

INTRODUCTION TO FIRMS AND MARKETS

7MHPH010 – Health Economics and Health Policy

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INTRODUCTION TO FIRMS AND MARKETS

OUTLINE

- Perfect Competition
- Monopoly
- Monopolist Competition
- Oligopoly
- Market Concentration

PERFECT COMPETITION

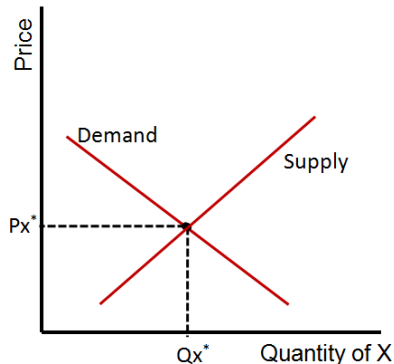
CHARACTERISTICS OF PERFECT COMPETITION

- A perfectly competitive market exists when each firm is a price taker and no individual participant (buyer or seller) can influence the market price
- Specific characteristics may include the following
 - Large number of sellers and buyers
 - Firms produce a homogeneous product
 - Perfect factor mobility
 - Firms maximize profits
 - No barriers to entry or exit
 - All economic agents possess perfect information
 - Firms face nondecreasing average costs of production

PERFECT COMPETITION

MARKET PRICE

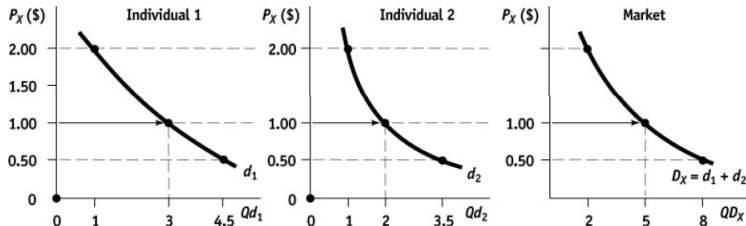
- Market price determined where aggregate demand intersects industry supply
 - Aggregate demand: horizontal aggregation of individual demand curves
 - Aggregate supply: horizontal aggregation of individual firm supply curve
- Where does market demand and supply come from?



MARKET DEMAND CURVE

HORIZONTAL AGGREGATION OF INDIVIDUAL DEMAND CURVE

- Market demand curve is the horizontal aggregation of individual demand curves
 - Announce a price and for that specific price add the quantities that each individual is willing to purchase
 - Repeat the process for different prices to trace out the aggregate demand curve



PERFECT COMPETITION

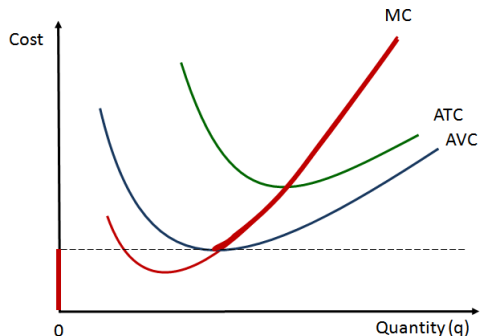
SHORT-RUN COMPETITIVE INDUSTRY SUPPLY

- An individual firm's supply curve is the portion of MC curve above the minimum point of the average variable cost curve (AVC)
- A market supply curve is the *horizontal* summation of of the individual firm supply curves
 - Announce a price and then add together the amounts each firm is willing to supply at that price
 - Additional points on the industry supply curve are generated by pairing prices with sums of individual firm supplies at those prices

SUPPLY CURVE

SHORT-RUN SUPPLY CURVE OF A PERFECTLY COMPETITIVE FIRM

- A competitive firm's supply curve is the MC curve above the minimum point of AVC

