

BasicMicro. Economics: An Outline

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Part II

Chapter twelve

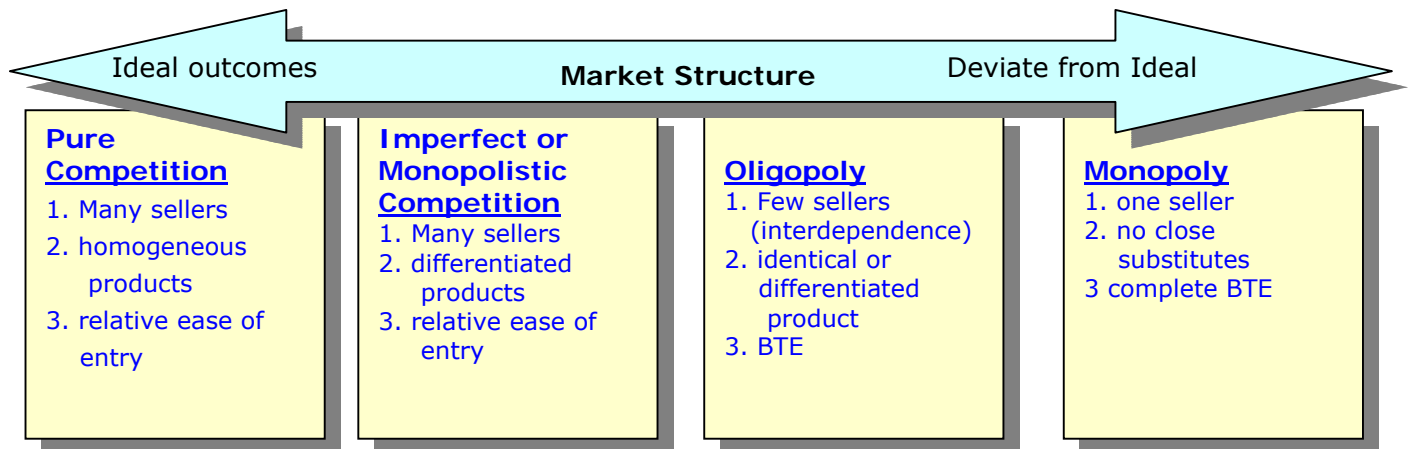
Pure Competition

Purely competitive markets are used as the benchmark to evaluate market performance. It is generally believed that market structure influences the behavior and performance of agents within the market. Structure influences conduct which, in turn affects performance.

A. Market Structure

Neoclassical microeconomics is an explanation of the behavior of individuals, firms, and organizations within a market context. Their behavior is thought to be a function of their objectives and the constraints that exist because of technology, quantity/quality of inputs and market structure. Market structures can be characterized by sellers or buyers or both. Most economics texts classify markets by seller. Generally, they identify 4 basic types of markets; (1) pure (or perfect) competition, (2) monopolistic (or imperfect) competition, (3) oligopolistic competition, and (4) monopoly. Pure competition is believed to produce ideal results in the allocation of resources. Monopoly is usually depicted as having less than optimal outcomes. The basic market structures

Figure VII.1



based on sellers is shown in Figure VII.1

Pure competition and Monopoly are at each end of the spectrum of markets. In fact, probably neither occur in market economies. Pure competition and monopoly are the boundaries and the "real world" (wherever that is) lies somewhere between the two extremes. Pure competition provides the benchmark that can be used to evaluate markets. The physician who attends you knows that 98.6° is a benchmark. Your temperature may not be precisely

98.6°, but if it deviates significantly, that deviation suggests problems. It might be in your best interests to know what the “normal” temperature is and the cause of the deviation from “normal.”

A. Characteristics of Pure Competition

The idealized purely competitive market insures that no buyer or seller has any market power or ability to influence the price. The sellers in a purely competitive market are *price takers*. The market set the price and each seller react to that price by altering the variable input and output in the short run. In the long run they can alter the scale of plant (size of the fixed input in each short run period). The conditions that ensure no seller has any market pose are:

- (1) Large number of sellers (and buyers), no one of which can influence the market.
- (2) Homogeneous output, buyers see goods as perfect substitutes.
- (2) Relatively "free" entry and exit to and from the market.

