

MONOPOLY

In a perfectly competitive market, the large number of sellers and buyers of a good ensures that no single seller or buyer can affect its price. The market forces of supply and demand determine price. Individual firms take the market price as a given in deciding how much to produce and sell, and consumers take it as a given in deciding how much to buy.

Monopoly is rare and an extreme opposite of perfectly competitive market structure. In a monopoly, there exists only a single seller who sells the products to a large number of buyers. For this he/she may charge a uniform price or may indulge into price discrimination. The main advantage to a monopolist is that it has no competitors or rivals in the market and hence, it earns profits even in the long run.

Characteristics of monopoly:

- (1) Single seller of a product-
- (2) Barriers to entry and exit
- (3) NO close substitute of the product is available in the market-
- (4) Imperfect knowledge about the product and market between buyers and seller
- (5) Price discrimination
- (6) NO supply curve of a monopolist firm

However the main source of the emergence of monopoly is barriers to entry like legal restrictions, patent rights, sole control over the scarce resources, efficiency etc.

First we discuss the behaviour of a monopolist. Because a monopolist is the sole producer of a product, the demand curve that it faces is the market demand curve. This market demand relates the price that the monopolist receives to the quantity it offers for sale. We will see how a monopolist can take advantage of its control over price and how the profit maximising price and quantity differ from what would prevail in a competitive market.

To determine maximum profit, the monopolist must first consider its cost and the characteristics of market demand. Knowledge of demand and cost is crucial for a firm's economic decision making. Given this knowledge, the monopolist must then decide how much to produce and sell. The price per unit that the monopolist receives then follows directly from the market demand curve. Equivalently, the monopolist can determine price, and the quantity

it will sell at what price following from the market demand curve.

Average Revenue and Market Revenue

The monopolist's average revenue — the price receives per unit sold — is precisely the market demand curve. To choose its profit maximising output level, the monopolist also needs to know its marginal revenue: the change in revenue that results from a unit change in output. To see the relationship among total, average and marginal revenue, consider a firm facing the following demand curve.

$$P = 6 - Q$$

| <u>P</u> | <u>Q</u> | <u>R</u> | <u>MR</u> | <u>AR</u> |
|----------|----------|----------|-----------|-----------|
| 6 | 0 | 0 | — | — |
| 5 | 1 | 5 | 5 | 5 |
| 4 | 2 | 8 | 3 | 4 |
| 3 | 3 | 9 | 1 | 3 |
| 2 | 4 | 8 | -1 | 2 |
| 1 | 5 | 5 | -3 | 1 |

AR > MR

$$P = 6 - Q = AR$$

$$R = PQ = 6Q - Q^2$$

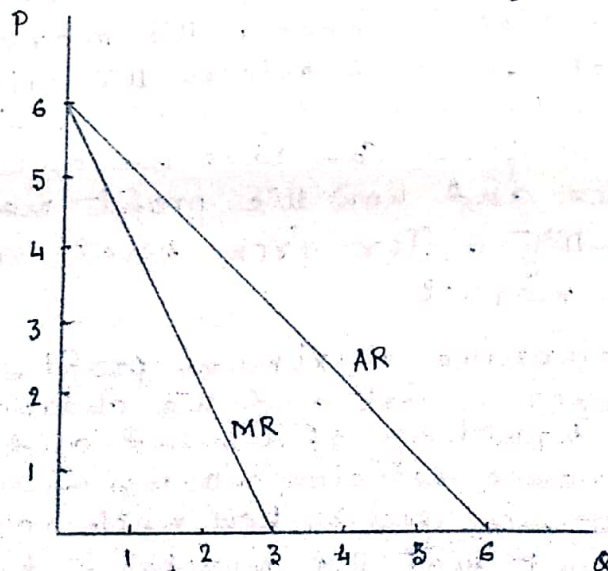
$$MR = \frac{dR}{dQ} = 6 - 2Q$$

$$AR + Q = 6$$

$$\Rightarrow \frac{AR}{6} + \frac{Q}{6} = 1$$

$$MR + 2Q = 6$$

$$\Rightarrow \frac{MR}{6} + \frac{Q}{3} = 1$$



We assume that at Q^* , profit will be maximised.

