

Study Session 4

Economics: Microeconomic Analysis





Study Session 4

Economics: Microeconomic Analysis

- 13. Demand and Supply Analysis: Introduction
- 14. Demand and Supply Analysis: Consumer Demand
- 15. Demand and Supply Analysis: The Firm
- 16. The Firm and Market Structures

Economics



Economics:

Microeconomic Analysis

13. Demand and Supply Analysis: Introduction

Economics

SS#4 Microeconomic Analysis

LOS 13.a, CFAI Vol. 2 p. 7

Demand and Supply Analysis: Introduction

Types of Market

- **Factor markets:** Factors of production
 - Raw materials, labor, etc.
 - Firms are buyers
- **Product markets:** Services and finished goods
 - Firms are sellers
 - **Intermediate markets:** One firm's finished products (components) used in the production of another firm's output

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LOS 13.b, CFAI Vol. 2 p. 9

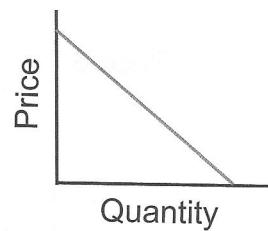
Demand and Supply Analysis: Introduction

The Demand Curve

$$Q_{DX} = f(P_x, I, P_y, \dots)$$

Quantity demanded is a function of:

- Price of good P_x
- Individuals' incomes I
- Price of related products (P_y)
- Many other factors may be added



Law of Demand: Typically, quantity ↑ as price ↓

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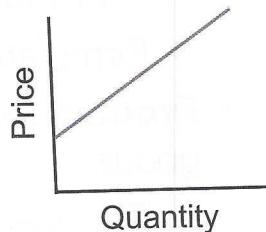
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The Supply Function

$$Q_{SX} = f(P_x, C_x, \dots)$$

Quantity supplied is a function of:

- Price of good P_x
- Cost of production C_x
- Labor cost
- Material cost
- Production overheads
- Technology
- Many other factors may be added

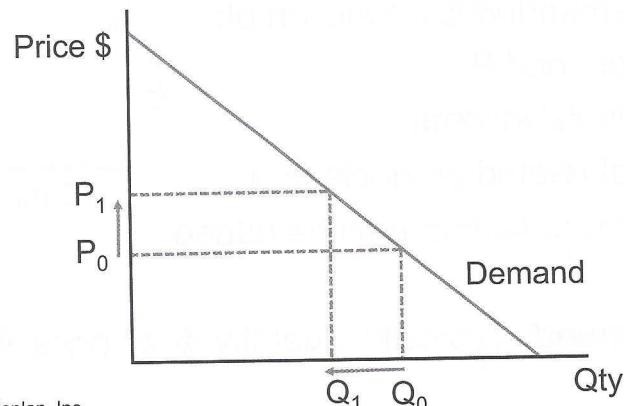


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Shifts and Movements

- Changes in price (P_x) cause movements along the supply and demand curves



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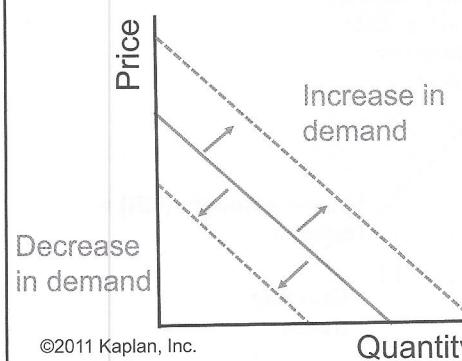
LOS 13.c, CFAI Vol. 2 p. 11

Demand and Supply Analysis: Introduction

Shifts and Movements

Changes in *other factors* of demand will shift the curve:

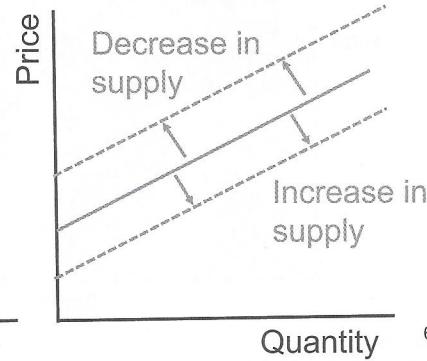
- Income levels
- Price of substitutes
- Price of complements...



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Changes in *other factors* of supply will shift the curve:

- Raw materials price
- Labor costs
- Overheads...



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LOS 13.d, CFAI Vol. 2 p. 17

Demand and Supply Analysis: Introduction

Aggregating Demand and Supply Curves

Market supply = aggregate of the supply functions of the firms in the market

Example:

