Competitive Price-Searcher Markets

Instructional Goals: You will understand:

1. The fundamental pricing rule: produce up to the point where MR=MC.
2. How price discrimination allows a organization with market power to set different prices for the same good to different consumers: the inverse elasticity rule or Ramsey optimal pricing.
3. Dynamic limit pricing.
4. How product differentiation increases an organization's market power.
5. The welfare effects of product differentiation.

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Competitive Price-Searcher Markets

Organizations in ***price-searcher*** markets with low entry barriers face downward sloping ***residual demand curves.***

- Organizations are free to set price, but face strong competitive pressure from substitutes for the services they supply.
- Competition exists from existing organizations and potential rivals
- Competitors produce similar products (good substitutes); organizations in price searcher markets confront ***elastic residual demand curves***.

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Residual Demand 1

- If the number of organizations in an industry (an industry is made up of all the organizations supplying products or services with similar attributes) is large, the demand curve facing any one of them is nearly horizontal (elasticity of demand is infinite) even though the demand curve facing the industry is downward sloping (elasticity is relatively small).
- There do not have to be very many organizations in an industry for the elasticity of demand facing a particular organization to be large.

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Residual Demand 2

- An organization sells to people whose demands are not met by the other organizations in the industry.
- The residual demand, $D_i(p)$, is the market demand, $D(p)$, minus the supply of other organizations, $S_o(p)$:

$$Dr(p) = D(p) - S_o(p)$$

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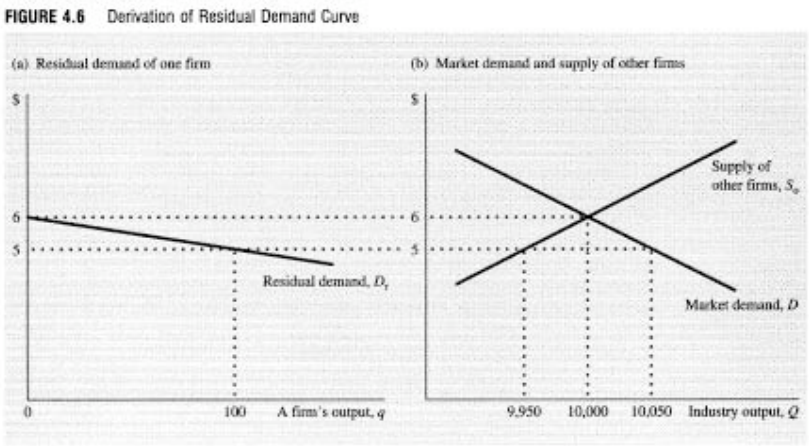
Residual Demand 3

- Figure b shows the market demand curve and the supply of all the organizations except one. The horizontal difference between the market demand curve and the supply of the other organizations is the residual demand facing a particular organization, Figure a.



- The horizontal difference is the quantity demanded by the market at a given price minus the supply of other organizations at that price.

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Residual Demand 4

More generally, if there are n identical organizations in the industry, then the elasticity of demand facing any one organization i is

$$e_i = en - un/(n - 1)$$

where **e** is the market elasticity of demand (a negative number), **u** is the elasticity of supply of the other organizations (a positive number), and (n -1) is the number of other organizations.

Thus for a given market elasticity, as the number of organizations in an industry, n, increases, the elasticity facing a single organization i, e_i grows large in absolute value (more negative). Similarly, the larger the elasticity of supply of the other organizations, or the more of these other organizations, the larger in absolute value (more negative) is the elasticity of demand facing organization i

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Residual Demand 5

TABLE 4.1 Price Elasticity for a Single Firm

Number of Firms n	*Market Elasticity* *Inelastic* $\varepsilon = -0.5$	*Unitary* $\varepsilon = -1$	*Elastic* $\varepsilon = -5$
10	−5	−10	−50
25	−12.5	−25	−125
50	−25	−50	−250
100	−50	−100	−500
500	−250	−500	−2500
1000	−500	−1000	−5000

NOTE: Because the elasticity of supply of the other identical firms is assumed to be perfectly inelastic ($\eta_0 = 0$), the elasticity of demand facing a particular firm is $\varepsilon_i = n\varepsilon$.

Table 4. 1 shows how the elasticity of demand facing a single organization varies with the number of organizations and the market elasticities, given that the elasticity of supply of other organizations is completely inelastic **(h= 0).**

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Price and Output

- A profit-maximizing price searcher will expand output as long as ***marginal revenue exceeds marginal cost***.
  - Price will be lowered and output expanded until ***MR*** = ***MC***
- The price charged by a price searcher will be greater than its ***marginal cost***.