Profit π is the difference between revenue and cost, both of which depend on Q .

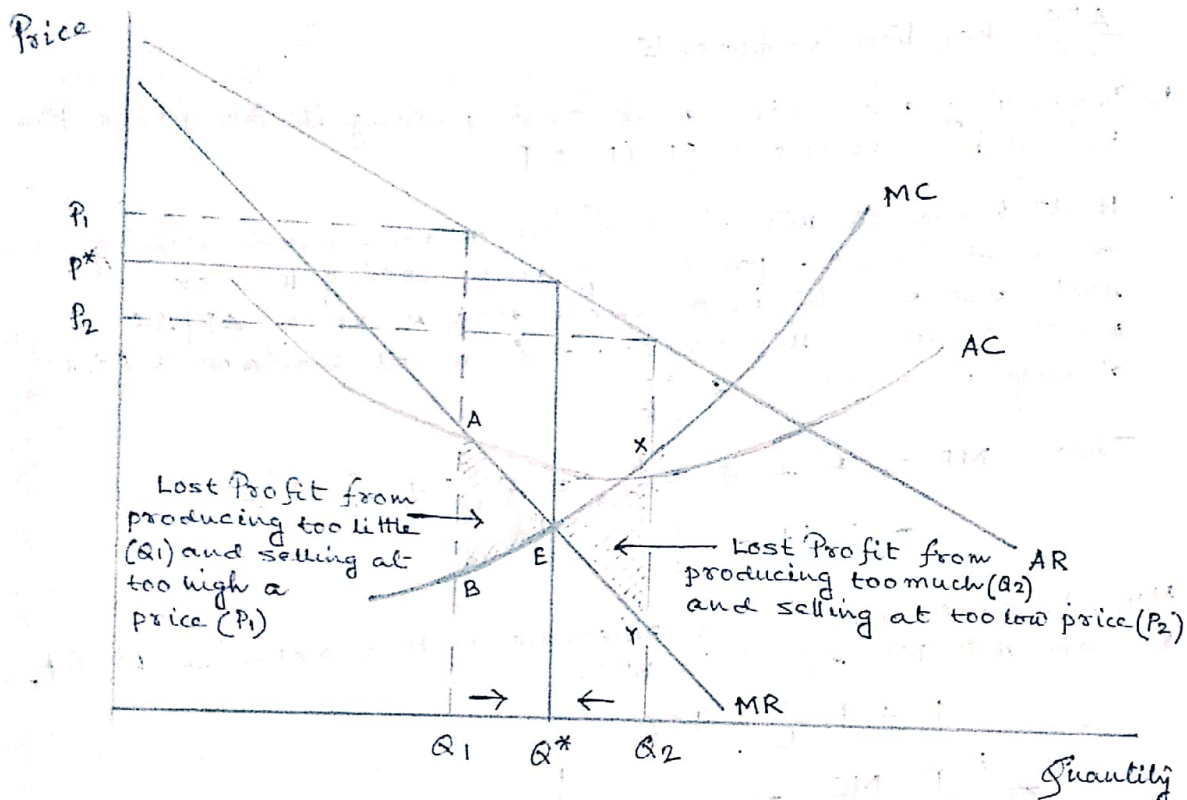
$$\pi(Q) = R(Q) - C(Q)$$

As Q is increased from zero, profit will increase until it reaches a maximum and then begin to decrease.

Thus the profit maximising Q is such that the incremental profit, resulting from a small increase in Q is just zero (i.e. $\Delta\pi/\Delta Q = 0$). Then

$$\Delta\pi/\Delta Q = \Delta R/\Delta Q - \Delta C/\Delta Q = 0$$

$$\Rightarrow MR - MC = 0 \Rightarrow MR = MC$$



At $Q_1 \Rightarrow MR > MC \Rightarrow$ extra profit

To increase π , monopolist keep increasing output until Q^* , at which point the incremental profit earned from producing one more unit is zero.

At $Q_2 \Rightarrow MR < MC \Rightarrow$ Loss

To increase π , monopolist produced little less than Q_2 , and keep reducing output until Q^* .

