Monopoly

In chapter 9 we described an idealized market system in which all firms are perfectly competitive. In chapter 11 we turn to one of the blemishes of the market system --the possibility that some industries are monopolized and the consequences of such a flaw in the market system.

We begin by defining monopoly and investigating some of the reasons for its existence. Then we will consider the monopolist's choice of an optimal price-quantity combination using the tools we developed in chapter 9. We can analyze how much a monopolist will produce, but the monopolist doesn't have a "supply curve" in the usual sense. We will see that monopolized markets do not allocate society's scarce resources efficiently opening up the possibility that the government can improve the workings of the market by constraining the actions of monopolists.

Monopoly Defined

There are very stringent requirements for pure monopoly:
(1) There is only one firm in the industry.
(2) There are no close substitutes for the good the firm produces.
(3) There is some reason why the entry and survival of a competing firm is unlikely.

Thus, even the sole provider of natural gas in a city is not considered a pure monopoly, since other firms provide substitutes like heating oil and electricity.

Pure monopolies are rare in the real world. For example, the local telephone company or post office in a small town. But most firms face competition from firms producing substitute products. If there is only one railroad, it still competes with bus lines, trucking companies, and airlines. Or the producer of a brand of soda may be the only supplier of that particular soda but it competes with other soda makers.

We will also learn that monopoly markets have a number of undesirable features so the government may step in to prevent monopolization or to limit the discretion of the monopolist to set the price of the good it produces.

If pure monopoly is fairly rare, then why do we bother to study it? Because like perfect competition, pure monopoly is a market form that is easier to analyze than the more common market structures of oligopoly (i.e., a fewer large producers) or monopolistic competition (i.e., many small firms producing slightly differentiated products). In addition, the "evils of monopoly" stand out more clearly when we consider monopoly in its purest form. This clarity will allow us to understand why governments rarely allow unfettered monopolies to exist.

Causes of Monopoly: Barriers to Entry and Cost Advantages

Preservation of a monopoly requires keeping potential rivals out of the market. There is some specific impediment to the establishment of new firms in the industry --such impediments are called "barriers to entry." Some examples are:

(1) <u>Legal restrictions</u>: The U.S. Postal Service has a monopoly because the U.S. Congress has given it one. It is unlawful for private companies to manufacture stamps. Monopolies are established if the government prevents other firms from entering the industry. For example, licensing one cable TV supplier or the right to operate a food stand in a public stadium.

(2) <u>Patents</u>: To encourage inventiveness, the government gives the exclusive production rights for a period of time (usually 17 years) to the inventors of certain products. As long as the patent remains in effect, the firm has a protected monopoly. For example, for many years Xerox had a monopoly in plain paper copying. Pharmaceutical companies get monopolies on the drugs they develop.

(3) <u>Control of a scarce resource or input</u>: If a good is produced only by using a rare input, a company that gains control of the source of that input can establish a monopoly position for itself. For example, the DeBeers diamond syndicate controls the supply of the highest quality diamonds in the world.

(4) <u>Deliberately erected entry barriers</u>: An incumbent firm can make it difficult for potential rivals to enter the market. For example, spending huge amounts on advertising forces any potential entrant to match that expenditure in order to obtain customers. Have you noticed the increasing use of ads by Intel?

(5) <u>Large sunk costs</u>: Entry into an industry is risky if it requires a large investment and if that investment is sunk --meaning that it cannot be recouped for a long time. The need for large sunk costs deters entry into an industry. This is considered to be the most important type of "naturally imposed" barrier to entry. For example, Boeing was the only supplier of top-end airplanes for many years after the introduction of the 747. But Airbus, with government subsidies can afford the high investment costs and is able to compete with Boeing in the production of wide-body jet airplanes.