Sellers cannot charge a price above the market price because sellers see all other goods in the market as perfect substitutes. They can buy those goods at the market price.

B. The Firm in Pure Competition

A purely competitive market is characterized by a large number of relatively small firms. No single firm can influence the market price and are considered *price takers*. In Figure VII.2 graphs representing a purely competitive market and one firm are shown.

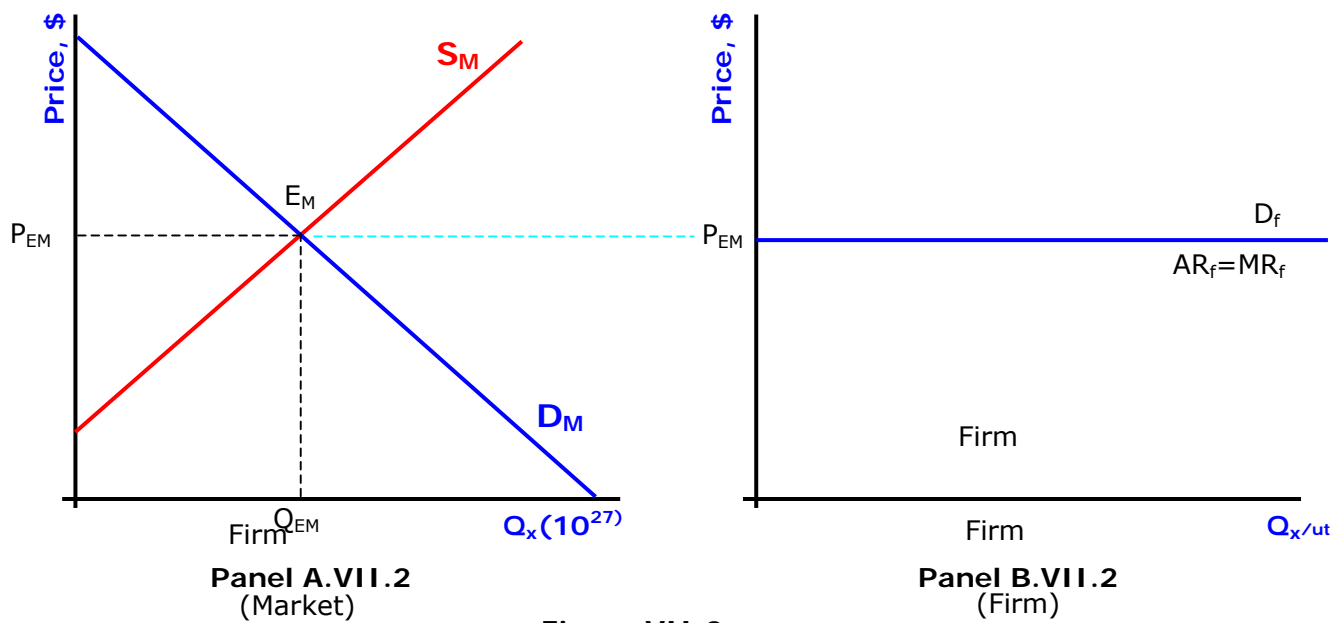


Figure VII.2

Panel A.VII.2 represents the market. D_M and S_M represent the market demand and supply functions. If the market is in equilibrium the equilibrium price and quantities are P_{EM} and Q_{EM} respectively. Notice that the quantity measured along the Q-axis in Panel A represent large quantities.

Panel B.VII.2 represents a single firm in the market. Note that the quantity measured along the Q-axis in Panel B is small relative to that in Panel A. The firm accounts for a very small portion of the goods offered for sale in the market. Since there are a large number of firms in the market with identical

or homogeneous products, buyers have no preference for any one firm's product. The demand faced by a single firm is perfectly elastic at the market price. This is represented as a horizontal line at the price of P_{EM} in Panel B. Remember that demand and AR coincide. Marginal revenue decreases at twice the rate (has twice the slope of the AR) as a linear AR function. Since the slope the AR for the purely competitive firm is 0, the MR does not decrease and lies along the demand and AR functions.

