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Economics

Industrial organization

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ABSTRACT Industrial organization is concerned with the workings of markets and industries, in particular the way firms compete with each other. The main reason for considering industrial organization as a separate subject is its emphasis on the study of the firm strategies that are characteristic of market interaction: price competition, product positioning, advertising, research and development, and so forth.

Four aspects of market structure have attracted the interest of students of industrial organization. These are :

(a) Firm Boundaries - Vertical integration occurs when a number of sequential production stages are organized within a single firm instead of each stage corresponding to a separate firm.

(b) Seller Concentration - Seller concentration is a measure of the number and size distribution of firms. Industrial organization attempts to identify the factors that influence or determine seller concentration.

(c) Product Differentiation - Product differentiation exists when products produced by different firms are not viewed as perfect substitutes by consumers. Alternatively, products are not homogeneous, but heterogeneous.

(d) Conditions of Entry - The conditions of entry refer to the ease with which new firms can enter a market.

KEYWORDS : market power, profit maximization, pricing of firm

Economics of Market Power

Profit Maximization Industrial Organization is about the behavior of firms in imperfectly competitive markets. To understand firm behavior, we start by assuming that the firm's objective is to maximize profits. Certainly shareholders want the firm to maximize profits because the greater the profits, the greater their income. We will typically assume that the objective of firms is to maximize profits. How do we then find how much a firm interested in maximizing its profits should produce?

Suppose that the minimum cost of producing 'q' units of output is given by 'C(q)' (the cost function).

Suppose further that the total revenues of the firm are determined by the output of the firm and denote this functional relationship as R(q).

Then the relationship between the output of the firm and its profits,i.e. the profit function, is $\pi(q) = R(q) - C(q)$ (1)

The key to finding the profit-maximizing level of output is to consider the effect of a change in output on profits. This rate of change is called marginal profit (MP). Since both revenue and costs change as output changes, changes in output affect profits. The rate of change of revenue with respect to output is called marginal revenue (MR) and similarly marginal cost (MC) is the change in cost as output changes. Marginal profit is simply the difference between marginal revenue and marginal cost, or

$MP(q) = MR(q) - MC(q)$ (2)

If MR > MC, marginal profit is positive—the profits of the firm increase as it expands its output.

If MR < MC, marginal profit is negative—the profits of the firm will increase if it reduces its output.

When MR = MC, the output level of the firm (q) will be profit maximizing—profit cannot be increased either by increasing or decreasing the output, q.

The profit-maximizing rule is that a firm should produce at the output level q* that equates marginal revenue and marginal cost, i.e.

$MR(q^*) = MC(q^*)$ (3)

Actually, equation (3) is the profit-maximizing rule only if a firm stays in business. Firms have another decision to make—whether to keep producing or shut down. In the short run, it is better to keep producing if price is greater than minimum average costs. In the long run, it is better to keep producing if price is greater than minimum long-run average costs. In the long run, all costs are avoidable, including some expenditures that might not be avoidable in the short run. Expenditures that are not avoidable in the short run are called sunk costs. We know that short-run avoidable costs include variable costs, but they also include quasi-fixed costs—costs that do not vary with output as long as output is positive. If the firm shuts down, it avoids quasi-fixed costs.

Monopoly Pricing

The profits of the firm are : $\pi = PQ - C(Q)$, where C(Q) is the cost function, P is the price of the product, and PQ is total revenue or the rupee value of sales of the product. The firm recognizes that P and Q are not independent. The feasible combinations for P and Q are given by the inverse demand function, P = P(Q). This function shows the maximum price the firm can charge consumers and have them voluntarily purchase Q units of output. Substituting it into the definition of profits, we find that profits depend only on the level of output that the monopolist selects. The profit function of the monopolist is

$\pi(Q) = P(Q)Q - C(Q)$ (4)

Now we know that the profit-maximizing output equates marginal revenue and marginal cost. For a competitive firm, the firm's revenue function was simply R(Q) = PQ. Here, however, R(Q) = P(Q)Q. The revenue function depends on Q not only directly, since increases in Q increase sales volume, but also indirectly because changes in Q require changes in price. Suppose the firm was selling 1000 units of the product. How would revenues change if it sold one more unit? The answer is marginal revenue and it consists of two components, a direct and an indirect effect. On the plus side—which is the direct effect—revenues will increase because the firm receives the price for the 1001th unit. But what price? In order to sell the 1001th unit, the firm must move down its demand curve and charge a lower price, one it now has to charge for the first 1,000 units as well. This is the indirect effect. So on the minus side, revenues go down because the price that the firm receives for the additional units declines. The 1001th unit is the marginal unit, the preceding 1,000 are not at the margin, they are "below" the margin, or inframarginal. Marginal revenue for the firm is simply the sum of these two terms. If we consider a marginal increase in output starting from any Q (rather than 1,000), we still determine marginal revenue by summing the direct and indirect effects:

$MR(Q) = P(Q) + \{d\,P(Q)/d\,Q\}\,Q$ (5)

Where, $\{d\,P(Q)/d\,Q\}$ is the rate of change of price with respect to quantity. Notice that it is the slope of the demand curve at Q, and it is how much price must fall to sell one more unit, given that existing production equals Q. The sign of $d\,P(Q)/d\,Q$ is negative, so marginal revenue is less than price. This relationship is shown graphically in the following Figure for output level Q1.