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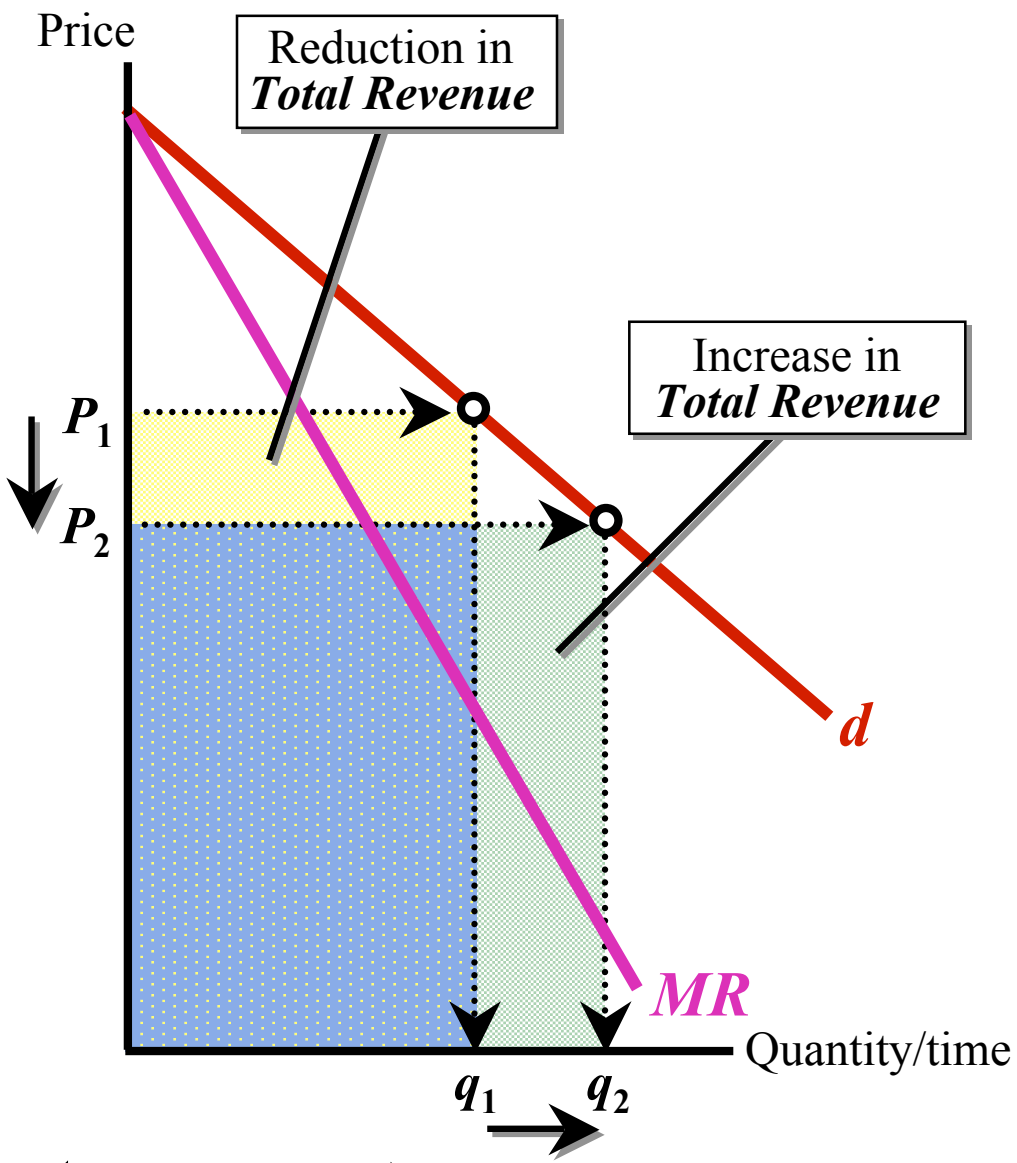
Marginal Revenue of a Price Searcher

- Consider the market for a product with initial price P_1 & output q_1. Total revenue (TR) = $P_1 * q_1$.
- With a downward sloping demand curve, price reductions that increases sales will exert two conflicting influences on TR.
- As the price falls from P_1 to P_2, output increases from q_1 to q_2. What effect does this have on TR?
- First, TR will rise because of an increase in the number of units sold $(q_2 - q_1) * P_2$.
- However, TR will decline by $[(P_1 - P_2) * q_1]$ as q_1 units once sold at the higher price (P_1) are now sold at the lower price (P_2).
- Depending on the size of the respective shaded regions, ***total revenue*** may increase or decrease.



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Optimal Pricing for a Price Searcher

For a organization facing a downward sloping residual demand curve, MR = P(1-1/|e|). In this case, the MR = MC rule takes the following equivalent forms:

- P = MC/(1-1/|e|)
- (P-MC)/P = 1/|e|
- P = MC/(1-1/|e|) = MC |e|/(|e|-1)
- (P-MC)/MC=1/(|e|-1)

Note that the higher the elasticity, the lower the markup of price over marginal cost. Elasticity tends to be higher when there are many competitors and substitutes. The lower the elasticity, the higher the markup. For a organization facing a horizontal demand curve, a price taking organization, the elasticity is infinite. In this case, MR = P(1-1/|e|) = P, The optimal pricing formula reduces to P=MC.

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True or false?, the optimal price will always be on the elastic portion of the residual demand curve.

