Chapter 13
Models of Monopoly

Models in the previous few chapters assumed that agents were all price takers. We will now explore situations in which sellers are capable of influencing price, but individual consumers are not.

Monopoly – a single seller (producer)

The firm is the industry, which is the polar opposite of perfect competition—one large firm instead of many small firms. The firm faces the entire market demand curve and knows that it can affect price. Using its knowledge of the demand curve, the firm decides how much to produce, and thus, controls the price within the limits of the demand curve. The firm can choose either price or quantity, but not both.
Barriers to Entry are the source of all monopoly power. These barriers prevent other firms from entering and competing for long-run profits.

Types of barriers to entry:

- Technical
  - Possession of a unique resource.
  - Private knowledge of low cost techniques.
  - Decreasing costs. If costs decrease as quantity increases, small firms will not be able to compete ("natural monopoly").

- Legal
  - Patents to make innovation profitable.
  - Exclusive franchises, eg., utilities, etc. The reason for granting the monopoly is usually decreasing costs (natural monopolies). In this case, dividing the market would increase costs to consumers!

Barriers may be created by the monopolist: eg., buying up resources or the competition; lobbying for legal barriers or franchises.
A monopolist chooses the quantity (Q) where MR = MC and charges the market-clearing price (P) for that quantity.

In contrast to perfect competition, the monopolist’s demand curve slopes downward, causing MR to be less than AR = P. Because the monopoly is so large relative to the size of market, it must reduce P to increase Q.
Inverse Elasticity Rule

Earlier we showed that profit maximization implies

$$\frac{P - MC}{P} = -\frac{1}{e_{QP}}$$

Thus, the gap between $P$ and $MC$ is related to the inverse of the price elasticity of demand. The gap is larger the less elastic demand is (closer to $-1$ than to $-\infty$).

If $e_{QP} = -1$ then $MC = 0$ (no production)

If $e_{QP} = -2$ then $P = 2MC$.

If $e_{QP} = -10$ then $P = 1.11MC$.

For $\frac{P - MC}{P}$ to exceed 1 ($-1/e_{QP} > 1$), $MC$ must be less than 0. Because $MC$ is always $> 0$, the profit-maximizing monopolist will only operate where demand is elastic ($e_{QP} < -1$), where $MR = MC$ is positive ($R$ increases as $Q$ increases).

The gap between $MR$ and $P$ narrows as $Q$ moves toward zero and demand becomes more elastic.

Also, a less steeply sloped demand curves implies $MC$ is closer to price at $MC=MR$ because $MR$ is vertically closer to $D$. 
Economic Profit for a monopoly with average cost equal to AC is the area of the rectangle $P_1ABAC_1$. This profit can exist in the long run because no entry is possible. This profit is the return to the factor that forms the basis for the monopoly. Thus, this profit may be thought of as monopoly rent. These monopoly rents are why firms pay for the rights to broadcast sporting events or sell cokes at a ball game.

If the basis for monopoly is something that could be sold to another operator, then isn’t the rent really an opportunity cost? How can the rent be economic profit if another would be willing to pay an amount up to the rent for the basis? Isn’t the rent just a part of normal profit? Patents can be sold and so can diamond mines in South Africa.

If $P < AC'$ (eg., $P_1$ is less than $AC_2$ above), the monopoly earns a loss of the rectangle $P_1ADAC_2$. In the short run, the monopoly will only operate so long as $P > AVC$. If $P < AC'$ in the long run, the monopolist will cease operation. Thus, large monopoly profits are not inevitable. If no one wants the product, it cannot be produced for a profit. Profit depends on demand and cost.
Price Discrimination

Usually we assume the monopolist must obey the “law of one price”, but if the monopolist can separate buyers into exclusive groups, it can increase profit by charging different prices in each market if $e_{QP}$ is different among markets. Buyers may be separated by space, time, volume purchased, form of product, membership, etc.

Third Degree Price Discrimination

If the market can be separated into two parts, say domestic and foreign, but the law of one price prevails within each market, then the monopolist may increase profit (increase total revenue for the same cost) by keeping total Q constant but allocating it between the two markets so that MR is equal between the two markets and equal to MC for the total Q. This form of price discrimination works to increase total revenue if the price elasticities of demand differ between markets.
Market 1

Less elastic demand

Market 2

More elastic demand

Total Market

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<thead>
<tr>
<th>Market 1</th>
<th>Market 2</th>
<th>Total Market</th>
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<tbody>
<tr>
<td>D1</td>
<td>D2</td>
<td>D_T = D1+D2</td>
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<tr>
<td>MR1</td>
<td>MR2</td>
<td>MR_T = MR1+MR2</td>
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<tr>
<td>Q1</td>
<td>Q2</td>
<td>Q_T = Q1+Q2</td>
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\[ \text{D}_T = \text{D}_1 + \text{D}_2 \] is the horizontal sum of the demand curves in each market.

\[ \text{MR}_T = \text{MR}_1 + \text{MR}_2 \] is the horizontal sum of the marginal revenue curves in each market.

