

Monopoly

April 12, 2004

1 Monopoly Characteristics

- 1 firm
- unique product
- barriers to entry

Because of these characteristics, a monopolist is a price maker: the quantity it produces determines the price.

Recall earlier that we determined that the profit maximizing problem for a monopolist is

$$\begin{aligned} \max_q p(q)q - TC(q) \\ p'(q)q + p - \frac{dTC}{dq} &= 0 \\ MR &= MC \end{aligned}$$

where $MR < p$.

In other words, we showed that the profit maximizing rule of a monopolist is the same as for a perfectly competitive firm. Profit is maximized by producing where $MR = MC$. We can show this result graphically. Since the monopolist is the only firm in the market, the firm's demand curve is the demand curve for the market. The firm's downward curving demand curve shows that as quantity increase, prices decrease. From above, since $MR < P$, the MR curve must lie below the demand curve (which shows price). The MC curve looks like before. Setting the two equal, the firm chooses to produce at Q^* . It then charges the highest price that consumers are willing to pay (shown by going up to the demand curve at Q^* , and over). We can show profits. Revenue is area $A + B$ ($P * Q$). Total cost is area B ($ATC(Q^*) * Q^*$). So profit is area A .

Example 1 $P = 24 - Q$. $TC(Q) = Q^2 + 12$. How much should the firm produce? What is its profit?

$$\begin{aligned} \max_Q (24 - Q)Q - (Q^2 + 12) \\ 24 - Q - Q - 2Q &= 0 \\ 24 - 4Q &= 0 \\ Q &= 6 \end{aligned}$$

Figure 1: Profit Maximization

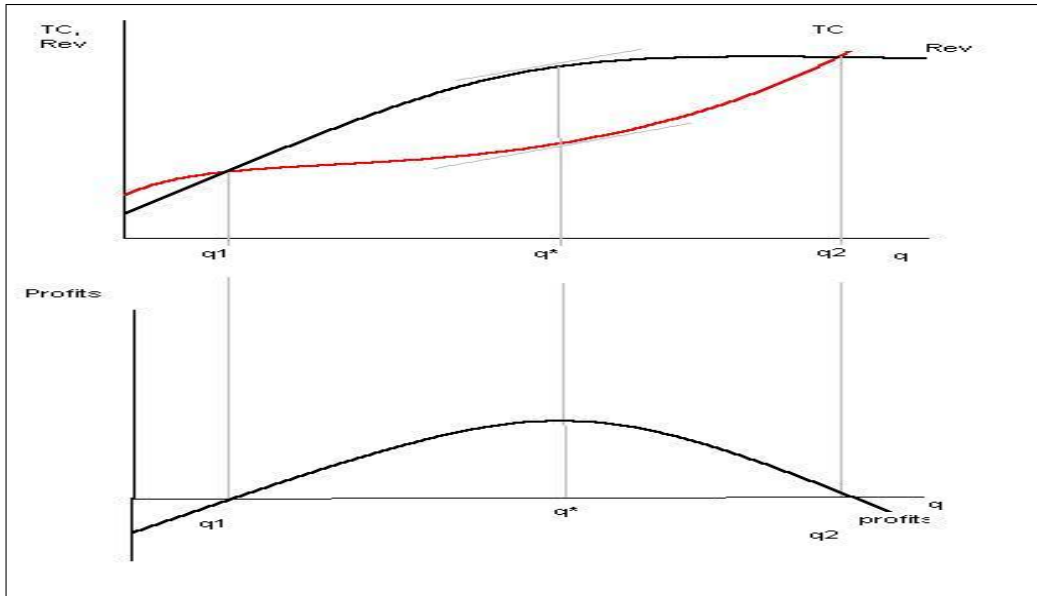
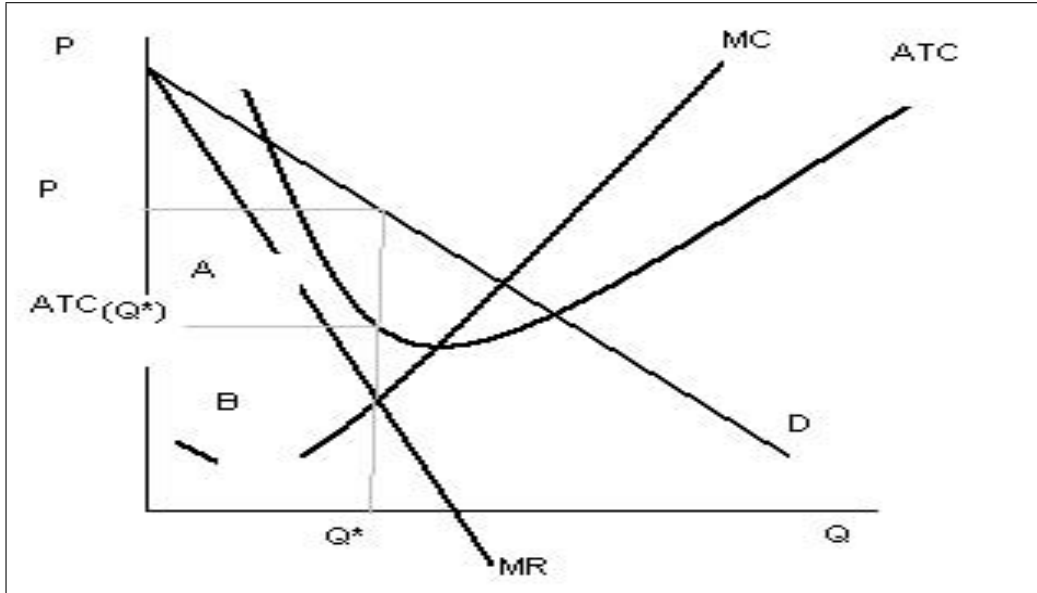


