriers. We show that in markets where the serial correlation of costs is below a certain critical value the cartel will reduce search, while in markets where cost serial correlation is sufficiently high the cartel will actually encourage search. Recall that we have labeled these two types of markets LL and LH; our results highlight the distinguishing aspects of cartel behavior in these two different market settings.

The entry barriers which the cartel creates arise because consumers are unaware of firms' true production costs. As a result the encumbent firms can form a cartel and charge monopoly prices without arousing consumers' suspicions. Since consumers do not realize that they are paying monopoly prices to the encumbent firms they will see no reason to visit the entrant's store, even though he is actually charging competitive prices which are below the encumbents' prices. In fact, even if the entrant possesses' the high cost technology in period 2 his prices are likely to be lower than the monopoly prices charged by the low cost encumbents. Thus regardless of the entrant's costs any consumer who happens to visit his store will buy from him; however, many consumers will remain ignorant of his prices.

If the market were informationally complete the entrant would sell to every consumer in period 2, since he is lowest price.

Thus the magnitude of the barrier facing the entrant is simply the percentage of consumers he does not sell to. The cartel manipulates consumer search patterns in order to increase this percentage and raise the entry barrier.

We divide this section into two parts. First, as an example of the reasoning lying behind our argument we consider the case of two encumbent firms, one representative consumer, and a single entrant. Then we generalize our results to an arbitrary number of encumbent firms and multiple consumer types.

The Case of 2 Encumbents

Consider a market with two encumbents, firms A and B, an entrant, firm E, and a single representative consumer. Since the consumer has search costs, the encumbents can affect his decision to search through their choice of price dispersion in period 1. Assuming the consumer enters the market, there are two cases to consider: Search(S) and No Search(NS). If the consumer searches he visits stores until he either finds an encumbent selling at what he believes is the lowest price in the market, p_1, or he finds the entrant, selling at price $p_E \quad p_1$(we assume that E is able to underprice the encumbents regardless of whether he possesses MC c_1 or c_2). If the consumer does not search, he buys at the first store he visits, which depends on the prices he has sampled in period 1.

Suppose first that at prevailing prices(p_1,p_2) the consumer does not search. He will buy from the first store he visits in period 1, say A; A will be low price with probability q. Now calculate the probability that the consumer visits the entrant in period 2. If A was low price, he will return to A since Prob(A is low in 2)=f   q; since he does not search, he will then buy from A. If A was high price in 1, he will be indifferent between visiting B or E, and will choose each ½ of the time. Hence the probability of the consumer visiting E is (1-q)/2. Assuming E prices competitively the consumer will always buy from E once he visits him, so E's sales are:

$$(1-q)/2 \qquad (2)$$

Had E been active in the market in period 1, the chances of the consumer visiting him would have been 1/3; assuming E was low, the consumer would then always have returned to E in period 2. E's period 2 sales would then have been: 1/3 + 2/3(1-q)/2. Therefore the entry barrier facing E is (1+q)/6.

Now suppose that the consumer does search. In period 1 3 cases are possible: 1) the first store the consumer visits is low price, in which case he buys from that store-this occurs with probability q; 2) the first store he visits is high price, so he visits the second store, which is low price, in which case he buys from the second store-this occurs with probability (1-q)q; and 3) he visits both stores and both are high, in which case he buys from either with probability ½-this occurs with probability $(1-q)^2$. In period 2 the consumer's preference for visiting stores is: first, to visit any store which he knows was low price in period 1; second, to visit the entrant and any stores which he did not visit in period 1; and third, to visit any stores which he knows were high price in period 1. Using this preference list we calculate the probability that the consumer visits

