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Abstract

Where qualitative characteristics are important, market structures utilizing reputation arise to minimize total average production and information costs. Chamberlin's branded-goods case is explained by a demand curve which is downward sloping only in the short-run in which a firm's reputation is fixed. Over time, firms invest or disinvest in reputation so as to achieve full equilibrium at the minimum point on the total average cost curve. At this equilibrium, the quantity produced may be greater or less than the quantity corresponding to the minimum point on the average production cost curve.

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Much recent research in the economics of information[1] has analyzed the implications of alternative market structures in the presence of qualitative characteristics which cannot be accurately and objectively measured or described.[2] This approach avoids the more basic question of the influence of qualitative information on the emergence of market structures. This paper argues that market structures arise which minimize total average production and information costs and that qualitative characteristics produce structures utilizing reputation.

The analysis applies directly to Chamberlin's model of monopolistic competition in the case of branded goods. It is argued in this case that Chamberlin's downward sloping demand curve is a short-run phenomenon existing because a firm's reputation is fixed at an instant of time. Over time however, firms can invest or disinvest in reputation. Full equilibrium occurs at the minimum point on the total average cost curve.

The informational efficiency of reputation is analyzed in Section I. Section II applies these results to the analysis of monopolistic competition. Other applications are discussed in Section III.

I. The Qualitative Information Problem

Economists have long been troubled by — or have ignored — the subjective nature of qualitative information and qualitative differences in goods. Subjective information -- like tastes which are often involved — has the undesirable ability to explain price differentials between any two goods and is thus of little direct use. However, the existence of valuable characteristics of a commodity which cannot be accurately or objectively described does have definite implications for market structure.

Qualitative information implies that, after the transaction, buyer and seller have knowledge concerning the characteristics of the commodity which can only be objectively demonstrated to a disinterested third party at prohibitive cost. Market structures will arise to conserve this subjective information and thereby minimize total production and information costs. This necessarily involves a partially nonenforceable contract.

In order for a contract to be enforceable by recourse to legal action, all conditions must be explicit and demonstrable to disinterested third parties. Where enforceable contracts alone are used in the sale of commodities with qualitative characteristics, information loss and moral hazard or fraud results. Analyses of such markets have been made by Arrow (1963), Akerlof (1970), Spence (1973), Stiglitz (1975), Klein, Crawford, and Alchian (1978), and Williamson (1979).

It is not generally appreciated that the qualitative information problem implies moral hazard under any contract system enforceable by law. As a result various "reforms" are proposed which would legislate a certain type of enforceable contract. Consider for example the durability of automobiles. It is often argued that limitations on warranties provide automobile

manufacturers with an incentive to produce less than optimal durability. So it is proposed that unlimited warranties be required. This treats repair frequency as solely determined by — and so an objective measure of -- automobile durability. But in fact the manner in which the automobile is operated makes a big difference in repair frequency. Unlimited warranties induce less careful operation by car owners. This incentive to moral hazard on the part of the unburdened party — whether buyer or seller — is the essence of the qualitative information problem; enforceable contracts cannot cover all the relevant charactertistics of the transaction.

Where such contracting is too costly, market forces may exist to ensure that high quality goods will be produced. Telser (1980), Fama (1980), and Klein and Leffler (1981) have analyzed such forces.[3] In general, these authors start by assuming it is impossible to distinguish before trade occurs between the two qualities of a certain good — high and low — that the seller can produce. Firms face two alternative streams of earnings. They must choose between a perpetual stream of quasi-rents, as a return to the firm's brand-name capital if it produces the high quality good, or a short run (cheating) return to producing the low quality good while selling it at the higher quality price.

As in these models, we will assume that trade occurs under strict caveat emptor rules. Additionally, we will follow the above authors and adopt those conditions expressed in the preceding paragraph. Under these suppositions it follows that under perfect competition in which buyers and sellers are randomly matched, only the cheaper low-quality good will be produced.[4] Net income of producers will be zero.

Now suppose a producer decided to produce the high quality good and place a trademark on it. Initially he can do so only be selling his goods at the

going price for low quality goods, so his net income is negative. He will however provide his customers with an incentive to return to his product instead of choosing at random. The more goods he sells, the more people who will be willing in the future to pay a premium for his goods. Thus a reputation is formed by a period of investment during which income is foregone. In order for the investment to be worthwhile, the branded producer must eventually charge a price sufficiently high to cover the marginal firm's average production costs for the high quality good plus the going rate of interest on the capital value of the foregone net income during the period of investment. Entry will assure that it is no higer. Only if the industry declines will exit occur through running down reputations.[5] A more formal analysis will be presented in Section II.

A closer look at the concept of reputation is in order. Reputation is the source of the ability to charge a positive price for information.[6] It is invariably based on past performance. The past performance may have been the free provision of valuable information or the provision in market transactions at a price commensurate with the value of the information. In the particular case at hand, the information concerns the qualitative characteristics of the commodity. Developing a reputation through free provision of information has the advantage of reaching individuals who would not pay for the information from the unknown source. The provider of the information must bear the costs of the production and dissemination of the information; so this free provision is advantageous only on an introductory basis.

Both parties to the sale of a commodity with qualitative characteristics have subjective information about the characteristics. If the seller uses his reputation to sell at a high price, the buyer can judge whether the seller in fact provided qualities which justified the premium price. There are markets

however — especially the labor market — in which the seller provides a commodity and the buyer uses his reputation to assure that the buyer will set a fair price after the comodity has been consumed and evaluated. Once again the fundamental symmetry of the qualitative information problem arises. Economies of scale in the maintenance of reputation appear to be quite significant empirically as reputation is normally found on the side of sellers or buyers according to which are the least numerous.

Markets for commodities with qualitative characteristics can be divided into two hypothetical categories: unbranded and branded. In unbranded markets buyers and sellers contract at random with the full terms of trade specified in enforceable contracts. Since some costly characteristics cannot be specified, either they or cooperative commodities[7] are not produced. That is, moral hazard results. In branded markets, either sellers or buyers set a price based upon their evaluation of the commodity's qualitative characteristics. This evaluation is accepted on the basis of reputation. The supplier of the evaluation earns a return on his reputation sufficient to compensate for its creation. In the absence of legal intervention, branded markets would be the predicted market structure for commodities with significant qualitative characteristics.

II. Monopolistic Competition

E. H. Chamberlin first introduced the concept of monopolistic competition in 1933. Since that time there has been a continuing debate as to the novelty and empirical usefulness of the approach. As observed in Sir John Hicks's (1935) review article, the model's applications to location and product differentiation are rather trivial cases of natural monopoly. The remaining interesting application of the monopolistic competition model — and the only one considered here — is the case of many firms selling an identical product distinguished by brands or trademarks so that each firm faces a downward-sloping demand curve. Harold Demsetz (1972) has stated the essential objection to this case — the internal inconsistency of the postulates of the model if consumers maximize utility.[8]

In earlier work (1959, 1964, 1968) Demsetz argues that the downward-sloping demand curve implies omitted selling and information costs which, if incorporated into the analysis, would vitiate Chamberlin's excess capacity theorem. Barzel (1970), however, points out that advertising has certain public-good aspects, and that to change advertising as output changes might actually change the quality of the good.[9] For instance, a billboard might provide as much information per unit of the good, whether one or a hundred units are sold. Adding additional billboards, as output increases, would change the quality of all units. Perhaps because he did not go on the identify the critical factors which provide the essence — but not the conclusions — of Chamberlin's model, Demsetz did not provide an entirely successful formal model. This is attempted below by taking account of the essential dynamic element of the case.