The profit-maximizing monopolist will produce \( Q_T \) where \( \text{MR}_T = \text{MC}_T \) and, without price discrimination, will charge \( P_T \) in both markets. At \( P_T \), \( Q_1 \) and \( Q_2 \) will be sold in markets 1 and 2.

If \( Q_1 \) is sold in market 1, marginal revenue will be \( \text{MR}_1 \) and if \( Q_2 \) is sold in market 2, marginal revenue will be \( \text{MR}_2 \).

If the monopolist simply redistributes \( Q_T \) away from market 1 toward market 2 by one unit, revenue would decrease in market 1 by \( \text{MR}_1 \) and increase in Market 2 by \( \text{MR}_2 \). Since \( \text{MR}_2 > \text{MR}_1 \), total revenue will increase. The monopolist will increase profit by redistributing until \( Q_1 \)' is sold in Market 1 and until \( Q_2 \)' is sold in Market 2 where \( \text{MR}_1' = \text{MR}_2' = \text{MRT}=\text{MCT} \).

At \( Q_1' \), the price will be \( P_1 \) in Market 1 and at \( Q_2' \), the price will be \( P_2 \) in Market 2. The product will be sold for the lowest price in the most elastic market.
Mathematically

Max \( \pi(Q_1, Q_2) = R_1(Q_1) + R_2(Q_2) - C(Q_1 + Q_2) \)

FOC \( \frac{\partial \pi}{\partial Q_1} = \frac{\partial R_1}{\partial Q_1} - \frac{\partial C}{\partial Q_1} = 0 \)

But \( \frac{\partial C}{\partial Q_1} = \frac{\partial C}{\partial Q_2} = \frac{\partial C}{\partial Q} = MC, \)

so \( MR_1 = MC_1 = MC = MC_2 = MR_2 \)

Also, remember that \( MC = MR = P\left(1 + \frac{1}{e_1}\right), \) so \( MR_1 = P_1\left(1 + \frac{1}{e_1}\right) \) and \( MR_2 = P_2\left(1 + \frac{1}{e_2}\right). \)

Therefore, \( P_1\left(1 + \frac{1}{e_1}\right) = P_2\left(1 + \frac{1}{e_2}\right) \implies \frac{P_1}{P_2} = \frac{1 + 1/e_2}{1 + 1/e_1} \)

More negative, more elasticity

Less negative, less elasticity

\( P_1 > P_2 \)

So, if \( e_1 > e_2 \) (\( e_1 \) less elastic then \( e_2 \)), then \( P_1 > P_2 \). Only if \( e_1 = e_2 \) will \( P_1 = P_2 \). The closer \( e_1 \) is to \(-1\) and the farther \( e_2 \) is from \(-1\), the larger \( P_1 \) will be in relation to \( P_2 \).

If \( e_1 = -1.5 \) and \( e_2 = -2.0 \) (in this case, \( e_1 > e_2 \)), \( \frac{P_1}{P_2} = \frac{1 + \frac{1}{-2}}{1 + \frac{1}{-3/2}} = \frac{1}{2} \) \implies \( P_1 = 1.5P_2 \)
First Degree (Perfect) Price Discrimination

The monopolist here is able to separate each buyer and charge his/her maximum willingness to pay along the demand curve. A different price is charged for each unit sold. Thus, $D = AR = MR$ because the price on all units does not fall when additional units are sold. Each unit is sold for a successively lower price until $P = MR = MC$, which is the profit-maximizing output and the Pareto efficient output. All consumer surplus is extracted by the monopolist. $TR = ABQ^*0$. Area $ABP$ is the reduction in consumer surplus and the increase in monopoly profit compared to the perfectly competitive situation where $P=MC$ in perfect competition. Thus, profit is substantially larger than without price discrimination.

To practice any kind of price discrimination, the monopolist must be able to separate buyers and prevent those in the higher-priced market from buying in the lower-priced market. Examples include prescription drugs in Canada versus the United States, after-season clothing sales, movie matinees, foreign versus domestic sales, fresh versus processing markets, marketing orders in agriculture, and manufacturers coupons.
The existence of monopoly will lead to a misallocation of resources from the perspective of the economy as a whole. Assume a monopolist with a horizontal MC = AC curve. The monopolist’s P and Q would be at A, while the perfectly competitive P and Q would be at B. The monopoly restricts Q from Q_C back to Q^* with a price of P^*. Thus, this good is under-produced, compared to the perfectly competitive market, while other goods are over-produced due to resources (inputs) being transferred to other industries.

