INTERMEDIATE MICROECONOMICS LECTURE 13 - MONOPOLISTIC COMPETITION AND OLIGOPOLY

Monopolistic Competition

Pure monopoly and perfect competition are rare in the real world. Most real-world industries and markets fall under the category of "imperfect competition." However, monopoly and perfect competition are useful benchmarks.

There is no clear separation between monopolistic competition and oligopoly, but we will examine industries which fit the description of monopolistic competitors and other industries which fit the description of oligopolies.

Both market structures are characterized by firms that possess some degree of market power.

Market Power relates to the firm's ability to affect the price of its product. Market power often depends upon the degree of concentration that characterizes a market. Concentration is measured by the concentration ratio, which is defined as the proportion of the output produced by the largest firms in the industry.

High concentration ratios suggest the potential for market power, but market power need not develop. The potential for market power can be diminished by the threat of potential entry as well as by the presence of actual competitors. Potential entry may act to restrain an existing firm from exercising market power and raising prices.

Monopolistic competition is characterized by product differentiation. The products are unique in some way but are very close substitutes. Product differentiation is very often associated with the brand name owned by the producer. This is responsible for the name "monopolistic competition" because firms are monopolists with regard to their own specific product, hence face down-sloping demand curves. However, the presence of close substitutes impacts on their market power: their demand curves are likely to be very elastic.

The question that we wish to answer is: what output level will the profit-maximizing Monopolistic Competitor choose in the short run? Again the answer is: it will choose the output level for which MC = MR.

For simplicity we will assume that pricing decisions are independent. Whether the Monopolistic Competitor can sustain economic profits in the long run depends on the ease of entry.

If there are effective barriers to entry, then the monopolistic competitor may earn economic profits in the long run. However, many monopolistically competitive industries are characterized by relatively low barriers to entry, and long run equilibrium will occur where MC = MR and where P = AC = LRAC, and economic profits will have been driven to zero.

Entry eats into the firm's market share, driving its demand curve to the left.

Profit   **Loss**

Long-Run Equilibrium   **Comparison with PC**
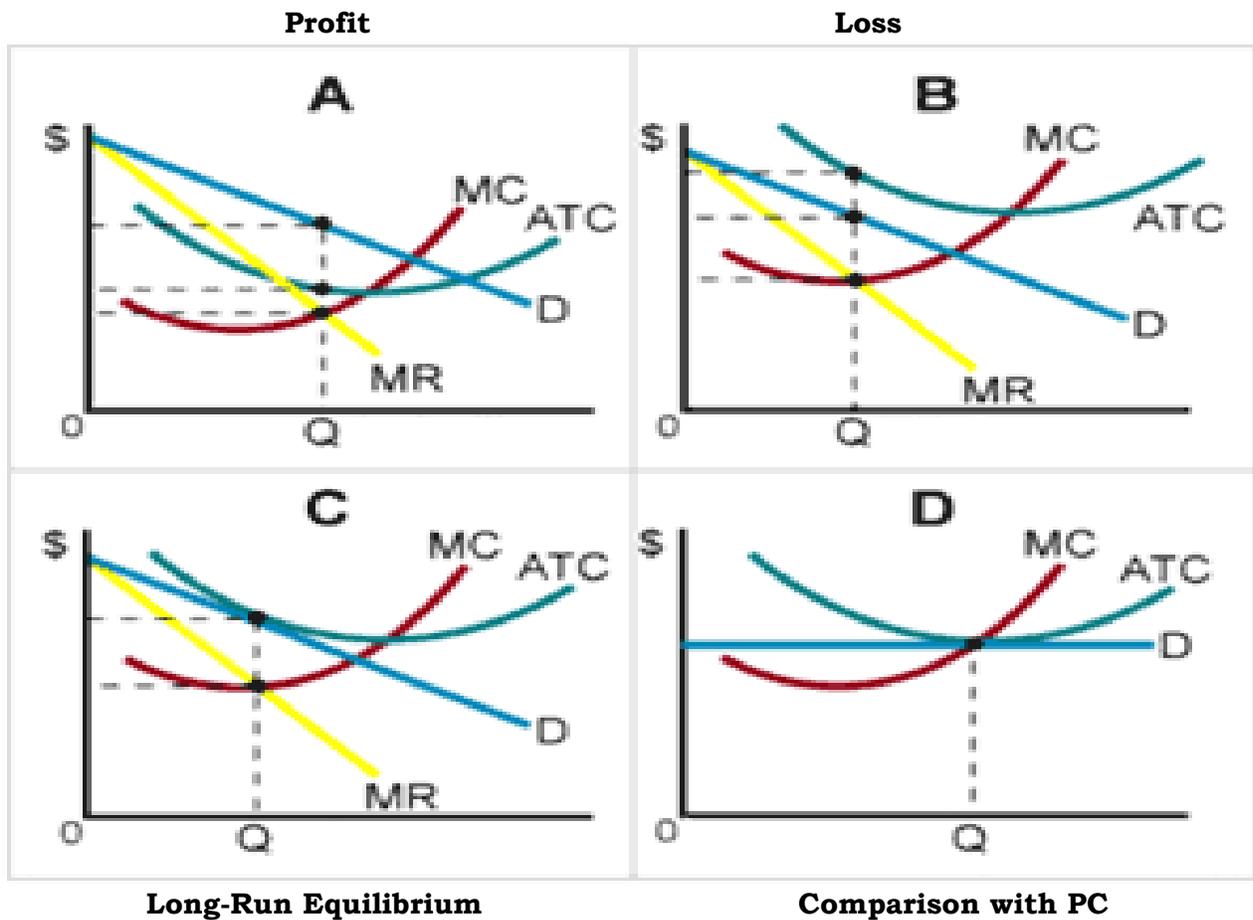
Even with the economic profits driven to zero, however, the long run in monopolistic competition fails to achieve efficiency because P ≠ MC (the socially optimal output level is not produced) and because capacity is under-utilized, so we do not produce at minimum LRAC.

