CHAPTER 13 LECTURE – MARKET STRUCTURE AND COMPETITION

Product Differentiation - Product differentiation between two or more products exists when the products possess attributes that, in the minds of consumers, set the products apart from one another and make them less than perfect substitutes. Examples are Pepsi is sweeter than Coke, brand name batteries last longer than "generic" batteries.

Superiority is when one product is viewed as unambiguously better than another so that, at the same price, all consumers would buy the better product.

We call this **Vertical product differentiation**.

Substitutability is when, at the same price, some consumers would prefer the characteristics of product A while other consumers would prefer the characteristics of product B.

This is called **Horizontal product differentiation**.

Type of Market Structures

Types of Market Structures

	Number of Firms			
Product Differentiation	**Many**	**Few**	**One Dominant**	**One**
Firms produce identical products	***Perfect competition*** (Chapter 9) Example: fresh-cut rose market	***Homogeneous*** products oligopoly Example: U.S. light bulb market	***Dominant firm*** Example: U.S. transparent adhesive tape market	***Monopoly*** (Chapter 11) Example: Internet domain name registration[a]
Firm produce differentiated products	***Monopolistic competition*** Example: local physicians markets	***Differentiated products oligopoly*** Example: breakfast cereal market	No applicable theory	

[a]Until 1999.

Four-Firm Concentration Ratio

TABLE 13.2

Four-Firm Concentration Ratios and Herfindahl–Hirschman Indices for Selected U.S. Manufacturing Industries, 2012

Source: U.S. Census Bureau, 2012 Economic Census: Manufacturing Summary and Subject Series, https://www.census.gov/newsroom/press-releases/2015/cb15-tps66.html (accessed July 18, 2019). Public Domain.

Industry	NAICS Code[a]	Total Number of Companies	4CR	HHI
Guided missiles and space vehicles	336414	16	93.3	na[b]
Beer breweries	312120	837	87.8	na
Glass containers	327213	19	86.3	na
Electric lamp bulb and parts	335110	52	83.7	3,395
Light truck and utility vehicles	336112	62	80.8	2,135
Breakfast cereal	311230	37	79.2	2,333
Computer storage devices	334112	105	75.3	3,212
Alumina refining and primary aluminum production	331312	36	73.7	2,089
Dog and cat food	311111	233	67.8	2,019
Ice	312113	308	61.7	1,564
Blank magnetic and optical recording tape	334613	76	57.6	1,194
Cement	327310	116	39.8	632
Curtain and linen mills	314120	1,635	19.7	172
Fabricated structural metal	332312	2,801	14.0	83

[a]NAICS, the North American Industry Classification System, is the system the U.S. Census Bureau uses to classify industries.

[b]For industries with only a few firms, the Census Bureau does not publish the HHI because of confidentiality concerns about disclosing data on the sales of individual companies.

When evaluating market structure metrics, it is important to recognize the geographic scope of an industry. An industry such as cement manufacturing is primarily regional. Although it is not highly concentrated national, in state or regional markets there may be only two or three large firms. By contrast, an industry such as primary aluminum production is global. Although it appears to be relatively concentrated in the United States, U.S. firms compete with firms located all over the world. On a global basis, the industry is more fragmented and may even be approximately perfectly competitive.

Oligopoly

Oligopoly -- A market dominated by many buyers and 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 than that of other models. 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.

Cournot Oligopoly - Augustin Cournot developed the first theory of oligopoly. In a Cournot game, each firm sets its output (quantity) taking as given the output level of its competitor(s), to maximize profits. Price adjusts according to demand and firm's guess about its rival's output determines its residual demand.

Firms act **simultaneously** if each firm makes its strategic decision at the same time, without prior observation of the other firm's decision

Firms act **non-cooperatively** if they set strategy independently, without colluding with the other firm in any way

Thus, assumptions of the model are:

- Firms set outputs (quantities)
- Homogeneous products
- Simultaneous
- Non-cooperative

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 residual demand curve (**this is the market demand not met by other sellers. It is equal to the market demand minus the supply of all other firms demand functions)** may therefore be written:

$P = 120 - (q_1 + q_2)$ or $P = 120 - q_1 - q_2$ $\qquad TR = 120q_1 - q_1^2 - q_1q_2$

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

Reaction Functions

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

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

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

$d\pi_1/dq_1 = 120 - 2q_1 - q_2 = 0$ $\qquad$ 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:

