

I. Production and Pricing in Monopolistic Markets

A. Transition to Markets. Last week we examined how firm owners would use resources to produce goods and services for sale. In general firm owners will use technologically and economically efficient methods of production, and produce outputs that maximize their net receipts or profits. They will produce the goods that they believe will yield the greatest profits for themselves. However, in order to do this, they have to produce products that consumers are willing to pay for.

II. Pricing and Outputs in Monopolistic Markets

- A.** The simplest case of production for market occurs when a single producer produces a good or service which he/she alone brings to market for sale. This is the case of a *pure monopoly*.
- Such an individual faces two decisions of interest to economists: (1) How much to produce, and (2) How much to sell it for at market.
 - Both of these clearly depend upon the willingness of prospective customers to purchase the "firm's" output. If the product is unique in the eyes of consumers, e. g. *no perfect substitutes* exist as assumed here, then the firm owner has his own market with his own *downward sloping demand curve*.
 - Given the firm owner's cost function, $C = c(Q, w, r, R)$, and the *inverse demand* function for the market of interest one can easily characterize the monopoly firm's profit maximizing output and price.
 - The inverse demand curve characterizes the highest uniform price at which one can sell a particular quantity of output, for example: $P = p(Q, P_s, P_c, W)$.
 - (The inverse demand curve goes through the same points as the ordinary Marshallian demand curve in the $P \times Q$ plane, the function just goes in the opposite direction: from Q into P rather than from P into Q .)
 - The firm owner's profit or net income can be written as:

$$\Pi = p(Q, P_s, P_c, W) Q - c(Q, w, r, R)$$

- The first order condition characterizing the firm's profit maximizing output is obtained by differentiating Π with respect to Q and setting the result equal to zero. This implies that at the profit maximizing output, Q^* , $P_Q Q + P - C_Q = 0$. Marginal revenue (the first two terms) equals marginal cost (the last term), $MR(Q^*) = MC(Q^*)$.
- The price at which the output is sold is just $P^* = p(Q^*, P_s, P_c, W)$. (Geometrically, this is the price on the demand function just above Q^* .)
- The *comparative statics* of a monopoly firm's decision to produce and price its output can be analyzed using the implicit function theorem. The implicit function theorem allows one to represent the monopolist's output as a function of the exogenous parameters of his decision problem, in our illustration: $Q^* = q(P_s, P_c, W, w, r, R)$.
- The implicit function differentiation rule allows us to analyze how changes in circumstances affect the firm's output and pricing decision. For example an increase in the price of a substitute good, P_c , can be analyzed by taking the derivative of the monopolist's quasi-supply function with respect to P_c :

$$Q^*_{P_c} = [Q P_{QP_c}] / - \Pi_{QQ} > 0$$

- B.** One of the key questions faced by individuals who sell a unique product is how unique it really is.

- Any time that potential consumers are *not indifferent* between firm A's product and that of any other firm, firm A *has some monopoly power*. And, this general framework may be used to analyze its pricing and output decisions.
- However, in cases where the pricing decisions of other firms are directly affected by this firm's decisions with respect to output and price, more complex (and often less decisive) models are required.

III. Price Taking and Perfectly Competitive Markets.

- A.** A somewhat simpler decision confronts firm owners who bring a product to market that is already being widely sold by other firms. In this case, there will be a prevailing market price at which consumers are prepared to purchase the output. The assumed homogeneity of the products, in the eyes of consumers, means that *consumers are indifferent* about whom they purchase the product from.
- B.** Here the *firm may be regarded as a price taker* who can sell as much as he wants to at the prevailing price, P .
- C.** The firm's optimization problem is similar to that of the monopolist, except that he does not have to be concerned with the effects of his production on the prevailing market price.
- Given the same cost function used in the monopoly example, again,

$$\Pi = PQ - c(Q, w, r, p)$$
 although in this case P is exogenous.
 - The optimal output of the firm can, again, be characterized by the first order condition obtained by differentiating Π with respect to output, Q .
 - Here, $P - C_Q = 0$. Again the firm selects the output that makes marginal revenue equal to marginal cost, but this time marginal revenue is simply price. $MR = MC = P$
- D.** The implicit function theorem, again, allows the firm's output decision to be characterized as a function of the various parameters of his optimization problem. Here: $Q^* = q(P, w, r, p)$.
- This function is the firm's *supply function*. (Also see Lecture 3A.)
 - Given particular values for w, r , and p , one can plot the firm's output, Q , as a function of P which is what we call the firm's *supply curve*.
 - The firm's supply function/curve characterized is its *long run* supply if the cost function used is a *long run cost* function (e. g. calculated with all inputs being variable). It will be a *short run* supply curve/function if the cost function being used is a short run cost function (e. g. calculated with some inputs being fixed during the period of interest). [Also, see 3A lecture notes.]