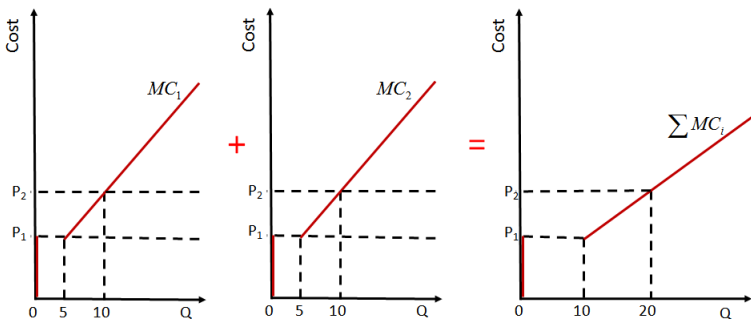


- Average total cost, ATC, equals the sum of average variable cost, AVC, and average fixed cost, AFC
- AFC is reflected in the vertical distance between the ATC and AVC
- MC cuts both of the average cost curves at their minimum points
- MC lies above the AVC and ATC curves when they are rising and below them when they are falling

SUPPLY CURVE

SHORT-RUN COMPETITIVE INDUSTRY SUPPLY

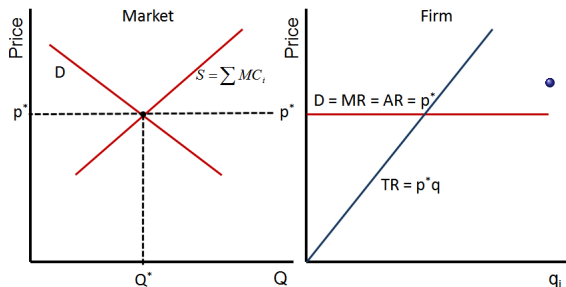
- Market supply curve is the horizontal aggregation of individual firm's supply curves (i.e., portions of short run MC curve above the min AVC)
 - Announce a price and for that specific price add the quantities that each firm is willing to supply
 - Repeat the process for different prices to trace out the industry supply curve



PERFECT COMPETITION

MARKET AND FIRM DEMAND CURVE

- The market demand curve is left to right downward sloping
- The short run market supply curve is the horizontal summation of the relevant portion of individual MC curves
- Market price is determined where the two curves intersect
- The demand curve faced by an individual firm is perfectly elastic – it is the horizontal line at the market price level



- The horizontal line is the demand for an individual firm – it is also the average revenue (AR) and the marginal revenue (MR) curve for a competitive firm
- Total, Average and Marginal Revenue (TR,AR,MR)

$$TR = p^* q$$

$$AR = \frac{TR}{q} = \frac{p^* q}{q} = p^*$$

$$MR = \frac{\Delta TR}{\Delta q} = \frac{\Delta(p^* q)}{\Delta q} = p^*$$

PERFECT COMPETITION

PROFIT MAXIMIZATION

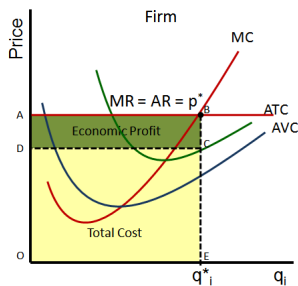
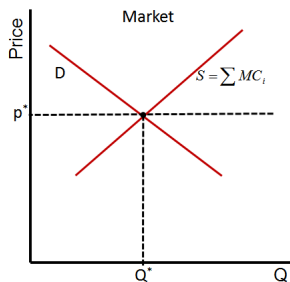
- Profit (Π) is maximized when the difference between TR and TC is maximum
 - A competitive firms total revue (TR) is given by $TR = p \times q$
 - The total cost (TC) is given by $TC = ATC \times q$
 - A competitive firm takes the price as given, i.e., p does not change with output
 - The firm chooses q such that $TR - TC$ is maximum
 - This happens when output q is chosen such that $AR = p = MC$
- Thus the profit maximizing condition for a competitive firm is

$$p = MC$$

PERFECT COMPETITION

SHORT RUN EQUILIBRIUM

- In the short-run, a competitive firm can make a profit ...