50 firms in the market

$$\text{Supply function: } Q_s = -250 + 2.5P_x$$

The same approach can be used to formulate market demand

$$\text{Market supply: } Q_s = -(50 \times 250) + (50 \times 2.5 P_x)$$

$$Q_s = -12,500 + 125 P_x$$

$$\text{Invert function: } P_x = 0.008Q_s + 100$$

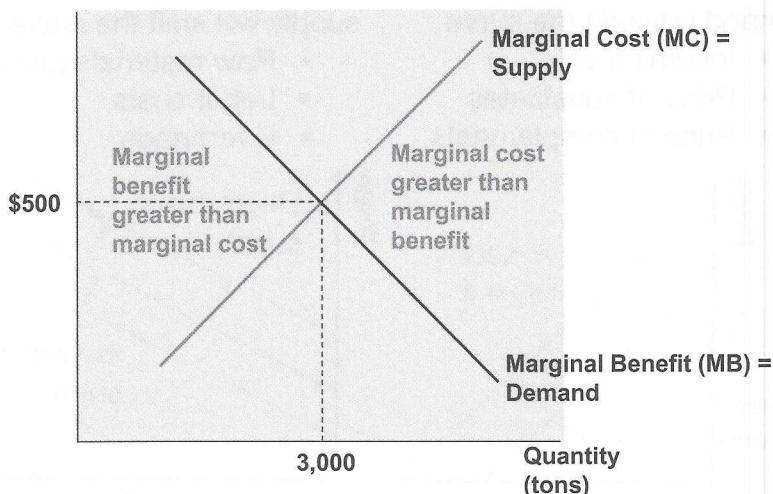
0.008 = slope coefficient of supply curve

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Equilibrium Quantity and Price

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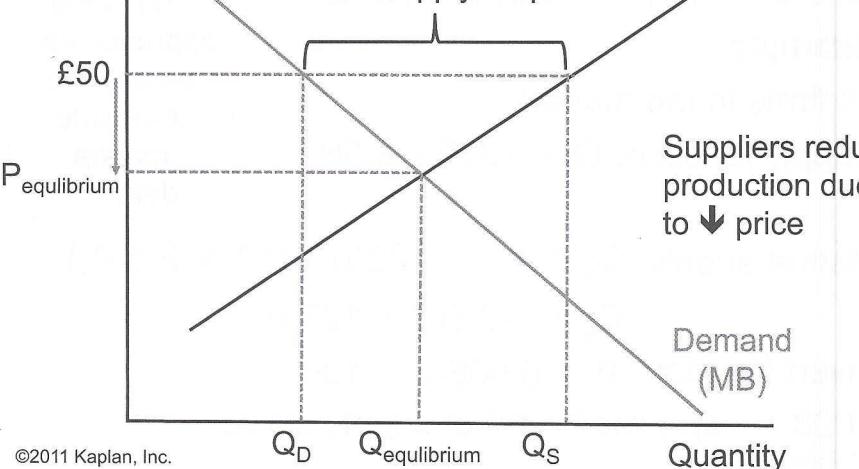
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Movement to Equilibrium

Price £

Supply > Demand
Excess supply: ↓ priceSupply
(MC)

Excess supply: ↓ price

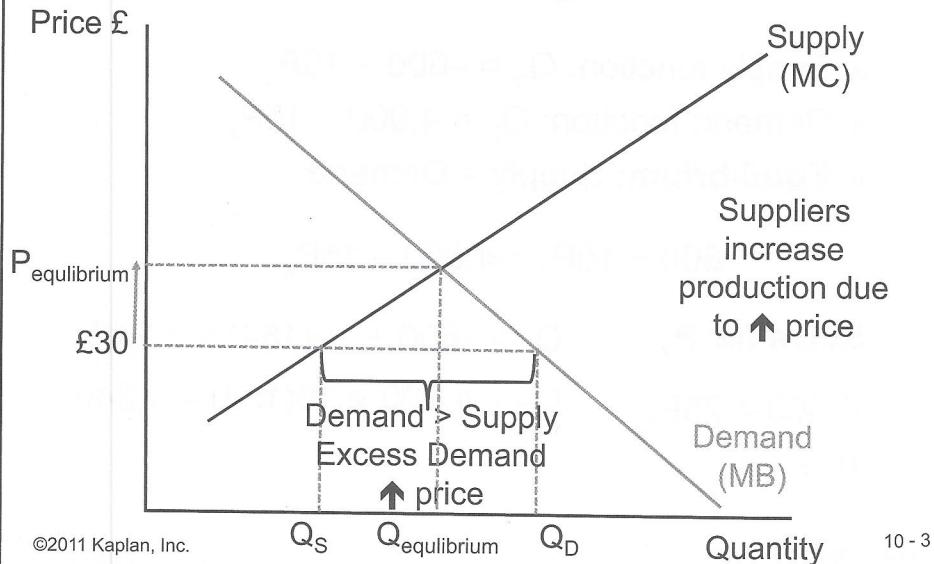
Suppliers reduce
production due
to ↓ priceDemand
(MB)

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LOS 13.d, CFAI Vol. 2 p. 17 Demand and Supply Analysis: Introduction

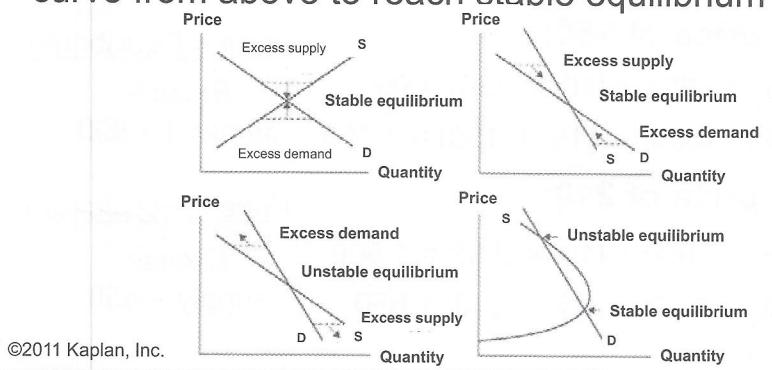
Movement to Equilibrium



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LOS 13.e, CFAI Vol. 2 p. 23 Demand and Supply Analysis: Introduction