Barriers to entry keep potential rivals out of the market, but so do the cost advantages shown below.
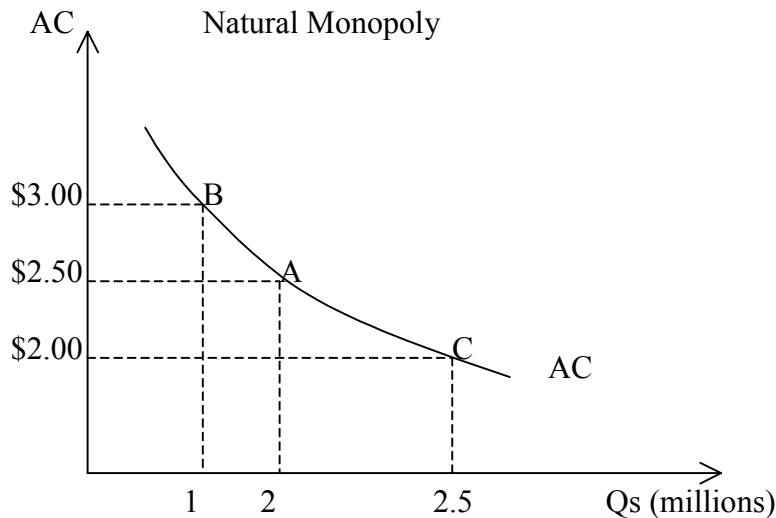
(6) <u>Technical Superiority</u>: A firm whose technological expertise vastly exceeds that of any potential competitor can, for a period of time, maintain a monopoly. For example, for many years IBM had little competition in the computer business because of its superior technology.

(7) <u>Economies of scale</u>: If the size of a firm gives a cost advantage over a smaller rival, it may be impossible for anyone to compete with the largest firm in the industry.

<u>Natural monopoly</u>

Natural monopoly is an industry in which the advantages of large scale production makes it possible for a single firm to supply the entire market output at a lower average cost than a larger number of firms producing smaller quantities.

Once a firm is big enough, its natural cost advantage will drive the competition out of business. However, the firm need not be large. It just needs to be large relative to the size of the market demand for the good. For example, a small bank in a rural town.

AC   Natural Monopoly

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AC
 ↑
 |
 |
 |
$3.00|- - - - - - B
 |          |\
 |          | \
$2.50|- - - - -|- A
 |          |  |\
 |          |  | \
$2.00|- - - - -|- |- - - C
 |          |  |      |  \___  AC
 |          |  |      |
 |          |  |      |
 |_____|__|_____|_____→
            1  2      2.5    Qs (millions)
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Consider a widget company with falling AC. Suppose any firm producing widgets would have this AC curve. Assume there are initially 2 firms in this industry. The larger firm produces 2 million widgets at an AC of $2.50 and the smaller firm produces 1 million widgets at an AC of $3.00. So the smaller firm can match the price of the larger firm only by operating at a loss. Clearly, the larger firm can drive the smaller firm out of business by offering to sell its output below the price of $3.00 but above the price of $2.50 and still earn a profit. Hence, the monopoly arises "naturally" even in the absence of barriers to entry.

Once the monopoly is established and producing 2.5 million widgets, the economies of scale act as a deterrent to entry because no entrant can hope to match the AC of $2.00 of the existing firm. If the firm uses its low cost to keep prices low, this is beneficial to society. However, once the rivals have left the industry, the monopolist may chose to raise its price.

Many public utilities (e.g., DWP or PG&E) operate as regulated monopolies for this reason. The technology of producing their output enables them to achieve large cost reductions by producing in large quantities. So it is preferable to allow these firms to achieve lower costs by having the entire market to themselves and have regulatory supervision versus breaking them up into a number of competing firms.

The Monopolist's Supply Decision

We now consider the actions taken by monopoly in the absence of government intervention. First, it is important to understand that a monopoly does not have a supply curve. Unlike a

perfectly competitive firm, a monopoly does not take the market price as given and then react to the price. Instead, it has the power to set price or select the price-quantity pair on the demand curve that maximizes its profits.