IV. Market Equilibrium in the Short Run

- A.** Prices in the latter type of model (II) in which firms and consumers are price takers, are modeled as reflecting the forces of supply and demand in the market of interest.
- The *market demand function* represents the sum of the demand functions of every individual in the market of interest. It characterizes the total amounts that can be sold at a given uniform price in the market of interest. $D = \sum_i Q_i^d(P, P_c, P_s, W_i)$
 - The *market demand curve* is the (horizontal) sum of the demand curves of every consumer at (or in) the market.

- iii. The *short run market supply function* is the sum of the short run supply functions of all firms *currently* in the market. $S^{SH} = \sum Q_i^S(P, w, r, p)$.
 - iv. The short run supply curve of an industry is the horizontal sum of all the individual short run supply curves of firms currently in the market. It is (approximately) the *short run marginal cost curve for the industry* of interest
- B. Market equilibrium in the short run** occurs when the prevailing market price equates the (short run) quantity supplied and demanded in the market. At the market clearing, or equilibrium price, $\sum Q_i^d(P^*, P_c, P_s, W_i) = \sum Q_i^s(P^*, w, r, p)$.
- i. Note that at that price, P^* , every firm is maximizing its profit given its fixed factors, technology and input prices, and every consumer is maximizing his/her utility given the prevailing market prices. At Q^* , $P^* = MR = MC^{SR}$ for every firm.
 - ii. No change in behavior is warranted by either firms or consumers in short run equilibrium *except* insofar as firms can "eventually" alter some of their fixed factors to reduce their costs or increase their net returns. That is to say, incentives for long run adjustments (may) still remain at short run equilibrium.

V. Market Equilibrium in the Long Run

- A.** Generally, no distinction is made between a consumer's long run and short run demand functions, although this is not always really correct.
- i. In cases where consumers demand a product for use in household production, consumers may, like firms, have fixed factors in the short run. Such fixed factors will affect their demand for goods that consumers privately regard to be "inputs" in their own household production.
 - ii. For example, the long and short run demand for gasoline differ. In the long run, individual can change their automobile, job, and location to economize on gasoline expenditures in addition to varying the number and length of trips taken in a given automobile between given locations.
- B.** An industry's *long run supply curve* is defined and derived in **two different ways**.
- i. In cases where the number of (potential) firms is assumed to be fixed and finite, it is the sum of the long run supply functions of all firms. (This is, for the example the case of Ricardian and Debreu long run supply functions.) Here: $S^{LR} = \sum Q_i^S(P, w, r, p)$. In this case, an industry's long run supply function is approximately the same as the industry's *long run marginal cost function*. [Why?]
 - ii. In cases, where the number of firms in an industry is effectively unbounded, long run supply reflects incentives to enter and exit the market of interest. Here *long run supply* is that output which occurs (at a given price) when economic profits fall to zero eliminating further incentives to *enter or exit* the market. (This is the more widely used Marshallian conception of long run supply.)
 - a. At this production level, each firm's total revenues equals its opportunity cost, $TR = TC$.
 - b. Dividing "a" by Q provides relationships within the firm in terms of its average cost and revenue. Recall that for a price taking firm, $TR = PQ$ so $TR/Q = P$. That is to say, in equilibrium, each firm produces an output, Q^* , where $P = MC = ATC$. The Marshallian long run supply curve is the *industry's average total cost curve*.
 - c. In this case, changes in supply occur through the *entry and exit* of efficiently sized firms.

- d. Firms that produce their products at a cost that is greater than the least possible cost would earn losses at this price, and exit the market (go bankrupt). Consequently, in the Marshallian model of long run supply, *consumers are able to acquire the industry's output at the lowest possible (sustainable) price in Long Run Equilibrium*.
 - e. More over, (and somewhat troublesome) since long run supply adjustments occur by the entry and exit of efficient sized firms, *long run supply is always perfectly elastic at this minimal price*, unless the prices of inputs are affected by changes in market output. The magnitude of production may (i) allow for greater specialization, reducing costs in which case S_{LR} would be downward sloping, or (ii) the prices of scarce factors of production may be "bid up" as output expands yielding an upward sloping S_{LR} .
- C. Long run market equilibrium** occurs when the prevailing market price adjusts to set long run demand equal to long run supply in the market(s) of interest. In LR equilibrium, all consumers are consuming their utility maximizing combinations of goods, and all firms are maximizing their profits (partly by minimizing their production costs). [See figures from Nicholson and Lecture.]
- D. Changes** in economic policies, consumer tastes, information, technology, or resource endowments can *change the long run equilibrium*. Often the competitive and monopolistic models, given conventional assumptions, can provide a good deal of useful insight about the manner in which markets adjust to such changes in the short and the long runs. [See figures from Nicholson and Lecture.]

VI. Problems:

- A.** Graphically depict the long and short run effects that an increase in natural resources has on a market initially in long run equilibrium. *Label all significant details*, and discuss the adjustment processes that implicitly underpin your graphical analysis.
- B.** Repeat for a monopolistic firm. But this time use mathematics to characterize the effects of a decrease in the price of a substitute. Discuss.
- C.** Discuss the difference between long run and short run supply. Is this a reasonable distinction? Does it matter how long in "calendar time" the long run really is?