At Q_1 instead of $Q^* \Rightarrow$ total profit lost indicated by shaded area between MR and MC. (AEB)

At Q^* instead of $Q_2 \Rightarrow$ total profit lost indicated by the shaded region MR and MC. (XEY).

A Rule of Thumb for Pricing

We know that price and output should be chosen so that MR equals MC, but how can the manager of a firm find the correct price and output level in practice? Most managers have only limited knowledge of the AR and MR curves that their firm face. Similarly, they might know the firm's marginal cost only over a limited output range. We therefore want to translate the condition that MR should equal MC into a rule of thumb that can be more easily applied in practice.

$$MR = \frac{\Delta R}{\Delta Q} = \frac{\Delta PQ}{\Delta Q}$$

$\frac{\Delta PQ}{\Delta Q}$ has two components

1. Producing one extra unit and selling it at price P brings in revenue = $(1) \cdot (P) = P$
2. But because the firm faces a downward sloping demand curve, producing and selling this extra unit also results in a small drop in price $\Delta P / \Delta Q$ which reduces the revenue from all units sold (i.e. change in revenue $\propto \frac{\Delta P}{\Delta Q}$)

$$\begin{aligned} \text{Thus, } MR &= P + Q \cdot \frac{\Delta P}{\Delta Q} = P \left(1 + \frac{Q}{P} \cdot \frac{\Delta P}{\Delta Q} \right) \\ &= P \left(1 + \frac{1}{E_d} \right) \end{aligned}$$

Now, because the firm's objective is to maximise profit, we can set MR equal to MC.

$$P + P \cdot \frac{1}{E_d} = MC$$
$$\Rightarrow \boxed{\frac{P - MC}{P} = - \frac{1}{E_d}}$$

This relationship provides a rule of thumb for pricing. The left hand side, $\frac{P - MC}{P}$, is the markup over MC as a percentage of price. The relationship says that this markup should equal minus the inverse of the elasticity of demand. (This figure will be positive number because E_d negative).

A monopolist charges a price that exceeds marginal cost, but by an amount that depends inversely on the elasticity of demand.

If E_d is extremely large or large negative value

$\Rightarrow P$ will be very close to MC

\Rightarrow monopoly will look like competitive one.

* Monopolist will never produce a quantity of output that is on the inelastic portion of the demand curve, i.e. $E_d < 1$

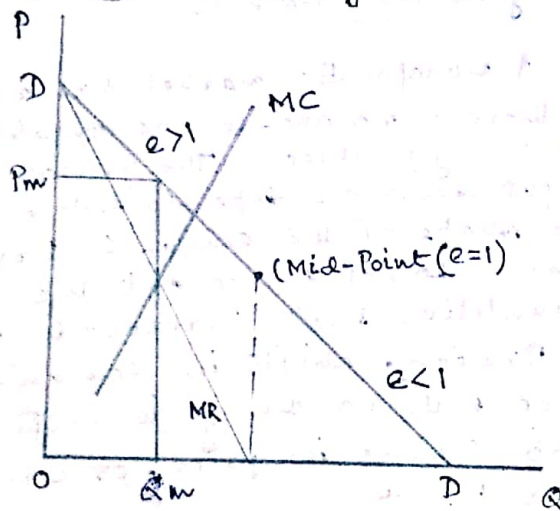
Suppose $E_d = 0.5 \Rightarrow 10\%$ reduction in output and 20% increase in price.

If $MC > 0$, then profit would be even more than 10% because the lower output would reduce firm's cost.

As the monopolist reduces output and raises price, it will move up the demand curve to a point where elasticity of demand is greater than one.

If $MC = 0$, maximised profit is equivalent to maximised revenue, and revenue is maximised when $E_d = -1$.

Marginal Revenue and Elasticity



$$MR = P\left(1 - \frac{1}{e}\right)$$

(1) If $MR = MC$, $P\left(1 - \frac{1}{e}\right) = MC$

$$\therefore P - \frac{P}{e} = MC \Rightarrow (P - MC) = \frac{P}{e} > 0$$

$$\therefore P > MC$$

Therefore the monopolist sets price above marginal cost.