The loss on inframarginal units is the lightly shaded area and the gain from the sale of the marginal unit is the dark area. To find the profit-maximizing quantity, the firm should set its marginal revenue function equal to its marginal cost function. This means that Q_m, the profit-

maximizing output level, is defined by equating (5) with the marginal cost function:

$$P(Q_m) + \{d\,P(Q_m)/d\,Q\}\,Q_m = MC(Q_m) \qquad (6)$$

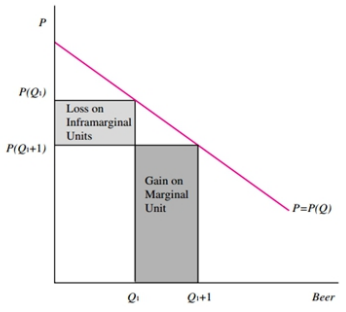

Figure 1 : Marginal Revenue of a Monopolist

Inefficiency of Monopoly Pricing

The following Figure also shows the efficiency effects of monopoly pricing. The socially optimum quantity, Q_s, is found where marginal cost equals the marginal benefit of consumption. Monopoly pricing affects both the magnitude of gains from trade and their distribution. Monopoly pricing is inefficient since the monopolist produces too few units.

- At Q_m, consumers' willingness to pay for another unit of output equals P_m, but the cost to society is only c. As shown in Figure, the difference between the total surplus under monopoly and maximum total surplus is called deadweight loss (DWL). It represents an opportunity cost to society. By not producing units of output between Q_m and Q_s, where willingness to pay per unit exceeds marginal cost, society forgoes surplus equal to the DWL.

- A second effect of monopoly power is the transfer of surplus from consumers to the firm as profits. Under competitive pricing, both monopoly profits and the deadweight loss would have gone to consumers as surplus. In order to realize a larger share of the gains from trade, the monopolist raises price above marginal cost. However, this comes at a cost to society in the form of lost surplus, since some consumers respond to the price rise by reducing their quantity demanded.

The following Figure shows the derivation of Q_m graphically, assuming that marginal cost is constant and equal to c. The lightly shaded area is the monopoly profit of the firm since $\pi_m(Q_m)$ is the area $(P_m - c)Q_m$.

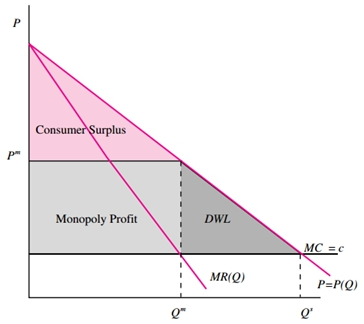

Figure 2: Profit- maximizing Monopolist

Is there market power?

Assuming that costs are proportional to output, a good approximation of the extent of market power can be obtained from data on prices, output, and profit rates. (The profit rate is given by revenues minus cost divided by costs, i.e : $r = (R - C)/C$. If costs are proportional to output, then costs are given by unit cost times output, $[UC \cdot Q]$ (Q is output), whereas revenues are given by $R = P \cdot Q$ (P is price). It follows that $r = (P - UC)/UC$, so r is a good measure of the gap between price and unit cost (which in this case is also equal to marginal cost). This finding is consistent with one of the central tenets of an important study: As long as there is free entry into each industry, the extent of market power is never significant. If a firm were to persistently set prices above cost, a new firm would find it profitable to enter the market and undercut the incumbent. Therefore, market power cannot persist, the argument goes. (The theory of **contestable markets** formalizes this argument).

Measurement and Determinants of Market Power

Observe that if we factor P_m out of the left-hand side, we can rewrite (6) as:

$$P_m\,[1 + d\,P(Qm)/d\,Q]\,Q_m\,P_m = MC(Q_m) \qquad (7)$$

The price elasticity of demand measures the responsiveness of demand to a change in price. It is the percentage change in quantity demanded from a percentage change in price, i.e.

$$\varepsilon = (-)\,\%\,Q/\%\,P = (-)\,[d\,Q/Q]/[dP/P] = (-)\,[d\,Q/d\,P] * [P/Q] \qquad (8)$$

Substituting the elasticity of demand into (6) yields

$$P_m\,[1 - 1/\varepsilon] = MC(Q_m) \qquad (9)$$

Rearranging (9) yields the Lerner index (L):

$$L = [P_m - MC(Q_m)]/P_m = [1/\varepsilon] \qquad (10)$$

which is defined as the ratio of the firm's profit margin $P_m - MC(Q_m)$ and its price. It is a measure of market power since it is increasing in the price distortion between price and marginal cost. It shows that the market power of a firm depends on the elasticity of demand ε. The more elastic demand, the larger ε and the smaller the price distortion. This arises because the greater ε, the greater the reduction in quantity demanded when price rises. The key determinant of a firm's market power therefore is the elasticity of its demand.