Consider an increase in the market supply shown in Figure VII.3. The market supply function increases from S_M to S_{M^*} in Panel A.VII.3. As a result, the

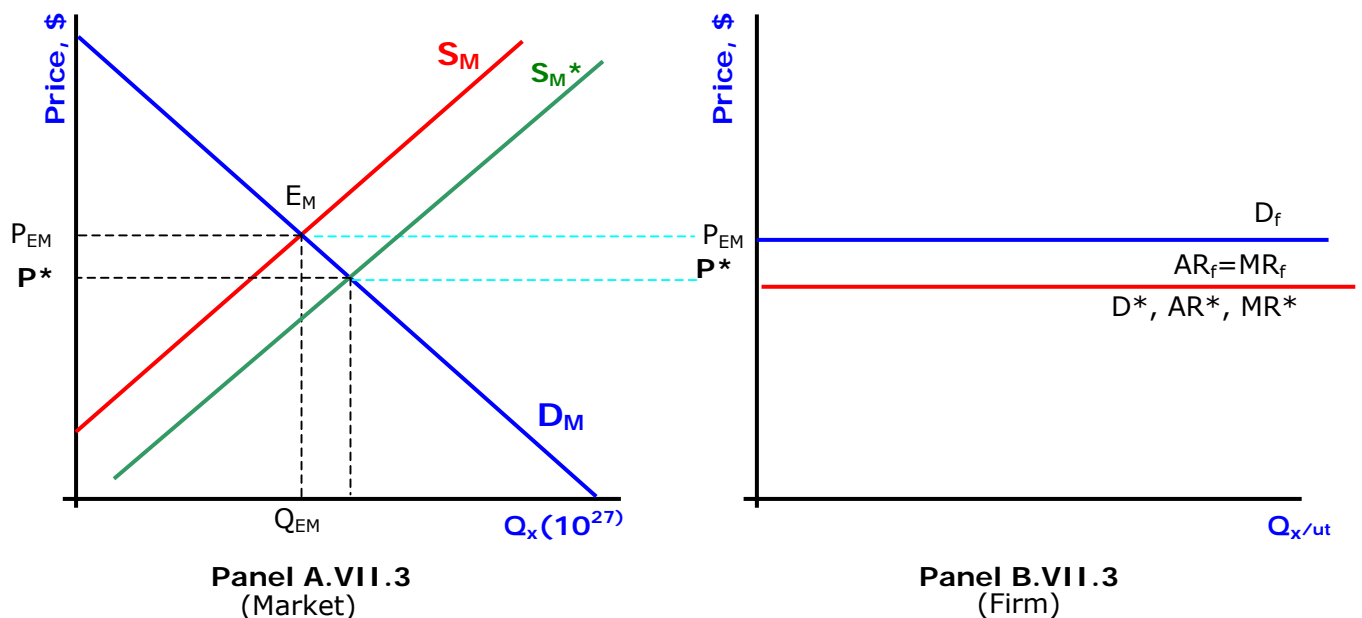


Figure VII.3

equilibrium price (in Panel A) in the market falls from P_{EM} to P^* . The equilibrium quantity will rise. Since the market price has fallen, the demand, AR and MR functions faced by the firm will fall to D^* , AR^* and MR^* . (As shown in Panel B.VII.3.) Note that a decrease in market supply will shift the firm's demand function up. An increase (decrease) in market demand would shift the firm's demand up (down).

Changes in the conditions in the market alter the price. These changes in price provide information to the firms who then react to those changes.

C Profit Maximization in the Short Run

If the firm's objective is to maximize profits (Π), they must maximize the difference between total revenue (TR) and total cost (TC). $\Pi = TR - TC$. It is possible to identify the output level that will maximize profits for the firm if the MR and MC functions are known. Where $MR = MC$, profits will be maximized (or losses minimized).

