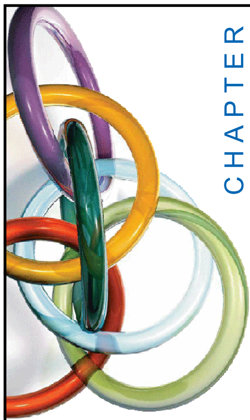

CHAPTER 16

Information, Market Failure, and the Role of Government

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CHAPTER 16 OUTLINE

16.1 GENERAL EQUILIBRIUM ANALYSIS

- **partial equilibrium analysis**
  Determination of equilibrium prices and quantities in a market independent of effects from other markets.
- **general equilibrium analysis**
  Simultaneous determination of the prices and quantities in all relevant markets, taking feedback effects into account.

16.1 GENERAL EQUILIBRIUM ANALYSIS

Two Interdependent Markets—Moving to General Equilibrium

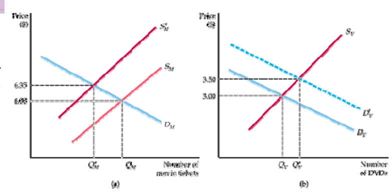
Figure 16.1

Two Interdependent Markets: (a) Movie Tickets and (b) DVD Rentals

When markets are interdependent, the prices of all products must be simultaneously determined.

Here a tax on movie tickets shifts the supply of movies upward from S_M to S^*_M, as shown in **(a)**.

The higher price of movie tickets ($6.35 rather than $6.00) initially shifts the demand for DVDs upward (from D_V to D'_V), causing the price of DVDs to rise (from $3.00 to $3.50), as shown in **(b)**.



16.1 GENERAL EQUILIBRIUM ANALYSIS

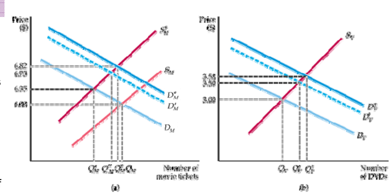
Two Interdependent Markets—Moving to General Equilibrium

Figure 16.1 (continued)

Two Interdependent Markets: (a) Movie Tickets and (b) DVD Rentals

The higher video price feeds back into the movie ticket market, causing demand to shift from D_M to D'_M and the price of movies to increase from $6.35 to $6.75.

This continues until a general equilibrium is reached, as shown at the intersection of D^*_M and S^*_M in **(a)**, with a movie ticket of $6.82, and the intersection of D^*_V and S_V in **(b)**, with a DVD price of $3.58.



16.1 GENERAL EQUILIBRIUM ANALYSIS

Reaching General Equilibrium

To find the general equilibrium prices (and quantities) in practice, we must simultaneously find two prices that equate quantity demanded and quantity supplied in all related markets.

For our two markets, we need to find the solution to four equations (supply of movie tickets, demand for movie tickets, supply of DVDs, and demand for DVDs).

Movies and DVDs are substitute goods. If the goods in question are *complements*, a partial equilibrium analysis will *overstate* the impact of a tax.

16.1 GENERAL EQUILIBRIUM ANALYSIS

EXAMPLE 16.1 The Global Market for Ethanol

The world ethanol market is dominated by Brazil and the United States, which accounted for over 90 percent of world production in 2005.

In 2007, about 40 percent of all Brazilian automobile fuel was ethanol, a response to the skyrocketing growth in the demand for flex-fuel cars.

The Energy Policy Act of 2005 required that U.S. fuel production include a minimum amount of renewable fuel each year—a stipulation which essentially mandated a baseline level of ethanol production.

The U.S. regulation of its own ethanol market can significantly affect Brazil's market. This global interdependence was made evident by the Energy Security Act of 1979, by which the U.S. offered a tax credit of $0.51 per gallon of ethanol.

To prevent foreign ethanol producers from reaping the benefits of this tax credit, the U.S. government imposed a $0.54 per gallon tax on imported ethanol.

While this policy has benefited corn producers, it is not in the interests of U.S. ethanol consumers. It is estimated that whereas Brazil can export ethanol for less than $0.90 per gallon, it costs $1.10 to produce a gallon of ethanol from Iowa corn.

16.1 GENERAL EQUILIBRIUM ANALYSIS

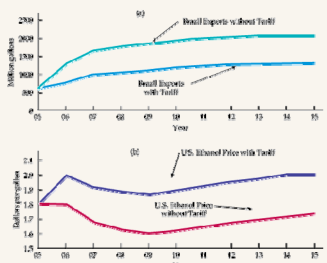
EXAMPLE 16.1 The Global Market for Ethanol (continued)

Figure 16.2

Removing the Ethanol Tariff on Brazilian Exports

If U.S. tariffs on ethanol produced abroad were to be removed, Brazil would export much more ethanol to the United States, displacing much of the more expensive corn-based ethanol produced domestically.