True. If |e| is less than 1, raising price will both increase revenue, and decrease costs (because you sell less quantity). If you face a downward sloping residual demand curve, price should always be raised to the point where demand is elastic, i.e. |e| > 1, or, if MC = 0, where |e| = 1.

Suppose that you know elasticity, marginal cost, and price, it follows, therefore, that if:

- 1/|e| | is greater than (P - MC)/P, price is too low
- 1/|e| is less than (P - MC)/P, price is too high
- 1/|e| = (P - MC)/P, price is set optimally.

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Given a linear demand curve that intersects the Y axis at a price of $10, and a marginal cost of $2 per unit, what is the optimal price?

First use the optimal pricing formula and compare $1/|e|$ to $(P - MC)/P$, where MC = $2. Using the graphical calculation for elasticity, calculate the left side of the equation, $1/|e| = (Pmax-P)/P=(\$10-P)/P$.

Then equate the right side of the equation to the left, $(\$10-P)/P = (P - \$2)/P$ or $(\$10 - P) = (P - \$2)$ or P = $6.

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Questions for Thought:

1. What are the distinguishing characteristics of competitive price searcher markets? Indicate a market that approximates these conditions.

2. Price searchers can set the price of their product. Does this mean that price searchers will charge the highest possible price for their product? What price will maximize the profits of a price searcher?

3. In price-searcher markets with low barriers to entry, will the organizations be able to make economic profit in the long run? Why or why not? What do competitive price searchers have to do in order to make economic profit?

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Contestable Markets and Price Discrimination

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Contestable Markets

- A ***contestable market*** is one in which entry and exit costs are low and there are no legal barriers to entry.
  - *Example*: Airline industry
- Actual and potential competition can lead to:
  - Zero economic profits
  - Efficient production
  - Price discrimination

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Price Discrimination

- ***Price discrimination***:
  When a seller charges different consumers different prices for the same good or service.
- ***Price discrimination*** can only occur when a price searcher is able to (***market power***):
  - identify groups of customers with different elasticities of demand (***sufficient information***)
  - prevent customers re-trading the product (***no arbitrage***)

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Price Discrimination

- Sellers gain from ***price discrimination*** by charging:
  - higher prices to groups of customers with ***more inelastic demand***
  - lower prices to groups of customers with ***more elastic demand***
- ***Price discrimination*** generally leads to more output and additional gains from trade.

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Price Discrimination

Figure 1 illustrates prices discrimination, P1 is 3 times MC, and P2 is twice MC. Solving for |**e**|, we find (3 - 1)/3 = 1/|**e**| = 1.5; (2 - 1)/2 = 1/|**e**| = 2 -- the more inelastic the demand, the higher the markup.

This rule is also referred too as inverse elasticity pricing and, where subject to a revenue constraint, Ramsey optimal pricing.