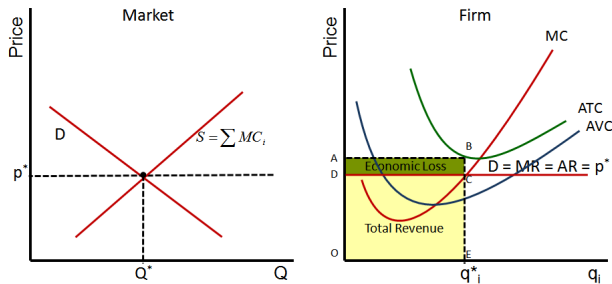


- Firm chooses output q_i^* where $p^* = MC_i$
- If the market price is greater than ATC at that output, the firm makes a positive economic profit
- $TR = pq = \text{Area OABE}$
- $TC = ATC \times q = \text{Area ODCE}$
- $\Pi = TR - TC = \text{Area DABC}$ (economic profit is positive)

PERFECT COMPETITION

SHORT RUN EQUILIBRIUM

- In the short-run, a competitive firm can make a loss ...

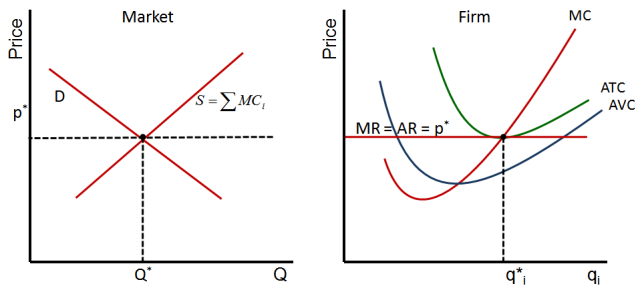


- If the market price is lower than ATC at that output, the firm makes a negative economic profit (loss)
- Firm chooses output q_i^* where $p^* = MC_i$
- $TR = pq = \text{Area ODCE}$
- $TC = ATC \times q = \text{Area OABE}$
- $\Pi = TR - TC = \text{Area DABC}$ (economic profit is negative)

PERFECT COMPETITION

LONG RUN EQUILIBRIUM

- In the long-run, a competitive firm makes zero economic profit



- The earlier situation of positive economic profits cannot be sustained
- Arrival of new firms or expansion of existing firms (if returns to scale are constant) causes the horizontal demand curve of each firm to shift down (industry supply curve moves out)
- The final outcome is that horizontal demand curve will touch the average total cost curve at its minimum point
- In the long run, a competitive firm will only make normal profit (zero economic profit)

MONOPOLY MODEL

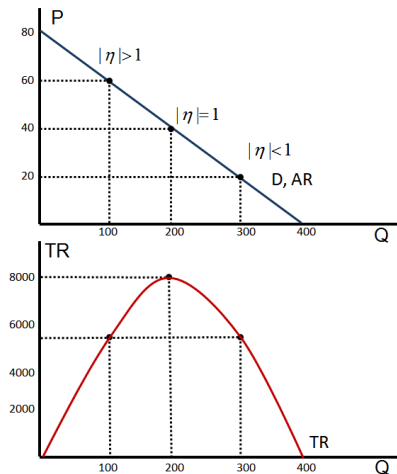
CHARACTERISTICS OF MONOPOLY

- In contrast to perfect competition, a monopoly market has the following features
 - One seller
 - Homogeneous or differentiated product
 - Complete barriers to entry
 - Exclusive control over inputs
 - Economies of scale
 - Patents
 - Government licence or franchise
- Because there is only one firm, the monopolist faces the market demand curve, which is downward sloping

MONOPOLY MODEL

DEMAND CURVE AND TOTAL REVENUE

- Because there is only one firm, the monopolist faces the market demand curve, which is downward sloping



- Unlike the competitive firm, the price is different for each level of output
- The total revenue curve (TR) first increase, reaches a maximum and then decreases
- Total revenue is maximum when the elasticity of demand is 1
- The firm wants to maximize profit, not revenue
- Thus, it must maximize the difference between the total revenue and total cost
- This is done when the revenue of the last unit is equal to the cost of the last unit, i.e., $MR = MC$
- What does the monopolists MR curve look like?