(2) We assume $MC > 0$ at the monopolist's profit maximising output. So

$$\left(1 - \frac{1}{e}\right) > 0$$

$$\therefore e > 1$$

The monopoly will always maximise profit on the elastic portion of the demand curve.

$$\frac{(p - MC)}{p} = \frac{1}{e}$$

$\frac{1}{e}$ is the profit maximising markup over price for the monopoly. The markup of price over marginal cost divided by price is called the Lerner Index of monopoly power. This is the measure of the monopolist's ability to set price above marginal cost.

If e higher \Rightarrow smaller is the markup

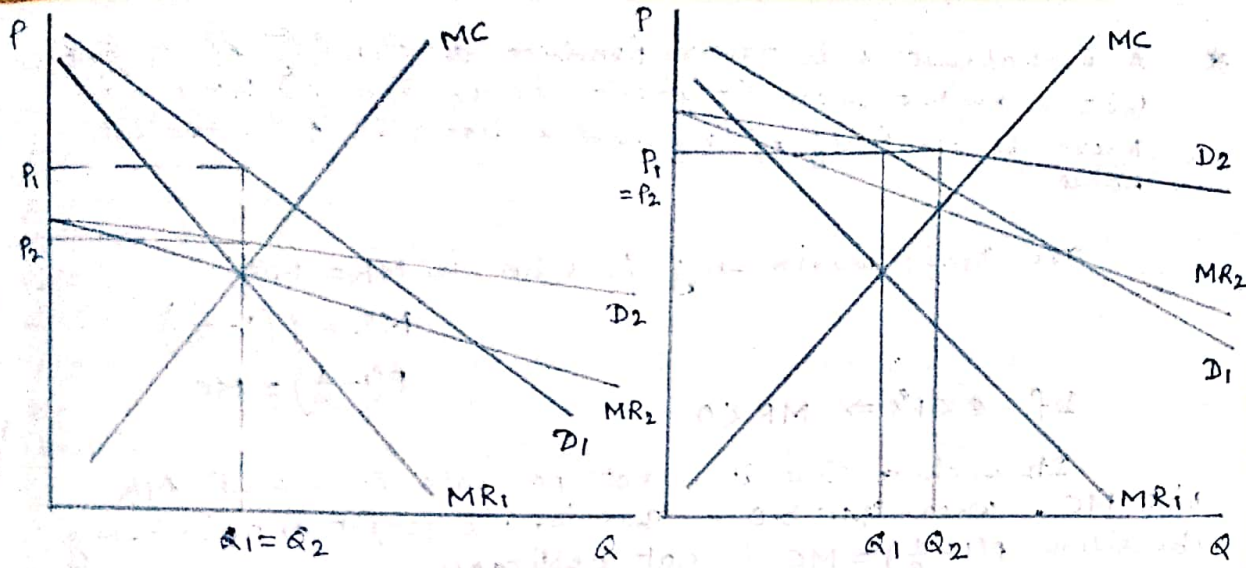
* The shut down Condition

The monopolist will shut down production if the demand curve everywhere lies below the short run average cost curve (SAC). Then price will be always below average cost and the monopolist will sustain losses on account of variable cost in addition to the fixed cost if she continues to produce. So she will stop producing.