The Role of Advertising: Since non-price competition (product differentiation) is very important in this type of market, we find that advertising plays an important role. Advertising aims to shift demand curves to the right (increase market share) and to make them less elastic (establish brand loyalty). However, advertising is expensive and increases the AC of the firm.

Chamberlain Model

| Short-Run | Long-run |
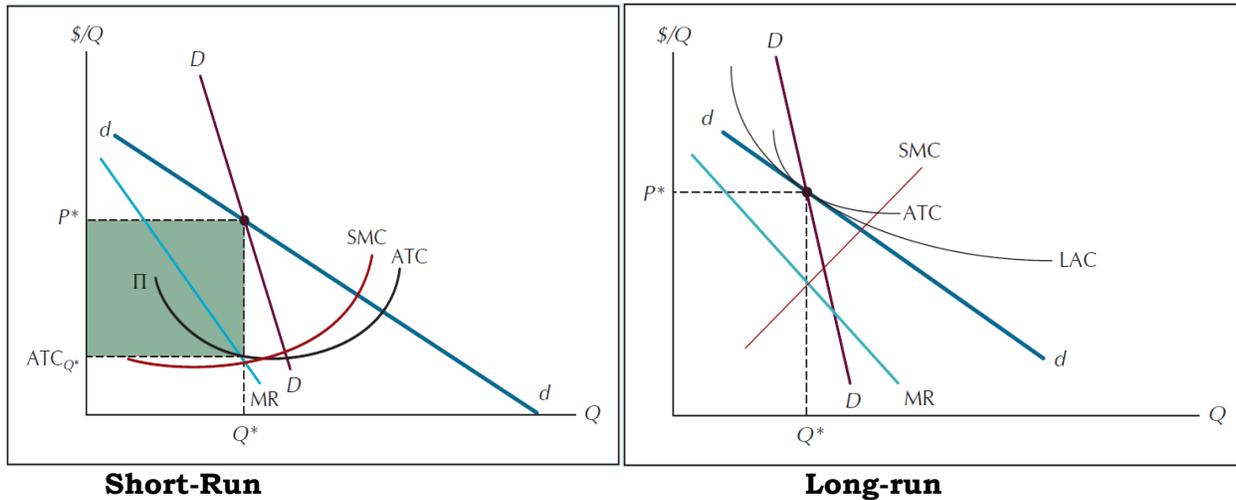
**Perfect Competition Versus Chamberlinian
Monopolistic Competition**

- Competition meets the test of allocative efficiency, while monopolistic competition does not.
- Monopolistic competition is less efficient than perfect competition because in the former case firms do not produce at the minimum points of their long-run average cost (LAC) curves.
- In terms of long-run profitability the equilibrium positions of both the perfect competitor and the Chamberlinian monopolistic competitor are precisely the same.

Oligopoly

<u>Oligopoly</u> -- A market dominated by a few sellers, in which at least some are large enough relative to the total market to influence the market price.

Goods can be either heterogeneous (e.g. autos) or homogeneous (e.g. oil). Barriers to entry make profits possible in the long run. This may be due to
- Scale economies
- Patents
- Reputation
- Strategic barriers

Because you need to account for your rival's behavior, finding equilibrium in an oligopoly market is more complicated then that of other model. We assume that each firm wants to do the best that it can, given what its competitors are doing.