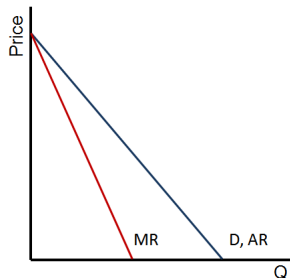
MONOPOLY MODEL

MARGINAL REVENUE

- Total Revenue: $TR = pq$
- Marginal Revenue – change in total revenue with respect to output q

$$MR = \frac{\Delta TR}{\Delta q} = \frac{\Delta(pq)}{\Delta q} = p + q \frac{\Delta p}{\Delta q}$$

- Because the second term in this formula represents a revenue loss, it is always negative
- Thus, at each level of output, marginal revenue is always lower than price
- The marginal revenue curve lies under the demand curve
- If the demand curve is linear, the MR curve will have the same intercept but twice the slope
- For example, if demand is given by $p = 10 - 2q$ then MR will be given by $MR = 10 - 4q$



- An additional useful characterization of MR is in terms of the elasticity of demand $MR = p(1 - \frac{1}{|\eta|})$

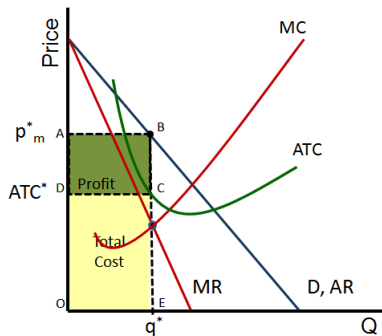
MONOPOLY MODEL

PROFIT MAXIMIZATION

- Profit maximization – a monopolist (facing a downward demand curve) maximizes profit when

$$MR = MC$$

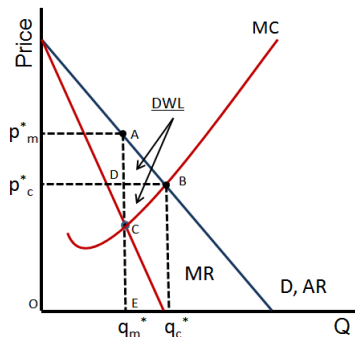
- Output is set at q^* , where $MR(q) = MC(q)$ – the monopolist's price (p_m^*) is determined on the demand curve corresponding to q^*
- $TR = p^*q^* = \text{Area OABE}$
- $TC = ATC(q^*)p^* = \text{Area ODCE}$
- $\Pi = TR - TC = \text{Area ABCD}$
- In the long-run, profit $\Pi \geq 0$
 - $\Pi \geq 0$ because $p \geq ATC$
 - $p > MC = MR$ (allocative inefficiency)
 - The firm is not producing quantity where ATC is at its minimum (productive inefficiency)



MONOPOLY VS. PERFECT COMPETITION

OUTPUT AND PRICE

- Monopoly price is higher than that under perfect competition while output under monopoly is lower than that under perfect competition
- In perfect competition (PC), price is determined by market demand curve and supply curve
- In PC, output will be determined where $p = MC$ (i.e. at q_c^*)
- For a monopolist, MR is below the demand curve
- Under monopoly, output will be determined where $MR = MC$ (i.e., at q_m^*)
- Compared to PC, consumers lose surplus equal to the amount ADB and producers lose surplus equal to the amount CDB
- Total dead weight loss (DWL) under monopoly is the triangle ACB
- The higher price and lower output in a monopolized market is why economists claim that competition is better for social welfare



MONOPOLY VS. PERFECT COMPETITION

PROFIT MAXIMIZING MARKUP

- Recall that $MR = p(1 - \frac{1}{|\eta|})$
 - The expression above tells us that the less elastic the demand, the more price will exceed the marginal revenue
 - In the limiting case of infinite price elasticity (competitive case), marginal revenue and price are exactly the same
- A monopolist produces where $MR = MC$
- Combine the previous two expressions, to obtain a monopolists markup
- Profit maximizing markup for a monopolist

$$\frac{p - MC}{p} = \frac{1}{|\eta|}$$

- Example: if the elasticity of demand were -2, the markup over the marginal cost would be $1/2 \Rightarrow$ price is twice the marginal cost
- Profit-maximizing markup grows smaller as demand grows more elastic
- In the limiting case of infinitely elastic demand, the markup is zero, i.e., $p = MC$ which the same as the perfectly competitive case