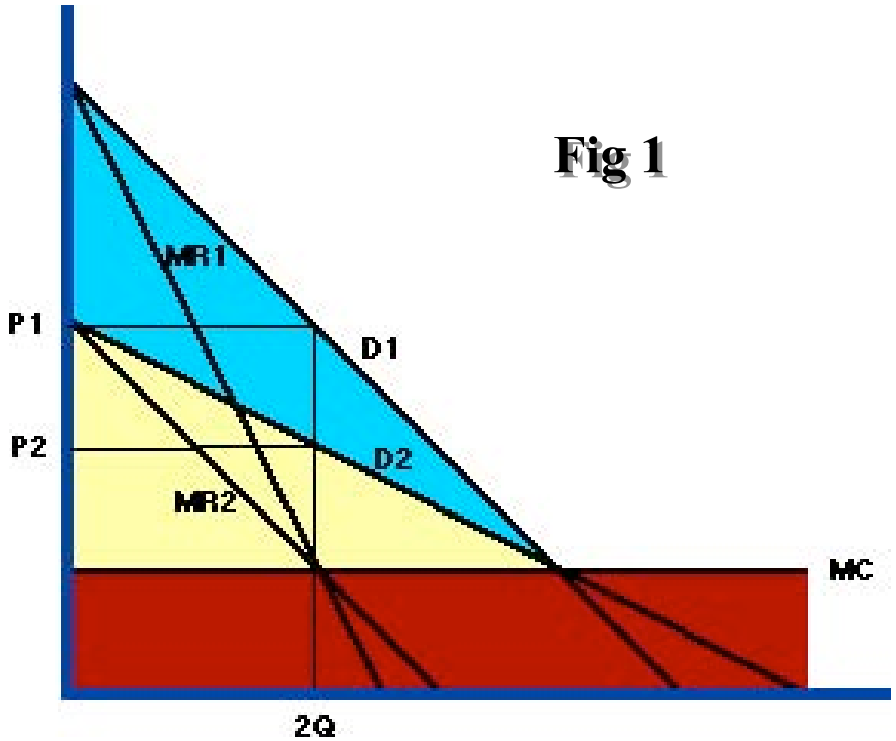

Fig 1

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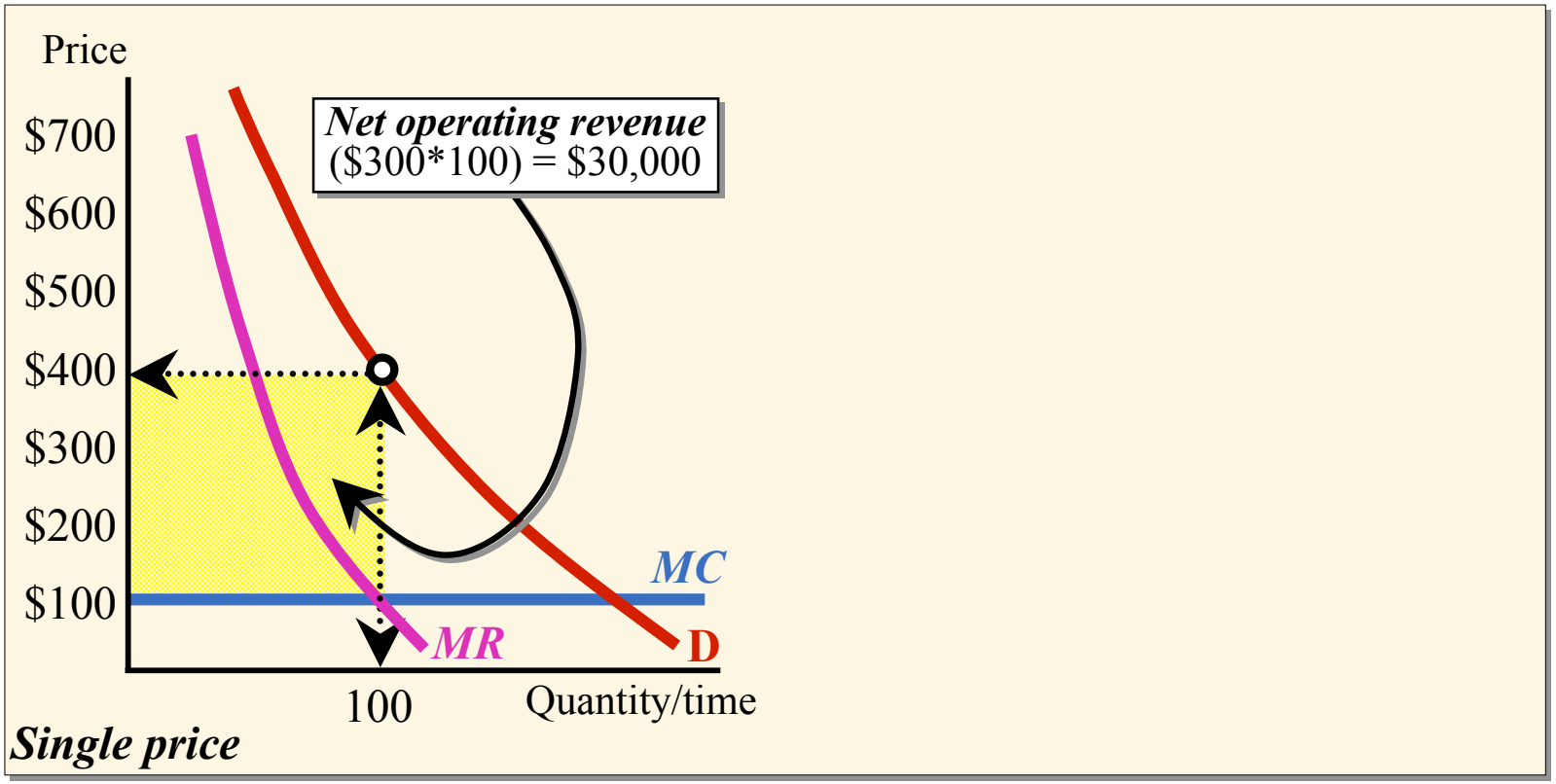
The Economics of Price Discrimination

- Consider a hypothetical market for ***airline travel*** where the ***Marginal Cost*** per traveler is $100.
- If the airline charges all customers the same price, profits will be maximized where ***MC*** = ***MR***. Here the airline charges everyone $400 and sells 100 seats.
- This generates ***Net Operating Revenue*** of $30,000 or (total revenues) $40,000 – (operating costs) $10,000.