The demand curve that a monopoly faces (unlike that of a perfectly competitive firm) is downward sloping, not horizontal. So an increase in price will not cause the monopoly to lose all of its customers. But, an increase in price does reduce the quantity demanded.

Monopolists chose a price-quantity pair on the demand curve to maximize profit. This does not mean that the monopolist earns positive profits. If it is inefficient and has high costs or demand is low, it may incur losses and eventually shutdown. However, if the monopoly does have economic profits, it can maintain these profits in the long run. Profits are not competed away by the entry of new firms as in the perfectly competitive industry.
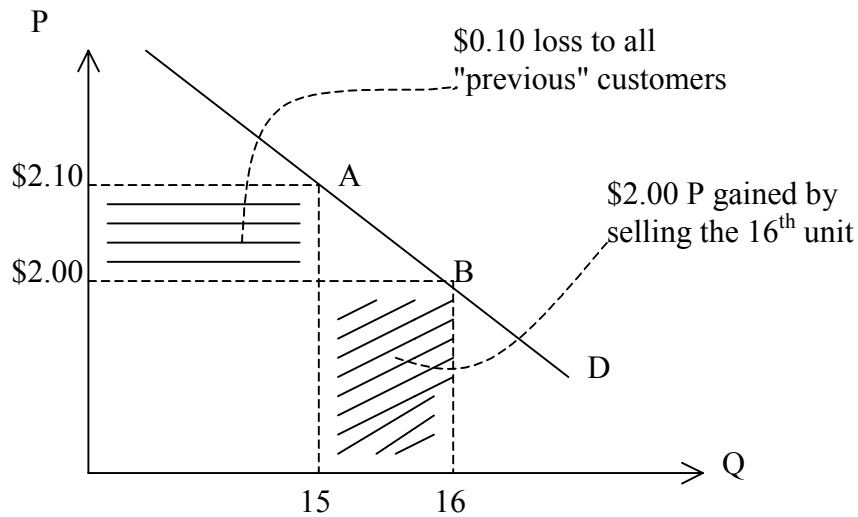
To maximize profit, the monopolist compares marginal revenue (MR) and marginal cost (MC). Recall that the demand curve is the average revenue (AR) curve or price. If the firm sells Q units at the price of P, then the AR is TR/Q = P.

MR is always below the demand curve if the demand is downward sloping, so that MR < P. Recall the average-marginal relationship. If the AR is falling then MR is pulling it down so that the MR curve lies below the demand curve.

The monopoly charges the same price to all of its customers. If the firm wants to increase sales by 1 unit it must reduce price somewhat to all customers. Thus the additional revenue that the monopolist takes in when sales increase by 1 unit (marginal revenue) is the price the firm collects from the new customer minus the revenue lost by cutting price to all of its "previous" customers. So MR is less than price.

MR was equal to price under perfect competition because the firm's demand curve was horizontal. The firm could expand its output without lowering its price.

Consider the relationship between MR and price by examining the graph below.

P

$0.10 loss to all
"previous" customers

$2.10 ⌐ - - - - - - - - - - A

$2.00 P gained by
selling the 16th unit

$2.00 ⌐ - - - - - - - - B

D

Q

15   16

Suppose a monopolist initially sells 15 units at a price of $2.10 (point A) and then wants to increase sales by 1 unit. Price must fall to $2.00 to sell the 16th unit (point B). How much revenue is gained at the margin? TR at A is $31.50 and TR at B is $32.00 so MR = $0.50. But the price is $2.00, so P > MR. Graphically, MR is the difference between the 2 shaded triangles.

Consider the monopolist's output decision graphically.