In addition, we assume that your competitors will do the best that they can given what you are doing. Thus, we have a Nash equilibrium.

Nash equilibrium -- Each firm is doing the best that it can given what its competitors are doing.

There is no one dominant model of oligopoly and we will look at several.

For simplicity, let's take an industry with two firms (Duopoly).

A Cournot Duopoly Model

The models of duopoly (two firms make up the industry) considered in microeconomics typically include the Cournot duopoly model.

The simplest approach to the Cournot duopoly model assumes the following: (1) demand curves are linear, (2) the good is homogeneous, (3) marginal cost is zero, and (4) each firm makes its output decision assuming the other firm's output is fixed at its current level.

Typically the Cournot model begins with one firm operating as a monopolist and then allowing the "other" firm to enter the market. Suppose we have the linear market demand curve:

$$P = 120 - Q$$

where **P** is the price of mineral water and the total quantity offered (Q) is the sum of the outputs of the two firms in the market. Let q_1 and q_2 represent the individual outputs of firms one and two, respectively. The demand function may therefore be written:

$$P = 120 - (q_1 + q_2)$$

The marginal revenue curve (MR) has the same vertical intercept as the demand curve and twice the slope or MR = $120 - 2 (q_1 + q_2)$

Reaction Functions

Since there are no costs, the profit function for Firm 1 is the same as the total revenue function (P x q_1) for Firm 1:

$$\pi_1 = 120q_1 - q^2_1 - q_1q_2$$

For maximum profit for Firm 1, differentiate the profit equation with respect to q_1 and set the result equal to zero:

$$d\pi_1/dq_1 = 120 - 2q_1 - q_2 = 0 \qquad \text{Solving this for } q_1: \qquad q_1 = 60 - 0.5q_2$$

The equation is known as the reaction function for Firm 1, since it determines how much output Firm 1 will produce (q_1) as a function of the output of Firm 2 (q_2). Similarly, the profit function for Firm 2 is:

$$\pi_2 = 120q_2 - q^2_2 - q_1q_2$$

and the first-order condition is:

$d\pi_2/dq_1 = 120 - 2q_2 - q_1 = 0$ Solving the equation for q_2: $q_2 = 60 - 0.5q_1$

The reaction functions for each firm are based on the output for the other firm. Therefore we can substitute the equation for q_1 into the equation for q_2:

$q_2 = 60 - 0.5(60 - 0.5q_2)$

Solving for q_2 yields: $q_2 = 30 + 0.25q_2$ or $0.75q_2 = 30$ $q_2 = 40$
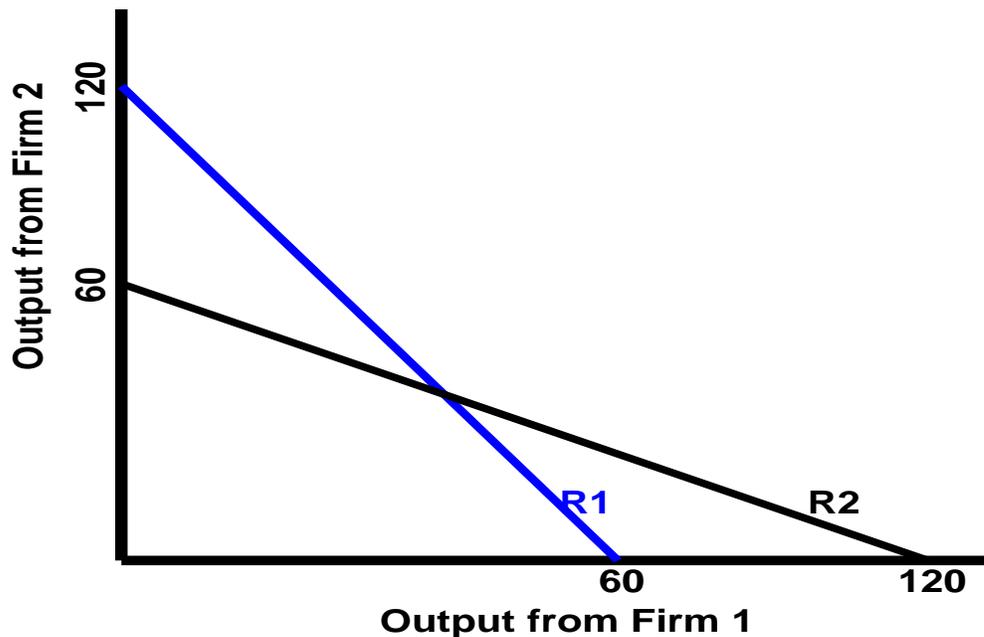
Substitute the solution for q_2 into firm's 1 reaction function and we find q_1 equals

q_1 = 60 - 0.5(40) = 40   Inserting q_1 and q_2 into the demand function we get an

equilibrium price of P = $40.