Figure 2: Profit Maximization for a Monopoly: Positive Profits



Firm should produce 6 units.

$$\begin{aligned}
 P &= 24 - Q \\
 &= 24 - 6 = 18 \\
 T &= Q^2 + 12 \\
 &= 36 + 12 = 48 \\
 \pi &= 18 * 6 - 48 = 60
 \end{aligned}$$

The firm is making positive profits of \$60.

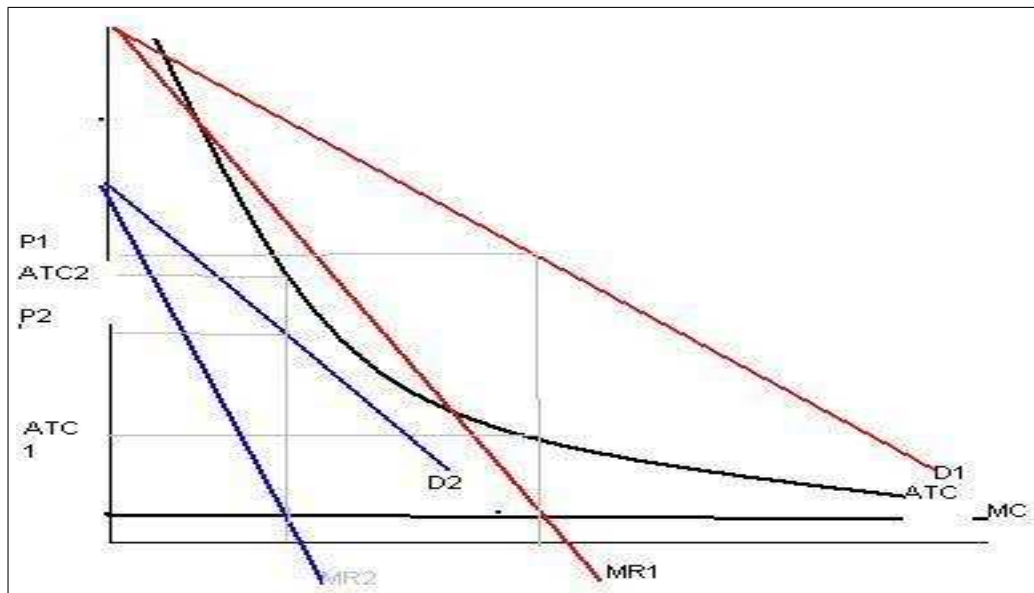
2 Causes of monopoly

The reason that there is just 1 firm in the market is because of barriers to entry, which prevent other firms from entering the market.