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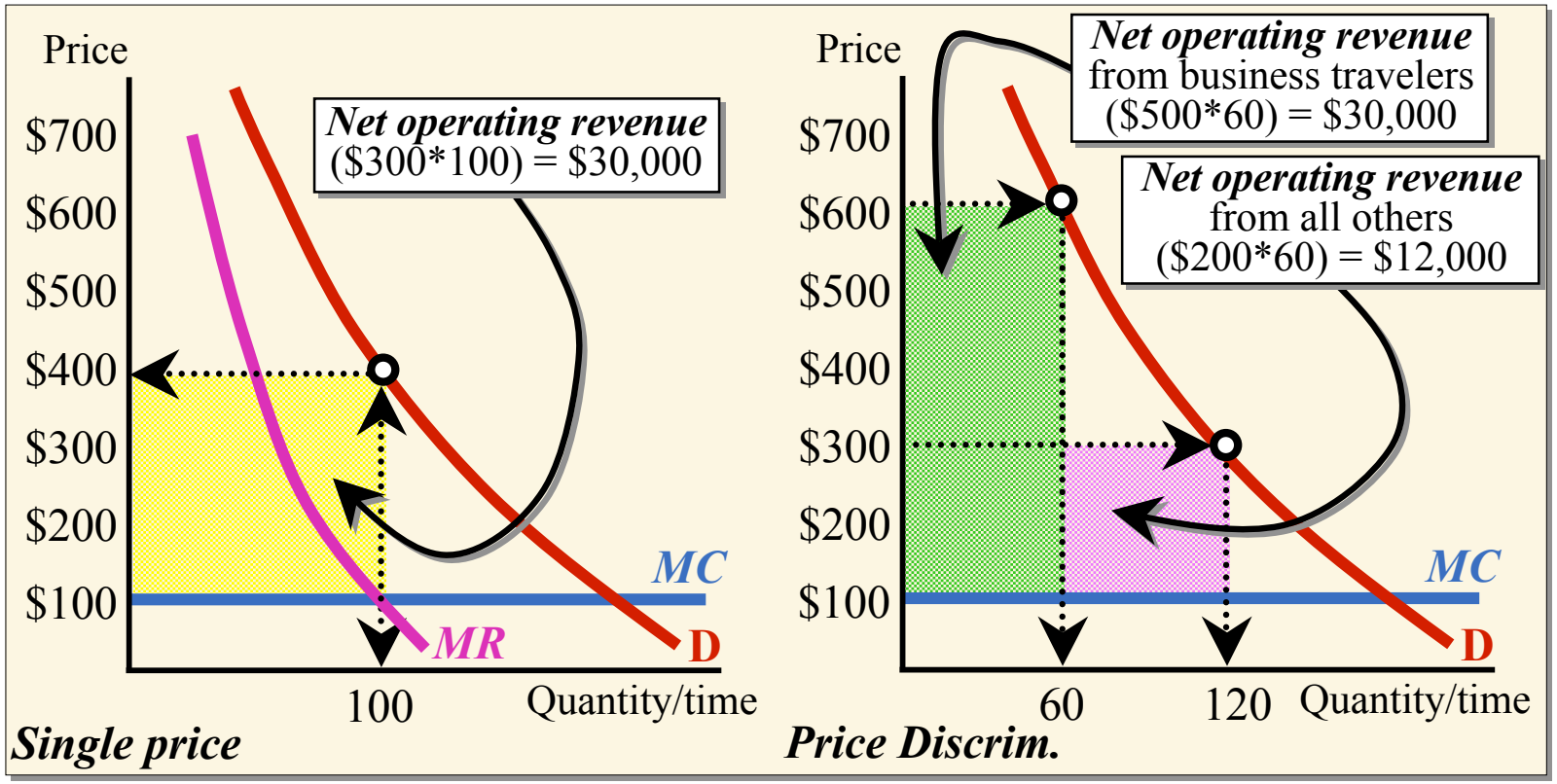
The Economics of Price Discrimination

- By charging higher prices to consumers with less elastic demand and lower prices to those with more elastic demand it will increase net operating revenue.
- If the airline charges $600 to business travelers (who have a highly inelastic demand) and $300 to other travelers (who have a more elastic demand), it can increase its ***Net Operating Revenue*** to $42,000.