Stable and Unstable Equilibria

- **Stable:** Market forces move price and quantity back to equilibrium
- If downward sloping, supply curve must cut demand curve from above to reach stable equilibrium



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LOS 13.f,g, CFAI Vol. 2 p. 11 Demand and Supply Analysis: Introduction

Calculation of Equilibrium

- Supply function: $Q_S = -600 + 10P_x$
- Demand function: $Q_D = 4,000 - 15P_x$
- **Equilibrium:** Supply = Demand:

$$-600 + 10P_x = 4,000 - 15P_x$$

Solve for P_x $Q_S = -600 + 10(184) = 1,240$

$$4,000 = 25P_x \quad Q_D = 4,000 - 15(184) = 1,240$$

$$P_x = 184$$

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LOS 13.f,g, CFAI Vol. 2 p. 11 Demand and Supply Analysis: Introduction

Excess Demand or Supply

- Supply function: $Q_S = -600 + 10P_x$
- Demand function: $Q_D = 4,000 - 15P_x$

At a price of 150:

$$\begin{aligned} Q_S &= -600 + (10 \times 150) = 900 \\ Q_D &= 4,000 - (15 \times 150) = 1,750 \end{aligned}$$

Price < Equilibrium

Excess

demand = 850

At a price of 210:

$$\begin{aligned} Q_S &= -600 + (10 \times 210) = 1,500 \\ Q_D &= 4,000 - (15 \times 210) = 850 \end{aligned}$$

Price > Equilibrium

Excess

supply = 650

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Demand and Supply Analysis: Introduction

Auctions

Alternative to markets for establishing equilibrium prices

- **Common value auction**

- Value of item same for all bidders
- Bidders do not know value at time of auction
- Beware: Winner's curse
- (e.g., mining rights)

- **Private value auction**

- Value of item different for all bidders
- Maximum bid is that value the item has for the bidder
- (e.g., antiques auctions)

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LOS 13.h, CFAI Vol. 2 p. 27

Demand and Supply Analysis: Introduction

Auctions

- **Ascending price auction (English auction)**

- Bidder must bid higher than previous bid
- Bids publically disclosed
- Process continues until no one is willing to bid higher
- Highest bid wins and pays bid price (last bid made)
- (e.g., automobile auctions)

- **Sealed bid auction**

- Each bidder provides one bid
- All bids remain unknown to other bidders (concealed)
- Highest bid wins and pays price bid
- Optimal bid < reservation price
- (e.g., government contracts)

Auctions

- **Second price sealed bid auction** (Vickrey auction)
 - Each bidder provides one bid
 - All bids remain unknown to other bidders (concealed)
 - Highest bid wins and pays price of *second highest* bidder
 - Optimal bid = reservation price
 - [e.g., stamp collecting (apparently!)]
- **Descending price auction** (Dutch auction)
 - Starts with a price > bidders are willing to pay
 - Reduces price until bidder agrees to pay
 - Bidder normally states quantity
 - Price is then further reduced until all is sold
 - Bidders pay price bid