2.1 Technical barriers to entry

One type of technical barrier to entry is when there are decreasing average costs over the reasonable output levels. This type of setup is often called a natural monopoly because it is only profitable for one firm to be in the market. Other firms will have no incentive to enter. To understand this, consider the following graph. The basic idea is that some industries have very high fixed costs and low variable costs. Consider an electricity plant. This means that for a low level of production the average costs will be very high; for a high level of production, the average costs will be quite low. If there is just one firm in the market, it can produce a low average cost. If there is more than one firm in the market, each firm produces at a high average cost. A firm that is considering entering the market will do the calculations and realize that if enters it will earn negative profits. Thus, it will decide not to enter and the current firm in the market can earn monopoly profits.

Figure 3: Natural Monopoly



Ownership of a unique resource such as land or minerals or managerial skills can also be a technical barrier to entry.

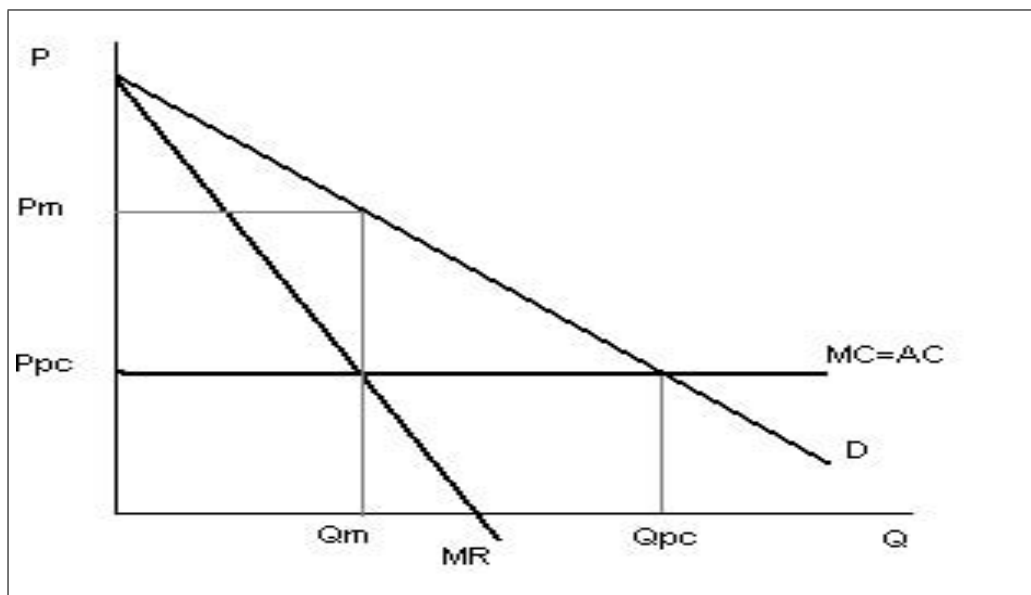
2.2 Legal barriers to entry

Most monopolies are created by laws rather than economics forces. Examples of legal barriers to entry are patents or specific licenses awarded to serve a market.

3 Why do economists not like monopolies?

Economists major objection to monopolies is that they are not efficient. Consider the following graph. Setting $MR = MC$, the firm produces at Q_m . Would it be efficient from a societal perspective for the firm to produce more? Yes. Individuals would be willing to pay more for one more unit than the additional cost of producing one more unit. From a societal perspective, the amount sold should be Q_{pc} , where the marginal benefit=marginal cost.

Figure 4: Efficiency



There is a deadweight loss associated with monopolies because less is produced than is efficient.

3.1 Deadweight loss of US postal service

Study calculated welfare loss from USPS monopoly on delivering 3rd class mail. In 1992, private companies could deliver at 12.3 cents/piece. US postal service charged \$16.7 cents apiece. Study assumed that private companies were price-takers and that $P_c = MC$.

