Principles of Microeconomics

Prof. Dr. Dennis A. V. Dittrich

Touro College Berlin

2015

Both the slope of the demand curve and the elasticity of demand are measures of how consumers alter their quantities demanded in response to changes in price.

a How are the two concepts different from each other?

b Given a negatively sloped straight-line demand curve, how will slope and elasticity differ?

c Given a vertical or horizontal demand curve, how will they differ?

Consider a competitive market for rolled steel (measured by the ton) with just two firms: SmallCo and BigCo. If we wanted to be more realistic, we could say there were 100 firms like SmallCo and 100 firms like BigCo, but that would just make the math harder without generating any insight.
What is the total cost at each firm of producing each level of output? Fill in the table.

Q	Marginal Cost SmallCo	BigCo
1	$10	$10
2	$20	$10
3	$30	$10
4	$40	$10
5	$50	$20
6	$60	$30
7	$70	$40
8	$80	$50

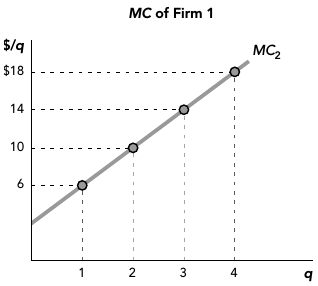
Q	Total Cost SmallCo	BigCo

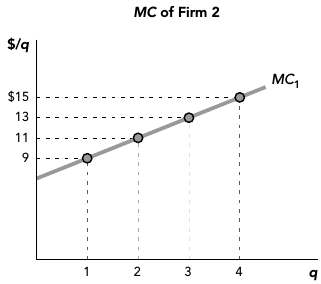
b. What's the cheapest way to make 11 tons of steel? 5 tons?

c. What would the price have to be in this competitive market for these two firms to produce a total of 11 tons of steel? 5 tons?

d. Suppose that a government agency looked at BigCo and SmallCo's cost curves. Which firm looks like the low-cost producer to a government agency? Would it be a good idea, an efficient policy, for the government to shut down the high-cost producer? In other words, could a government intervention do better than the invisible hand in this case?

e. Let's make part d more concrete: What would the total cost be if BigCo were the only firm in the market, and it had to produce 7 tons of rolled steel? What would marginal and total cost be if SmallCo and BigCo let the invisible hand divvy up the work between them?





Which firm produces the first unit of industry output? Which firm produces the second unit of industry output? Why?

Quantity	Industry-Wide MC
1	$6
2	$9
3	
4	
5	
6	
7	

In the following diagram, label the marginal revenue curve, the profit-maximizing price, the profit-maximizing quantity, the profit, and the deadweight loss.

a What's the rule: Monopolists charge a higher markup when demand is highly elastic or when it's highly inelastic?

b What's the rule: Monopolists charge a higher markup when customers have many good substitutes or when they have few good substitutes?

c For the following pairs of goods, which producer is more likely to charge a bigger markup? Why?

  i Someone selling new trendy shoes, or someone selling ordinary tennis shoes?

  ii A movie theater selling popcorn or a New York City street vendor selling popcorn?

  iii A pharmaceutical company selling a new powerful antibiotic or a firm selling a new powerful cure for dandruff?

A dry cleaner has a sign in its window: "Free Internet Coupons." The dry cleaner lists its Web site, and indeed there are good discounts available with the coupons. Most customers don't use the coupons.

a What probably would be the main difference between customers who use the coupons and those who don't?

b Some people might think "The dry cleaner offers the coupons to get people in the door to try the place out, but then the customers will pay the normal high price afterward." But the coupons are always there, so even repeat customers can keep using the coupons. Is this a mistake on the business owner's part? Hint: Think about marginal cost.

Game Theory and the Economic Way of Thinking

- Game theory is formal economic reasoning applied to situations in which decisions are interdependent
- Game theory is a very flexible tool that allows us to develop more precise models of situations that involve strategic interactions
- Game theory models are more flexible than the standard economic models
- Game theory is a framework to use in understanding real-world events

Applications of Game Theory

- Economic Decisions
  - Oligopoly, Cartels
  - Externalities
- Political Decisions
  - Strategic decisions within countries and of countries on an international level
- Social Interactions
  - Public Goods

Normal Form Games

Normal Form Games

In a normal form game all agents decide simultaneously.
A normal form game consists of

- the set of players
- the set of strategies for each player
- a function assigning payoff to each strategy combination

Two Person Normal Form Games

Payoff matrix

		Player B	
		L	R
Player A	U	$3, 9$	$1, 8$
	D	$0, 0$	$2, 1$

The first term denotes the payoffs of the row player A; the second term denotes the payoffs of the column player B.

