Price Discrimination (Chapter 12)

Uniform Price vs Price Discrimination

Definition: A monopolist charges a **uniform price** if it sets the same price for every unit of output sold.

While the monopolist captures profits due to an optimal uniform pricing policy, **it can still extract greater profits and greater producer surplus with price discrimination.**

Definition: A monopolist **price discriminates** if it charges more than one price for the same good or service, e.g. different prices in movie theatres, airlines, etc.

Forms of Price Discrimination

Definition: A policy of **first degree (or perfect) price discrimination** prices each unit sold at the consumer's maximum willingness to pay. This willingness to pay is directly observable by the monopolist.

Definition: A policy of **second degree price discrimination** allows the monopolist to offer consumers a quantity discount.

Definition: A policy of **third degree price discrimination** offers a different price for each segment of the market (or each consumer group) when membership in a segment can be observed.

Conditions for Price Discrimination

To be able to adopt Price Discrimination,

- The firm must have some market power to price discriminate.
- The firm must have some information about buyers.
  - Willingness to pay for each individual (for 1st Degree)
  - Willingness to pay for each group (for 2nd Degree)
  - PED for each segment of the market (for 3rd Degree)
- The firm must be able to prevent "arbitrage", i.e. resale.

1st Degree Price Discrimination

Definition: A policy of **first degree price discrimination** prices each unit sold at the consumer's maximum willingness to pay.

Definition: The consumer's maximum willingness to pay is called the consumer's **reservation price**.

We can think of the demand curve as a "willingness to pay" curve. If the monopolist can observe the willingness to pay of each customer, then the monopolist can "perfectly" price discriminate. **In other words, it can charge each consumer the highest price he/she is willing to pay for the product.**

1st Degree PD gives an efficient allocation of resource, i.e. there is no deadweight loss.

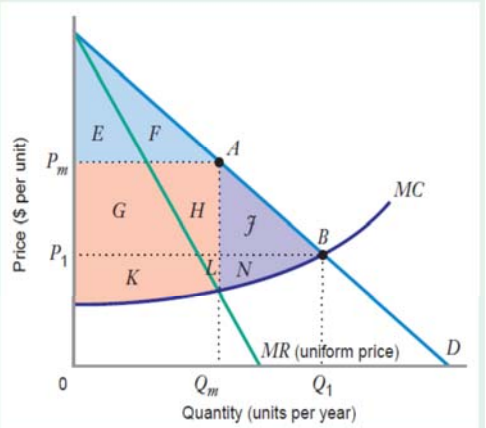


FIGURE 12.1 Monopoly with Uniform Pricing
A profit-maximizing monopolist charging a uniform price would choose the price P_m and sell Q_m. Its producer surplus would be the area $G + H + K + L$. However, some consumer surplus (area $E + F$) escapes the producer. In addition, the deadweight loss (area $J + N$) represents potential surplus that neither the producer nor consumers capture.

1st Degree Price Discrimination

LEARNING-BY-DOING EXERCISE 12.1

Capturing Surplus: Uniform Pricing versus First-Degree Price Discrimination

In this exercise we will see how a monopolist can capture more surplus with first-degree price discrimination than with a uniform price. Suppose a monopolist has a constant marginal cost $MC = 2$ and faces the demand curve $P = 20 - Q$, as shown in Figure 12.3. There are no fixed costs.

Problem

(a) Suppose price discrimination is not allowed (or is not possible). How large will the producer surplus be?

(b) Suppose the firm can engage in perfect first-degree price discrimination. How large will the producer surplus be?

Solution

(a) The marginal revenue curve is $MR = P + (\Delta P/\Delta Q)Q = (20 - Q) + (-1)Q = 20 - 2Q$. To find the optimal quantity, we set marginal revenue equal to marginal cost. Thus, $20 - 2Q = 2$, or $Q = 9$. Substituting this into the demand curve, we find that $P = 20 - 9 = 11$.