* Monopoly Supply in the short run

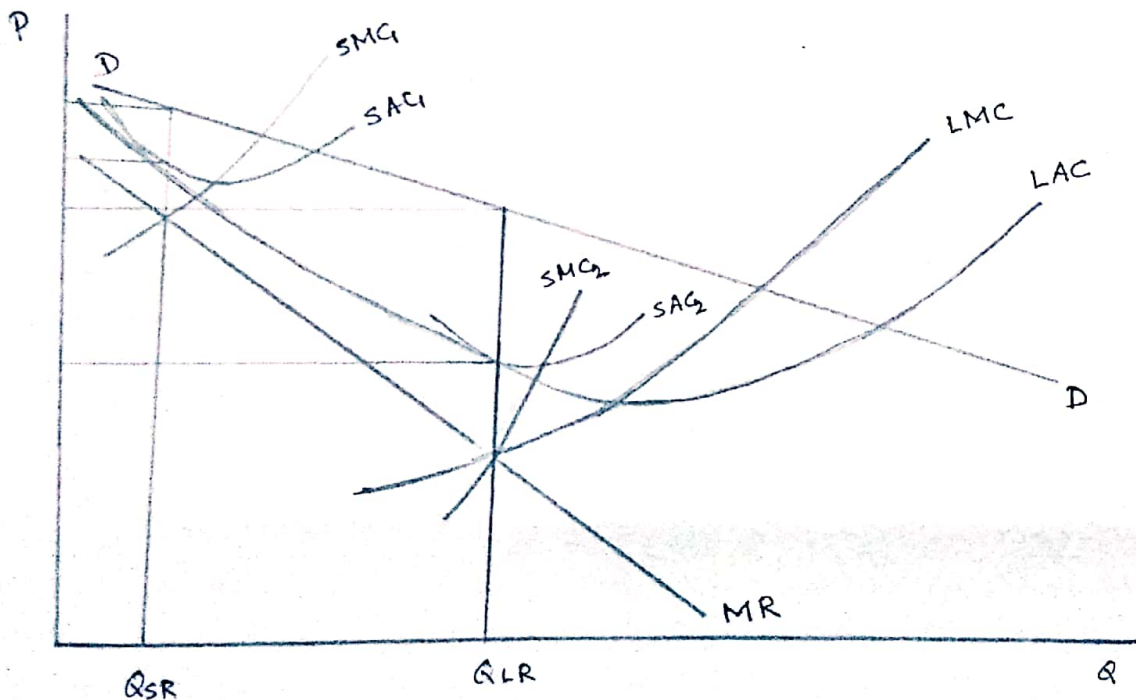
A monopolistic market has no supply curve. In other words, there is no one-to-one relationship between price and the quantity produced. The reason is that the monopolist's output decision depends not only on marginal cost but also on the shape of the demand curve. As a result, shifts in demand do not trace out the series of prices and quantities that corresponds to a competitive supply curve. Instead, shifts in demand can lead to changes in price with no change in output, changes in output with no change in price, or change in both price and output.

Monopoly supply depends on the shape and location of the demand curve and does not have the clear and exact meaning that competitive supply has. It is meaningless to ask in general what price a monopolist will charge for a given output since the answer is not unique.



Long-run Equilibrium in a single plant Monopoly

Longrun equilibrium adjustment in a single plant monopoly must take one of two possible cases. First, if the monopolist incurs loss a short-run loss and if there is no plant size that will result in pure profit (or at least no loss), the monopolist goes out of business. Second, if the firm earns a short run profit with its original plant, it must determine whether a plant of different size (and thus a different price and output) will earn a larger profit.



A monopolist maximises profit in the long run by producing and marketing that rate of output for which longrun marginal cost equals marginal revenue. The optimal plant is the one whose short run average total cost curve is tangent to the longrun average cost curve at the point corresponding to longrun equilibrium output. At this point short run marginal cost equals marginal revenue.

* A monopolist will never produce a quantity of output that is on the inelastic portion of the demand curve - i.e. where the elasticity of demand is less than 1 in absolute value.

The Profit maximising Condition is $MR = MC$

$$MR = P\left(1 - \frac{1}{\epsilon}\right)$$

If $\epsilon < 1 \Rightarrow MR < 0$

$$P\left(1 - \frac{1}{\epsilon}\right) = MC$$

In such a case it is not possible to equate MR with MC, where $MC > 0$. That is, the profit maximising condition $P\left(1 - \frac{1}{\epsilon}\right) = MC$ is not applicable.

If demand is inelastic, then a reduction of output increases the revenue and decreases the cost hence profit increase. As the monopolist reduces output and raises price, it will move up the demand curve to a point where the elasticity is greater than 1 in absolute value and the markup rule of equation i.e. $P\left(1 - \frac{1}{\epsilon}\right) = MC$ will be satisfied.