P

MC

$10 - - - - - - P

AC

$8 - - - - - M

C

D

$4 - - - - -

MR

0   150   Q
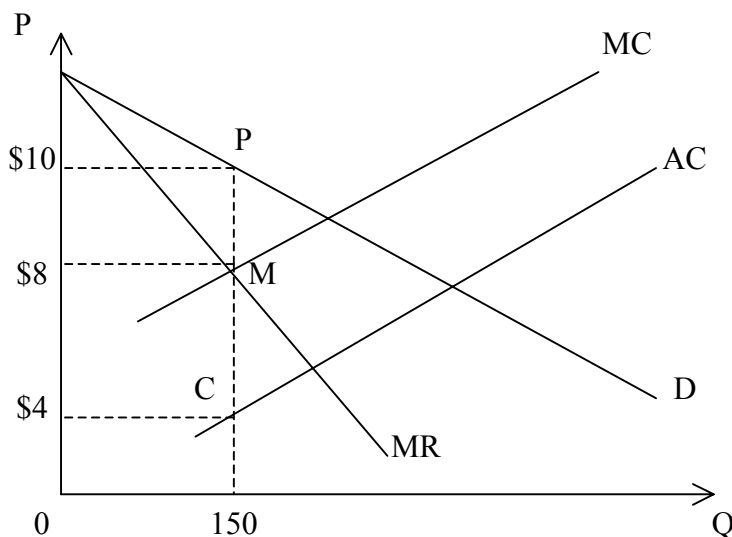
The monopolist maximizes profit by setting MR = MC. It selects point M in the diagram where quantity is 150 units. But point M doesn't tell us the price charged by the monopolist, because P > MR. We must look at the demand curve to determine the price at which consumers are willing to buy the 150 units. The answer is given at point P. The price of $10 is higher than MR or MC, which equal $8. The monopolist earns positive profits as P > AC. The monopolist earns a per

unit profit (P - AC) of $6, so total profit is $6 x 150 = $900. Profit is represented by the area $10 $4 P C.

To study the price and output decision of a profit-maximizing monopolist:
(1) Find the Q at which MR = MC to select the profit maximizing output level.
(2) Find the height of the demand curve at that level of output to determine the corresponding price.
(3) Compare the height of the demand curve with the height of the AC curve to determine whether the monopolist earns a profit or suffers a loss.

We can also determine the monopolist's profit maximizing quantity and price numerically. Consider the following data for a monopolist.

Quantity	Price	Total Revenue	Marginal Revenue	Total Cost	Marginal Cost	Total Profit
0	------	$0	------	$10	------	-$10
1	$140	140	$140	70	$60	70
2	107	214	74	120	50	94
3	92	276	62	166	46	110
4	80	320	44	210	44	110
5	66	330	10	253	43	77
6	50	300	-30	298	45	2

We can use this table to bring out several important points.
(1) A fall in price will lower (raise) TR when demand is inelastic (elastic). Demand is represented by the first 2 columns of the table and it is elastic (inelastic) from Q = 1 to Q = 5 (from the Q = 5 to Q = 6). It follows that MR > 0 (MR < 0) when demand is elastic (inelastic).

A monopolist will always produce where demand is elastic. If the monopolist produces where demand is inelastic, then it can raise total revenue by cutting back quantity and increasing price. The reduction in quantity also reduces total cost, which raises profit. The profit maximizing output occurs where MR = MC and since MC > 0, then MR > 0 and demand is therefore elastic.

(2) By comparing columns 2 and 4 we see that P > MR after the 1st unit of output.

(3) By comparing columns 4 and 6 we see that profit is the highest ($110) at 4 units of output where MR = MC = $44.

(4) The table assumes that the firm knows its entire demand schedule for it to calculate the MR curve. However, after a lot of messy algebra (shown on page 302 in the textbook) we can show that the profit-maximizing price is:

$$P = \frac{MC}{1 - \frac{1}{\eta}}$$ where η is the price elasticity of demand.

If the firm has some understanding of its η and marginal cost, then it does not have to know the entire demand curve.

The expression for price can be rewritten as: $\dfrac{P - MC}{P} = \dfrac{1}{n}$.

The left-hand side of the equation is the markup of price over marginal cost as a percentage of product price. Thus, the smaller the elasticity (i.e., more inelastic) of demand, the greater the markup. If demand is infinitely elastic (as in perfectly competition) then price must equal marginal cost.