Which strategy combination should we expect?

Nash Equilibrium

Nash Equilibrium

A Nash equilibrium is a strategy combination under which no player has an unilateral incentive to deviate.

- No player can obtain a higher playoff by deviating
- In equilibrium the strategy choice of a player is his best reply to the strategy choices of all other players and vice versa
- Nash equilibria are the only strategic stable states

Two Person Normal Form Games

Payoff matrix

		Player B	
		L	R
Player A	U	$3,9$	$1,8$
	D	$0,0$	$2,1$

Best replies:
If B chooses L A's best reply is U.
If B chooses R A's best reply is D.
If A chooses U B's best reply is L.
If A chooses D B's best reply is R.

There are two Nash equilibria: (U, L) and (D, R).

Which equilibrium is more plausible, (U, L) or (D, R)?

The theory does not tell us anything about this!

Other factors may influence which equilibrium is more likely.

Prisoner's Dilemma

- The Prisoner's Dilemma is a typical example for a two person normal form games
- Two prisoners are interrogated independently and simultaneously. They jointly committed a crime. Both can either confess ("C") or stay silent ("S").

		Mr. White	
		S	C
Mr. Brown	S	$-5,-5$	$-30,-1$
	C	$-1,-30$	$-10,-10$

Prisoner's Dilemma

Dominant Strategy

A dominant strategy is always optimal independent of the action of the other players.

		Mr. White	
		S	C
Mr. Brown	S	$-5,-5$	$-30,-1$
	C	$-1,-30$	$-10,-10$

- C is a dominant strategy for both players.
- There is only one Nash equilibrium: (C,C).
- In this equilibrium the payoffs are not maximized!
- If they coordinate on (S,S) both could obtain a better payoff. (S,S) is not an equilibrium!

Nash Equilibrium and Dominant Strategies

Dominant Strategies

- I do the best – independent of what you are doing.
- You do the best – independent of what I am doing.

Nash Equilibrium

- I do the best I can do given what I expect you to do.
- You do the best you can do given what you expect me to do

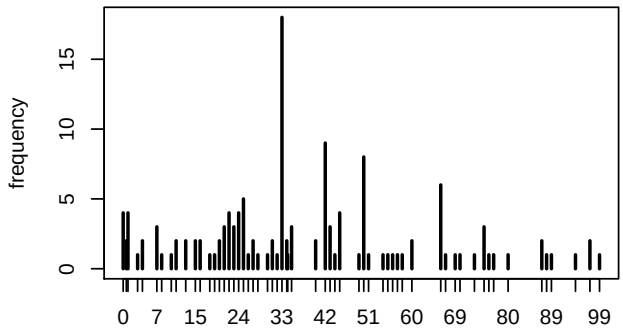
The Two-Thirds Game

- Each player chooses a number between 0 and 100, and the person who chooses 2/3 of the average chosen by the class wins

The Two-Thirds Game – or the Beauty Contest

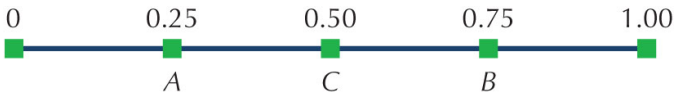
- Each player chooses a number between 0 and 100, and the person who chooses 2/3 of the average chosen by the class wins
- If people choose randomly, the average would be 50, 2/3 of which is 33, so the person choosing 33 would win
- If other people reason the same way, and choose 33, then the winning number is 22, 2/3 of 33
- If the roll-back reasoning continues, the winning number gets smaller and smaller, and the Nash equilibrium is zero

The Two-Thirds Game – or the Beauty Contest



Location Game

- Two competitors Y and C sell soft drinks on a beach
- The beach is 200 meters long.
- The sun worshippers are uniformly distributed over the whole range of the beach
- Both competitors charge the same price
- Consumers buy at the seller closest to them



Which location do the competitors choose (i.e. where is the Nash equilibrium)?