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

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:

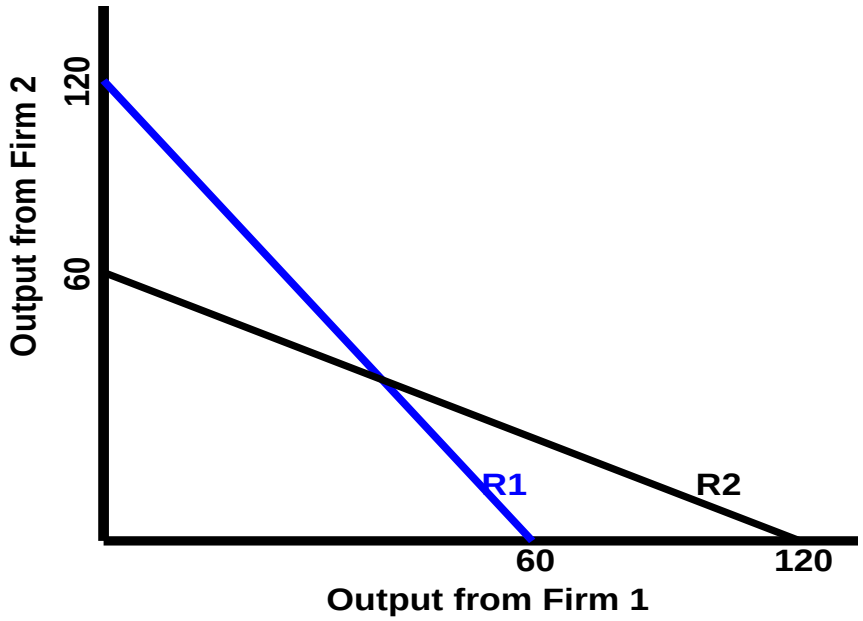
$q_2 = 60 - 0.5(60 - 0.5q_2)$ Solving for q_2 yields: $q_2 = 30 + 0.25q_2$ or $0.75q_2 = 30$ $q_2 = 40$

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 $\pi_1^* = \pi_2^* = 40(40) = 1600$

Computing the Cournot Equilibrium for Two or More Firms with Linear Demand

Suppose that a market consists of N identical firms, the market demand curve is P = a − bQ, and that each firm's marginal cost is c.

Problem: What is the Cournot equilibrium quantity per firm? What are the equilibrium market quantity and price?

Solution: The residual demand curve (**remember this is the market demand not met by other sellers. It is equal to the market demand minus the supply of all other firms**) for any one firm (call it Firm 1) is

$$P = (a - bX) - bQ_1,$$

where X denotes the combined output of the other N − 1 firms.

Thus, Firm 1's marginal revenue curve is $MR = (a - bX) - 2bQ_1$.

To find Firm 1's reaction function, we equate its marginal revenue to marginal cost:

$$(a - bX) - 2bQ_1 = c, \text{ or } \quad Q_1 = \frac{a-c}{2b} - \frac{1}{2}X$$

Since the firms are identical, each will produce the same amount. Thus, the value of X is $N - 1$ times Q_1, so

$$Q_1 = \frac{a-c}{2b} - \frac{1}{2}[(N-1)Q_1]$$

To find the Cournot equilibrium quantity per firm, we solve this equation for Q_1 (which we can rewrite as Q^*, representing the output of any arbitrary individual firm):

$$Q^* = \frac{1}{(N+1)}\left(\frac{a-c}{b}\right)$$

b. Market quantity is N times an individual firm's quantity:

$$Q = \frac{N}{(N+1)}\left(\frac{a-c}{b}\right)$$

To find the equilibrium market price, we substitute this value for Q into the equation for the demand curve:

$$P = a - b\frac{N}{(N+1)}\left(\frac{a-c}{b}\right) = \frac{a}{N+1} + \frac{N}{N+1}c$$

As N gets bigger, $N/(N+1)$ gets closer to 1, which means that the Cournot equilibrium output approaches the perfectly competitive output and the Cournot equilibrium price approaches the marginal cost c.