Comparison of Monopoly and Perfect Competition

We now use the perfectly competitive market structure as a benchmark for monopoly. We will see that the monopoly is inefficient in comparison to the idealized market structure of perfect competition.

(1) A monopolist' profits persist: Barriers to entry create the 1st difference between perfect competition and monopoly. Profits are competed away by entry into a perfectly competitive market. In the long run, firms can only hope to cover their costs, including the opportunity cost of capital and labor supplied by the firm's owners. But positive economic profits can persist under monopoly, if it is protected from competition by barriers to entry. The monopolist can grow rich at the expense of their customers. Such accumulation of wealth is objectionable by most people and therefore monopoly is widely condemned. As a consequence, monopolies are often regulated by governmental agencies that try to limit the profits they can earn.

(2) Monopoly restricts output to raise price: Excessive profits are a problem but economists believe that this 2nd difference between monopoly and perfect competition is more troubling. Compared with the ideal of perfect competition, the monopolist restricts quantity and charges a higher price.

Imagine a court order that breaks apart a monopoly into a large number of perfectly competitive firms and that the industry demand and costs stay the same. These are somewhat unrealistic assumptions, but it allows us to compare the long run price-quantity pair selected by monopoly versus perfect competition. For ease of exposition, assume that the perfectly competitive industry is a constant-cost industry. Thus, both the monopolist and the perfectly competitive firms face input supply curves that are perfectly elastic. This implies that both industries are "price takers" in input markets, so an expansion in industry output will not raise input prices or firm costs.

P   Comparison of the 2 markets
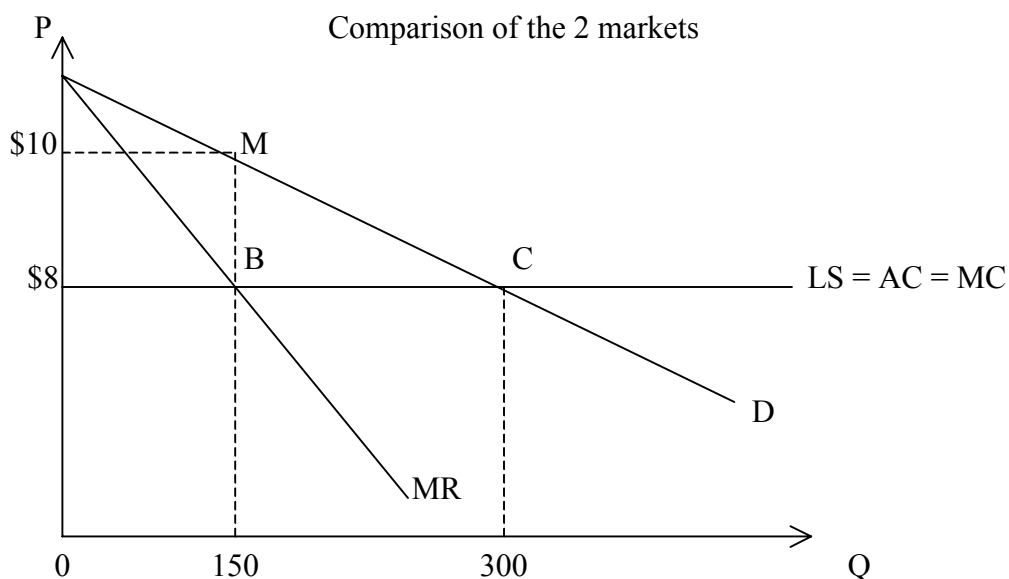
To further simplify matters assume that MC = AC = $8. LS represents the long run industry supply curve for the constant-cost competitive industry. D is the downward sloping industry demand curve with its corresponding marginal revenue curve, MR.

Monopoly output is determined by equating MR and MC at point B, but the competitive industry produces where P = AC and economic profit is zero at point C. By comparing points B and C we see the monopolist produces less output and charges a higher price than the perfectly competitive industry with the same demand and cost conditions. This is troubling because the monopoly leads to an inefficient resource allocation.