4 Price Discrimination

So far, our model has assumed that the firm can only charge one price to all customers. Intuitively, if a firm could charge different prices to different groups, (e.g., charge a high price for those with a high willingness to pay and a low price for those with a low willingness to pay) it could earn higher profits. In order for a firm to be able to price discriminate, the following criteria must be met:

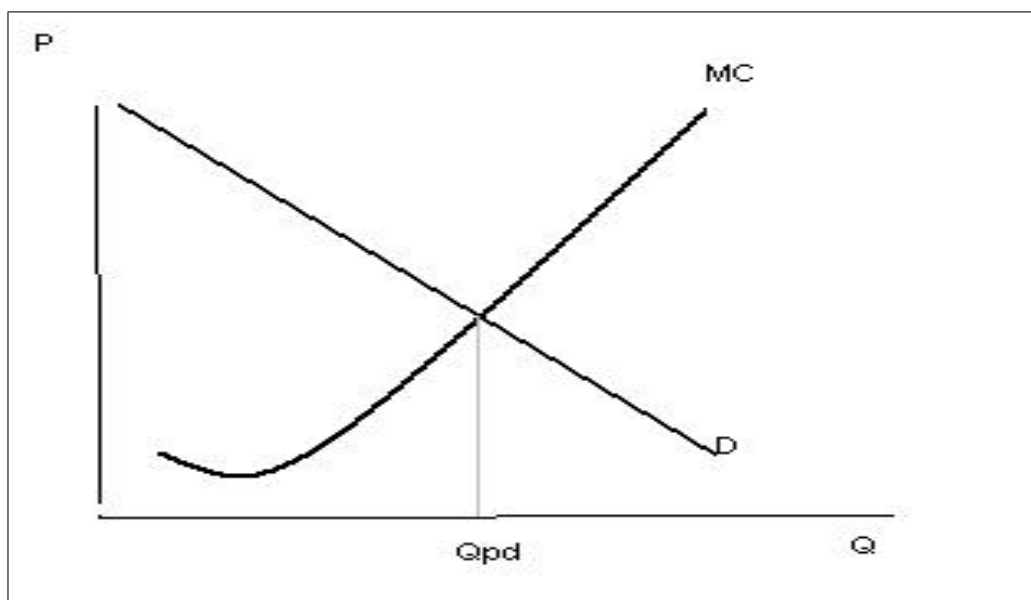
- Firm must have market power
- There must be varying willingness to pay and ε^d among consumers (ie, different markets)
- Consumers must not be able to resell the good (otherwise those who could buy at the low price would just resell to the high value consumers, undercutting the monopolist)

There are various degrees of price discrimination.

4.1 Perfect price discrimination

In the case of perfect price discrimination, each consumer is charged a different price that is equal to her willingness to pay. Given this setup, the firm will sell to the point where $P = MC$. Note that this is the efficient outcome.

Figure 5: Perfect Price Discrimination



The obvious problem with perfect price discrimination is the difficulty of determining consumer's willingness to pay.

Example 2 *Suez canal sets prices on an individual basis*

Example 3 *College aid. Through provision of financial aid, students pay very different prices for the same good, an education. A number of firms do analysis that predict acceptance as a function of SAT scores, major, campus visit, high school, and aid package. This allows the university to predict willingness to pay.*

4.2 Quantity Discounts

Another form of price discrimination is to charge a lower price for buying more. Essentially, a firm sells the first units of the good at P_m and then offers a lower price for additional units purchased.

Example 4 *Pizza Hut: sells 2nd pizza for cheaper price*

Example 5 *Frequent flyer miles*

5 Two-Part Tariffs

Consumer pays entry fee for right to purchase good.

Example 6 *Rides at the country fair*

Example 7 *Auction fee*

Example 8 *Disneyland in the 1970's: pay admission price - get book with tickets to various rides.*