Before we consider these problems there are several points to reconsider.

- A normal profit is included as a cost of production just as wages, interest, rent and materials costs are expenses.
- The objective of the firm is to maximize profits (not revenue)
- MC is the change in TC (or VC) caused by a change in output.

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{\Delta VC}{\Delta Q}$$

- AC is the total cost per unit. It is calculated by dividing TC by Q. AC tends to fall

and then rise as output increases. When MC is less than AC, AC is decreasing. When MC is greater than AC, AC will be increasing. When MC equals AC, AC will be a minimum. $AC = \frac{TC}{Q}$

- AVC is the variable cost per unit. AVC is the variable cost per unit. It is calculated by dividing VC by Q. AVC tends to fall and then rise as output increases. When MC is less than AVC, AVC is decreasing. When MC is greater than AVC, AVC will be increasing. When MC equals AVC, AVC will be a minimum. $AVC = \frac{VC}{Q}$
- The vertical distance between AC and AVC is the AFC. $(AFC = AC - AVC)$ AFC will tend to decrease as long as output (Q) increases.
- Demand faced by a purely competitive firm is perfectly elastic (horizontal, straight line) at the market price.
- The AR is the same as the demand function.
- MR falls at twice the rate of AR. Since AR has a slope of 0 in a purely competitive market, MR and AR are the same in a purely competitive market.
- MR = price in a purely competitive market.
- A firm will offer additional units for sale so long as the price they obtain is greater than the opportunity cost (MC) of producing the units.

The behavior of the firm in the short run can be shown using total values (TR and TC) or unit values (MR, MC and AC)

Short Run Profits using TR and TC

Maximum profits will occur at the output level where there is the greatest vertical distance between TR and TC, when $TR > TC$. In Figure VII.4 the TR and TC functions for a firm are shown. The TR is a straight line (with a constant slope). TR is price times quantity. Since TR is a linear function this implies that the price for all quantities are the same, the firm is in a purely competitive market (the demand is perfectly elastic at the market price.). MR is defined as the change in TR associated with a change in Q. MR is the slope of TR, so MR is the price.

The TC intercept is at W, which is the fixed cost and shows that this is a graph depicting a short run condition. The TC function increases at a decreasing rate that implies that MC is falling and MP of the variable

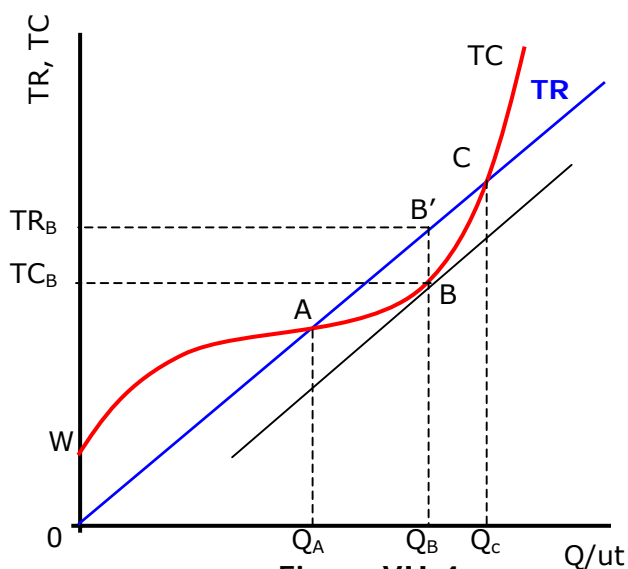


Figure VII.4

input is rising. Beyond the inflection point in the TC, TC increases at an increasing rate. The model shows "break-even" points (A and C) at output level Q_A and Q_C . At these break-even point the firm is earning a normal profit. (Remember normal profits are included in the cost functions.) Between output levels Q_A and Q_C , the $TR > TC$. This means that economic profits (Π) exist. Maximum Π occur at output level Q_B , the greatest vertical distance between TR and TC. Note that at point A (producing Q_A) the firm obtains a normal profit. If they produce and additional unit the MC (slope of TC at point A) is less than the slope of the TR (MR), i.e. they can produce additional units for less than someone is willing to pay for them. At output level Q_B , the slope of the TC (MC) is

equal to the slope of the TR (MR). If they attempt to increase output above Q_B , the cost of additional units (shown by the slope of the TC) increases faster than the increase in TR (shown by the slope of TR). Where the slope of the TC (MC) is the same as the slope of the TR (MR), profits (the vertical distance between TR and TC) are maximized.