Sources of Monopoly Power

Monopoly power is the ability to set price above marginal cost and that the amount by which price exceeds marginal cost depends inversely on the elasticity of demand facing the firm.

$$L = \frac{P - MC}{P} = -\frac{1}{E_d}$$

This equation shows, the less elastic is demand curve, the more monopoly power a firm has. The ultimate determinant of monopoly power is therefore the firm's elasticity of demand.

Three factors determine a firm's elasticity of demand.

1. The elasticity of market demand. Because the firm's own demand will be at least as elastic as market demand, the elasticity of market demand limits the potential for monopoly power.
2. The number of firms in the market; If there are many firms, it is unlikely that any one firm will be able to affect price significantly.
3. The interaction among firms.

1. The elasticity of market demand

$$L = \frac{P - MC}{P} = -\frac{1}{E_d}$$

When $|E_d| > 1 \Rightarrow$ demand is elastic \Rightarrow firm has less monopoly power

When $|E_d| < 1 \Rightarrow$ demand is inelastic \Rightarrow firm has more monopoly power.

2. The number of firms in the market

The second determinant of a firm's demand curve and thus of its monopoly power — is the number of firms in its market. Other things being equal, the monopoly power of each firm will fall as the number of firms increases. As more and more firms compete, each firm will find harder to raise prices and avoid losing sales to other firms.

When only a few firms account for most of the sales in a market, we say that market is highly concentrated.

An important aspect of competitive strategy is finding ways to create barriers to entry - conditions that deter entry by new competitors. Barriers to entry include

- (a) Patent
- (b) Copyright
- (c) Government license
- (d) economies of scale.

3. The interaction among firms.

The way in which competing firms interact is also an important - and sometimes the most important - determinant of monopoly power. Suppose there are four firms in a market. They might compete aggressively, undercutting one another's prices to capture more market share. This could drive prices down to nearly competitive levels. Each firm will fear that if it raises its price it will be undercut and lose market share. As a result, it will have little monopoly power.

On the other hand, the firms might not compete much. They might even collude, agreeing to limit output and raise prices. Because raising prices in concert rather than individually is more likely to be profitable, collusion can generate substantial monopoly power.

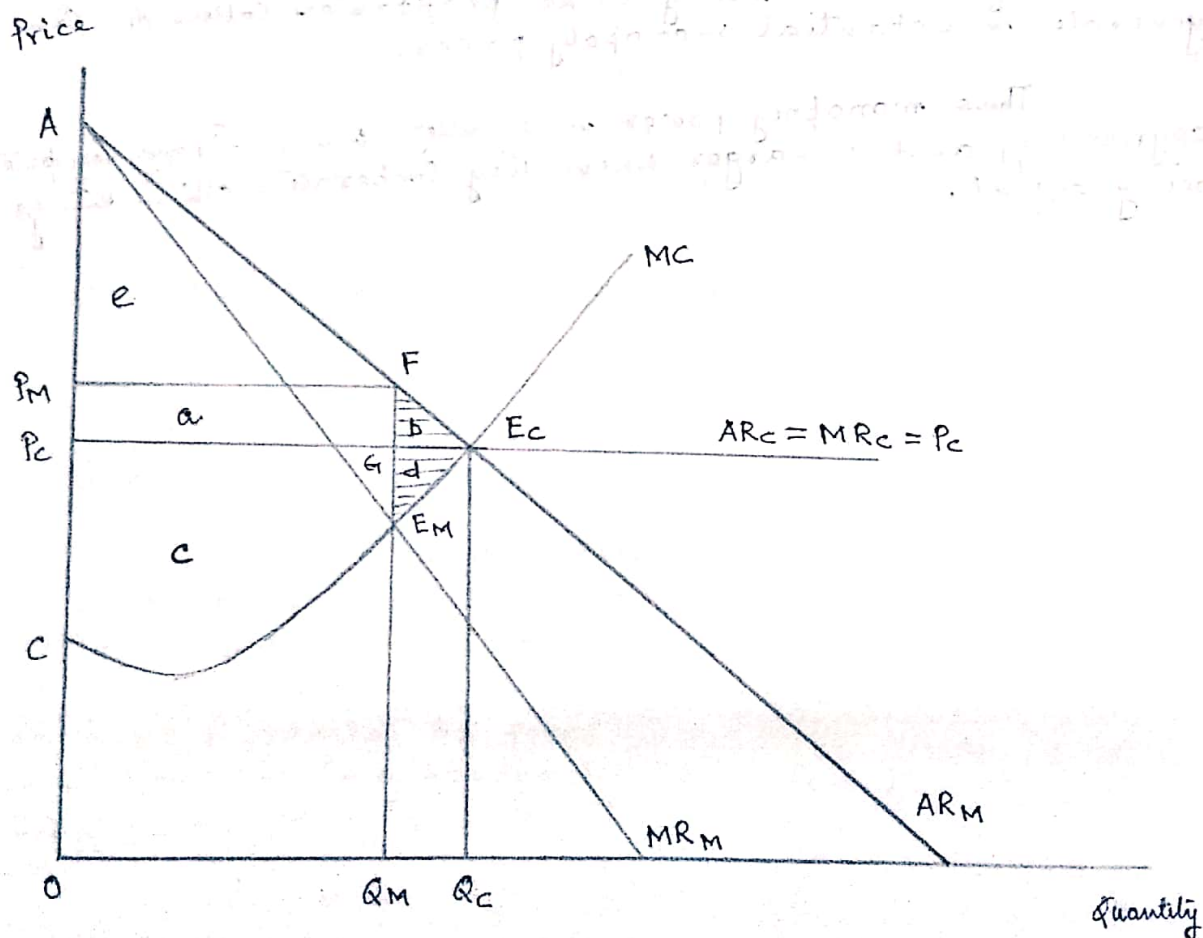
Thus monopoly power is smaller when firms compete aggressively and is larger when they cooperate, other things being equal.