We saw in chapter 9 that competitive industries produce what society wants at the minimum cost to society. So if a monopolist is producing less, then it is producing too little of the good. Efficiency in resource allocation requires that MU = MC. This occurs under perfect competition because the industry produces where demand (or MU) equals MC. Yet, the monopolist produces a smaller quantity where MU > MC. This implies that consumers are willing to pay an additional amount for the good (its MU) that exceeds the cost to produce another unit of the good (MC). Thus, resources are allocating inefficiently under monopoly, because too few resources are being used to produce the monopolized good. The welfare cost associated with the reduced monopoly output is called "deadweight loss" and it is shown by the triangle MBC in the graph above.

Can anything good be said about monopoly?

Except for the cost savings offered by a natural monopoly or monopoly obtained with a patent to encourage innovation, it is difficult to find arguments in favor of monopoly. However, our previous comparison of monopoly and perfect competition was pretty artificial. It is a static approach that assumes demand and cost conditions are the same under the 2 market structures,

which is unlikely. A more dynamic approach would allow for the possibility that monopolies may aid in the development and improvement of new products or production techniques.

Monopolies are shielded from competition and any innovation that reduces their costs also raises their profits. Some economists argue that monopolies have more incentive to invest in research and development (R&D). In the short run, the AC of monopolists may be higher with the R&D expenditures, but in the long run the AC are lowered by the use of new technologies or production processes.

Consider the market for personal computers.
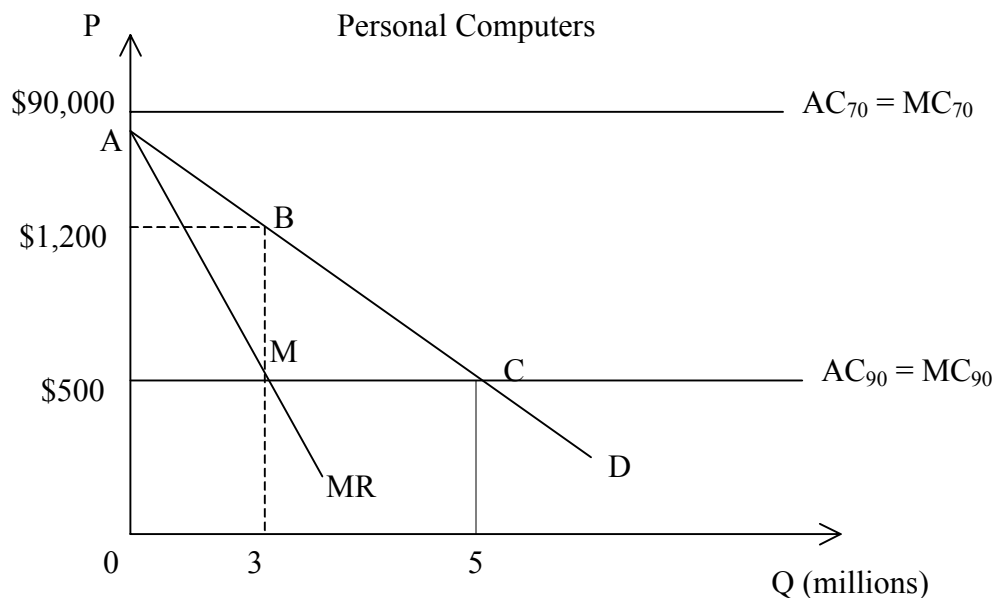
The market for home computers was virtually nonexistent in the early 1970s. Prior to the invention of the microchip the cost and size of computers was huge. The 1970 AC and MC of computers ($90,000) were above the maximum price that consumers were willing to pay for them. Companies like Intel, Apple, and IBM figured out how to reduce the cost of manufacturing personal computers so that AC and MC is much lower in the 1990s ($500). This product innovation was undertaken in the quest for monopoly profits, represented by the area $1200 B M $500. But it also increased the welfare of consumers shown by the area A B $1200. Thus, the welfare of society is increased by the total area A B M $500.