Short Run Profits using Unit Cost and Revenue

The process of determining the output level that maximizes profits in the short run can also be made by an analysis of the unit cost and revenue functions. MC and MR determine whether to produce a given output or not. If the cost of an additional unit (MC) is less than the revenue obtained from that same additional unit (MR), producing the additional units will add to profits (or reduce losses). If the cost of additional units of output (MC) cost more than they add to revenue (MR), the firm should not produce the additional units. The rules for profit maximization are simple:

- $MR > MC$, produce it!
- $MR < MC$, don't produce it!
- When $MR = MC$, you are earning maximum profits!

The process of determining the profit maximizing level of output using unit cost and revenue functions is shown in Figure VII.5.

Figure VII.5 represents a single firm in a purely competitive market. It must be pure competition because of the perfectly elastic demand function at the price P . D , MR and AR are all horizontal functions at the price P . As output increases from 0 to Q_B , the AVC decreases. AC decreases up to output Q_B . Both AVC and AC are U-shaped functions. Remember the AP of the variable input increases while the AVC falls. The MC falls (up to output Q_A) and then rises intersecting AVC and AC at their minimum points. At outputs Q_A and Q_J the firm has break-even points, normal profits exist at output level Q_A and Q_J . The firm produces where $MR = MC$ (point H) to maximize profits at output level Q_H . Since $AR > AC$ at this level, the firm earns above normal profits.

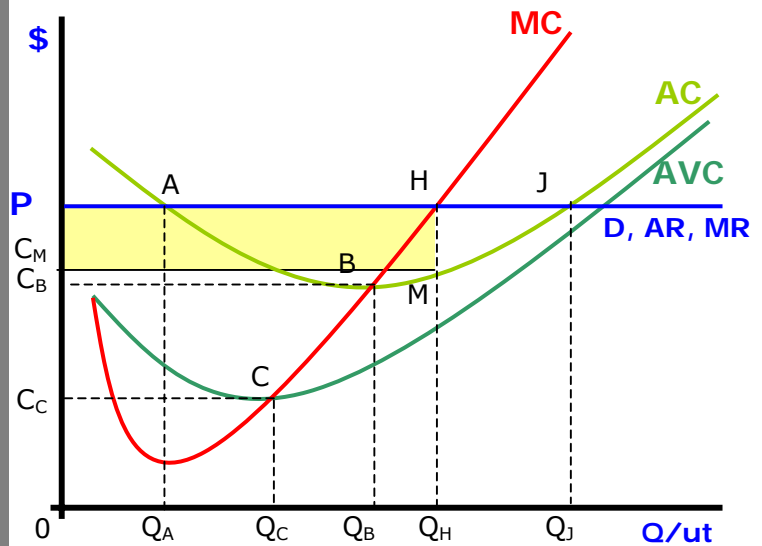


Figure VII.5

The firm will produce units so long as the market price (P , which is equal to MR when Demand is perfectly elastic.) is greater than the cost of producing the additional unit (MC). If MC is greater than the price (or MR) the firm will not produce. All possible profits are captured where $MR = MC$. This is shown as point H at output level Q_H in Figure VII.5.

At output level Q_H , where $MR = MC$, profits are a maximum and can be shown as the area $C_M M H P$ (the area in yellow). Total revenue (TR) is area $0 Q_H H P$. TR is calculated by price multiplied by quantity, in this model, $P \cdot Q_H$ is the area $0 Q_H H P$. Total cost (TC) is area $0 Q_H M C_M$ (the product of the AC and quantity, which is $C_M \cdot Q_H$). Profits are the

difference between TR and TC, area $C_M MHP$ or $(P - C_M)Q_M$.