SOCIAL COST OF MONOPOLY POWER

In a Competitive market, $P = MC$. Monopoly power, on the other hand, implies that $P > MC$. Because monopoly power results in higher prices and lower quantities produced, we would expect it to make consumers worse off and the firm better off. But suppose we value the welfare of consumers the same as that of producers. In the aggregate, does monopoly power make consumers and producers better or worse off.

We can answer this question by comparing the consumer and producer surplus that results when a competitive industry produces a good with the surplus that results when a monopolist supplies the entire market.

The social responsibility of a firm implies that the firm must provide quality product at a reasonable price to the consumers. It is evident that consumers can not be as happy with a monopoly as with a competitive firm because the monopoly provides less at a higher price than what a competitive firm does. In other words, social welfare is lower under monopoly than that under a competitive firm. Following figure demonstrates how a monopoly leads to loss of social welfare.



Let the firm be a competitive one initially, price must equal marginal cost, so the competitive price and quantity, P_c and Q_c are found at the intersection of the average revenue (demand) curve and the marginal cost curve. Now suppose the firm transforms into a monopoly. Its AR and MR change respectively to AR_M and MR_M , both sloping downwards. As a monopoly, it fixes its equilibrium position at E_M where it produces quantity Q_M to sell it at a price P_M . Evidently, it supplies less [$Q_M < Q_c$] at a higher price [$P_M > P_c$] as a monopoly than as a competitive firm.

Under competitive market $CS = AP_c E_c$
 $PS = CE_M E_c P_c$

Under monopoly $CS = AP_M F$
 $PS = CE_M F P_M$

Consumer lost a surplus worth the area of the trapezium = $P_c P_e E_c F$

But $P_M P_e G F$ is acquired by the firm in the form of gain in producer's surplus as a monopoly, and rest

$FG E_c$ accrues to none and hence is a loss of social welfare.

Transformation involves a gain of $P_M P_e G F$ and a loss of $FG E_c$. This loss accrues to none and hence is a loss of social welfare.

The total loss of social welfare is the sum of the two, i.e. $FG E_c + P_c P_e G F = FE_M E_c$

The loss of social welfare, the dead weight loss, is a consequence of the firm's transformation into monopoly.

The social cost associated with monopoly makes it economically less efficient than a competitive firm. Causes responsible for the social cost include sub-optimal operations of monopoly and its policy of setting a price above its MC.