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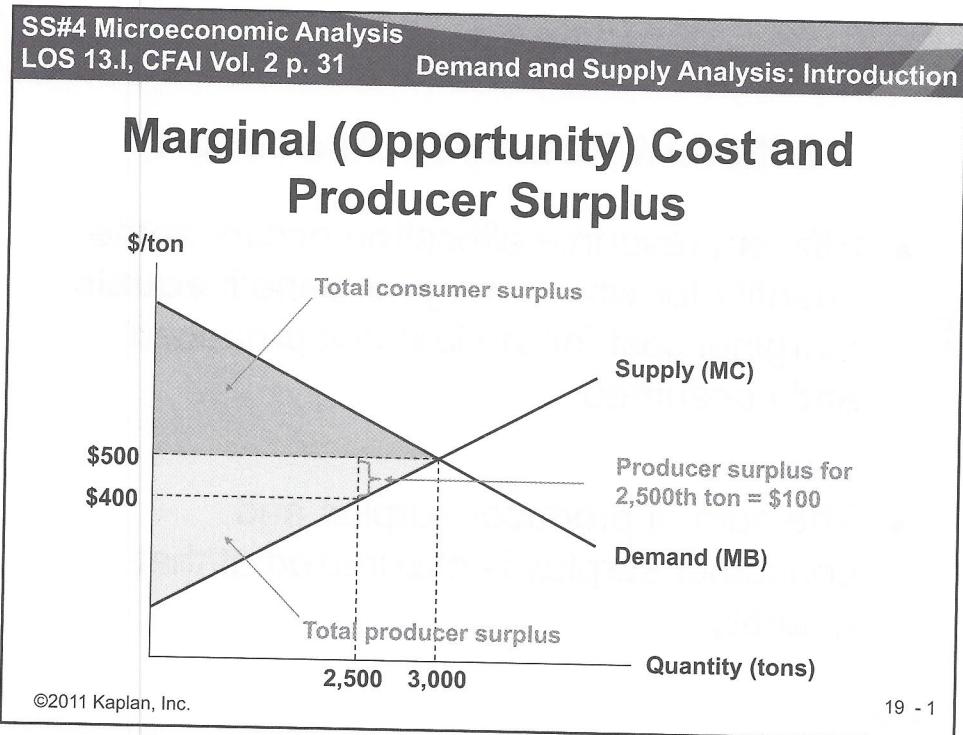
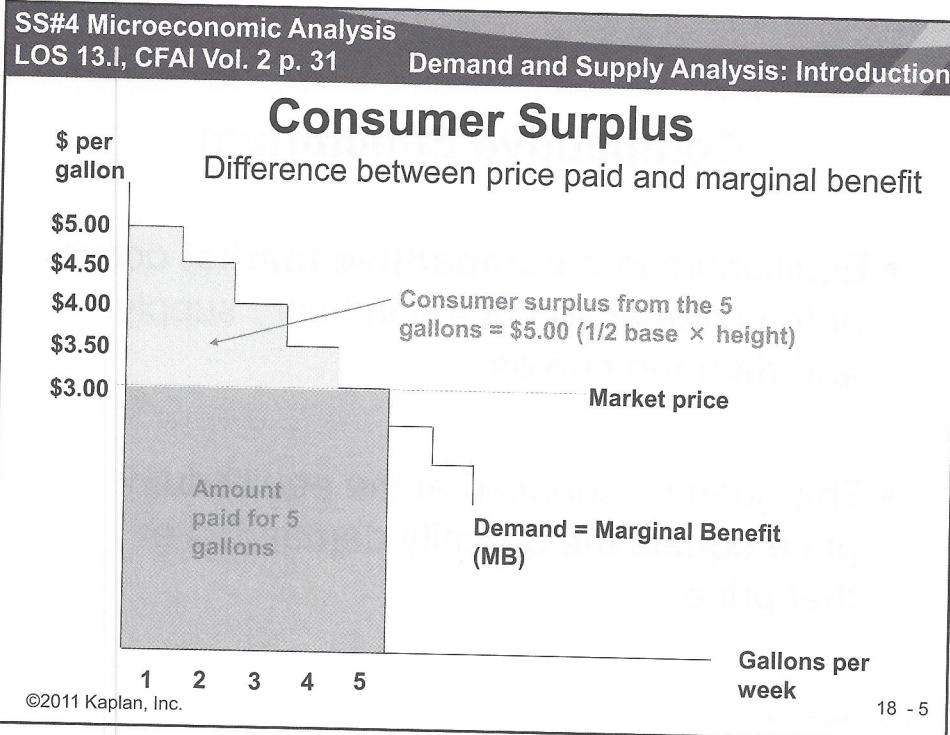
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Auctions

- **Descending price auction modified** (Modified Dutch auction)
 - Starts with a price > bidders are willing to pay
 - Reduces price until bidder agrees to pay
 - Bidder normally states quantity
 - Price is then further reduced until all is sold
 - All bidders pay price of the bidder who wins the last units offered. *Single price* to all.
 - (e.g., U.S. Treasuries)
- **Noncompetitive bid**
 - Bidders state quantity but not price
 - Pay the single price from modified Dutch auction
 - (e.g., U.S. Treasuries)

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Competitive Equilibrium

- Equilibrium in a **competitive market** occurs at the intersection of the industry supply and demand curves
- The quantity supplied at the equilibrium price equals the quantity demanded at that price

Efficient Resource Allocation

- Efficient resource allocation occurs at the quantity for which marginal benefit **equals** marginal cost for the last unit produced and consumed
- The sum of producer surplus and consumer surplus is maximized at that quantity

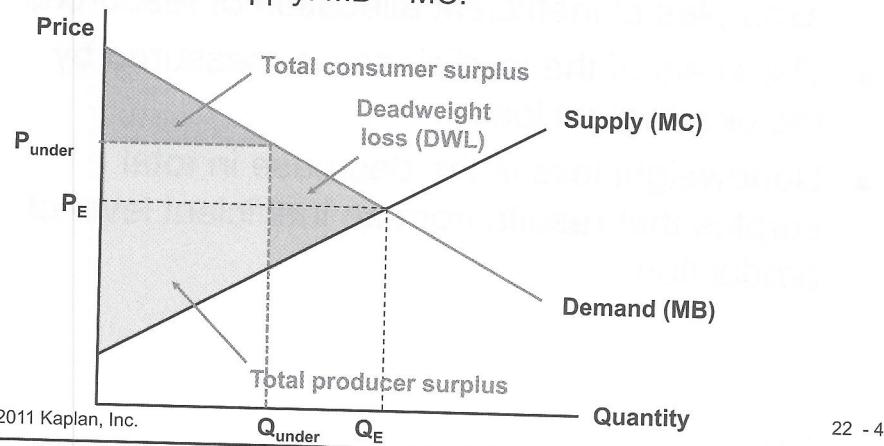
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LOS 13.I, CFAI Vol. 2 p. 31

Demand and Supply Analysis: Introduction

Underproduction and Overproduction

- Underproduction** means producing at a quantity less than equilibrium. Consumers are willing to pay more than the cost to supply. $MB > MC$.