Figure VII.5 represents a single firm in a purely competitive market. It must be pure competition because of the perfectly elastic demand function at the price P . D , MR and AR are all horizontal functions at the price P . As output increases from 0 to Q_C the AVC decreases. AC decreases up to output Q_B . Both AVC and AC are U-shaped functions. Remember the AP of the variable input increases while the AVC falls. The MC falls (up to output Q_A) and then rises intersecting AVC and AC at their minimum points. At outputs Q_A and Q_J the firm has break-even points, normal profits exist at output level Q_A and Q_J . The firm produces where $MR = MC$ (point H) to maximize profits at output level Q_H . Since $AR > AC$ at this level, the firm earns above normal profits.

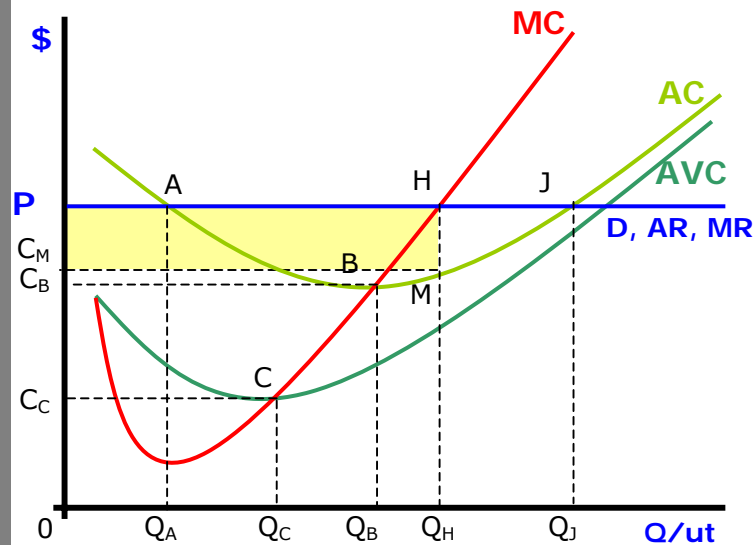


Figure VII.5

(Graph is repeated so you don't have to flip or scroll pages!)

Loss Minimization and Shutdown in the Short run

In the short run the maximum the firm must lose is its fixed cost. If the firm can recover all its variable cost it may as well operate unless it sees no hope of improvement in the future. In Figure VII.5 the firm is earning above normal profits by producing at Q_H output. If the price were to fall to C_B (which is consistent with the minimum of the AC function) the firm would earn normal profits. (Remember that normal profits are included in the cost functions as an opportunity cost for the entrepreneur.) If the price falls below C_B , the firm will lose money, i.e. will earn less than normal profits. So long as the price is above C_C , the firm is recovering all the variable cost and a little more to offset the fixed cost that it would have lost if the firm would have shutdown. At a price of C_C , the firm is recovering all its variable cost and losing its fixed cost (which it would have done anyway if it had closed down.). Therefore, so long as the firm can recover all its variable costs at a price of C_C , it may as well operate in the short run. Point C , at a price of C_C and output of Q_C is called the shutdown point. It will always be at the point where the MC intersects the AVC (the minimum of the AVC).

In the long run all costs are variable, therefore the shut down point in the long run is the minimum of the $LRAC$ where $MC = LRAC$.

There may be other reasons for operating a production facility. In some cases individuals may operate at less than normal profits because they get non-monetary benefits from being in a particular line of work or being "their own boss." A government may encourage firms that produce particular products to operate for reasons of national defense or national pride. In these cases public policy may be used to subsidize the firms that would find it necessary to shut down in a free market economy.

D. Profits in Long Run Pure Competition

In the long run, producers are able to alter their scale of plant. The LRAC or envelope curve was constructed from a series of short run periods with different plant sizes. In the long run the firm is essentially able to select the scale of plant (or a specific set short run production and cost functions associated with a specific fixed (in the short run) input). This is essentially the meaning of "relative ease of exit and entry from the market."