1st Degree Price Discrimination

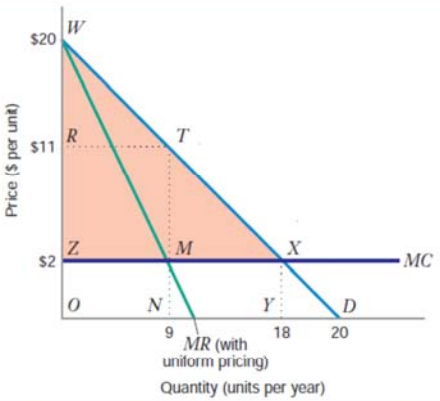


FIGURE 12.3 Capturing Surplus: Uniform Pricing versus First-Degree Price Discrimination
With uniform pricing, the firm produces 9 units (corresponding to the intersection of the marginal cost curve *MC* and the marginal revenue curve *MR*). It sells these units at a price of $11 per unit, capturing a producer surplus of $81 (area *RTMZ*). With perfect first-degree price discrimination, the firm produces 18 units (corresponding to the intersection of *MC* and the demand curve *D*), capturing a producer surplus of $162 (area *WXZ*).

2nd Degree Price Discrimination

Definition: A policy of **second degree price discrimination** allows the monopolist to charge a different price to different consumers. **While different consumers pay different prices, the reservation price of any one consumer cannot be directly observed.**

2nd Degree Price Discrimination often involves **Multipart Tariff,** which is a tariff/price that consist of two or more prices, e.g.

- Block Pricing or Block Tariff (Quantity Discount)
- Subscription and Usage Charges (Club / Membership)

Two-Part Tariff

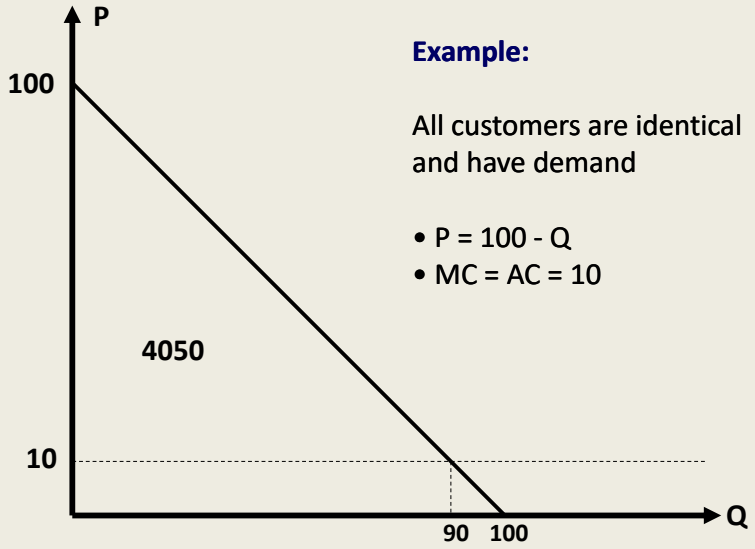
Definition: A monopolist charges a two-part tariff if it charges **a per unit price plus a lump-sum price** (paid whether or not a positive number of units is consumed).

Unit Price is also called "**Usage Charge**".
Lump-Sum Price is also called "**Subscription Charge**".

This, effectively, charges demanders of a low quantity a different average price than demanders of a high quantity.

Example: hook-up charge plus usage fee for a telephone, club membership, or the like.

Two-Part Tariff



Example:

All customers are identical and have demand

- P = 100 - Q
- MC = AC = 10

Two-Part Tariff

What is the optimal two-part tariff?

Two steps:

(1) maximize the benefits to the consumers by charging UNIT PRICE = MC = 10.

(2) capture this benefit by setting LUMP-SUM PRICE = consumer benefits = 4050.

Two-Part Tariff

Any higher usage charge would result in a dead-weight loss that could not be captured by the monopolist. Any lower usage charge would result in selling at less than marginal cost.

In essence, the monopolist maximizes the size of the "pie", then sets the lump-sum fee so as to capture the entire "pie" for itself.

The total surplus captured is the same as in the case of perfect price discrimination.

Two-Part Tariff

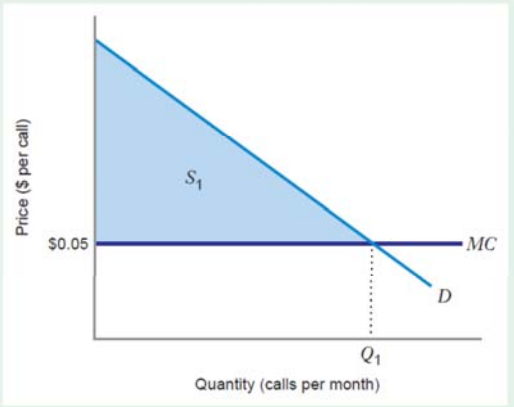


FIGURE 12.8 Subscriber and Usage Charges
Each consumer has the demand curve *D* for telephone service, and the telephone company incurs a marginal cost of $0.05 for each call. If the company sets a usage charge of $0.05 for each call, the consumer would make Q_1 calls each month and realize a consumer surplus of S_1. The telephone company could capture virtually all the consumer surplus by implementing a monthly subscription charge of slightly less than S_1 dollars.