From before: $q_2 = 60 - 0.5q_1$ $q_1 = 60 - 0.5q_2$

The figure below shows the two reaction functions, where the vertical axis is the output of Firm 2, q_2, and the horizontal axis measures the output of Firm 1, q_1.

R1 is the reaction function for Firm 1 and **R2** is the reaction function for Firm 2. The equilibrium is found at the intersection of the two reaction functions, where q_1 = 40, along the horizontal axis and q_2 = 40, along the vertical axis.

We can see that P = 40 $\pi_1^* = \pi_2^* = 40(40) = 1600$

Cournot, Monopoly, and Competition

Although the Cournot model is often criticized as being naive, especially in its assumptions, it is intuitively appealing when compared to the models of monopoly and perfect competition. The monopoly output can be found by setting marginal cost (which is zero) equal to marginal revenue (derived from the total revenue function P x Q, where P is the demand function).

We look at monopolist with demand curve: P=120 – Q and MC = 0.

$$TR = 120Q - Q^2$$

You can show that profit-maximizing condition is satisfied when firm produces where

$$MR = 120 - 2Q = 0$$

Q = 60, P=60

The monopolist would produce an output of 60, and the corresponding price would be 60. Notice from either reaction functions, if the output of the "other" firm is zero, the equilibrium output is indeed equal to the monopoly output, which is the expected result with only one firm in the industry.

Output for the duopoly equilibrium is *80,* more than the monopoly output, and price $40 is also lower than the monopoly price. The competitive output is found where marginal cost equals price *(MC = P),* or an output of *120,* where *P* = 0. The Cournot duopoly output and price equilibrium values fit nicely between the monopoly and competitive extremes.

Bertrand Duopoly

Some assumptions of the model:

If the two firms charge the same price each will get half of the market demand at that price.

If one firm charges more than the other, even just a little bit, then the one with the higher price will sell nothing and the one with the lower price will have all the demand at that price.

Each firm wants to maximize its profit.

Let's say the demand in a market is

P = 120 – Q

Suppose the marginal cost for each firm is 20

$TR = 120Q - Q^2$ Solving for $MR = 120-2Q$

Setting $MR = MC$ $120-2Q = 20$ so $Q = 50$.   Each firm will produce 50 units of output.

Now suppose this is a perfectly competitive industry. Set $P = MC$

$120 - Q = 20$ so $Q = 100$

Thus Betrand Model give same result as Perfect Compettion.

Now let's look at a firm that sees at a situation ***where its optimal production depends on what some other firm does***.

Stackelberg Leadership Model

Assume: two firms (leader, follower)
 homogeneous product
 quantity is strategic variable
 leader chooses a quantity; follower observes this
  and chooses its quantity.

Behavior: 1) Follower takes leader's *output* as given and maximizes profits
  2) Leader takes follower's *best response function* as given and
    maximizes profits

Residual demand of follower: $q_2 = Q - q_1$
Residual demand of leader: $q_1 = Q - R(q_2)$

Where: q_1 is *observed* by firm 2, but firm 1 simply *anticipates* firm 2's best response.

Example:

Go back to the Cournot model in which we had the following demand function

 $P = 120 - Q$.

But now Q is not just want you produce but it's what both of you produce, so $Q = q_1 + q_2$. And, assuming you're firm 1, you do not control what the other firm produces.

Therefore,

$$P = 120 - q_1 - q_2$$

We assume that MC = 0. but we (Firm 1) have to take into consideration what the other firm does.

So how does this affect our decision? Profit maximization still requires that we produce until MR = MC.

To get MR, we must first know Total Revenue (TR). It is as follows:

$$TR = 120q_1 - q_1^2 - q_2q_1$$

We can solve for MR=MC to get $MR = 120_1 - 2q_1 - q_2 = 0$

Now we have a problem as we have no definitive answer to our production decision unless we know what the other firm is producing. (And, as you can imagine, the other firm has the same problem.) Firm 1's profit maximizing decision is a function of what Firm 2 is producing.