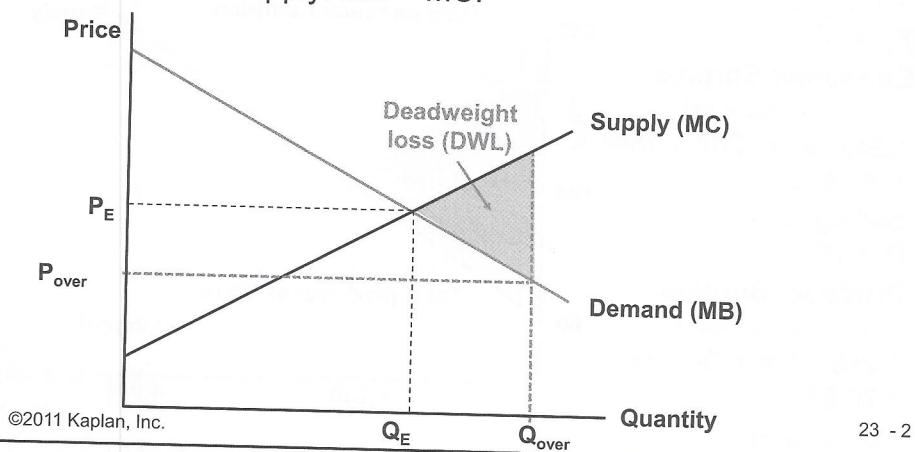
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LOS 13.I, CFAI Vol. 2 p. 31

Demand and Supply Analysis: Introduction

Underproduction and Overproduction

- Overproduction** means producing at a quantity greater than equilibrium. Consumers are willing to pay less than the cost to supply. $MB < MC$.



Deadweight Loss

- Both overproduction and underproduction are examples of inefficient allocation of resources
- The scale of the inefficiency is measured by the deadweight loss
- Deadweight loss is the decrease in total surplus that results from an inefficient level of production

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Calculating Surplus

Setting $P_x = 0$:

$$Q_D = 4,000$$

Setting $Q_D = 0$:

$$P_x = 267$$

Consumer Surplus:

Area of a triangle!

$$1,240 / 2 \times (267 - 184) \\ = 51,460$$

Setting $Q_s = 0$:

$$P_x = 60$$

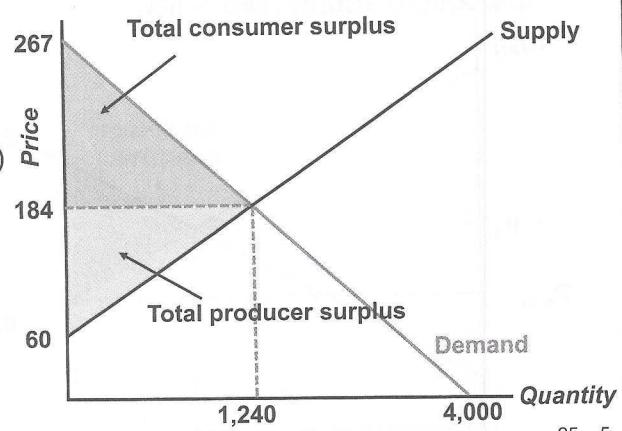
Producer Surplus:

Area of a triangle!

$$1,240 / 2 \times (184 - 60) \\ = 76,880$$

$$\text{Demand Function} = Q_D = 4,000 - 15P_x$$

$$\text{Supply Function} = Q_S = -600 + 10P_x$$

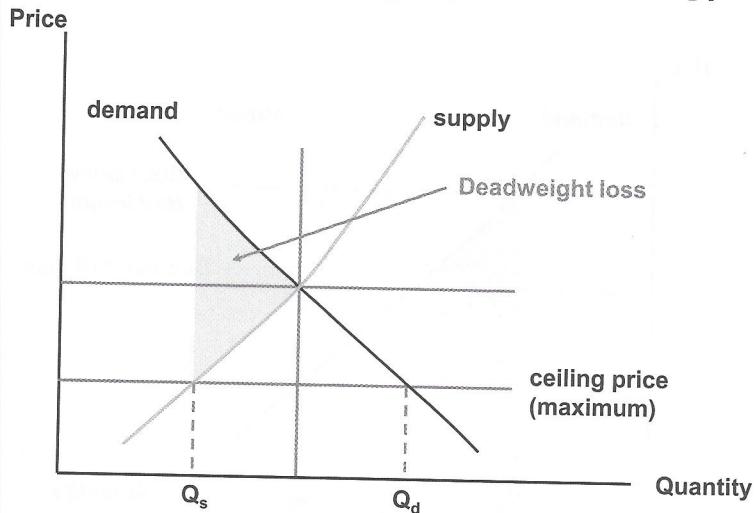


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Price Ceiling (e.g., Rent Ceiling)



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Price Ceiling

Long-run impact:

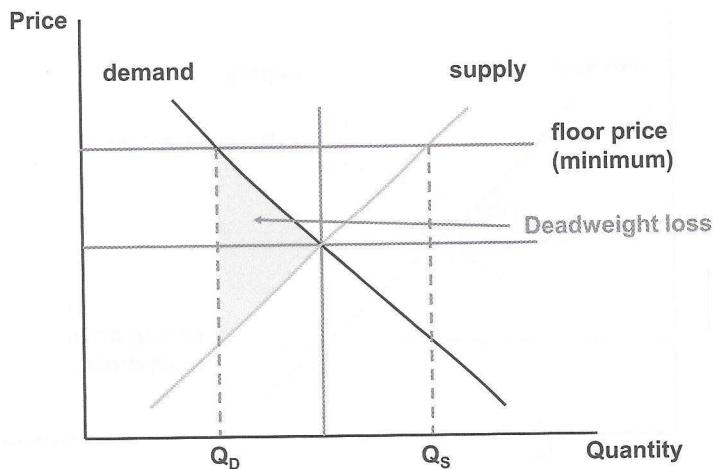
- Long waiting period to purchase
- Sellers discriminate
- Sellers take bribes
- Sellers reduce quality
- Black markets develop (Black market prices > ceiling prices)

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Price Floors (e.g., Minimum Wage)



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Price Floor

Long-run effects

- Excess supply of the good
- Substitution in consumption away from the price controlled good

Minimum wage is an example of a price floor

- Excess supply of labor increases unemployment
- Producers substitute capital for labor
- Non-monetary benefits, working conditions, on-the-job training all decrease

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Effect of Taxes

- Tax on suppliers: $P_E \uparrow Q_E \downarrow$
- **Statutory incidence versus actual incidence**

Who is legally responsible for paying the tax

Who bears the cost of the tax:
Buyers: increase in price paid
Sellers: decrease in price received

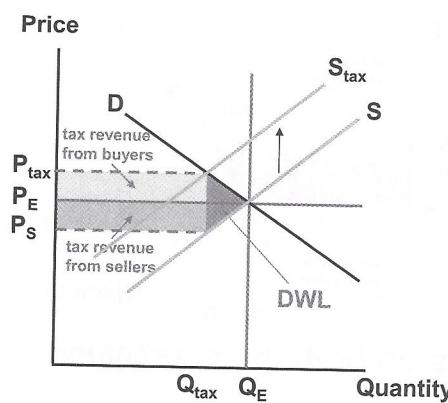
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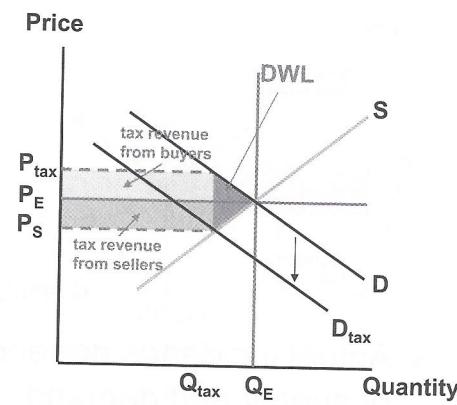
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Actual Incidence of a Tax Is Independent of Who Must Pay

(a) Tax on producers



(b) Tax on buyers



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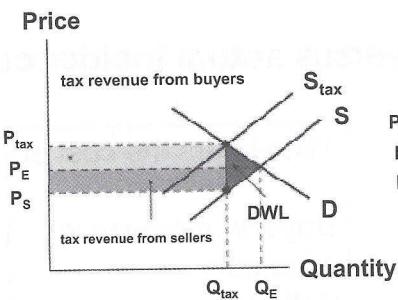
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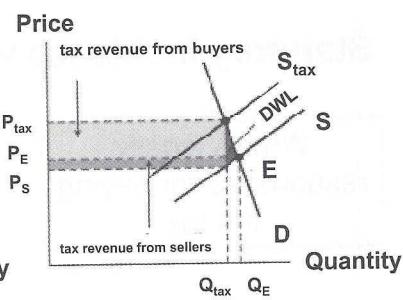
Actual Incidence of a Tax

- Inelastic demand: Buyers suffer the greater burden

(a) Elastic Demand Curve



(b) Inelastic Demand Curve



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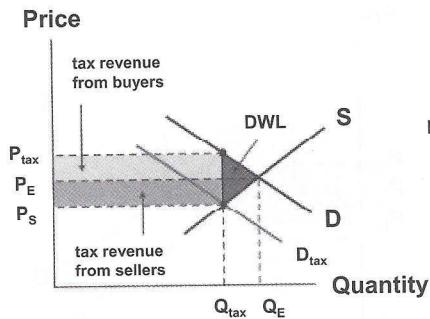
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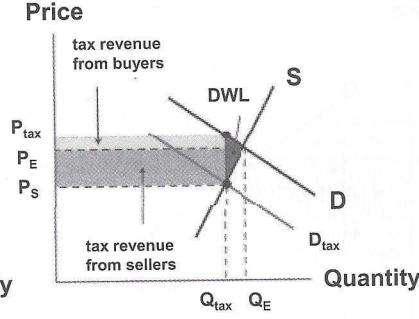
Actual Incidence of a Tax