The central issue in the analysis of branded goods is the nature of the demand curve. Economists have accepted a downward sloping demand curve on the basis of little more than casual introspection. A more careful analysis will show that this negative slope is strictly a short-run phenomenon in Chamberlin's case of many branded producers.

The first step is to formulate a downward-sloping demand curve for an individual firm which is consistent with many firms, free entry, and also individual utility maximization. Suppose that a good has two characteristics Q and X valued by consumers. Using Q as a numeraire, the quality of the good can be described by the amount of X sold per unit of Q or $\frac{X}{Q}$. To say many firms means that the price ($'s per unit of Q) that a firm receives is a function solely of the quality of the good -- as measured by X/Q — and not of the quantity it sells. So the demand function faced by every firm is[10]

(1) $P = D(X/Q)$.

Since X is valued, $dP/d(X/Q)$ is positive.

The demand function (1) is interpreted as giving the height of the horizontal demand curve faced by a firm for any given quality $\frac{X}{Q}$ of output. Alternatively, there is a demand surface in (Q,X,P) with a constant height P corresponding to the intersection with a plane through the origin perpendicular to the (Q,X) plane.

If the total quantity of the characteristic X is fixed at an instant of time, the demand price will be a decreasing function of the quantity of the other characteristic Q. In this case, a firm cannot directly determine the quality of the good provided. It the firm raises its price P by a small amount, unit sales will fall (as measured in the numeraire Q) until quality

X/Q rises sufficiently to justify the price increase. So at an instant of time each firm faces a downward-sloping demand curve — or better, average revenue curve -- because quality varies inversely with sales.

Before showing that this is an adequate description of the downward-sloping demand curve faced by the producers of branded goods, it will clarify matters to first consider a simpler case which does not involve branding. Suppose X is the floor space of a restaurant and Q is the number of meals. So X/Q measures the amount of elbow room allowed a diner and is assumed to be known costlessly for this example. The restaurant clearly faces a downward-sloping average revenue curve with respect to Q in the usual sense that

$$(2) \quad \frac{\partial P}{\partial Q} = -\frac{X}{Q^2} D' < 0.$$

The revenue function of the firm is given by

$$(3) \quad R = R(Q,X) = QP = QD(X/Q)$$

Note the following derivatives:

$$(4) \quad \frac{\partial R}{\partial Q} = P - \frac{X}{Q} D'$$

$$\frac{\partial R}{\partial X} = D'$$

Assuming a cost function $C = C(Q,X)$, the net income function is

$$(5) \quad \pi = R(Q,X) - C(Q,X)$$

In the long-run, the firm is free to select the level of both Q and X and the first order conditions for the maximization of net income are

$$\frac{\partial \pi}{\partial Q} = \frac{\partial R}{\partial Q} - \frac{\partial C}{\partial Q} = 0 \tag{6}$$

$$\frac{\partial \pi}{\partial X} = \frac{\partial R}{\partial X} - \frac{\partial C}{\partial X} = 0 \tag{7}$$

In the short-run, X is fixed at $\bar{X}$ so only equation (6) is relevant.

I will argue below that the received analysis of monopolistic competition omits a characteristic like X entirely; so suppose someone were to overlook the cost of building the restaurant and the possibility of adding on or renting out floor space. Then $\frac{\partial R}{\partial Q}$ is called marginal revenue and $\frac{\partial C}{\partial Q}$ is called marginal cost. These are improper usages however since they refer to variations in revenue and costs for which quality $\frac{X}{Q}$ is also varying. Proper usage would refer to the marginal revenue and marginal cost of variations in quantity for which quality is held constant. These long-run concepts are

$$MR = \left.\frac{dR}{dQ}\right|_{d(X/Q) = 0} = \frac{\partial R}{\partial Q} + \frac{\partial R}{\partial X}\frac{dX}{dQ} \tag{8}$$

$$= P - \frac{X}{Q}D' + \frac{X}{Q}D' = P$$

$$MC = \left.\frac{dC}{dQ}\right|_{d(X/Q) = 0} = \frac{\partial C}{\partial Q} + \frac{\partial C}{\partial X}\frac{dX}{dQ} \tag{9}$$

$$= \frac{\partial C}{\partial Q} + \frac{X}{Q}\frac{\partial C}{\partial X}$$

Since X is fixed in the short run, short-run marginal revenue and marginal cost are undefined.

Consider the long-run equilibrium values of Q and X. It will be true that marginal revenue will equal marginal cost; so

$$(10) \qquad P = \frac{\partial C}{\partial Q} + \frac{X}{Q}\frac{\partial C}{\partial X}$$

But substituting from equation (7) and rearranging terms yields

$$(11) \qquad (P - \frac{X}{Q} D') - \frac{\partial C}{\partial Q} = 0,$$

which is equation (6). So it is seen that the erroneous analysis which ignores X treats true marginal revenue less the effect of quality variation on revenue as if it were marginal revenue. Similarly true marginal cost less the marginal cost of maintaining quality is treated as if it were marginal cost.

The simultaneous determination of Q, X, and P is awkward to depict graphically. It can be managed, however, for a given quality $\frac{X}{Q} = \gamma$. In long-run equilibrium, free entry implies zero profits with price = marginal revenue = marginal cost = average cost. This is illustrated in Figure 1. The typical firm will sell $\bar{Q}$ and $\bar{X} = \gamma\bar{Q}$ at a price of $\bar{P}$ per unit measured in terms of Q. Free entry and exit assures that the price will be neither more nor less than $\bar{P}$.

Figure 2 illustrates the long-run equilibrium in terms of an analysis which omits the characteristic X. The demand curve is the short-run average revenue curve $P = D(\bar{X}/Q)$ for the given output of $\bar{X}$. The corresponding quasi-marginal-revenue curve is $QMR = \frac{\partial R}{\partial Q}$ evaluated at $(Q,\bar{X})$. The quasi-marginal-cost curve is $\frac{\partial C}{\partial Q}$ evaluated at $(Q,\bar{X})$. The quasi-average-cost curve is drawn for costs exclusive of the cost of producing $\bar{X}$ and so is given as[11]

$$(12) \qquad QAC(Q) = \frac{\int_0^Q \frac{\partial}{\partial q}[C(q,\bar{X})]dq}{Q}$$

The area $(\bar{P}-\rho)\bar{Q}$ can thus be interpreted as the quasi-rent available to cover the quasi-fixed cost of producing $\bar{X}$.