Another crucial aspect of long run pure competition is that the demand faced by the firm is perfectly elastic at the market price. The AR and MR functions coincide with the firm's demand function. Because the firm's demand function is perfectly elastic, they cannot raise their price above the market price. If they do, their sales will fall to 0. There is no reason to lower their price below the market price because they can sell all they want at the market price. The firms in pure competition have no "market power." Market power, in microeconomics, refers to the ability of an agent to raise the price and not have their sales fall to 0. A quick review of price elasticity suggests that market power is influenced by a firm's demand function. Purely competitive firms are price takers. These firms have no incentive to advertise. The largest producer in a purely competitive market can sell all they can produce or none at all and the market price will be unaltered.

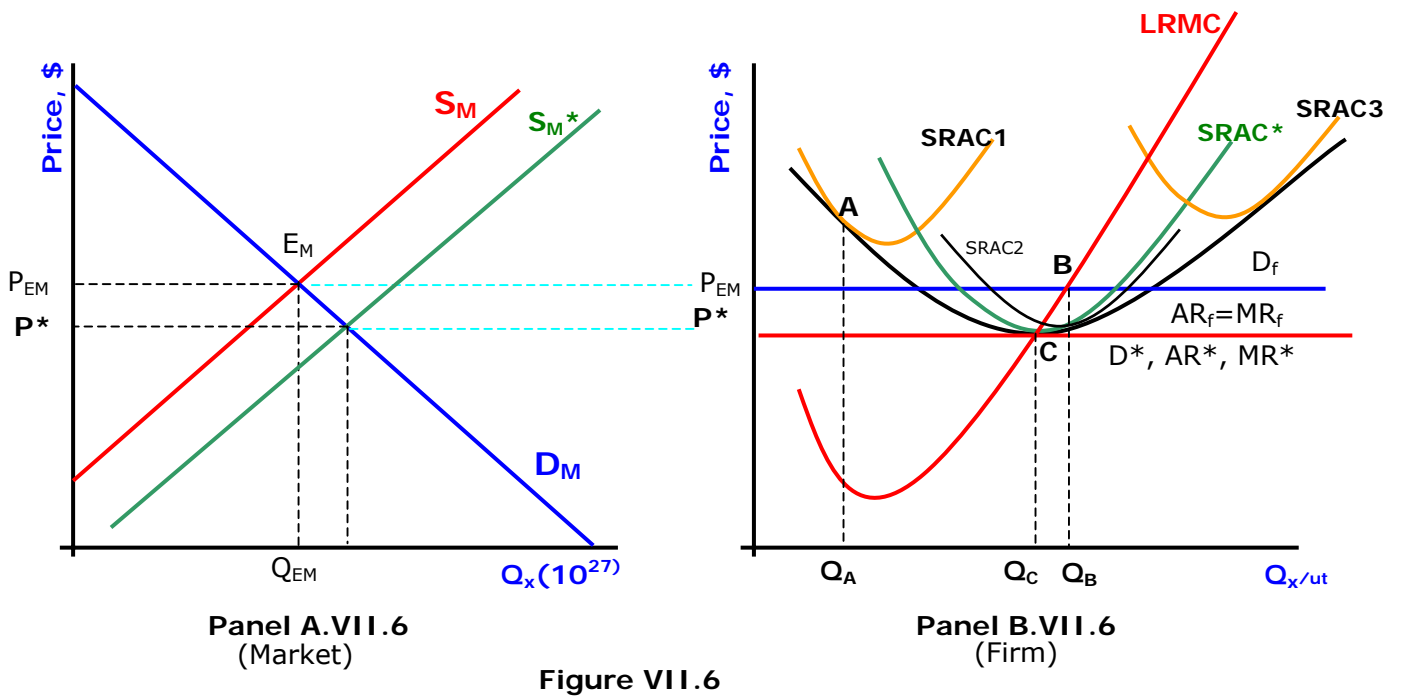


Figure VII.6

In Figure VII.6 The market demand and supply functions (in Panel A) are initially D_M and S_M . Given these demand and supply functions, the market equilibrium is at point E_M resulting in an equilibrium price (P_{EM}) and quantity (Q_{EM}). When the market price is P_{EM} , the firm reacts to that price (The firm is a price taker.). If the firm's objective is to maximize profits, it will operate at the point where $MR = MC$. This equality of MR and MC occurs at point B in panel B. Note that the short run MC will lie to the right of the $LRMC$ at this point, so short run output would be greater. The firm will select plant size $SRAC2$ since it will minimize the cost per unit at that output level (Q_B). This $SRAC2$ is not the most efficient size plant ($SRAC^*$). The AR is greater than the AC at this point. The firm can earn "economic profits" under these conditions. Remember "normal profits" are included in the cost functions.

Since entry is relatively free, other entrepreneurs will desire to capture some of these economic profits and enter the industry. The supply function will increase (shift to the right) causing the equilibrium price to fall from P_{EM} to P^* . The equilibrium quantity in the market rises but there are more firms. The firm represented in Panel B must adjust to the lower market price, P^* . The new demand and revenue functions faced by the firm is D^* , AR^* and MR^* . $MR^* = MC$ at point C. The firm reduces output to Q_C and adjusts plant size to $SRAC^*$.

The firm now is operating where:

- the plant that has allows the lowest cost per unit (most efficient size plant),
- they operate that plant at the level of output that has the lowest cost per unit,
- they earn a normal profit,
- They are maximizing their profits given circumstances (They have no incentive to change output or plant size, they are in equilibrium.),
- The price is equal to the MC (This is the condition to optimize the welfare of the individuals in society given the income distribution.)