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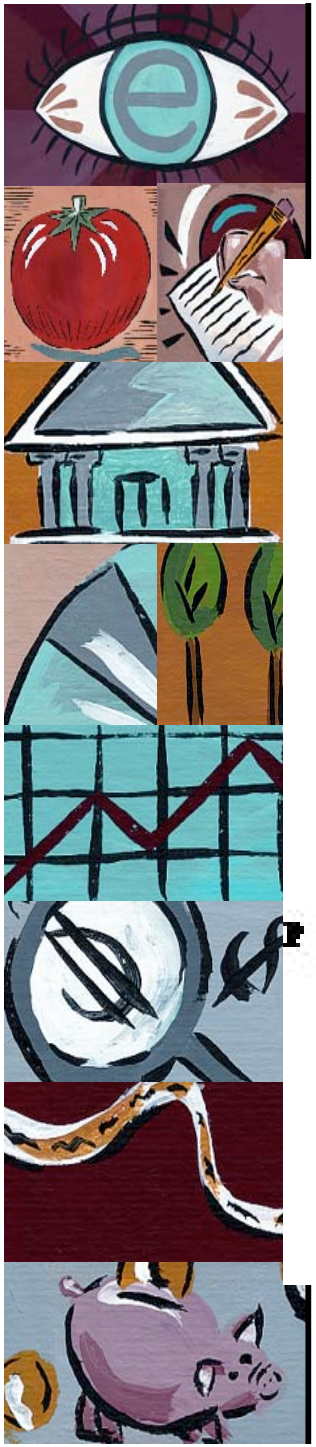
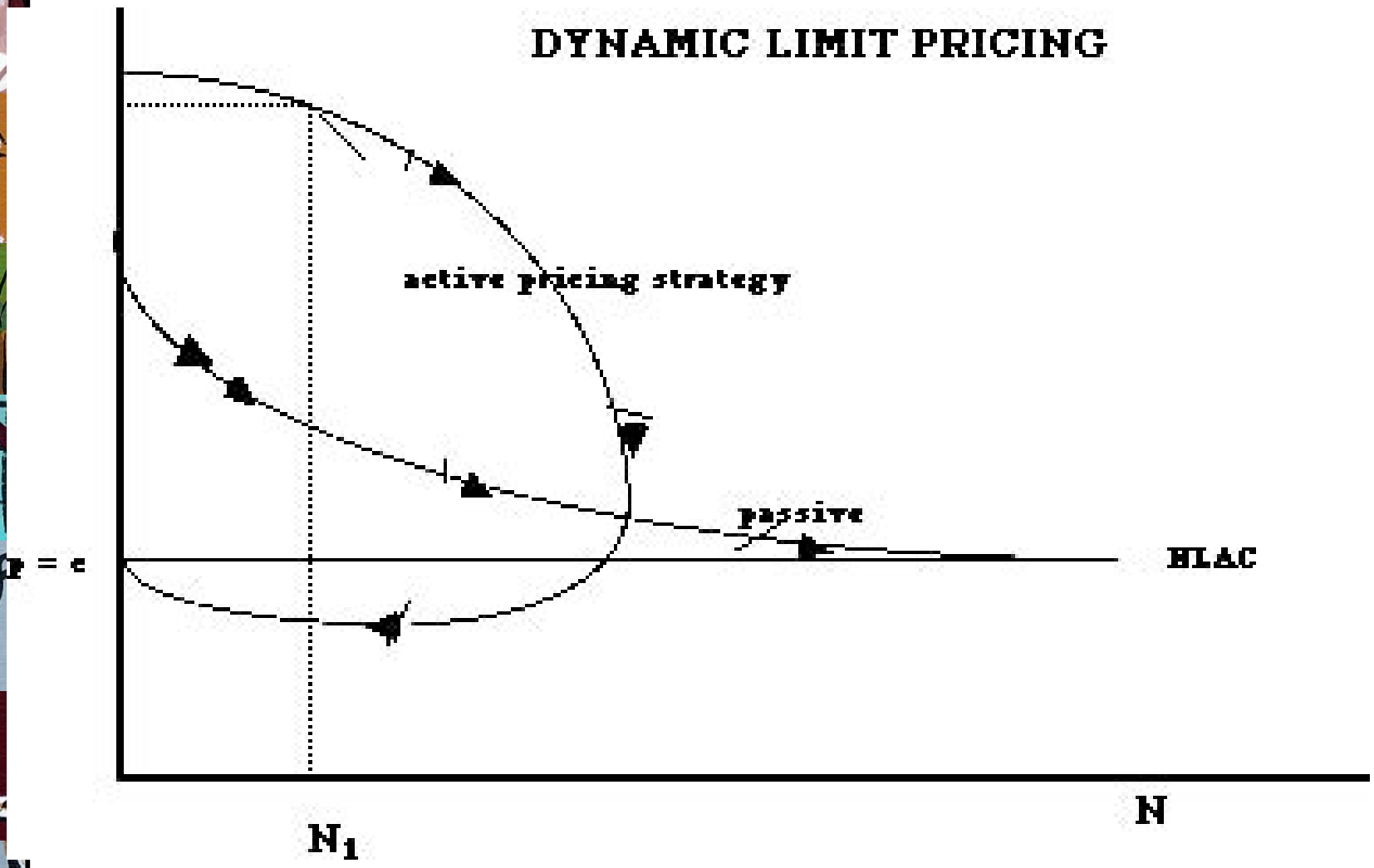


The Economics of Price Discrimination



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Examples of price discrimination

- Coupons in the newspaper offer lower prices to consumers with lower opportunity cost of time.
- Senior citizen and children's' discounts offer lower prices to those with more elastic demands for movies.
- Universities offer lower prices in the form of financial aid (need based aid) to those with higher elasticities of demand (note: it is easier to discriminate where services are concerned than where goods are concerned and where consumables are concerned than durables).
- Tying supplies to use of a durable piece of equipment, sometimes called Barbie Doll Marketing: give away the dolls but charge a lot for the dresses.
- All or nothing offers allow sellers to choose both a price and a quantity. This ability permits organizations to extract all consumer surplus.
- Popcorn at the movie theater is priced high to extract surplus from high value customers.

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Questions for Thought:

1. Is price discrimination harmful to the economy? How does price discrimination affect the total amount of gains from exchange? Explain. Why do colleges often charge students different prices, based on their family income?