Block Tariff

Definition: If a consumer pays one price for one block of output and another price for another block of output, the consumer faces a **block tariff.**

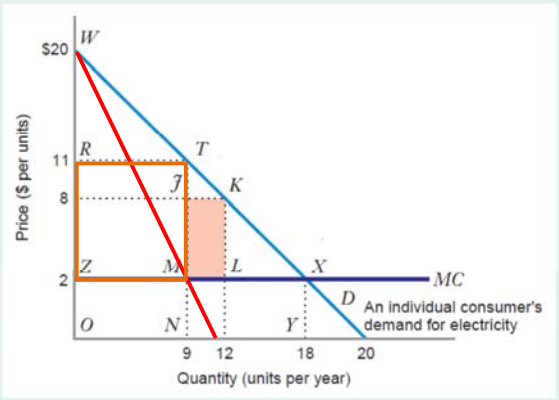
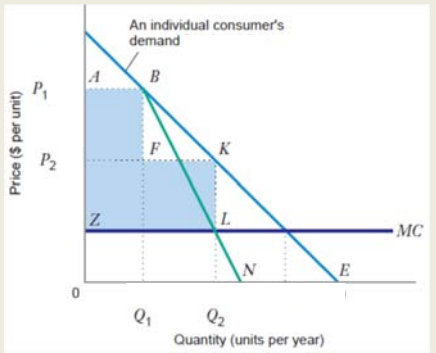


FIGURE 12.4 Uniform Pricing versus Second-Degree Price Discrimination
With uniform pricing, the firm captures a producer surplus of $81 (equal to area *RTMZ*). With a block tariff, the firm charges a price of $11 for the first 9 units a consumer purchases and a price of $8 for the three additional units. This example of second-degree price discrimination lets the firm capture a producer surplus of $99 (areas *RTMZ* + *JKLM*).

Block Tariff

For 2-Block Tariff, we need to find Q1, Q2, P1, P2 such that producer surplus is maximized.

That is, we try to maximize the shaded area.



If the monopolist could set a <u>different block price for **each customer**</u>, it would capture the same amount of surplus as a <u>perfectly price-discriminating monopolist</u>.

Block Tariff

Example 1

Let
Inverse Demand: P = 20 – Q
Marginal Cost: MC = 2 = AC

Assume that the monopolist wants to charge two different prices. What the two prices should it charge in order to maximize the producer surplus?

Block Tariff

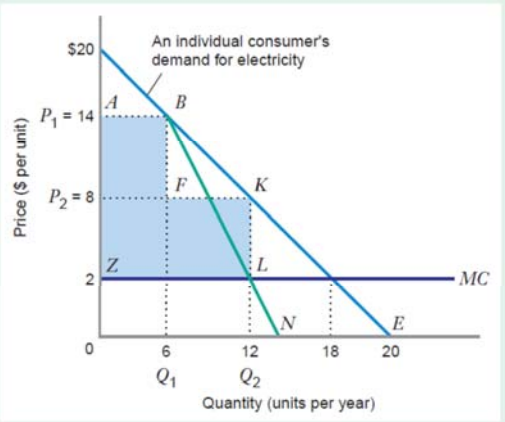


FIGURE 12.5 **Optimizing Producer Surplus with Second-Degree Price Discrimination**
With the optimal block tariff (assuming only two blocks), the firm sells 6 units at a price of $14 per unit and 6 additional units at a price of $8 per unit. This maximizes producer surplus at $108 (the shaded area *ABFKLZ*).

Block Tariff

Example 2

Let
Inverse Demand: P = 100 – Q
Marginal Cost: MC = 10 = AC

Assume that the monopolist wants to charge two different prices. What the two prices should it charge in order to maximize the producer surplus?

Answer: It should sell the first 30 units at P = 70 and another 30 units at P = 40. Total Q = 60.