- Inelastic supply: Sellers suffer the greater burden

(a) Elastic Supply Curve



(b) Inelastic Supply Curve



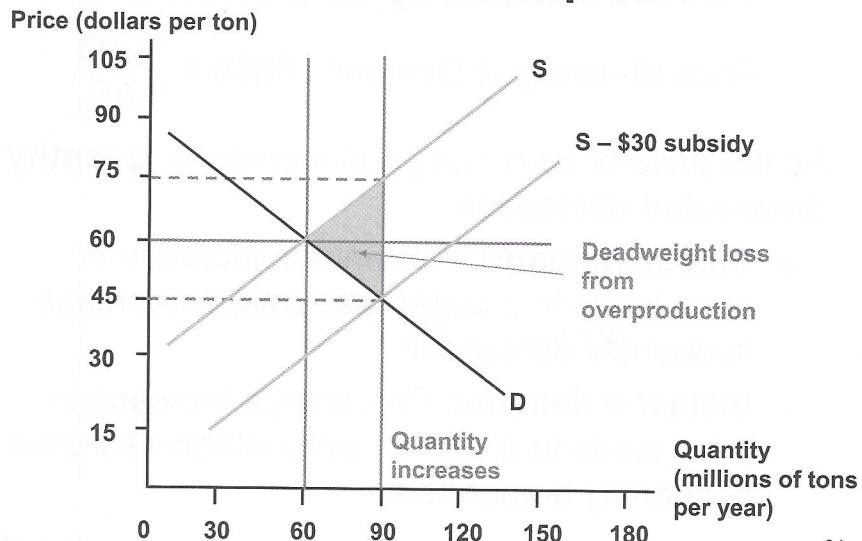
- Actual incidence depends on both the elasticities of supply and demand

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Subsidies Lead to Overproduction

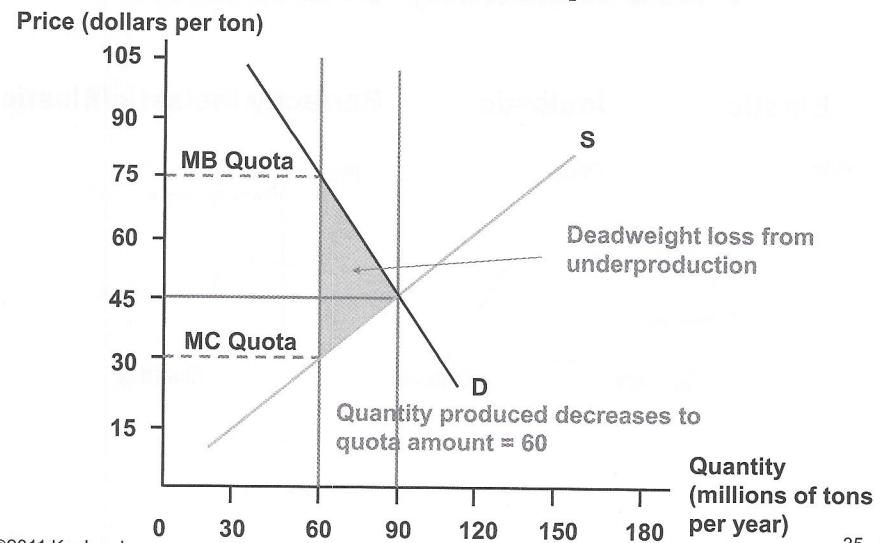


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Quotas Lead to Underproduction



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Demand and Supply Analysis: Introduction

Price Elasticity of Demand

$$\text{Price Elasticity of Demand (PED)} = \frac{\% \Delta Q}{\% \Delta P_x}$$

As the price of a normal good increases, **quantity demanded decreases**

- **Elastic demand:** Percentage increase in price leads to a larger percentage decrease in quantity demanded
- **Inelastic demand:** Percentage increase in price leads to a smaller percentage decrease in quantity demanded

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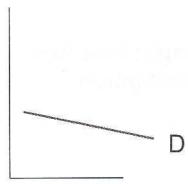
LOS 13.m, CFAI Vol. 2 p. 44

Demand and Supply Analysis: Introduction

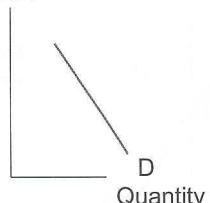
Price Elasticity of Demand

Elastic

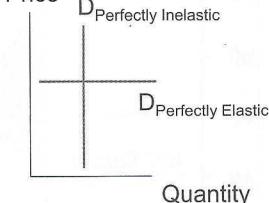
Price

**Inelastic**

Price

**Perfectly Inelastic/Elastic**

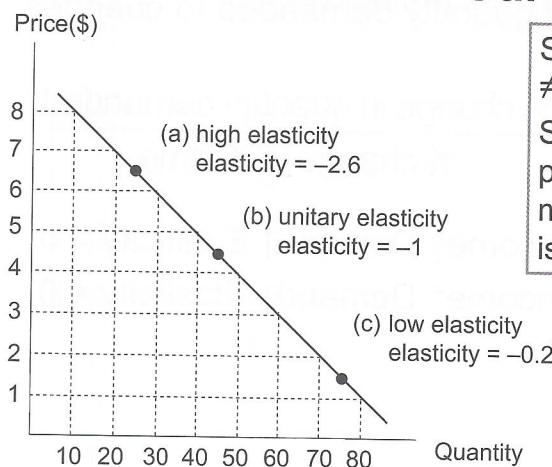
Price



Factors That Influence Elasticity of Demand

- Availability and closeness of **substitutes**
↑ Substitutes: ↑ Elasticity
- Proportion of income spent on the item
↑ Proportion of income: ↑ Elasticity
- Time elapsed since previous price change
↑ Time: ↑ Elasticity

Elasticity on a Straight-line Demand Curve



Slope of demand curve ≠ price elasticity
Slope depends on units
price and quantity are measured in. Elasticity is based on % change