It was shown above that in long-run equilibrium the quasi-marginal revenue curve will intersect the quasi-marginal cost curve at $\bar{Q}$; the output corresponding to the minimum point on the total average cost curve for $\gamma = \bar{X}/\bar{Q}$. This intersection will not generally correspond to the minimum point on the quasi-average cost curve. It will however, as in Figure 2, if the cost function is separable as

$$C(Q,X) = C(Q) + \alpha X, \tag{13}$$

where α is a constant. In the figure, $\bar{P} - \rho = \alpha\gamma$. This can be interpreted as the firm "producing" Q and purchasing X in the market for resale with Q. If the cost of X were not proportional to the quantity of X, the minimum point on the quasi-average-cost curve would occur at a lower or higher level of Q than for the total average cost curve according to whether the marginal cost of X was above or below the average cost of X. In the general case in which the cost function is nonseparable, there is no presumption one way or the other. Nor should there be any particular interest in the question. Note also that the intersection of the quasi-marginal-revenue curve with the quasi-marginal-cost curve at $\bar{Q}$ is an implication of the existence of an equilibrium, not geometry: Entry will assure that the marginal valuation of X ($\partial R/\partial X = D'$) is equated to the (long-run) quasi-marginal-cost of X ($\partial C/\partial X$).

An alternative interpretation of the monopolistic competition model is that X is not omitted but fixed permanently at an optimal amount $\bar{X}$. In that case quasi-average costs would be defined as

$$QAC^*(Q) = C(Q,\bar{X})/Q \tag{14}$$

The long-run equilibrium is illustrated in Figure 3. Again the figure shows the long run optimal scale of output for a firm producing quality γ as $(\bar{Q}, \bar{X} = \gamma\bar{Q})$. The alternative quasi-average-cost curve QAC* will intersect the

average cost curve for quality γ at the latter's minimum point $(\bar{Q},\bar{P})$ and will be tangent there to the short-run demand curve $P = D(\bar{X}/Q)$. The quasi-average cost equals average cost at output $\bar{Q}$ because $\bar{X} = \gamma\bar{Q}$; at lower Q's, quality $\bar{X}/Q$ exceeds γ so that quasi-average costs are higher than average costs for quality γ. Similarly for higher Q's where $\bar{X}/Q$ is less than γ. The tangency of QAC* and $P = D(\bar{X}/Q)$ follows from observing that the price paid for various qualities will equal the minimum average cost for producing each quality which must be less than or equal to the average cost for producing each quality given $X = \bar{X}$. Continuity gives us the equivalence of the slopes at $\bar{Q}$, but stronger assumptions are required for strict tangency rather than coincidence.[12]

The discussion has been motivated so far by the special case in which X is interpreted as an overhead item such as floor space or staff size which can be easily viewed as purchased in the market — albeit on long-term contracts. It remains to be shown that a brand or trademark has similar characteristics.

If free-entry is to have economic meaning, it must be the case that consumers value not the brand per se — on which each firm has its own monopoly — but a stock of information associated with that brand. So any other firm could choose another brand name for the same product and would face an identical demand curve if an identical stock of information were associated with its brand name. If the stock of information is measured by X, then it is sensible that the demand function (1) should apply: In order for a firm to sell more, it must increase sales to those relatively less familiar with the goods and terms offered by the firm. That is, X/Q determines the confidence or subjective probability which the marginal customer places upon the fairness of a firm's evaluation of premium quality as illustrated in Figure 4. In order for a firm to expand its sales at a moment of time — for which reputation is fixed — it must sell at the margin to customers less familiar with its brand. The assumption of many firms obviates consideration of oligopolistic

effects of the change in one firm's sales on the market share of other firms. Thus the fixed stock of information X associated with a brand at an instant of time implies that variations in quantity Q imply inverse variations in quality as anticipated by the marginal customer.

The intuitive appeal of Chamberlin's downward sloping demand curve for a branded product such as aspirin arises because we immediately think of a firm with an established reputation fixed at an instant of time. All characteristics are varied in proportion except for the scale of reputation which is treated as a gift of God rather than a costly output. The cost conditions of producing X when X is reputation have some interesting interpretations which are discussed below. In discussing reputation as a costly output, it is a neat question whether Chamberlinian analysis should be viewed as ignoring the costs of the fixed output or as including the costs of reputation but taking reputation as exogenously fixed on the firm.

If the quasi-average-cost curve is interpreted as in Figure 2 ignoring the capital costs of producing a reputation, Chamberlin is wrong to assert that entry would force price to the quasi-average cost curve thus eliminating quasi-rents. The fixed cost element must be covered also, so this does not occur. If it were costless to produce $\bar{X}$ in the long-run, it would have 0 marginal value to consumers and D' would be identically zero. But that is inconsistent with the postulate of downward sloping demand curves.

If the costs of the optimal scale of reputation are included in the quasi-average-cost curve as in Figure 3, the quality of the good as anticipated by the marginal customer varies along the short-run demand curve and quasi-average-cost curve. Output is nevertheless at the minimum point on the average cost curve with constant quality as anticipated by the marginal customer.

A careful reading of Chamberlin's discussion (1965) of selling costs provides bases for either interpretation, but my analysis of cost conditions

will proceed on the view that monopolistic competition ignores the costs of reputation as well as its variability.

It is now important to distinguish advertising and other selling costs from reputation. Were selling costs to affect only current sales, no new analytical difficulties arise. Such selling costs represent a valued characteristic -- like elbow room -- which can be instantaneously adjusted with the output of other characteristics so that the firm will always produce at the minimum point on a constant quality average cost curve as shown by Telser (1964).[13] The problem is simplified by assuming that there is a constant optimal ratio of advertising to other characteristics so that advertising -- like all other currently variable characteristics -- is subsumed in the quantity index. An alternative approach would define output as a vector (Q_1, Q_2, Q_3, ..., Q_n, X) where X is fixed in the short-run and the demand function is

$$P = D\left(\frac{Q_2}{Q_1}, \frac{Q_3}{Q_1}, \ldots, \frac{Q_n}{Q_1}, \frac{X}{Q_1}\right). \tag{15}$$

There are no changes in the conclusions, but one should be careful to discuss average or marginal revenue and average or marginal cost only for variations in the numeraire accompanied by proportional variations in Q_2, Q_3, ..., Q_n, X.

Advertising differs from other characteristics in so far as current advertising affects future sales. Nerlove and Arrow (1962) have analyzed advertising which creates a stock of "good will."[14] This stock -- so far as it is fixed in the short-run -- provides an alternative, perhaps complementary, basis for a downward sloping short-run average revenue curve with quality varying with the quantity of the variable numeraire characteristic sold. The analysis for floor space fixed in the short-run applies directly. Nerlove and Arrow were therefore erroneous to conclude (p. 132) that $\frac{\partial R}{\partial Q} = \frac{\partial C}{\partial Q} < P$ implied monopoly power or other than marginal cost pricing.

So a fixed stock of good will associated with past advertising may rationalize an incautious acceptance of a downward-sloping (short-run) demand curve. Because advertising is an independent decision variable of the firm, there is no real difference between past decisions to build floor space or good will. A fixed reputation X based on past sales is a more subtle source of erroneous analysis because there is no explicit cost or independent decision involved. Phillip Nelson (1974) has argued that advertising may be valuable in creating and maintaining a reputation with respect to qualitative characteristics. Separate treatment of advertising as a determinant of $\frac{dX}{dt}$ adds nothing substantive to the following interpretation of the effect of branding on output and so is omitted.