2. What is the primary requirement for a market to be competitive? Is competition necessary for markets to work well? How does competition influence the following:
   (a) the cost efficiency of producers
   (b) the quality of products
   (c) new product discovery and development

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Questions for Thought:

3. Which of the following is a necessary condition for long run equilibrium in **both** competitive price searcher and competitive price taker markets?
   a. Price must equal ***marginal cost*** (***MC***).
   b. The typical organization in the market must be earning zero economic profit.
   c. All of the organizations in the market must be charging the same price.

4. "If a movie theater is going to increase its revenues by charging students a lower price than other customers, the demand of students must be more elastic than the demand of other customers." Is this statement *true*?

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Questions for Thought:

5. Which of the following indicates that a organization operating in the highly competitive retail sector is providing goods and services that consumers value highly relative to their cost?
   a. The organization is making losses and its sales are declining.
   b. The wages earned by the employees of the organization are low.
   c. The organization is highly profitable and its sales have grown rapidly.

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Product Differentiation

- Price-searchers seek to ***differentiate their products*** in terms of design, dependability, location, ease of purchase, etc. thereby reducing substitutability

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Premises of Product Differentiation

- The price of one brand exerts greater constraint on a second brand's price when they are perceived to be close substitutes (share identical attributes in the mind of consumers) than when they are not.
- Products/services are differentiated because consumers think they are different.

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The effect of differentiation on a product's residual demand curve

- **Where an industry serves its market with differentiated products, the residual demand facing an organization depends on the behavior of each of its rivals. In undifferentiated markets the market will be cleared by a single price. In which case, the inverse residual demand function facing a single firm can be written as:**

$$p_i = p = D(q_1 + q_2 + \ldots + q_n) = D(Q)$$

For example, if $n = 2$, $p = a - bQ = a - b\,(q_1 + q_2) = a - bq_1 - bq_2$.

- **In contrast, if consumers are not indifferent between brands or products, organization 1's demand function will be subtlety different insofar as p_i is not equal to p: $p_1 = a - b_1q_1 - b_2q_2$, where $a > 0$ and $b_1 > b_2 > 0$, which means that an increase in organization 1's output has a greater effect on its price than a similar increase in organization 2's.**
- ***Hence, the more an organization differentiates its product, the more insulated demand for its product is from the behavior of other organizations, the steeper the slope of its demand curves, and the greater its market power.***

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Location models 1

- In this class we make the presumption that consumers have preferences regarding attributes or characteristics that can bundled into services or goods in a nearly infinite variety of ways -- the majority of which have not been discovered yet.
- This view contrasts with the standard view found in elementary economics texts, which holds that consumers have preferences for goods or services per se -- and that the characteristics of those goods are known and, implicitly, invariable.
- The standard view is quite satisfactory for a number of purposes (e.g., understanding the demand and supply of 'white bread' bonds), but is fundamentally incompatible with the goals of this course. Even where financial markets are concerned, it has the effect of directing attention away from product innovation and development (financial engineering).
- If each product is a bundle of attributes, it follows that, where the relevant attributes *can be identified*, each product can be mapped on an n-dimensioned (one for each attribute) space.

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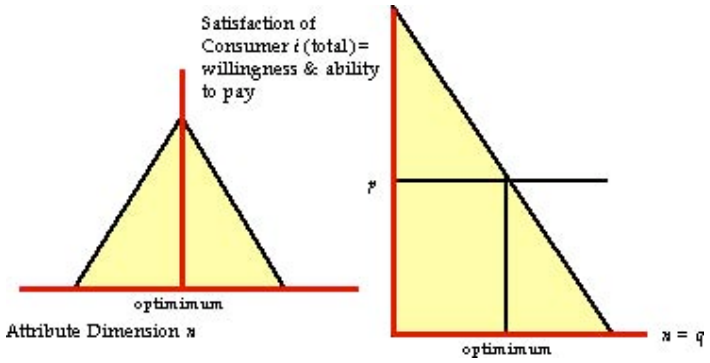
Location models 2

For example, soft drink brands can be mapped as points along the sweetness dimension (or attribute space), with club soda at one extreme, Coke in the middle, and Jolt at the other.

The closer two products are to each other in attribute space, the better substitutes they are.

This is because consumer preferences also exist in attribute space, with each individual's optimum located at a particular node, surrounded in all dimensions by indifference surfaces (necessarily non intersecting), so that individual satisfaction levels decrease with the distance from the node.



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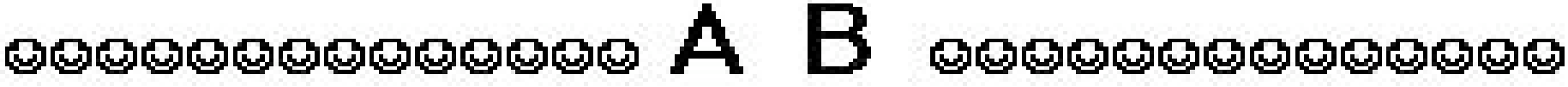
Location models 4

Location models can produce some surprising results.
For example, if consumers were spread out equally
along a single dimension and if they could support only 2 brands,
A&B, the social optimum would look like:

But the market equilibrium would look like



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Is product differentiation inefficient?