Oligopoly – characteristics

- Small number of firms
- Identical or (imperfectly) differentiated products
- Market entry barriers
  - "natural"
    - economies of scale
    - patents
    - brand names
  - "strategic"
    - market saturation
    - control of an essential input

Examples

- Automobile
- Steel, Aluminum
- Computer

Equilibrium

- In an oligopoly all producers have to consider the reaction of their competitors to their own decisions (price or quantity choice)

Definition of the equilibrium

- All firms assume that each competitor considers the decisions of all involved parties
- All firms act in their best possible way and no firm has an incentive to change its price or quantity

Models of Oligopoly Behavior

- There is no single model of oligopoly behavior
- An oligopoly model can take two extremes:
  - The cartel model is when a combination of firms acts as if it were a single firm and a monopoly price is set
  - The contestable market model is a model of oligopolies where barriers to entry and exit, not market structure, determine price and output decisions and a competitive price is set
- Other models of oligopolies give price results between the two extremes

Oligopoly – Duopoly

- In any oligopoly we have to discriminate between whether decisions are made simultaneously or sequentially and whether firms compete by setting prices or by setting quantities
- To keep things simple we look only at duopolies. All conclusions also apply to more general oligopolies.

Taxonomy of duopolies

	Decisions of competitors: simultaneously	sequential
Quantity	Cournot	Stackelberg
Price	Bertrand	sequential price setting

Cournot equilibrium

- The Cournot equilibrium is characterized as the mutual best reply to the output level decision of the competitor.
- No firm has an incentive to deviate from the equilibrium output level.
- A tuple of output levels (y_1^*, y_2^*) is a Cournot-Nash equilibrium if

$$y_1^* = B_1(y_2^*) \quad \text{and } y_2^* = B_2(y_1^*)$$

with B being the best reply function

Cournot-Oligopoly – mark-up rule
1.) Mark-up rule of a monopolist

- Goal: general formula for the relation of equilibrium price and the number of oligopolists
- Like the monopolist the oligopolist maximizes his profits at MR=MC.
- For monopolies we know the mark-up rule

$$R = PQ \qquad \text{revenue}$$

$$MR = \frac{\partial R}{\partial Q} = P + Q\frac{\partial P}{\partial Q}$$

$$= P(1 + \frac{Q}{P}\frac{\partial P}{\partial Q})$$

$$\epsilon = \frac{P}{Q}\frac{\partial Q}{\partial P} \qquad \text{price elasticity of demand}$$

$$MC = MR = P(1 + 1/\epsilon)$$

$$P = \frac{MC}{1 + 1/\epsilon} > MC = MR$$

Cournot-Oligopoly – mark-up rule

- The more elastic the demand the closer is the monopoly price to marginal costs
- It can be shown that on a market with n identical oligopolists $\epsilon_r = n\epsilon$ with ϵ being the total demand elasticity
- Thus, for (symmetric) oligopolies:

$$MC = MR = p\left[1 + \frac{1}{n\epsilon}\right]$$

$$p = \frac{MC}{1 + 1/n\epsilon}$$

- For $n = 1$ we have a monopoly and the known mark-up rule results
- The bigger the number of oligopolists n the lower the price (closer to MC).
- For n "very big" the second term of the denominator goes to 0 and we obtain the equilibrium condition of a perfect competitive market $p = MR = MC$.

Price competition – Betrand competition

- In an oligopolistic industry competition can be, of course, via prices instead of via quantities.
- A Duopoly, in which both firms simultaneously set their prices for an (near) identical good is called Bertrand Duopoly.
- The Bertrand model is used to analyze price competition in oligopolistic industries with identical or differentiated goods.
- Price competition with differentiated products:
  The market share of a firm does not only result from its prices but also from differences in
  - design,
  - performance,
  - durability, etc.

Competition vs. Collusion

Prisoner's dilemma

Payoff matrix for the price setting game

	Price	Firm 2: 4	Firm 2: 6
Firm 1	4	12, 12	20, 4
	6	4, 20	16, 16

Question: Why do both firms charge only 4 Euro even though they could increase their profits if both charged 6 Euro?

- Both firms play a *non-cooperative game*.
- Each firm optimizes its decision by considering the behavior of his competitor.

Price signaling & price leadership – A Cartel Model

- In some oligopolistic industries a tacit agreement between firms emerges after a period of stable price setting patterns. The firms begin to collude.
- In other oligopolistic industries competitors remain aggressive and no tacit agreement emerges. The firms keep competing.

Price signaling

Tacit agreement under which one firm can expect that other firms will follow if it announces a price change.