E under each of the three period 1 scenarios. Under Scenario 1, he visits E with probability (1-f)(1/2 + (1-q)/2), which represents P(A is high)(P(he visits E ahead of B) + P(he visits B ahead of E and B is high)). Under scenario 2, the probability that the consumer visits E is (1-f), while under scenario 3 the probability is 1, since both A and B are known to have been high in period 1. Summing these 3 probabilities, each multiplied by the probability of the scenario, yields a probability of the consumer visiting E of:

$$q(1-f)(1-q/2) + q(1-q)(1-f) + (1-q)^2 \qquad (3)$$

One can perform an identical calculation for the case where E has produced in period 1 as well as period 2, and one finds that in this case the probability of a consumer visiting E in period 2 is:

$$1/3 + (1-q)^2/3 + 1/3(1 - q^2/2 - qf + q^2f/2) \qquad (4)$$

Therefore the entry barrier facing E under the search regime is $q^2/6 + qf - 5/6q^2f$. Since $q < 1$, this is no smaller than $q^2/6$.

Our final calculation is a comparison of (2) and (3), the relative barriers facing E under the S and NS regimes. It is this comparison which is of interest to encumbent cartel of A and B interested in reducing the entrant's period 2 sales. Numerical calculations demonstrate: 1) for all $q < \frac{1}{2}$, the NS regime has a larger barrier, meaning that (3) exceeds (2), regardless of f; and 2) for all $f < .9$, the NS regime again has a larger barrier, regardless of q. The shaded region in figure 1 depicts the (q,f) pairs for which the NS regime has larger entry barriers. Thus only when the market is characterized by a very high serial correlation parameter f, or a large likelihood of low price firms, will increasing search increase entry barriers. The intuition behind this result is that only when serial correlation is high or the chances of an encumbent being low cost are good will it pay the 2 encumbent firms to encourage search in period 1, because only then is the consumer likely to find a low price firm in period 1 which remains low price in period 2, so that the consumer has no incentive to visit the entrant; in all other cases the encumbent cartel will reduce search. In fact, direct calculations demonstrate that for many (q,f) pairs the NS entry barriers are as much as 4 or 5 times larger than the S entry barriers.