Block Tariff

LEARNING-BY-DOING EXERCISE 12.3

Increasing Profits with a Block Tariff

Softco is a software company that sells a patented computer program to businesses. Each business it serves has the demand for Softco's product: $P = 70 - 0.5Q$. The marginal cost for each program is $10. Assume there are no fixed costs.

Problem

(a) If Softco sells its program at a uniform price, what price would maximize profit? How many units would it sell to each business customer? How much profit would it earn from each business customer?

(b) Softco would like to know if it is possible to improve its profit by implementing block pricing. Suppose that Softco were to sell the first block at the price you determined in (a), and that the quantity for that block is the quantity you determined in (a). Find the profit-maximizing quantity and price per unit for the second block. How much extra profit would Softco earn from each of its business customers?

(c) Do you think Softco could earn even more profits with a set of prices and quantities for the two blocks different from those in part (b)? Explain.

3rd Degree Price Discrimination

Definition: A policy of **third degree price discrimination** offers a different price for each segment of the market (or each consumer group) when membership in a segment can be observed.

Example: Movie ticket sales to older people or students at discount

Given that the whole market is segmented into sub-markets, the monopolist can set different P* and Q* for each sub-market in order to maximize its total profit, e.g. sub-market for students and sub-market for seniors.

3rd Degree Price Discrimination

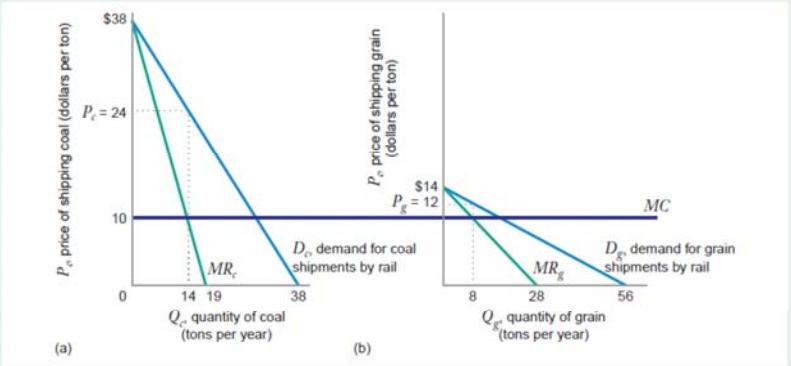


FIGURE 12.9 Pricing Coal and Grain Transport by Rail: Third-Degree Price Discrimination
The demand for rail transport of coal is much less price sensitive than the demand for rail transport of grain. Railroads can exploit this fact, using third-degree price discrimination to set a much higher profit-maximizing price for coal than for grain, even though the marginal costs of transporting the two goods are the same.

Example

Suppose the monopolist operates in two market segments, at the same constant marginal cost.

MC = AC = 20 in both segments

Mkt Segment 1: $P_1 = 100 - Q_1$

Mkt Segment 2: $P_2 = 80 - 2Q_2$

What P* and Q* should be in each market?

LEARNING-BY-DOING EXERCISE 12.4

Third-Degree Price Discrimination in Railroad Transport

Suppose a railroad faces the demand curves for transporting coal and grain shown in Figure 12.9. For coal, $P_c = 38 - Q_c$, where Q_c is the amount of coal moved when the transport price for coal is P_c. For grain, $P_g = 14 - 0.25Q_g$, where Q_g is the amount of grain shipped when the transport price for grain is P_g. The marginal cost for moving either commodity is $10.

Problem Equate marginal revenue and marginal cost to find the profit-maximizing rates for coal and grain transport.

3rd Degree Price Discrimination

LEARNING-BY-DOING EXERCISE 12.5

Third-Degree Price Discrimination for Airline Tickets

According to Table 2.2, the estimated price elasticity of demand for coach class airline tickets for business travelers is $\epsilon_{Q_B,P_B} = -1.15$, while for vacation (leisure) travelers it is $\epsilon_{Q_V,P_V} = -1.52$.[15] Suppose an airline facing these demand elasticities wants to use third-degree price discrimination to maximize profit, by setting the price of a business travel ticket to P_B and the price of a vacation travel ticket to P_V. Also suppose that the airline faces the same marginal cost MC for both types of travelers.

Problem Use the inverse elasticity pricing rule [IEPR; see equation (11.4)] to determine the ratio P_B/P_V.