Price Elasticity of Demand and Total Revenue

- Greatest total revenue ($P \times Q$) at the point where elasticity = -1
- **Inelastic range:** Price increase will **increase total revenue**; percentage decrease in quantity demanded < percentage increase in price
- **Elastic range:** Price increase will **decrease total revenue**; percentage decrease in quantity demanded > percentage increase in price

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Income Elasticity of Demand

- The sensitivity of quantity demanded to changes in income

$$\text{income elasticity} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}}$$

- **Normal good:** Income↑ Demand↑ Elasticity > 0
- **Inferior good:** Income↑ Demand↓ Elasticity < 0
(e.g., bus travel)

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Price elasticity of Demand

$$= \frac{\Delta Q}{\Delta P} \in P(AD)$$

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Demand and Supply Analysis: Introduction

Cross Price Elasticity of Demand

Price of coffee increased 16.65% and demand for tea increased 11.10%

$$\text{cross price elasticity of demand} = \frac{11.10\%}{16.65\%} = 0.67$$

cross price elasticity > 0: the goods are *substitutes*

Price of pizza increased 25.0% and demand for cola decreased 10.7%

$$\text{cross price elasticity of demand} = \frac{-10.7\%}{25.0\%} = -0.43$$

cross price elasticity < 0: the goods are *complements*

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Demand and Supply Analysis: Introduction

Calculating Elasticities

$$Q_{DX} = 4,000 - 140 P_X + 0.75 I - 300 P_Y$$

Where:

Q_{DX} = Quantity demanded of good X

P_X = Price of good X

I = Consumers' average income in € (normal good: positive coefficient)

P_Y = Price of complementary product (negative coefficient)

Assume:

$$I = €40,000 \quad Q_{DX} = 4,000 - 140 P_X + 30,000 - 4,500$$

$$P_Y = €15 \quad Q_{DX} = 29,500 - 140 P_X$$

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Demand and Supply Analysis: Introduction

Calculating Elasticities

$$\text{Price elasticity of demand (PED)} = \frac{\% \Delta Q}{\% \Delta P_X}$$

$$\frac{\% \Delta Q}{\% \Delta P_X} = \frac{\Delta Q/Q_0}{\Delta P_X/P_0} = \frac{P_X}{Q_0} \times \frac{\Delta Q}{\Delta P_X}$$

Calculate PED at a price of €150:Slope coefficient
of Price (-140)

$$Q_{DX} = 29,500 - 140 P_X$$

$$Q_{DX} = 29,500 - (140 \times €150)$$

$$Q_{DX} = 8,500$$

$$\text{PED} = \left(\frac{150}{8,500} \right) \times (-140) = -2.47$$

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Demand and Supply Analysis: Introduction

Calculating Elasticities

$$\blacksquare \text{ Income elasticity (IE)} = \frac{\% \Delta Q}{\% \Delta I} = \frac{\Delta Q/Q_0}{\Delta I/I_0} = \frac{I_0}{Q_0} \times \frac{\Delta Q}{\Delta I}$$

$$Q_{DX} = 4,000 - 140 P_X + 0.75 I - 300 P_Y$$

Assume:

$$P_X = €150$$

$$Q_{DX} = 4,000 - 21,000 + 0.75 I - 4,500$$

$$P_Y = €15$$

$$Q_{DX} = -21,500 + 0.75 I$$

Calculate IE at an income of €40,000:

$$Q_{DX} = -21,500 + 0.75 I$$

$$Q_{DX} = -21,500 + 30,000$$

$$Q_{DX} = 8,500$$

$$\text{IE} = \left(\frac{40,000}{8,500} \right) \times (0.75) = 3.53$$

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Demand and Supply Analysis: Introduction

Calculating Elasticities

- Cross price elasticity of demand (CPE) = $\frac{\% \Delta Q}{\% \Delta P_Y} = \frac{\Delta Q/Q_0}{\Delta P_Y/P_0} = \frac{P_Y}{Q_0} \times \frac{\Delta Q}{\Delta P_Y}$
 $Q_{DX} = 4,000 - 140 P_X + 0.75 I - 300 P_Y$

Assume:

$$\begin{aligned}P_X &= €150 & Q_{DX} &= 4,000 - 21,000 + 30,000 - 300 P_Y \\I &= €40,000 & Q_{DX} &= 13,000 - 300 P_Y\end{aligned}$$

Calculate CPE at a complementary price of €15:

$$\begin{aligned}Q_{DX} &= 13,000 - 300 P_Y & CPE &= \left(\frac{15}{8,500} \right) \times (-300) = -0.53 \\Q_{DX} &= 13,000 - 4,500 \\Q_{DX} &= 8,500\end{aligned}$$

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Economics: Microeconomic Analysis

14. Demand and Supply Analysis: Consumer Demand

Economics

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Demand and Supply Analysis:
Consumer Demand

Utility Theory

Explains consumer choice/behavior

- Preferences for combinations of goods
- Based on satisfaction
- Satisfaction measured by utility

Utility function:

$$\text{Utility} = U(Q_1, Q_2, Q_3, \dots, Q_N)$$

- Variables are quantity consumed of goods 1 to N
- Quantity must be ≥ 0 for each good
- \uparrow quantity of a good holding all others constant:
 \uparrow utility (non-satiation)
- Utility is an ordinal measure