Recall from Section I that reputation can be viewed as built up by making past sales of high-quality products at losses and maintained by making current sales. Two functional relationships are valuable in the analysis of reputation. The first is the equation of motion which describes the growth of reputation over time:

$$\frac{dX}{dt} = f(Q,X). \tag{16}$$

It is assumed that the greater the rate of sales, the more new customers are buying the product so $\frac{\partial f}{\partial Q} > 0$. Reputation, on the other hand, depreciates through death and exit of customers so $\frac{\partial f}{\partial X} < 0$. The second equation gives the good-will value of the firm as a function of the stock of reputation

$$W = W(X). \tag{17}$$

This is the net present value of the returns to the optimal program of outputs over time for a firm with a current reputation stock X.

Therefore the cost function C(Q,X) can be written as

$$C(Q,X) = C(Q) + iW(X) - W'(X)\, f(Q,X). \tag{18}$$

The last term reduces costs by the rate of increase in good-will value. The conditions (6) and (7) for long-run equilibrium are[15]

$$(19) \qquad \frac{\partial R}{\partial Q} = \frac{\partial C}{\partial Q} \equiv C'(Q) - W'(X)\,\frac{\partial f}{\partial Q}\,;$$

$$(20) \qquad \frac{\partial R}{\partial X} = \frac{\partial C}{\partial X} \equiv W'(X)\,\left(i - \frac{\partial f}{\partial X}\right).$$

It is seen that the partial derivative of cost with respect to quantity Q is the marginal production cost[16] less the value of the induced change in the value of the firm. Also, the partial derivative of cost with respect to reputation X equals the required increase in good-will value times the sum of the interest rate i and the depreciation rate $-\frac{\partial f}{\partial X}$. This allows for the value of sales in maintaining reputation and for the natural depreciation of reputation over time.

Substitution of equations (19) and (20) into equation (10) yields

$$(21) \qquad P = C'(Q) + \frac{X}{Q}\,iW'(X) - \frac{W'(X)}{Q}\left(Q\,\frac{\partial f}{\partial Q} + X\,\frac{\partial f}{\partial X}\right).$$

For this to be a long-term equilibrium with free entry, X must be constant and net income zero:

$$(22) \qquad f(Q,X) = 0$$

$$(23) \qquad PQ - C(Q) - iW(X) = 0$$

Note that so long as the function f is homothetic, equation (22) implies that the last right-hand-side term of equation (21) is zero, so that

$$(24) \qquad P = C'(Q) + \frac{X}{Q}\,i\,W'(X).$$

Dividing equation (23) by Q and substituting into equation (24) yields the condition which determines whether output will be larger or smaller than the output that minimizes average production cost:

$$(25) \qquad C'(Q) - \frac{C(Q)}{Q} = \frac{X}{Q}\left[\frac{iW(X)}{X} - iW'(X)\right].$$

In order for output to be less than the Q which minimizes average production costs it must be true that the marginal effect of reputation on the good-will value of the firm is greater than the average effect. While this might be the case, it has generally been supposed that the average cost of a reputation falls over a considerable range. That would imply that minimum total average costs would generally occur at a level of output greater than the minimum of average production costs ($C'(Q) > C(Q)/Q$) contrary to the "excess capacity" proposition advanced by Chamberlin.

The graphical interpretation of this equilibrium differs from Figure 2. This is because a Chamberlinian would not typically consider the quasi-marginal-cost curve $QMC = \frac{\partial C(Q,\bar{X})}{\partial Q}$ but instead the marginal-production-cost curve $MPC = C'(Q)$. The firm will never operate at the output Q^* (and price P^*) defined by the intersection of the quasi-marginal-revenue curve and the marginal-production-cost curve, however. Instead as in Figure 5 (drawn on the assumption that the total average cost curve and average production cost curve happen to have minima at the same output), output $\bar{Q}$ will be larger and price $\bar{P}$ lower.[17] The reason is that the present value of current sales in producing future net income affects the output decision of the firm.

So the Chamberlinian analysis of branded goods fails on two grounds: (1) A costly characteristic (reputation) which affects the product price and is fixed in the short-run is neglected. (2) As a corollary to the first point, the positive effect of current output on future net income is neglected. Correction of these omissions implies that the short-run downward sloping demand curves which result from branding will not be tangent to the average production cost curve in long-run equilibrium and that short-run marginal revenue will not be equated to marginal production costs. Output may be either larger or smaller than the output which minimizes average production costs -- though

there is a mild presumption that it will be larger. Once the information cost required for the exchange of commodities with valuable qualitative characteristics is recognized, only the efficient output which minimizes total average costs would appear to be of either economic or normative interest.

III. Other Applications

The most straightforward case of reputation as a solution of the qualitative information problem is the one of the preceding section: branded producers. There are other less obvious but important applications, particularly the labor market. It is generally argued that reputation will not be a solution in this market because the sellers (workers) are numerous and only irregularly in the market so that it is not worthwhile for them to establish a reputation.[18] This seems to be the normal situation in the labor market.

If a firm invests in a reputation for fairness in assessing the quality of work and paying afterwards a commensurate compensation, potential workers will be willing to accept a low beginning wage on the understanding that the quality of his work will be reflected in deferred compensation and make-up pay increases. Where considerable time and cost is involved in the evaluation process a substantial forfeitable guarantee in the form of a nonvested pension may be attractive to both worker and firm.[19]

The reward to the firm for investing in reputation arises because there are exploitable gains from reducing what Alchian and Demsetz (1972) have called "shirking," and Spence (1973) has called "signalling." Shirking arises because the quality of work by any member of a productive team cannot be objectively measured. If only enforceable contracts were relied on each member of the team would be undercompensated for qualitative characteristics of his labor and so underproduction of those characteristics or shirking would result. If the qualitative characteristics could be objectively measured at zero cost, there are clearly gains from trade in doing so. This is not the case since in order for the employer to compensate qualitative characteristics he must invest in a reputation and expend resources in monitoring. If the

potential gains are substantial however, it will be worthwhile to bear the costs involved. Similarly, contingent contracts greatly reduce or eliminate the incentive to overinvest in signals such as education as a preemployment indication of productivity. As with the analagous case of transportation costs in international trade, there will be less production of the qualitative characteristics and more signalling than if transaction costs were zero but to a smaller extent than if they were infinite.[20]

It should be noted that similar reputational analysis can be applied within the firm. For example, transfer pricing of goods in process between divisions will generally be possible because of the reputations of the heads of the divisions involved and the reputation of their superior.

In Section II, it was remarked that the optimal scale of a reputation -- in terms of minimum average cost -- is generally thought to be quite large relative to market size. This may be due to frequency of sale and mobility of potential customers (or for a buyer's reputation, potential sellers). Suppose that this is indeed the case for whatever reason and suppose also that rapidly rising marginal production costs and rapidly falling demand curves would imply much smaller sellers and much smaller buyers. In this case, it would at first appear that the costs of the reputational solution to the qualitative information problem would be prohibitive and the moral hazard solutions apply. It might be so, but not necessarily.