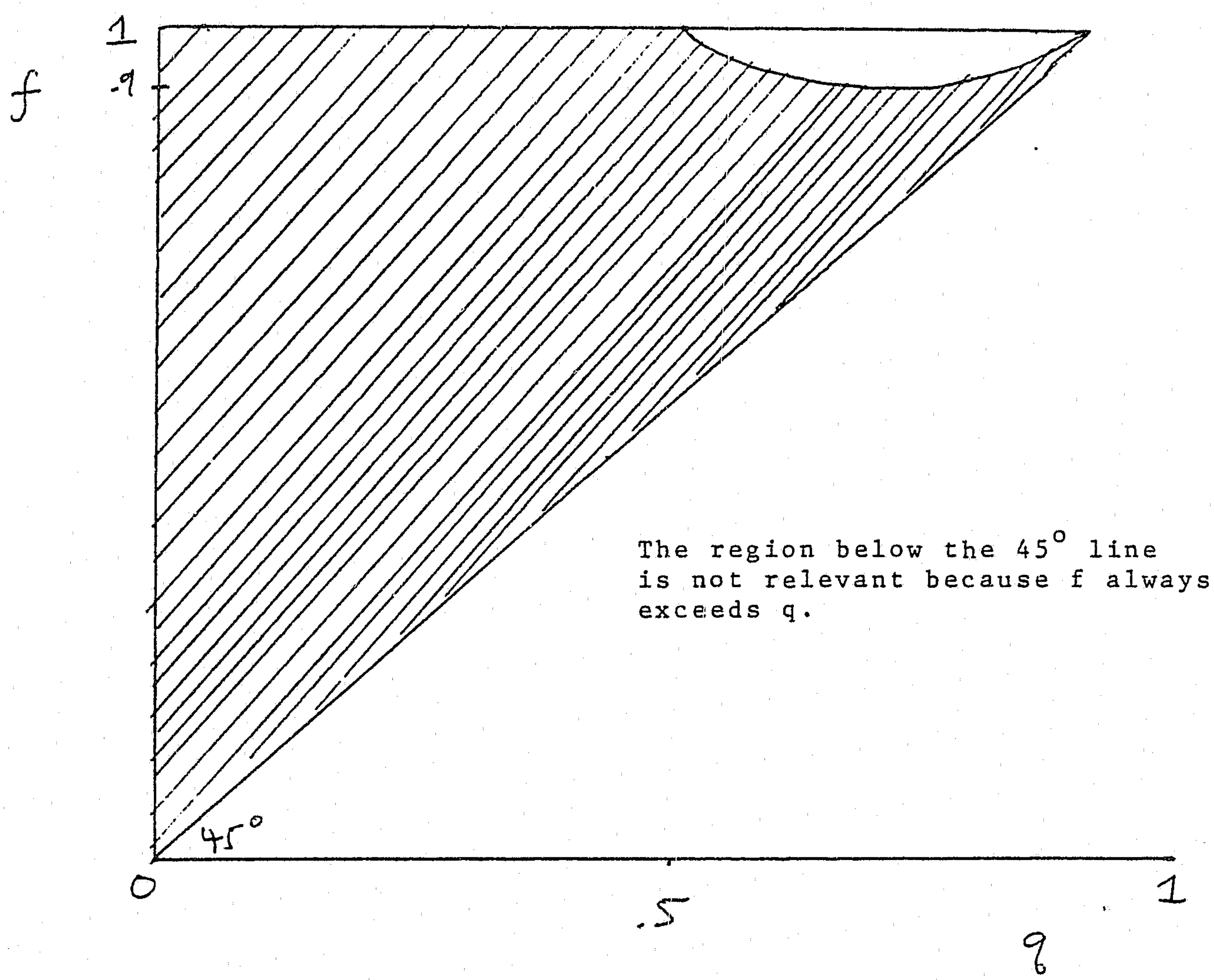
1
.9
f
The region below the 45° line
is not relevant because f always
exceeds q.
45°
0
.5
1
q

figure 1

The General n Case

Now consider the case of n encumbent firms, and a distribution of consumer types, indexed by j. Assume that the entrant prices competitively so that he sells to all consumers who visit his store. Consumers of an arbitrary type j will either choose to search, or choose not to search, depending on the prices which prevail in period 1.

If a consumer of type j does not search, the the probability that he will shop at the entrant's store is just:

$$(1-q)/n \qquad (4)$$

If the consumer does search, the calculation is more difficulat, but reduces to:

$$(1-q)^n + (1-f) \sum_{m=1}^{n-1} \frac{(1-q)^m(1-(1-q)^{n-m+1})}{n-m+1} \qquad (5)$$

The No Search(NS) entry barrier is higher than the Search(S) entry barrier whenever (5) exceeds (4). We then have:

<u>Theorem 1</u>: (i). for all n, there exists $q^*(n) > 0$ sth for all $q < q^*(n)$ the NS regime has higher entry barriers than the S regime, regardless of f;

(ii). $\lim_{n \to \infty} q^*(n) = 0$;

(iii). for all n, there exists $f^*(n) > 0$ sth for all $f < f^*(n)$, the NS regime again has higher entry barriers than the S regime, regardless of q;

(iv). $\lim_{n \to \infty} f^*(n) = .78$.