Comparisons of Cournot, Monopoly, and Competition

Comparison of Equilibria			
Market Structure	**Price**	**Market Quantity**	**Per-Firm Quantity**
Monopoly	$\frac{1}{2}a + \frac{1}{2}c$	$\frac{1}{2}\left(\frac{a-c}{b}\right)$	$\frac{1}{2}\left(\frac{a-c}{b}\right)$
Cournot duopoly	$\frac{1}{3}a + \frac{2}{3}c$	$\frac{2}{3}\left(\frac{a-c}{b}\right)$	$\frac{1}{3}\left(\frac{a-c}{b}\right)$
N-firm Cournot oligopoly	$\frac{1}{N+1}a + \frac{N}{N+1}c$	$\frac{N}{N+1}\left(\frac{a-c}{b}\right)$	$\frac{1}{N+1}\left(\frac{a-c}{b}\right)$
Perfect competition	c	$\frac{a-c}{b}$	Virtually o

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, Bertrand Model give same result as Perfect Competition.

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 is 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.

Monopolistic Competition

Market Structure Characteristics

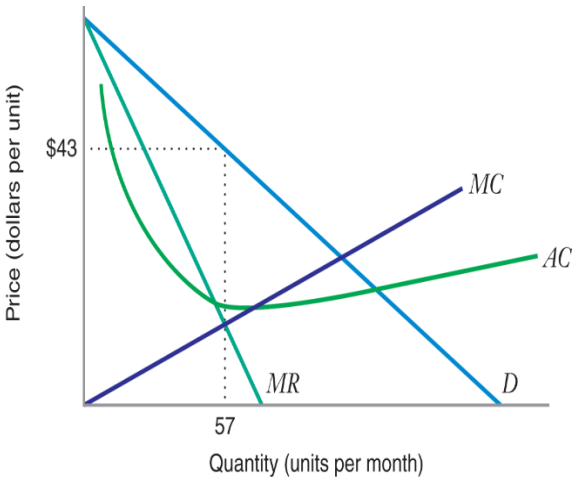
- Many buyers
- Many sellers
- Free entry and exit
- (Horizontal) product differentiation

When firms have horizontally differentiated products, they each face downward-sloping demand for their product because a small change in price will not cause all buyers to switch to another firm's product

Example: restaurants, local markets for doctors

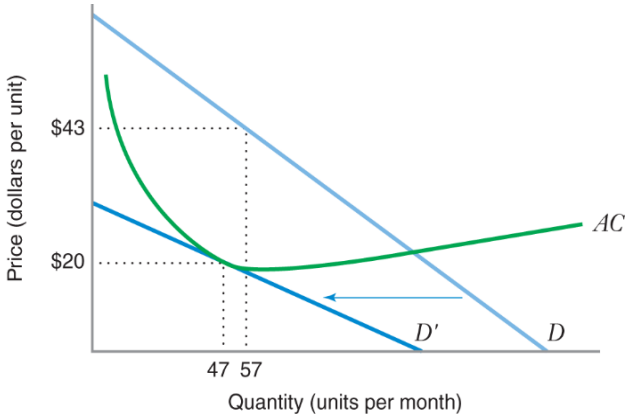
Short-Run and Long-Run Equilibrium in Monopolistically Competitive Markets

Profit Maximization and Short-Run Equilibrium



Each firm faces the demand curve D and maximizes profit at the point where marginal revenue MR equals marginal cost MC, at a quantity of 57 units and a price of $43. This is a short-run equilibrium but not long run, because the price exceeds the firm's average cost AC, indicating profit opportunities that will attract new entrants.

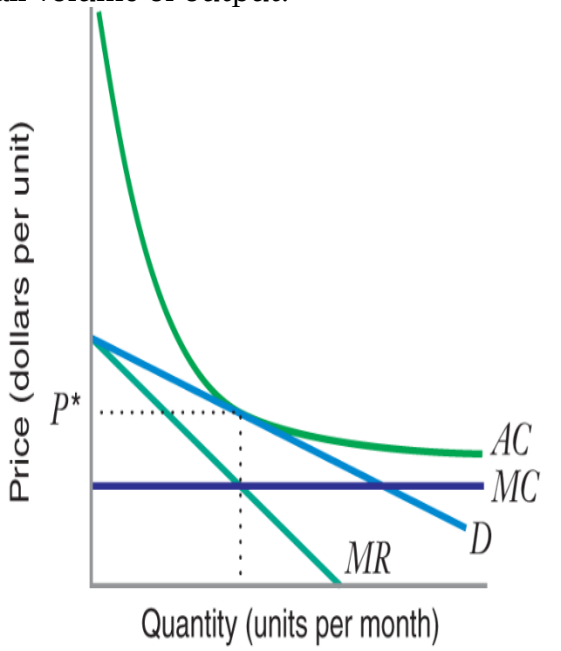
Profit Maximization and Long-Run Equilibrium