George Stigler (1951) has provided an elegant analysis of almost precisely this problem in his development of Adam Smith's theorem that "The Division of Labor Is Limited by the Extent of the Market." One can consider the physical production of high quality goods and their selling as two distinct productive processes. Stigler's analysis would suggest that where the optimal scale of selling is much larger than physical production, the many producers would sell

to a few selling firms. The problem is that the producing firms still have to sell to the selling firms. Here however there is a difference. The selling firms -- or middlemen -- are few in number and so can acquire a reputation as fair buyers at a reasonable average cost. So the reputational solution is feasible. Since the costs of two reputations must be borne in transacting through the middle-man, there is a somewhat larger range for the moral hazard solutions to apply.[21]

Doubly reputable middle-men are quite significant and varied. Consider franchise operations, art dealers, used car dealers, and department store chains such as Sears. Since reputation ultimately relates to reliability of information or evaluation, the large scale of operation may be based on a number of individually infrequent, small sales of a variety of products to a regular clientele. Nor is the open sale of different qualities at different prices inconsistent with maintaining a reputation so long as the differences are commensurate.

IV. Conclusion

Qualitative characteristics of commodities imply two general types of market structures, those involving moral hazard and those involving reputation. The moral hazard solution involves a divergence of the values of a characteristic to the producer and to the buyer of that characteristic. Whenever this divergence would be substantial in the case of random matching of buyers and sellers, a market structure based on reputation arises. Reputation is a costly capital asset and its creator must be compensated; yet this cost appears to be generally lower than for the only alternatives -- markets with moral hazard.

The downward sloping demand curve of the monopolistically competitive model is understandable as a short-run phenomenon based on the fixedness at any instant of a firm's reputation. In the long-run, reputation is a decision variable and so its costs must be included in determining entry. This implies that in full ("group") equilibrium the downward sloping short-run demand curve and horizontal long-run demand curve will be above the average production cost curve and intersect the average total cost curve at the output level which minimizes average total costs.

The basic result is that the qualitative information problem is symmetric: If buyers and sellers are randomly matched, moral hazard will be implied for the party -- whether buyer or seller -- who is unburdened by the explicit contract. If reputations are permitted, moral hazard can be eliminated by reputation on the part of either buyer or seller. Because of this symmetry, the cost conditions may even imply middle men who create a reputation to buy from numerous sellers and another reputation to resell to numerous buyers.

APPENDIX

WHY FIRMS RUN DOWN THEIR REPUTATION ONLY IF DEMAND DECLINES

The discussion here will follow along the lines of the full information model developed by Klein and Leffler (1981). The buyers are assumed to know the cost functions for firms producing either the high or low quality output. Higher quality and larger quantities require higher production costs, and marginal cost increases with quality. If buyers could costlessly obtain information on quality prior to purchase, the competitive price of low quality output (q_{min}) would be P_0 and the competitive price for high quality (q_h) P_1. The corresponding outputs will be shown as Q_0 and Q_1 respectively, and the marginal cost functions denoting high quality output is $MCq_h(Q)$ and low quality $MCq_{min}(Q)$.

In the case where information concerning quality prior to purchase is prohibitively costly, such as the example of the producer initially selling the product at a loss in order to inform consumers of its higher quality, the seller must expect to eventually receive a price of P_1 plus a premium equal to the interest rate times the loss incurred in creating this reputation. This last price will be called P_2 and the associated output Q_2.

The perpetual stream of quasi-rents, as a return to the firm's brand-name capital if it produces the high quality good, is thus

$$(26) \quad W_1 = \frac{1}{r}\left\{(P_2-P_1)Q_2 - \int_{Q_1}^{Q_2} [MCq_h(Q)-P_1]dQ\right\}$$

W_1 is equal to the loss incurred in creating the reputation.

Assuming the firm is only able to cheat for one period before getting caught -- therefore, no longer being able to sell the low quality good at the

higher quality price — and that because of our full information assumptions the cheating firm must sell at the same output as the noncheating firm or it will be detected, then the gains to cheating are

$$(27) \quad W_2 = \frac{1}{1+r}\left\{(P_2-P_0)Q_2 - \int_{Q_1}^{Q_2}[MCq_{min}(Q)-P_o]dQ\right\}$$

The question we wish to address is what is the effect of a change in demand conditions (and thus price) on W_1 and W_2. That is to say whether an increase or decrease in demand will induce a firm to "cheat." It seems that the return to providing high quality (W_1-W_2) must be increasing in price (and thus quantity, since marginal cost has a positive slope). The logic is as follows. If $\partial(W_1-W_2)/\partial Q_2 < 0$, new firms could enter and have lower average cost than existing firms. Thus entry will continue and P_2 will decline until $\partial(W_1-W_2)/\partial Q_2 > 0$.

Under our assumption that the capital investment used to produce reputation only provides information about product quality, consumers would want W_1 to be just slightly above W_2. It follows then that an unexpected downward shift in the industry demand curve would thus cause $W_2 > W_1$, and therefore make cheating attractive.

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Footnotes

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[1]Interesting surveys of this literature by Hirshleifer (1973), Rothschild (1973), Hirshleifer and Riley (1979), and Lippman and McCall (1981) are available.

[2]It is not sufficient that this information be merely costly to produce because then a guarantee with a high forfeit could be risklessly offered by the seller as a guarantee of stated quality.

[3]Though Fama's application to the market for managers seems to be flawed by a last period problem, since it is possible to identify the date on which the manager will retire.

[4]An unguaranteed claim of high quality would be worthless and a guarantee would cause all customers to claim that they had been supplied low quality goods whatever the actual quality.

[5]This is demonstrated in the Appendix.

[6]Evaluation would be more precise than information, but the two concepts are so closely related that the distinction is not attempted here.

[7]Reference is made here to contracts -- such as the unlimited automobile warranty example — which measure characteristics in terms of an output produced in cooperation with commodities supplied by the buyer.

[8]This internal inconsistency doubtless explains why attempts to apply the model start with a demand curve rather than utility functions.

[9]Also, see comments by Schmalensee (1972). Since then, Ohta (1977) has attempted to dispute these claims.

[10]A more general representation is $P = D(Q,X/Q)$ with $D_1 = 0$ and $D_2 > 0$. The analysis is related to Lancaster (1971). Telser (1964, pp. 538-39) used a similar demand function to analyze advertising.

[11]There is an obvious relation between the quasi-average-cost curve and the average variable cost curve of standard price theory.