Proof: Fix n and f. When $q=0$, (4) gives an NS barrier of $1/n$, while (5) gives an S barrier of 1; hence at $q=0$ (5) exceeds (4). Since both (4) and (5) are continuous functions of q, it follows that for all n there exists a neighborhood of 0 where (5) exceeds (4), which proves (i). Now fix f at 1, which minimizes (5) for each q and n pair. (5) is then $(1-q)^n$. Since $q < 1$, $(1-q)^n$ goes to 0 more rapidly than $(1-q)/n$ as $n \to \infty$, so that for $q = \varepsilon$, for arbitrary ε, there exists an n large enough for (4) to exceed (5). Hence $\lim_{n \to \infty} q^*(n) < \varepsilon$; since ε was arbitrary, this proves (ii). Now fix n and q. (5) is decreasing in f while (4) is independent of f. Hence the claimed $f^*(n)$ must exist, the only question being whether it is 0, or strictly greater than 0. Suppose $f=0$; then (5) may be rewritten: $(1-q)^m + (1-q)/n - (1-q)^{n+1} + H$, where H, the terms from $m=2,...$, is positive. Since $(1-q) < 1$, this exceeds (4) for all n, because $(1-q)^n > (1-q)^{n+1}$. Since (5) is continuous in f, it follows that $f^*(n)$ is > 0 for all n. This proves (iii). Part (iv) cannot be proved by abstract methods; instead, direct calculations, available from the author, prove the result by showing that 1) $f^*(n)$ declines with n; and 2) $f^*(n)$ asymptotically approaches the value .78.

Part (iv) of Theorem 1 is of particular practical value since it provides a relatively high lower bound, independent of n, on the extent of serial correlation required before a cartel will shift the market from the NS to the S regime.

Section III: Theoretical Results on Price Dispersion

The next step in the analysis is the proof that a profit maximizing cartel will reduce price dispersion as the preferred method of reducing search and increasing the barrier facing the entrant.

We prove that, in the NS regime, as the threat of entry increases the cartel responds by steadily reducing price dispersion; this lowers consumers' returns to search, and thus reduces the chances of consumers shopping at the entrant's store. A comparable result holds for the S regime.

An alternative interpretation of our result is that a cartel will impose ever stricter price standards on its members as the threat of entry increases. An analogous result will hold when producers differ in the quality of good they produce rather than in the cost of producing the good, and in this case the cartel will impose quality standards on its members.

Theorem 2: When the threat of entry increases, and the market is in the NS regime, a profit-maximizing cartel responds by reducing price dispersion.

Proof: Define: 1) a = the fraction of consumers who search;

2) T_E = the threat(probability) of entry, with $0 < T_E < 1$;

and 3) Z = the cartel's losses due to entry should it occur.

By Theorem 1 we know that in the NS regime $\frac{dZ}{da} > 0$.

Cartel profits are:

(profits at p_1 stores) + (profits at p_2 stores) - $T_E Z$

If T_E rises by the amount dT_E , then to restore cartel profit maximization requires reducing a by some amount da^* which the cartel must determine. We will show that for any da^* chosen, the cartel will accomplish the reduction in a by reducing price dispersion.

By Lemma 1 there are 3 possible cases by which the cartel can achieve the da^* reduction: (i). $dp_2 < 0$ and $dp_1 > 0$; (ii). $dp_2 > 0$ and $dp_1 > 0$; and (iii). $dp_2 < 0$ and $dp_1 < 0$. We will rule out cases (ii) and (iii), leaving case (i), which is unambiguous reduced price dispersion.