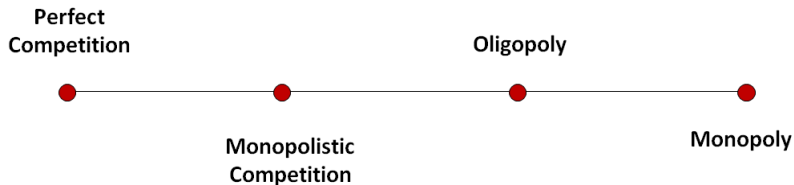
MONOPOLY MODEL

BARRIERS TO ENTRY

- A monopoly only maintains its status if there are no substitutes for the product it sells – thus there must be barriers to entry, so that other firms cannot enter the market to compete
- The two most common barriers to entry
 - Economies of scale
 - If a monopoly is producing output at a level where long run average costs are declining, then new firms cannot compete on a cost basis
 - A monopoly hospital in a small town may have substantial economies of scale if it can meet demand with only 40-50 beds
 - Unless a new hospital could take away a substantial share of the existing hospitals patients, it could not match the existing hospital in costs (and therefore profits as well)
 - Legal restrictions
 - Physicians require a license to practice medicine
 - Many states require that providers obtain a Certificate of Need to offer a new service
 - Drug companies obtain patents for new pharmaceutical products

THE MARKET STRUCTURE CONTINUUM

- We have talked about 2 extremes of the market structure continuum
 - Perfect Competition
 - Pure Monopoly
- Along this continuum, there are 2 more levels of competitiveness that we will encounter in the health care sector



MONOPOLISTIC COMPETITION

CHARACTERISTICS

- Monopolistic competition has characteristics of both competition and monopoly
- Characteristics similar to perfect competition
 - Many buyers and sellers
 - Free entry and exit in long run
 - Perfect knowledge
- Characteristics similar to monopoly
 - Product differentiation
 - Independent decision making
 - Each company faces a downward sloping demand curve
 - Market power
- Examples
 - Breakfast cereals
 - Ibuprofen (Advil, Motrin, etc.)
 - Cigarettes

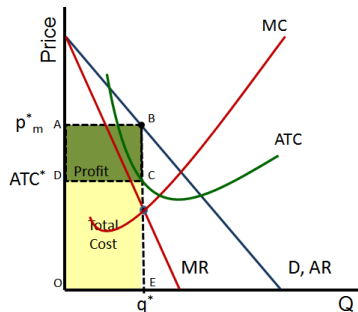
MONOPOLISTIC COMPETITION

PRICE SETTING AND PROFITS

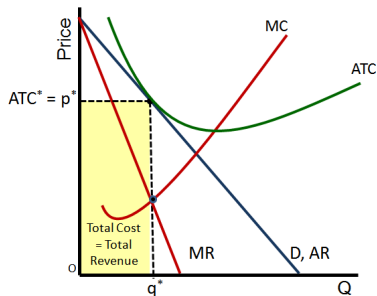
- In the short-run
 - Marginal revenue is always less than demand
 - Profit is maximized where $MR = MC$
 - Profit = (price - average total cost) * quantity
 - The short-run equilibrium in monopolistic competition is the same as for a monopolist, and firms may make positive, zero, or negative profits in the short run
- In the long-run
 - In the long run, entry and exit are both possible
 - If profit is greater than zero, more firms will enter, and each company's market share will fall because of more variety – as a result, each company's demand curve will decrease, along with price and quantity
 - If profit is less than zero, firms will exit, and each incumbent's market share will increase – this will cause the remaining firms' demand curves to increase, along with the price and quantity
 - If profit is equal to zero, there will be no entry into or exit from the industry – in the long run, all firms make zero economic profit

MONOPOLISTIC COMPETITION

PRICE SETTING AND PROFITS



- Short-run
- Output where $MR = MC$
- $p^* > MC$
- Positive (or negative profit) is possible

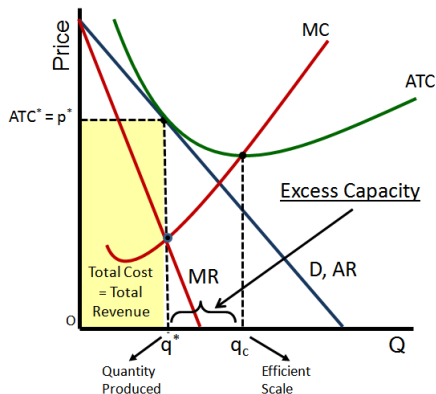


- Long-run
- Output where $MR = MC$
- $p^* > MC$
- Due to entry/exit, demand curve faced by a firm shifts until it is just tangent to long-run ATC, $\Pi_i = 0$