[12]Formally, $\frac{\partial QAC^*}{\partial Q} = \frac{1}{Q}\left[\frac{\partial C}{\partial Q} - \frac{1}{Q}C(Q,\bar{X})\right]$

$$= \frac{1}{Q}\left[\frac{\partial R}{\partial Q} - P\right] \quad \text{at } (\bar{Q},\bar{X})$$

$$= \frac{1}{Q}\left[-\frac{X}{Q}D'\right] \quad \text{by equation (4)}$$

$$= \frac{\partial D(\bar{X}/\bar{Q})}{\partial Q} \quad \text{Q.E.D.}$$

It is conceivable although surely unlikely that the optimal output combinations for qualities γ and $\gamma + \Delta\gamma$ would be $(\bar{X}/\gamma,\bar{X})$ and $(\bar{X}/(\gamma+\Delta\gamma),\bar{X})$.

[13]One must however avoid Schmalensee's error (1972, p. 588) of assuming that perfect competition implies an infinite partial price elasticity of demand with the total level of advertising held constant. Larger quantities there imply less advertising per unit and so lower quality as viewed by the marginal buyers.

[14]In fact, Nerlove and Arrow assumed that the stock of good will could be instantaneously increased as desired and depreciated over time. Gould (1970) provided a fixed element by assuming a nonlinear advertising cost function.

Schmalensee (1974) recently showed that such models do not imply that advertising is in any sense a barrier to entry unless imperfect capital markets are assumed.

[15]Note that in deriving equation (20) use is made of the definition of long-run equilibrium given in equation (22) below.

[16]Recall that production cost is used here in the special sense inclusive of current selling costs (e.g., advertising) which affect current sales.

[17]The area (P-S)Q, which is the excess of revenues over production costs, covers the capital cost iW(X).

[18]See for example Spence (1973, pp. 355-56).

[19]The nonvested portion of compensation — the pension payable at the employers discretion — assures the employer that he will not lose out if the worker is eventually found to not provide services commensurate with the total compensation. See Darby and Karni (1973) for an investigation of models involving such guarantees and probabilistic learning over time.

[20]It makes sense to compare the branded case with the case in which branding is prohibited. This provides a measure of the potential loss from prohibiting branding. A comparison of the branded case with the zero information cost case makes no more sense than comparing it with the zero production cost case. There is no way to eliminate either element of cost and still produce the commodity.

[21]The general possiblity of mergers and spin-offs is considered by Demsetz (1964). In the case of qualitative characteristics it is seen that production and selling are complementary in the sense that the cost of the middleman's reputation as a buyer is avoided where the two processes are carried out by a single firm.