Suppose initial market equilibrium is at (p_1^*, p_2^*) and $a = a^*$. Now suppose the cartel uses (ii) to reduce a^* by the amount da^*, choosing dp_1 = some $\widetilde{dp}_1$ and dp_2 some $\widetilde{dp}_2$. At the prior level of entry threat T_E the cartel's maximum occured at (p_1^*, p_2^*). By the Kuhn-Tucker theorem this maximum is continuous and concave as a function of (p_1, p_2) in a neighborhood of (p_1^*, p_2^*). Now treat the choice of a as a constraint; then the requirement that a by reduced from a^* to $a^* - da^*$ may be looked upon as a tightening of the constraint. It then follows from the concavity of the maximum function that if (p_1^A, p_2^A) and (p_1^B, p_2^B) are two price choices both of which satisfy the constraint $a \leq a^* - da^*$, and if $p_1^* < p_1^B < p_1^A$ and $p_2^* < p_2^B < p_2^A$, then the maximum function evaluated at (p_1^B, p_2^B) must exceed the maximum function evaluated at (p_1^A, p_2^A), so that a profit-maximizing cartel will always choose the former over the latter. We have assumed that the cartel's choice dp_1 and dp_2 satisfies the new tigher a constraint $a \leq a^* - da^*$; however, by Lemma 1, the cartel can reduce dp_1 slightly and then still reduce dp_2 slightly and maintain the same degree of market search, and hence still satisfy the a constraint. Call these new dp values $\hat{dp}_1$ and $\hat{dp}_2$. We have $p_1^* < p_1^* + \hat{dp}_1 < p_1^* + \tilde{dp}_1$, and and $p_2^* < p_2^* + \hat{dp}_2 < p_2^* + \tilde{dp}_2$; therefore it must be the case that the cartel will prefer $(\hat{dp}_1, \hat{dp}_2)$ to $(\tilde{dp}_1, \tilde{dp}_2)$ by the preceding result. Therefore the cartel cannot have chosen $(\tilde{dp}_1, \tilde{dp}_2)$ as its response to the increase in the threat of entry, dT_E. Since $(\tilde{dp}_1, \tilde{dp}_2)$ was arbitrary, and da^* was arbitrary, this rules out case (ii). Case (iii) can be ruled out using identical reasoning.

Exactly equivalent reasoning can establish that in the S regime a profit-maximizing cartel will respond to an increase in the threat of entry by increasing price dispersion.

What conclusions should be drawn from Theorem 2? First, concentrate markets which exhibit standard products being sold at standard prices merit particular attention as potential hotbeds of collusion. And second, economists' cannot dismiss the possibility of collusion in markets which appear to possess contestable cost structures- for a market to be invulnerable to cartelization it must not only possess a contestable cost structure, but also a sufficiently complete and symmetric information structure, so that an entrant will be able to attract consumers to his store.

Section IV: Extensions

In this section we present two simple extensions of our basic results on barriers to entry and price-quality standards.

The first extension focuses on the affect of consumer informedness on the effectiveness of the cartel's entry barrier. Suppose that consumers are divided into two classes. Consumers in the first class are uninformed about specific firm prices and behave just like the consumers in our basic model. Consumers in the second class are informed about firm specific prices and buy only from the lowest priced firms. Since the entrant is lowest price, he will sell to all consumers in the second class; his sales to the first class correspond to our calculations in Section II. Thus:

> Extension 1: As the fraction of consumers who are informed rises, the informational entry barrier decreases.

The proof of this result is immediate, since the barrier's magnitude is the product of the number of uninformed consumers times the likelihood of any particular uninformed consumer not visiting the entrant's store. Extension 1 suggests that cartels will be more prevalent in markets where fewer consumers are informed about firm specific prices.

Our second extension concentrates on the entrant. We ask: if the entrant is not certain to sell to every consumer who visits his store, for example because of quality variations, how much will he invest in research and product development prior to entry so as to increase the likelihood of consumers' buying his product? We have:

> Extension 2: As the informational barrier facing the entrant increases, the entrant's investment in research and development prior to entry decreases.

The proof of this result is also quite direct. For each dollar the entrant invests, his returns increase by the product of the number of consumers who visit his store times the enhanced likelihood, due to the added investment, of each consumer who visits his store buying. As the number of consumers visiting his store declines his marginal returns from investing fall, while the marginal cost of investing remains fixed. Thus under the usual assumptions of diminishing marginal returns to investing(measure as the enhanced likelihood of a consumer buying) and increasing marginal costs of investing, his overall investment will fall.

Extension 2 documents an indirect welfare loss arising from the cartelization of an informationally incomplete market. We believe that many more results along these lines could be obtained.