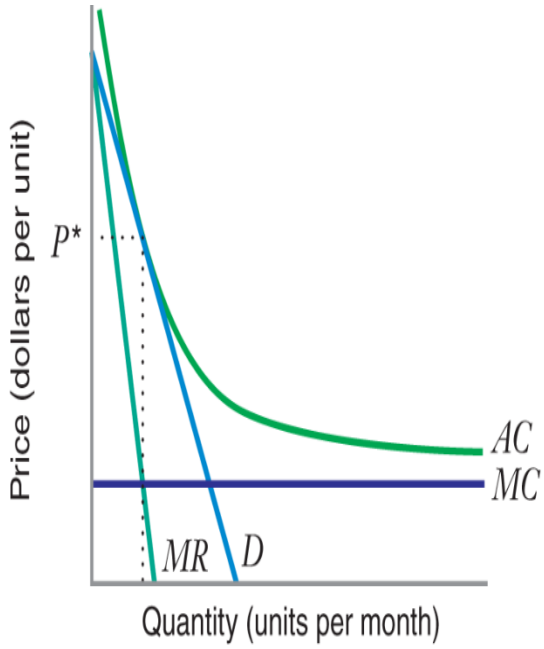
As firms enter the monopolistically competitive market, each firm's demand curve shifts leftward from D to D′. Long-run equilibrium occurs at a price of $20 and a quantity of 47, where D′ is just tangent to the average cost curve AC, and the firm makes zero economic profit.

Price Elasticity of Demand and Long-Run Equilibrium

In Market A, firms face a relatively elastic demand. At the point of long-run equilibrium, the margin P* − MC between price and marginal cost is small, and each firm produces a large volume of output. In Market B, firms face relatively less elastic demand. At a long-run equilibrium, the margin between price and marginal cost is large, and each firm produces a small volume of output.

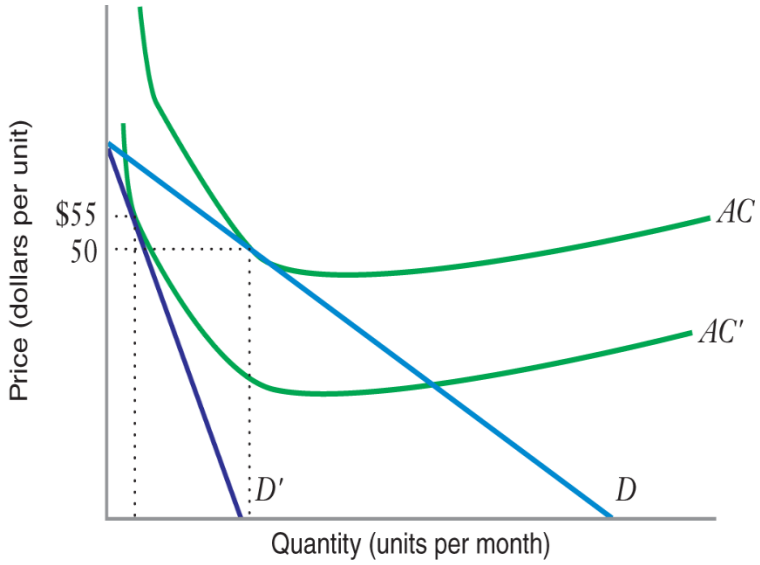


(a) Market *A* firms face relatively elastic demand



(b) Market *B* firms face relatively inelastic demand

Equilibrium Price under Monopolistic Competition In the diagram below, initially, the market is in long-run equilibrium at a price of $50 and with each firm facing the demand curve D. If the average cost curve shifts from AC to AC′, firms start earning positive economic profit. More firms enter the market, shifting each firm's demand curve from D to D′. In the new long-run equilibrium, the price ($55) is higher than before, even with more firms in the market.



The smallest quantity at which AC reaches its minimum is called **full capacity or minimum efficient scale.**

Monopolistically competitive firm operates at less than full capacity in the long run.