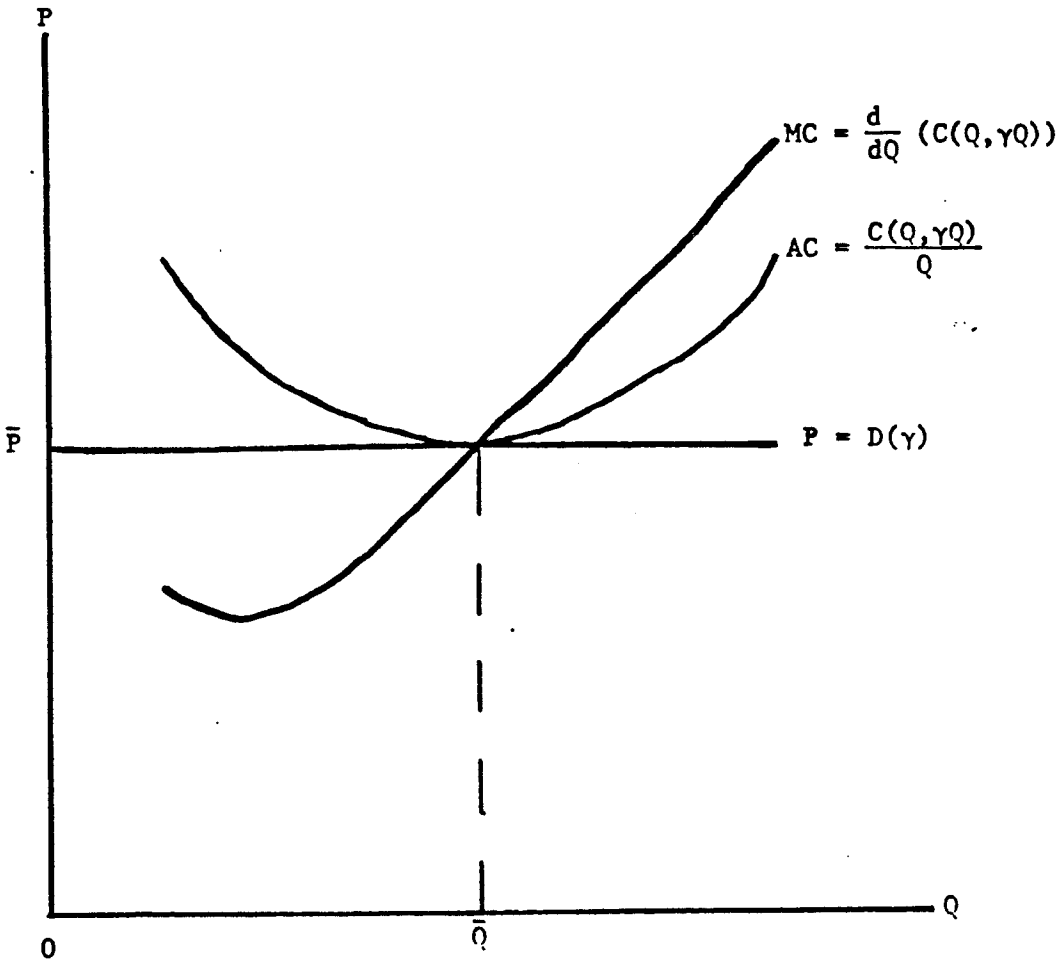

Figure 1

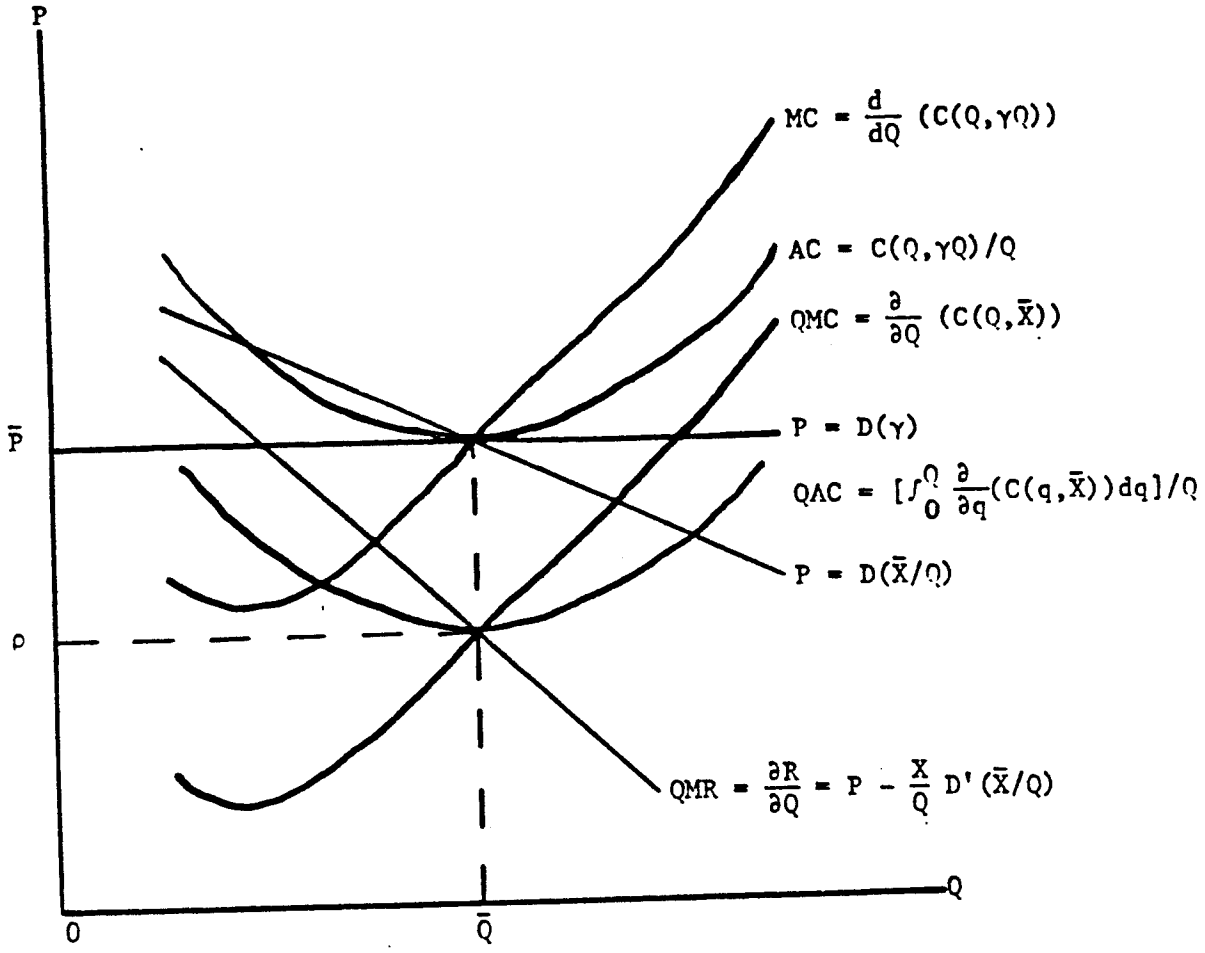
P
$\bar{P}$
p
0
$\bar{Q}$
Q
MC = $\frac{d}{dQ}$ (C(Q,γQ))
AC = C(Q,γQ)/Q
QMC = $\frac{\partial}{\partial Q}$ (C(Q,$\bar{X}$))
P = D(γ)
QAC = $[\int_0^Q \frac{\partial}{\partial q}(C(q,\bar{X}))dq]/Q$
P = D($\bar{X}$/Q)
QMR = $\frac{\partial R}{\partial Q}$ = P - $\frac{X}{Q}$ D'($\bar{X}$/Q)

Figure 2

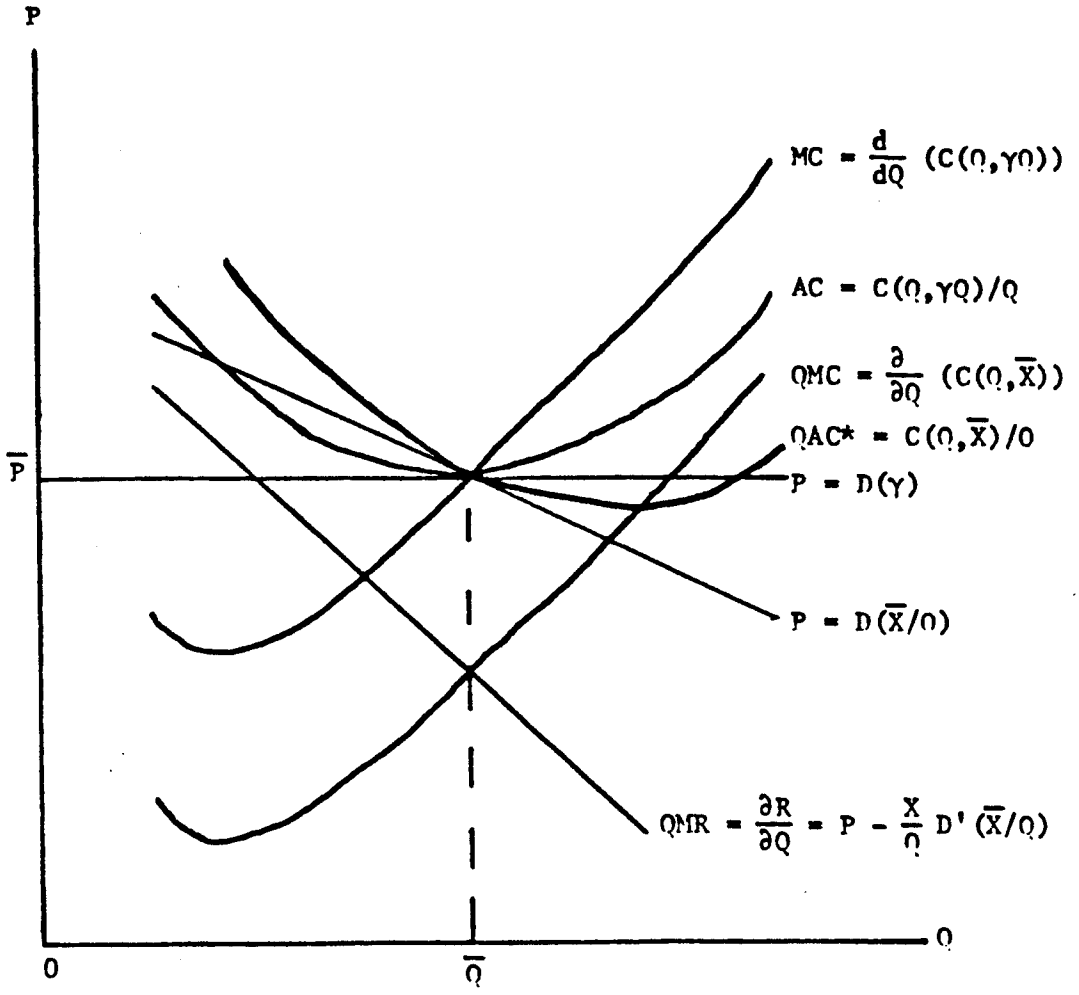
P
$\bar{P}$
$MC = \frac{d}{dQ}(C(Q,\gamma Q))$
$AC = C(Q,\gamma Q)/Q$
$QMC = \frac{\partial}{\partial Q}(C(Q,\bar{X}))$
$QAC^* = C(Q,\bar{X})/Q$
$P = D(\gamma)$
$P = D(\bar{X}/Q)$
$QMR = \frac{\partial R}{\partial Q} = P - \frac{X}{Q} D'(\bar{X}/Q)$
Q
0
$\bar{Q}$