Section IV: Comparisons

The received cartel literature describes numerous institutional arrangements through which cartels can block entry. Examples include licensing requirements and state agency regulation. Most examples follow these two in tracing the entry barriers to successful cartel manipulation of the political system. The inspiration for this literature derives principally from George Stigler's contributions, which emphasize the ability of special interest groups to manipulate the state into serving as an instrument for the interest groups' members own private benefit.

While the Stiglerian view of cartels as cohesive political interest groups has been a fruitful approach to American economic life of the Twentieth century, the vast majority of all manufacturing and service industries remain unprotected by government statutes, and hence inaccessible by the Stiglerian approach. While it is difficult to assess how prevalent collusion in these industries is as compared with regulated and licensed industries, it is instructive to note that nearly allDepartment of Justice price-fixing cases of the last 20 years have involved such unregulated and unlicensed industries. Our explanation of cartel pricing and entry blockage suggest that cartels do not require state intervention in order to flourish in contestable markets. To be useful, however, our theory should include certain predictions of cartel pricing behavior which can be empirically distinguished from the Stiglerian theory's prediciтons.

In fact, our model and the Stiglerian model do differ in at least two implications. Our model predicts that in markets with very high serial correlation a cartel will actually increase price and quality dispersion, while in markets with less serial correlation a cartel will reduce price and quality dispersion. Thus there should be a positive correlation between serial correlation and price and quality dispersion. The Stiglerian view, as we interpret it, does include the proposition that cartels will reduce price and quality dispersion as a way to reduce cheating on the cartel; however, it has little to say on the relationship between a market's cost structure, and particulary its serial correlation coefficient, and the degree of dispersion. At most the Stiglerian view suggests that cartels will be unstable in markets with very high serial correlation because low cost members will be tempted to break away from the cartel. The two models also differ in the relationship they predict between price-quality dispersion and consumer informedness. The Stiglerian theory implies that dispersion is lowest when cheating is most pervasive, which will typically occur when consumers are better informed and able to search out cheating members. In contrast, our model has the exactly opposite implication the dispersion is positively correlated with the informedness of consumers, since better informed consumers reduce the efficiency of reduced search entry barriers.

We remark that our theory and the received Stiglerian theory do in fact agree about the effects of several market forces. For example, our view is that effective advertising will severely limit the informational entry barriers which cartels can create-hence we do not expect to see cartels in markets where the good is such that advertising can replace search. Similarly, the Stiglerian theory suggests that advertising restrictions are one effective instrument of cartels which manipulate the state-hence cartels will frequently be found in markets without advertising. As another example of the models' similar predictions, both suggest that cartels will do best in markets with relatively uninformed consumers. Our view is that informational entry barriers are more effective in markets where the majority of consumers are ignorant of firm production costs, while the Stiglerian view is that a special interest group such as a cartel can most effectively manipulate the state machinery when its opposition, in this case consumers, is less well informed and hence less well organized as a counter political force.

In view of these strong similarities, one could hardly claim that our model is a sweeping revision of existing beliefs about cartel behavior. Rather we have put it forward as an alternative explanation of certain common obervations about producer cartels. with its advantage lying in the fact that it does not resort to state or legal manipulations as the sources of cartel entry barriers, but only to standard informational price theory.

Section V: Conclusion

This paper has presented a market in which costs follow a simple serially correlated stochastic structure, and consumers are relatively uninformed about producer costs. We have shown that when a producer cartel emerges in such a market it will manipulate consumer search patterns in order to create entry barriers. In the typical case of less than complete serial correlation the cartel will impose price and quality standards on its members in order to reduce the amount of consumer search. We have exhibited the informational entry barriers facing an entrant in a market with serially correlated costs and uninformed consumers, and have also suggested that in such markets a cartel will discourage the entrant's investment in research and development prior to entry. Finally, we have compared our view of cartel response to the threat of entry with the received theory, in the process drawing certain statistically differences between the two.