Remember we derived Firm 2's reaction function = $q_2 = 60 - 0.5q_1$

We can now look once again at TR function:

$$TR = 120q_1 - q_1^2 - (60 - 0.5q_1)q_1 = 60q_1 - 0.5q_1^2$$

From that we can get MR:

$$MR = 60 - q_1$$

We now set MR = MC and solve for q_1 as follows:

$MR = 60 - q_1 = 0$ so q_1 = 60   If q_1 = 60 then q_2 = 60-0.5(60) = 30

The outcome in terms of Price and Profits is:

P^* = 120 – Q = 120 – 60 -30 = 30

π_1^* = 30(60) - 0   = 1800
π_2^* = 30(30) =900

From above we can see that

1) The profit of the leader is higher than in Cournot.
2) Profit of the follower is less than Cournot, but higher than perfect competition.

> Why? Because the leader can commit to a level of output before the other, uses this *commitment* to grab the bulk of the market. The follower reacts non-aggressively to this because of the lack of business-stealing effects in this model.

3) Price above marginal cost

Why? Because both firms act as monopolists on their residual demand curve (as in Cournot)

4) Profit of the leader (and industry) lower than monopoly profit.

TABLE 13.5
Comparison of Oligopoly Models

Model	Industry output Q	Market price P	Industry profit Π
Shared monopoly	$Q_m = a/(2b)$	$P_m = a/(2)$	$\Pi_m = a^2/(4b)$
Cournot	$(4/3)Q_m$	$(2/3)P_m$	$(8/9)\Pi_m$
Stackelberg	$(3/2)Q_m$	$(1/2)P_m$	$(3/4)\Pi_m$
Bertrand	$2Q_m$	0	0
Perfect competition	$2Q_m$	0	0
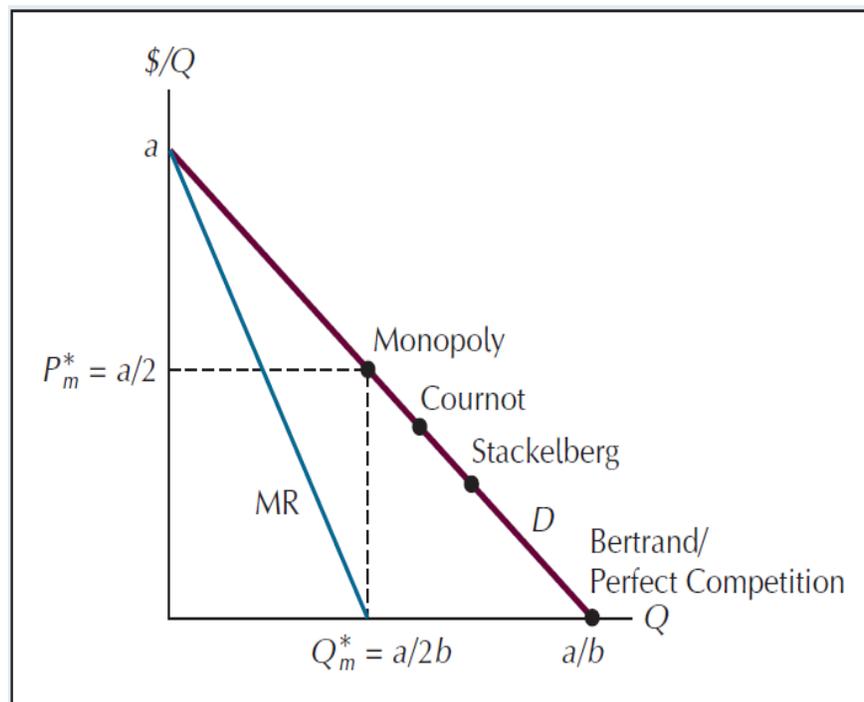
Collusion

Now if you think about what the firms should do, you may realize that there is an incentive to *collude.*

There are only two of them so why compete and drive our profits to zero when we could co-operate with each other and earn economic profits.

This would reduce our industry analysis back to a monopoly situation. The two firms would collectively want to produce 60 and then they can divide up the profits what every way they like (no matter how they divide both sides are better off than competing (collectively producing 80).

What are the problems with collusion (or cartels)?

First, it presumes that they can prevent entry. All of the benefits of the monopoly situation arose because no one else could the industry and acquire those economic profits. In perfect competition, that entry brought profits to zero. So now that they collude and make profits they have to have some way to prevent others from coming in. And that's a tough problem -- just ask OPEC.

Second, once the collusion begins, everyone has an incentive to cheat. They have an incentive to cheat because MR > MC therefore if they produce more a firm can increase its profits. Given that is true for one firm, it's true for all firms -- so if all firms cheat, then all profits are dissipated away and we're back to a competitive outcome.

So what you really want is for everyone else to keep their word and you cheat.

There are also other problems like how do you actually divide up the profits but we'll come back to all this. But, cartels are inherently unstable.