Figure 3

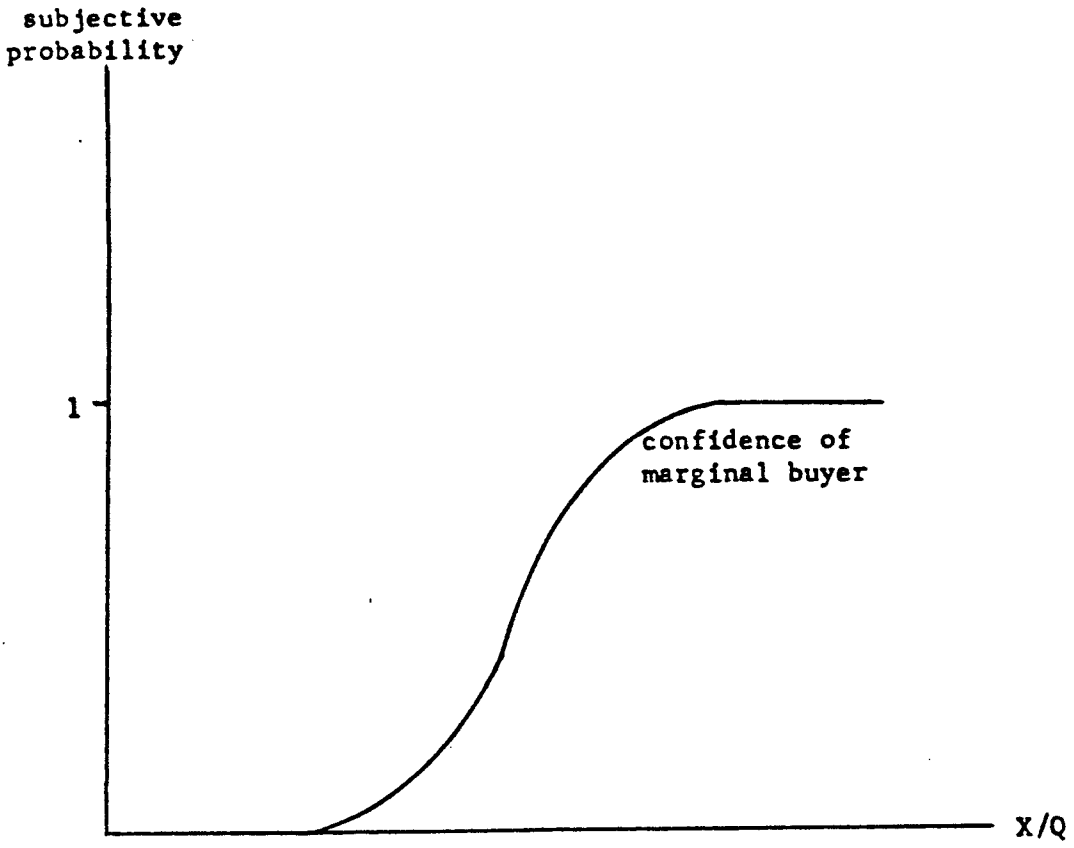

Figure 4

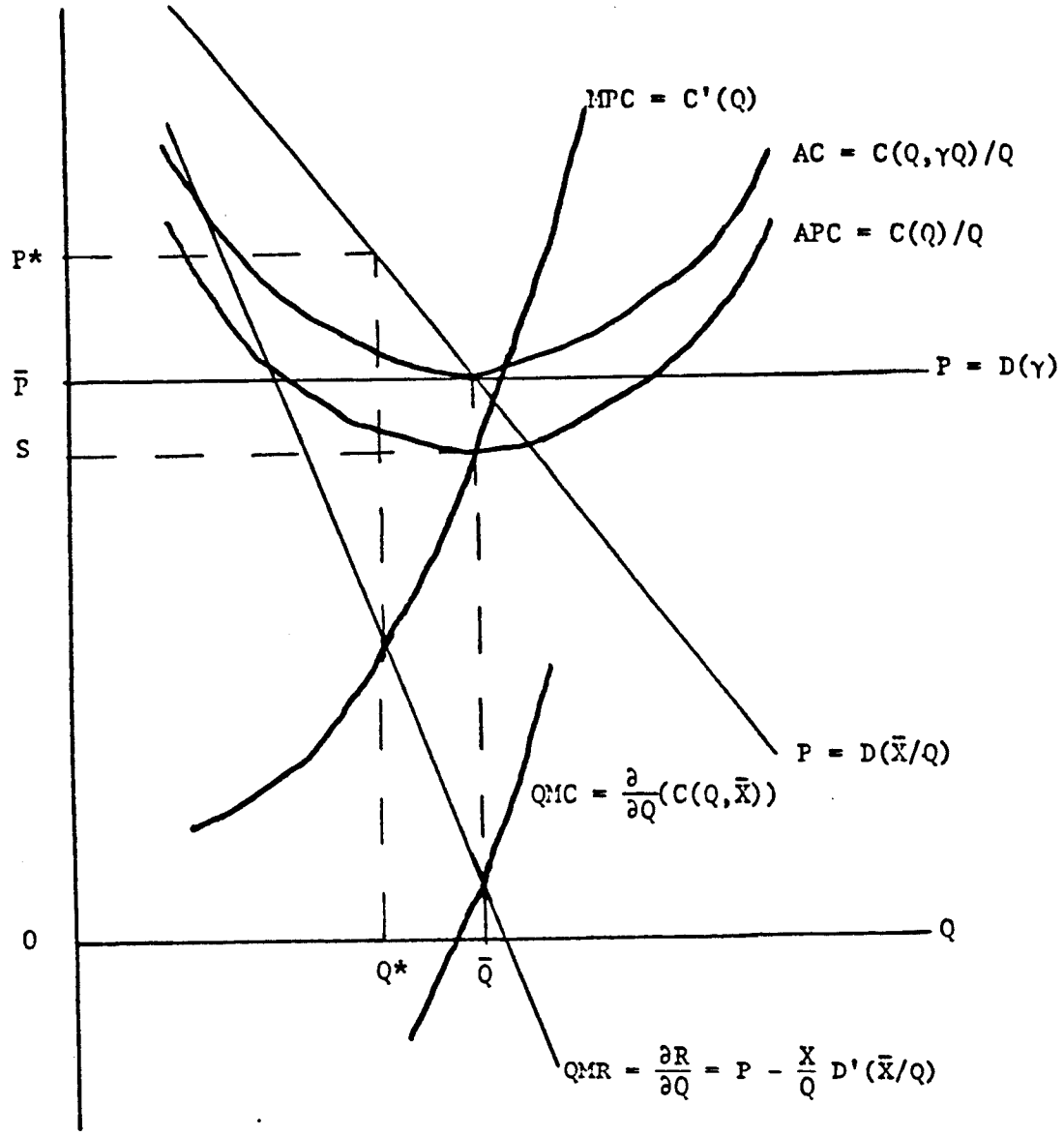
MPC = C'(Q)
AC = C(Q,γQ)/Q
APC = C(Q)/Q
P*
P̄
S
P = D(γ)
P = D(X̄/Q)
QMC = ∂/∂Q(C(Q,X̄))
0
Q
Q*
Q̄
QMR = ∂R/∂Q = P - X/Q D'(X̄/Q)

Figure 5