However, society would still be better off under perfect competition *once* the innovations are in place. If the monopoly (say Intel) were broken up into a number of perfectly competitive firms, then output would rise from 3 to 5 million and price would fall from $1200 to $500. The welfare gain is measured as BMC, which is the gain in consumer surplus $1200 B C $500 minus the loss in producer surplus (or profits) $1200 B M $500.

From a dynamic perspective, society is better off with pure monopoly and innovation than with no firms possessing the cost reducing technology. But from a static perspective, society is better off with perfect competition after the lower cost technology has been invented.

Regulation of Monopoly Price

The government often uses price ceilings (i.e., a legal maximum on the price that can be charged for a good) to reduce a monopoly's ability to set price. We have seen that price ceilings lead to reductions in quantity supplied and shortages in competitive markets. However, a monopoly may actually increase its output in response to a price ceiling.

Recall that the monopolist restricts output in order to raise prices. Restricting output cannot increase prices under a price ceiling, which eliminates the reason for restricting output.

Consider the imposition of a price ceiling in the diagram below.
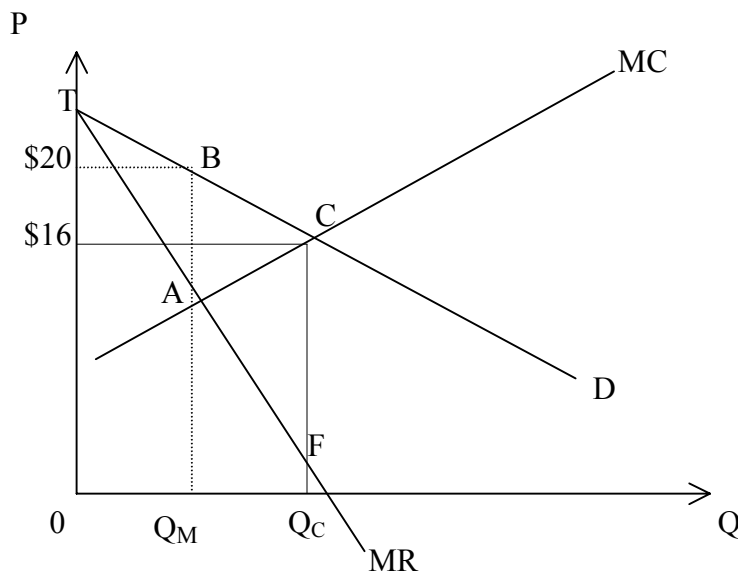
Without government intervention, the monopolist produces the quantity Q_M where MR = MC and charges a price of $20. Suppose the government imposes the price ceiling of $16. This alters the shape of the monopoly's MR and demand curves. The demand curve becomes $16 C D because the monopolist can no longer charge prices above $16 (portion T C on the old demand curve). The new MR curve is $16 C F MR because MR = P = $16 for the units from Q = 0 to Q = Q_C.

After the imposition of the price ceiling the output Q_M is no longer the profit maximizing quantity because MR > MC at Q_M. The monopolist will expand its output up until the point where MR = $16 = MC at the output level of Q_C. Profit rises as output expands from Q_M to Q_C.

The price ceiling lowers the monopoly's profits by the area A F C (Can you see why?) and raises consumer surplus by the area $20 B C $16. In addition, the price ceiling encourages the monopolist to produce the efficient level of output Q_C where MU = MC at point C. Thus, the regulation has eliminated the deadweight loss of B A C associated with the unfettered monopoly output.

This positive outcome is difficult to achieve for several reasons.
(1) Government regulators do not know the firm's MC and demand curves. This makes it difficult to set the price ceiling so that MC = MU.
(2) The monopolist may be forced out of business if the price ceiling is set too low. The monopolist will close if its AC > price ceiling.
(3) The monopolist has an incentive to reduce the quality of its product to reduce its costs. If quality is reduced then consumer surplus is also lowered.