Price leadership

Price formation pattern under which one and the same firm regularly announces new prices that other firms accept and implement themselves afterwards

Competition vs. Collusion - A Cartel Model

Best price policy

Payoff matrix for the price setting game

		Firm 2	
	Price	4	6
Firm 1	4	12, 12	20, 4
	6	4, 20	16, 16

Payoff matrix for the price setting game with best price policy

		Firm 2	
	Price	4	6
Firm 1	4	12, 12	12, 12
	6	12, 12	16, 16

Competition vs. Collusion – The Cartel Model

- A best price policy promising the customer that he can buy the good always at the lowest price any (nearby) competitor charges for the good is a coordination device of a high price cartel. The customer has to pay a higher price than without the best price policy.

Implicit Price Collusion

- Explicit (formal) collusion is illegal in most countries while implicit (informal) collusion is permitted
- Implicit price collusion exists when multiple firms make the same pricing decisions even though they have not consulted with one another
- Sometimes the largest or most dominant firm takes the lead in setting prices and the others follow

New Entry as a Limit on the Cartelization Strategy and Price Wars

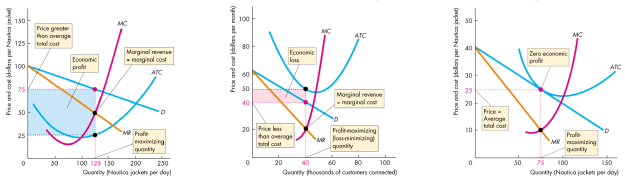
- The threat of outside competition limits oligopolies from acting as a cartel
- The threat will be more effective if the outside competitor is much larger than the firms in the oligopoly
- Price wars are the result of strategic pricing decisions gone wild
- A predatory pricing strategy involves temporarily pushing the price down in order to drive a competitor out of business

Characteristics of Monopolistic Competition

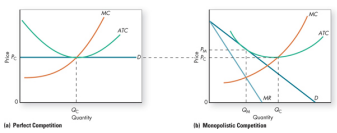
Four distinguishing characteristics:

1. Many sellers that do not take into account rivals' reactions
2. Product differentiation where the goods that are sold aren't homogeneous
3. Multiple dimensions of competition make it harder to analyze a specific industry, but these methods of competition follow the same two decision rules as price competition
4. Ease of entry of new firms in the long run because there are no significant barriers to entry

Output, Price, and Profit of a Monopolistic Competitor



- Like a monopoly,
  - The monopolistic competitive firm has some monopoly power so the firm faces a downward sloping demand curve
  - Marginal revenue is below price
  - At profit maximizing output, marginal cost will be less than price
- Like a perfect competitor, zero economic profits exist in the long run



Comparing Monopolistic Competition with Monopoly

- It is possible for the monopolist to make economic profit in the long run because of the existence of barriers to entry
- No long-run economic profit is possible in monopolistic competition because there are no significant barriers to entry
- For a monopolistic competitor in long-run equilibrium,

$$(P = ATC) \geq (MC = MR)$$

Advertising

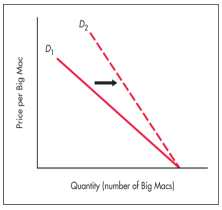
What functions does advertising serve?

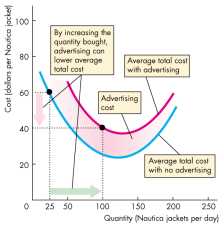
Advertising

- "Informative" Advertising:
  price, quality and availability information
- Advertising as Signaling
  "If they are spending so much money on advertising for this product, they must expect it to be profitable and around a long time. Must be good."
- Advertising as Part of the Product:
  Even if NO information is given, does "Branding" make the product more enjoyable?

Advertising and Monopolistic Competition

- Perfectly competitive firms have no incentive to advertise, but monopolistic competitors do
- The goals of advertising are to increase demand and make demand more inelastic
- Advertising increases ATC
- The increase in cost of a monopolistically competitive product is the cost of "differentness"





Essay 2

Both employer and employee are required by law to contribute (about) the same percentage of before-tax wages to the Social Security fund (in Germany, the USA, etc.).

A politician demands that only employers pay these contributions to the Social Security fund.

Write a brief essay discussing the merits and reasonableness of this demand. Your audience will not include economists (so you will have to explain all economic concepts that you use) but will consists of people who expect the standard scientific structure, approach, and style.

Further instructions will be posted on the web page.
Deadline: May 21st