MONOPOLISTIC COMPETITION

EXCESS CAPACITY

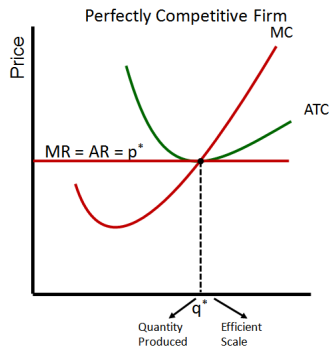
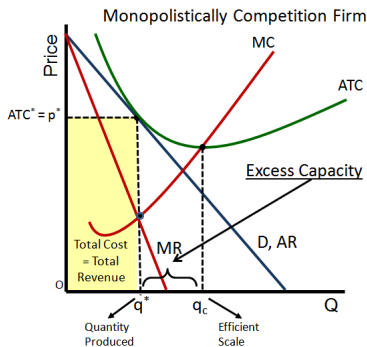
- A firm has **excess capacity** if it can reduce its average cost by raising its output
- Monopolistically competitive firms have excess capacity in long-run equilibrium
- Average costs could be decreased by reducing product variety



MONOPOLISTIC VS PERFECT COMPETITION

EXCESS CAPACITY AND MARKUP

- For a monopolistically competitive firm, price exceeds marginal cost (and $\Pi = 0$)
- There is excess capacity in monopolistic competition in the long run
- In monopolistic competition, output is less than the efficient scale of perfect competition
- For a competitive firm, price equals marginal cost (and $\Pi = 0$)
- There is no excess capacity in perfect competition in the long run
- Free entry results in competitive firms producing at the point where average total cost is minimized, which is the efficient scale of the firm



MONOPOLISTIC COMPETITION

PRODUCT DIFFERENTIATION AND ADVERTISING

- How do sellers differentiate their product?
 - Advertising
- Is advertising bad for consumers?
 - Creates imaginary or artificial wants
 - Persuasive, not informative
 - Business stealing, w/ no benefits to consumer
 - Habit buying is a barrier to entry
- Benefits of advertising
 - May convey important information on value of a good or service
 - People benefit from real diversity & choice
 - Cheap information to customers to distinguish b/w products
 - May promote quality competition
 - Firms willing to invest in creating a brand name reputation will work to keep it
 - May inform the consumer of good or service they were not aware of before
 - Shifts out the demand curve

MONOPOLISTIC COMPETITION

DTC DRUG ADVERTISING

- August 1997, FDA permitted brand-specific direct-to-consumer (DTC) advertising w/o brief summary of drug effectiveness, side effects, and contraindications
- DTC advertising rose from \$800m in 1996 to \$2.5b in 2000
- Iizuka & Jin, 2003
 - Track monthly expenditures on DTC advertising for 1994-2000
 - Also track monthly visits to the doctor in a recurring national survey for 1994-2000
 - Survey indicates whether a drug was prescribed during the visit, and for what class
 - Found that classes of drugs w/ heavy advertising had large increase in prescribing
 - Classes of drugs w/ less advertising had no increase in prescriptions
 - After deregulation, each \$1 increase in DTC Ads raises # of visits w/ a prescription by .0464

OLIGOPOLY

CHARACTERISTICS

- Few, dominant sellers
- Homogeneous or differentiated product
- Substantial barriers to entry
- Because there are only a few dominant sellers, actions of any one firm can change the overall market price
- Like monopoly, oligopoly will lead to lower output and higher prices than would be observed under perfect competition
- Examples
 - Tertiary services at teaching hospitals
 - Many prescription drugs

OLIGOPOLY

OLIGOPOLISTIC BEHAVIOR IN MEDICAL CARE MARKETS

- \$2 billion blood banking industry
 - Late twentieth century
 - Two dominant not-for-profit firms
 - American Red Cross – 46% of the nations blood banking business
 - Americas Blood Centers (ABC) – 47%
 - None held monopoly power locally
 - 1998, American Red Cross
 - Aggressive behavior: entered new regional markets – 65%
 - Competitive oligopoly model
 - Local markets
 - Where both firms coexisted: Lower price of blood than in regions where only one firm operated