Example 9 *Telephone service: monthly fee + long-distance fees*

Example 10 *Private golf clubs: annual membership + greens fee*

Example 11 *Car rental: rental price + price/mi*

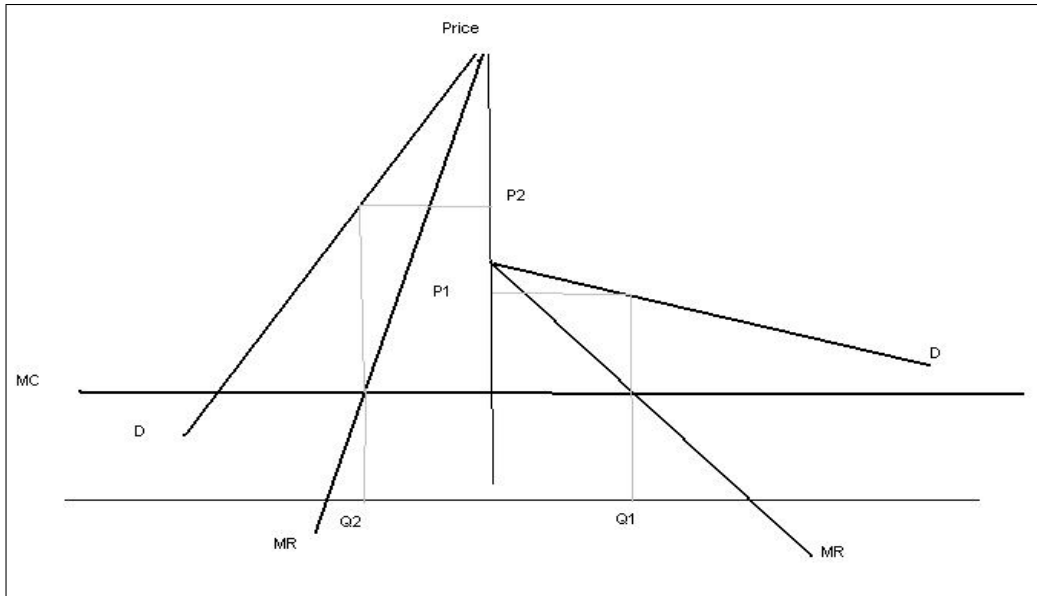
Example 12 *Costco: membership price + item price*

6 Market Separation

Suppose you can separate consumers into two markets, high willingness to pay and low willingness to pay, and prevent resale. Then can charge different prices to the two markets.

Example 13 $Q_1 = 100 - p_1$; $Q_2 = 100 - 2P_2$; $MC = 20$. *If can price discriminate, what price to charge?*

Figure 6: Price Discrimination in Separated Markets



Example 14 *The Grand Theater is a movie house in a medium-sized college town. This theater shows unusual films and treats early-arriving moviegoers to live organ music and Bugs Bunny movies. If the theater is open, the owners have to pay a fixed nightly amount of \$500 for films, ushers, and so on, regardless of how many people come to the movie. For simplicity, assume that if the theater is closed, its costs are zero. The nightly demand for Grand Theater movies by students is $Y_s = 220 - 40P_s$. The nightly demand for non-student moviegoers is $Y_n = 140 - 20P_n$. What is the profit maximizing number of tickets for the Grand Theater to sell if it charges one price to everybody? At what price would this number of tickets be sold? How much profits would the Grand make? How many tickets would be sold to students? Nonstudents?*

Example 15 *Suppose that the cashier can accurately separate the students from the non-students at the door by making students show their school ID cards. Students cannot resell their tickets and nonstudents do not have access to student ID cards. Then the Grand can increase its profits by charging students and non-students different prices. What price will be charged to students? How many student tickets will be sold? What price will be charged to nonstudents? How many nonstudent tickets will be sold? How much profit will the Grand Theater make?*

6.1 Intuition on Segmented Markets

Monopoly power is both a curse and a blessing. While it allows higher profits, monopoly profits are restricted by the fact that changing their production level affects the market price and thus their profits. If they decrease their price in order to sell more, they lose money on high value consumers. The difficulty is that the typical monopoly must charge just one price to all customers. When a monopoly can separate the market into different groups and prevent resale, it can charge a high price to those who value the good a lot and charge a low price to those with a lower willingness to pay.

Imagine that a monopoly is just charging one price and discovers that it can separate consumers into two markets. Intuitively, we would expect that it is profit-maximizing for the monopolist to increase the price for consumers with inelastic demand and decrease the price for consumers with more elastic demand. Consumers with inelastic demand won't decrease their consumption much, causing revenue to increase. In the elastic market, decreasing the price will cause a large increase in consumption, also increasing revenue. Let's show this result mathematically: the market with more inelastic demand will experience a higher price.