To say that product differentiation is messy does not mean that it is socially inefficient. If the logic of locational models is valid, product differentiation is inherently wealth creating (or net benefit maximizing) when it supplies goods that some people prefer to a homogenous good.

This makes residual demand schedules steeper and shifts total demand for goods in this market up and out.

Fig a

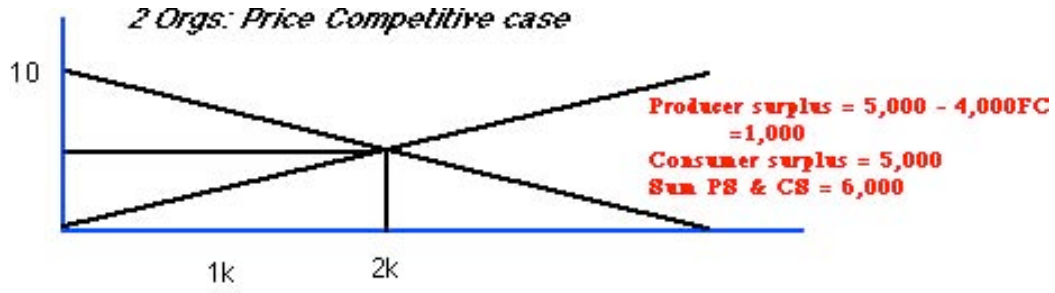
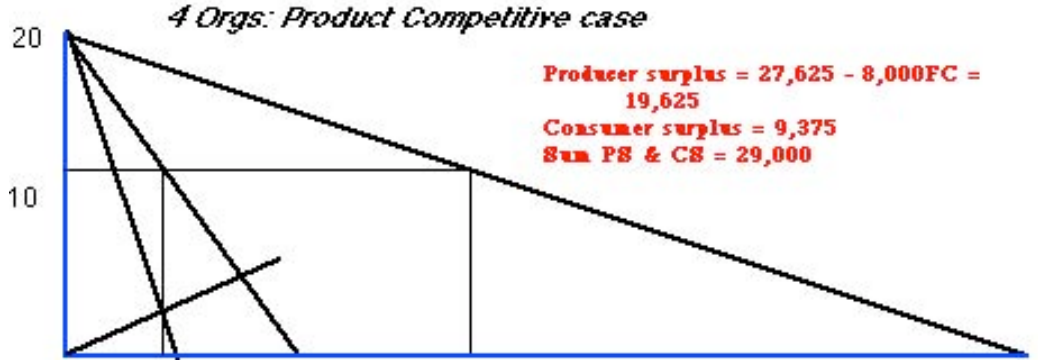


Fig b



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Product differentiation: An example

Contrast, figure a to figure b. Both of these figures assume identical technology is available to all, costless exit and entry, fixed costs of $2000 per brand, and increasing marginal costs.

In figure a, we have a static equilibrium in which only two firms operate, but both are price takers, make an identical product -- milk-flavored ice cream, let's say -- and operate at optimal scale and price, given D.

In figure b, product innovation has taken place, let's say 4 organizations invent new flavors: vanilla, chocolate, strawberry, and peppermint, and, for convenience let's say, the demand for each of these flavors is identical, but with an intercept (2a) twice that of milk-flavored ice cream (a).

So long as the knowledge of how to make flavors is proprietary, there will be only four firms. Each will have considerable market power, and operate where mr = mc. In which case, the price in the ice cream market would increase from $5 to $12.50 per unit. The consumer surplus for each flavor would be $2,343.75; the producer surplus, $6,906.25, less fixed cost of $2,000; producing net benefits of $7,250 per flavor, or $29,000 altogether -- five times the net benefit produced by the homogenous product!

Product differentiation is consistent with "dynamic equilibrium" -- for the rate of investment in all things, even product development, to rise towards the level at which this investment yields only a normal return. In the ice cream example, once others learn the secret of flavors, firms will enter the market and compete all supranormal profits away.

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Product differentiation: Conclusion

The dynamic equilibrium story is story is consistent with empirical research on industrial dynamics which shows product life cycles marked by waves of entry and exit, innovation and production, and profits.

These waves can be derived from the interaction of selection effects and search effects (innovation) in multi-attribute product-space models (*n*k-landscapes).

That is: rival organizations imitate the innovator's product, or produce close substitutes, and this causes demand to become more elastic. As demand becomes more elastic, organizations reduce their markup of price over marginal cost (i.e., they cut prices): $(p - mc)/p = 1/|\mathbf{e}|$. If markups are not big enough to recover fixed costs, producers must exit the market or create new products that have less elastic demands.

Joseph Schumpeter called this the process of "creative destruction." Note that this process is similar to but not the same as the mechanism that drives long run competition in price-taking markets.

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