OLIGOPOLY

OLIGOPOLISTIC BEHAVIOR IN MEDICAL CARE MARKETS

- Johnson and Johnson (J&J): stent
 - 1997, J&J - dominant firm
 - 95% of the \$600 million stent market (patent protection)
 - 1998, stent market: \$1 billion; J&J held 8%
 - J&J angered key customers
 - Rigid pricing for its \$1,600 stent
 - Refusing discounts even for hospitals that purchased more than \$1 million worth of stents per year
 - Buyers (cardiologists)
 - Pressure FDA to approve new stents as quickly as possible
 - Helped quicken the approval process
 - Willingly testing the stents offered by new firms
 - Guidant Corporation
 - 45 days after its patent was approved
 - Controlled 70% of sales in the stent industry

RELEVANT MARKET

MEASURING CONCENTRATION & IDENTIFYING MARKET POWER

- Better understand & predict market behavior and performance
- Determine – precise boundaries of a market
- Determine – precise product being bought & sold
- How many sellers of that particular product are located in the market area
- Theoretical issues and practical limitations when defining markets
- How market concentration and market power are measured in practice

RELEVANT MARKET

RELEVANT PRODUCT AND GEOGRAPHICAL MARKETS

- Market – two dimensions
 - Relevant product market (RPM)
 - Relevant geographical market (RGM)
- Relevant product market (RPM)
 - Various goods and services
 - That a set of buyers might switch to
 - If the price of any one good /service increases
 - Substitutability
 - General and family practitioners
- Relevant geographical market (RGM)
 - Establishes the spatial boundaries in which a set of buyers purchase their products
 - Local – physician, nursing home care, acute hospital care, and dialysis services
 - Regional – tertiary care hospitals, health insurance
 - National – prestigious medical academic centers
 - International – pharmaceuticals, medical devices
 - Include all of the seller locations to which buyers might switch

MEASURING MARKET CONCENTRATION

CONCENTRATION RATIO

- Percentage of industry output produced by the largest firms in an industry
- CR_4 = sum of market shares of the four largest firms (sales, volume of output, or employment)
 - Between 0 and 100%
 - Highly concentrated industry
 - High CR_4
 - The largest four firms account for a larger share of industry output
- Industry classifications (number & size distribution)
 - $CR_4 \geq 60\%$ –
 - CR_4 between 40 and 60% – loose oligopoly
 - CR_4 – reasonably competitive
- Shortcoming: fails to reveal the distribution of industry output among the largest firms

MEASURING MARKET CONCENTRATION

HERFINDAHL-HIRSCHMAN INDEX (HHI)

- Sum the squared market shares of all the firms in the relevant market
- s_i – percentage market share or percentage of industry output produced by the i th firm
- $0 < \text{HHI} \leq 10,000$

$$\text{HHI} = \sum_i^N s_i^2 = s_1^2 + s_2^2 + \dots + s_n^2$$

- $\text{HHI} = 10,000$
 - Market is dominated by one firm
- HHI - closer to 0
 - A greater number of firms, N , exist in the market
 - And/or the existing firms are more equally sized
 - Industry – less concentrated or more structurally competitive

IDENTIFYING MARKET POWER

LERNER INDEX

- Lerner index of monopoly power, L
 - Monopoly - market power
 - Measured by how high price, P , can be elevated above the marginal costs, MC , of production
 - Depends on the price elasticity of market demand, η , facing the monopolist

$$L = \frac{(p - MC)}{p} = \frac{1}{|\eta|}$$

- Ability to elevate above marginal cost is limited by the responsiveness of buyers to a price increase
- If $MC = ATC$

$$L = \frac{(p - ATC)}{p} = \frac{q(p - ATC)}{qp} = \frac{(TR - TC)}{TR} = \frac{\Pi}{TR}$$

- Drawing inferences about market power from profit data
 - Reported rates represent accounting and not economic profits
 - Even perfectly competitive firms earn a normal, economic profit rate
 - Investments in some industries are riskier than others
 - Favorable or unfavorable industry or economy-wide shocks