The firm releases inputs valued at CBQ_C Q^* for use in other industries. The loss in consumer surplus is P^*ABP_C. Part of this loss was transferred to the monopolist as producer surplus (P^*ACP_C). Is this transfer desirable? The remainder of the lost consumer surplus (area ABC) is a deadweight loss in that it is lost to consumers, but no one gets it. It is truly lost and is the principal problem for society as a result of monopoly.

Obviously, many people would like to buy the product at prices between P^* and MC. These trades would be Pareto superior changes. They will not occur under monopoly.

Perfect price discrimination would eliminate the deadweight loss of the monopoly because all consumer surplus is transferred to the monopolist; none is lost. The transfer may be viewed as undesirable by society, but resources are still allocated efficiently (P = MC).
Monopoly and Product Quality

Perfect competition assumes a homogenous product. A monopolist, however, may alter product quality to maximize profit. The monopolist may produce either higher or lower quality products than would be produced under perfect competition. The monopolist would choose that level of quality for which the MR of quality = MC of quality (MR from increasing quality by one unit equals the MC of increasing quality by one unit). Profit maximization requires the firm to move to the MR=MC point for all of the decision dimensions it can (eg. Advertising, quality, quantity).

The perfect competitor has no leeway on quality or any dimension other than quantity. If the pure competitor changes his/her product, it would no longer be homogeneous and the firm will no longer be a part of the same industry as before the change. Many perfect competitors cannot change their product (no leeway), but corn is not corn. High oil corn is a different product than regular corn. The firm needs different storage facilities to separate it from regular corn so it can receive a higher price. The firm can put it in the regular corn market, but at a lower price because the high oil corn loses its identity.
Regulation of Monopolies

Governmental regulation often accompanies the granting of a monopoly by the government. Because economists use the perfect competition model as the standard of efficiency, many feel that price should equal marginal cost. This eliminates dead weight loss from monopoly. If regulation could force monopoly to operate at the competitive price and quantity, efficiency could be achieved.

But if regulation forces the Pareto Optimal price and quantity, the monopoly could suffer a loss rather than making a profit. Where is AC?

Monopoly might incur a loss at Q' and not at Q*.

For natural monopolies (e.g., public utilities, etc) where costs are decreasing as Q increases, MC pricing will lead to long-term economic losses for the monopoly. At P'Q', this monopoly cannot cover AC, so the government must subsidize it indefinitely or raise price to AC or higher. Average cost pricing would leave some deadweight loss, but probably less than with no regulations.
Two-tier Pricing

Another way to regulate monopoly is to use several tiers of pricing. This amounts to sanctioned price discrimination among users, charging those willing to pay higher prices more (to cover losses of MC pricing) than those willing to pay only a lower price.

0 to $Q'$ units are sold at a price of $P_h$. $Q'$ to $Q''$ units are sold at a price of $P_{MC}$. 0$Q'$ is produced at an average cost of $AC_M$ at $A$. The loss on $Q'$ to $Q''$ of EBCF is offset by the profit on 0 to $Q'$ of $PhGAAC_M$. The high price need not be set at the price where $MC=MR$. It can be set at the price where profits from the high price and quantity just offset the losses from marginal cost pricing.

Many monopolies are regulated by an agency allowing the monopoly to earn a “fair rate of return on capital investment.” This involves charging a price above average cost that allows a certain percentage return on investment. Problems with this form of price regulation involve: 1) Calculating average cost, 2) Determining what a “Fair” rate of return is, and 3) Poor management leading to rising costs (lack of incentive), and non-optimal input combinations (excessive capital usage).
Negative vs. Positive Summary of Monopoly

There are two negative results of monopoly: 1) Allocational argument – Monopoly restricts supply of the monopolized good and results in under allocation of resources to the good’s production, resulting in a deadweight loss of consumer surplus and Pareto inefficiency, and 2) Distributional argument - Monopoly transfers surplus from consumers to a producer who may already be wealthy, while consumers may already be poor.

The “invisible hand” fails to lead to efficiency and it may exacerbate an inequitable distribution of wealth.

Some positive arguments for monopoly exist.

Some economists argue that monopoly profits can be used in research and development efforts and thus speed technological innovation and economic growth. These R and D expenditures may be undertaken either to maintain a monopoly position or to acquire a new one.

Patents play a significant role in innovation. Innovations spread to other producers of that or other goods. Innovation leads to cost reductions; but pure competition may exert more pressure for cost reductions.

Monopolies usually do not need to spend much on advertising and sales promotion. This compares monopolies to oligopolies or monopolistic competition. Perfect competition also does no advertising.

Most economists feel that these benefits are real, but that they are not large enough to outweigh the negative aspects of monopolies in many cases.