The process of long run equilibrium in pure competition can be shown in Figure VII.6. You may remember part of Figure VII.6 as Figure VII.3. Both the market and an individual firm's demand and cost (supply) functions are shown.

In Figure VII.6, it is apparent that a market price below P^* would result in the firm's AC exceeding the AR at all levels. If this were the case firms would earn less than normal profits and would have an incentive to leave the market. As firms leave the market, the market supply decreases (shifts to the left) and the market price would rise.

There are two important features in pure competition. First each firm is a price taker and has no market power. The demand function faced by the firm is perfectly elastic at the equilibrium price established in the market. This is because the output of the purely competitive firms is homogeneous and there are a large number of sellers, none of whom can influence the market price. Secondly, entry and exit from the market is relatively free. Above normal profits attract new producer/seller that increases the market supply driving the market price down. If profits are below normal, firms exit the market. This reduces the market supply and drives the price up.

Long run equilibrium in a purely competitive market is established when the D (AR and MR) is just tangent to the long run average cost function (LRAC). This will be at the minimum of the LRAC where its slope is 0 (the demand function faced by the firm has a slope of 0). Firms earn normal profits at this point and there is no incentive to enter or leave the market. There is no incentive to alter plant size or change the output level.

At the point of long run equilibrium in Figure VII.6 at point C, the following conditions will exist:

- **AR = AC**; Firms earn a normal profit. There is no incentive for firms to enter or leave the market.
- **LRMC = LRAC**; the firm is operating with the plant size that results in the lowest cost per unit, i.e. the fewest resources per unit of output are used.
- **MR = LRMC**; the firm has no incentive to alter output or plant size.
- **P = MR = MC**; the price reflects the marginal value of the good to the buyers and the marginal cost to the producer/seller.

Long run equilibrium in pure competition results in an optimal allocation of resources. The price reflects the marginal benefits of the buyers and the marginal cost of production. The user of the last unit of the good places a value (the price they are willing and able to pay) on the good equal to the cost of producing that unit of the good. Units of the good between 0 and the equilibrium quantity have a greater value than the cost of production.

The purely competitive model provides a benchmark or criteria to evaluate the performance of a market; **MB = P = MC**. The marginal benefit (MB) to the buyer is suggested by the price they are willing and able to pay. The MB to the seller is the marginal revenue (MR) they earn. The marginal cost (MC) reflects the opportunity cost to society.