First, recall that we can express MR as

$$\begin{aligned}
 MR &= P'(Q)Q + P \\
 &= \frac{dP}{dQ}Q + P \\
 &= P \left(\frac{dP}{dQ} \frac{Q}{P} + 1 \right) \\
 &= P \left(\frac{1}{\frac{dQ}{dP} \frac{P}{Q}} + 1 \right) \\
 &= P \left(\frac{1}{-\varepsilon} + 1 \right) \\
 &= P \left(1 - \frac{1}{\varepsilon} \right)
 \end{aligned}$$

We know that for each market, the firm will following its profit-maximizing rule of setting $MR = MC$. Since the same good is being sold in each market, the MC for each market is the same. Therefore, $MR_1 = MC = MR_2$. From above, this implies that

$$\begin{aligned}
 P_1 \left(1 - \frac{1}{\varepsilon_1} \right) &= P_2 \left(1 - \frac{1}{\varepsilon_2} \right) \\
 \frac{P_1}{P_2} &= \frac{1 - \frac{1}{\varepsilon_2}}{1 - \frac{1}{\varepsilon_1}}
 \end{aligned}$$

Lets suppose that market 1 has a more elastic demand. So $\varepsilon_1 > \varepsilon_2$. Therefore, $\frac{1}{\varepsilon_2} > \frac{1}{\varepsilon_1}$. So, $1 - \frac{1}{\varepsilon_2} < 1 - \frac{1}{\varepsilon_1}$. So, for the equation to hold, $P_1 < P_2$. This shows our result: the market that is more elastic will have a lower demand.

6.1.1 Examples of Pricing in Segmented Markets

Example 16 *Textbook pricing in US versus other countries*

Example 17 *Drug pricing*

7 Pricing for Multiproduct Monopolies

If firm has pricing in power in markets for several related goods, it increases the possibilities for price discrimination. Two examples of this are tying and bundling.

7.1 Tying

Definition 18 *Tying: if you buy 1 product from a firm, required to buy all purchases of some related good from that firm.*

Example 19 *Xerox: buy copier; must buy service/supplies from them also*

Example 20 *Certain coffee machines can only use certain filters that are only available from the firm*

With tying, the per unit price per consumer varies. Those who value the good more will use it more and thus will pay a higher cost.

7.2 Bundling

Definition 21 *Two goods are combined; can't buy either good separately*

8 Regulation of Natural Monopolies

Recall that we discussed natural monopolies above under technical barriers to entry. Essentially, we explained that in the case of falling ATC it is possible that a second firm would never choose to enter the market because it would experience negative profits. This logic established why an industry that experiences falling average cost may be a natural monopoly. We know from our earlier discussions that monopolies tend to charge higher prices than a perfectly competitive market and produce less than is efficient. Natural monopolies tend to occur in industries such as electricity or water. What then, if anything, should be done about a natural monopoly?

Consider the following graph. If the firm profit maximizes, it will choose to produce at level Q_m and charge P_m . Profits are shown by area P_mABC . The regulatory agency might decide that it wants the firm to produce at level Q_r , which is efficient. Therefore, the regulatory agency will say that the maximum price that the firm can charge is P_r . Note that at this output level and price, the firm is now experiencing a loss, shown by area $GFEP_r$. Over the long run, the firm would not stay in business. So either the regulatory agency must be willing to continually provide a subsidy, equal to area $GREP_r$ or it must use another regulatory scheme.

Another possible regulatory system is to allow the monopoly to charge two prices where those who pay the high price subsidize those who pay the low price. The regulatory agency could let the firm charge one group the monopoly price, P_m . These individuals would demand amount Q_m . The second group would be charged the efficient price, P_r . This group would demand $Q_r - Q_m$. The total amount demanded would then be Q_r . What about the firm's profits? On the first group, it earns profits equal to P_mAHG . Note that this is because the total amount produced is Q_r , so the ATC on all units is G . On the second group, it loses money equal to $HFEJ$. Note that $Q_r - Q_m = Q_m$ because for a linear demand curve, MR is $1/2$ of the demand curve. Therefore, if $P_m - G > G - P_r$, this firm will be making money. Note that even if the firm doesn't make money and the regulatory agency has to provide a subsidy, the subsidy will be less than it would provide under the first regulatory scheme. This practice is essentially what was done with telephone pricing. High long-distance prices subsidized low local phone services.

Figure 7: Regulation of a natural monopoly