As a result, the price of ethanol in the U.S. would fall, benefiting U.S. consumers.



16.2 EFFICIENCY IN EXCHANGE

- **exchange economy** Market in which two or more consumers trade two goods among themselves.
- **efficient** (or **Pareto efficient) allocation** Allocation of goods in which no one can be made better off unless someone else is made worse off.

16.2 EFFICIENCY IN EXCHANGE

The Advantages of Trade

TABLE 16.1 The Advantage of Trade

Individual	Initial Allocation	Trade	Final Allocation
James	7F, 1C	– 1F, + 1C	6F, 2C
Karen	3F, 5C	+ 1F, – 1C	4F, 4C

The Edgeworth Box Diagram

- **Edgeworth box** Diagram showing all possible allocations of either two goods between two people or of two inputs between two production processes.

16.2 EFFICIENCY IN EXCHANGE

The Edgeworth Box Diagram

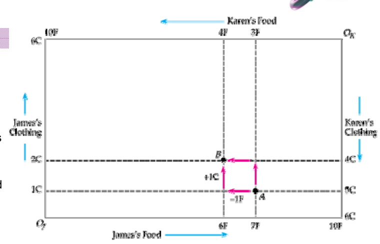
Figure 16.3

Exchange in an Edgeworth Box

Each point in the Edgeworth box simultaneously represents James's and Karen's market baskets of food and clothing.

At *A*, for example, James has 7 units of food and 1 unit of clothing,

and Karen 3 units of food and 5 units of clothing.



16.2 EFFICIENCY IN EXCHANGE

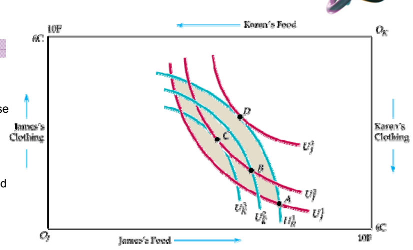
Efficient Allocations

Figure 16.4

Efficiency in Exchange

The Edgeworth box illustrates the possibilities for both consumers to increase their satisfaction by trading goods.

If *A* gives the initial allocation of resources, the shaded area describes all mutually beneficial trades.



16.2 EFFICIENCY IN EXCHANGE

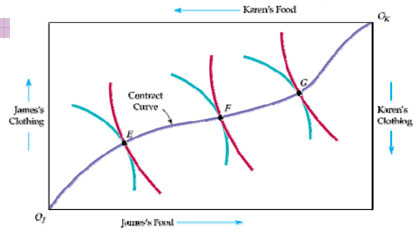
The Contract Curve

Figure 16.5

The Contract Curve

The contract curve contains all allocations for which consumers' indifference curves are tangent.

Every point on the curve is efficient because one person cannot be made better off without making the other person worse off.



- **contract curve** Curve showing all efficient allocations of goods between two consumers, or of two inputs between two production functions.

16.2 EFFICIENCY IN EXCHANGE

Consumer Equilibrium in a Competitive Market

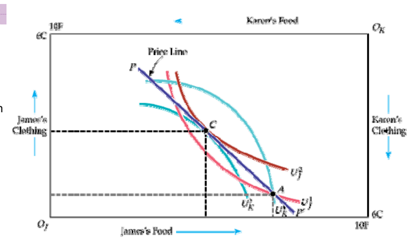
Figure 16.6

Competitive Equilibrium

In a competitive market the prices of the two goods determine the terms of exchange among consumers.

If *A* is the initial allocation of goods and the price line *PP'* represents the ratio of prices, the competitive market will lead to an equilibrium at *C*, the point of tangency of both indifference curves.

As a result, the competitive equilibrium is efficient.



16.2 EFFICIENCY IN EXCHANGE

Consumer Equilibrium in a Competitive Market

- **excess demand** When the quantity demanded of a good exceeds the quantity supplied.

- **excess supply** When the quantity supplied of a good exceeds the quantity demanded.

Chapter 16: Information, Market Failure, and the Role of Government

16.2 EFFICIENCY IN EXCHANGE

The Economic Efficiency of Competitive Markets

- **welfare economics** Normative evaluation of markets and economic policy

If everyone trades in the competitive marketplace, all mutually beneficial trades will be completed and the resulting equilibrium allocation of resources will be economically efficient.

Let's summarize what we know about a competitive equilibrium from the consumer's perspective:

1. Because the indifference curves are tangent, all marginal rates of substitution between consumers are equal.

2. Because each indifference curve is tangent to the price line, each person's MRS of clothing for food is equal to the ratio of the prices of the two goods.

$$MRS^{J}_{FC} = P_F / P_C = MRS^{K}_{FC} \quad \textbf{(16.1)}$$

Chapter 16: Information, Market Failure, and the Role of Government

16.3 EQUITY AND EFFICIENCY

The Utility Possibilities Frontier

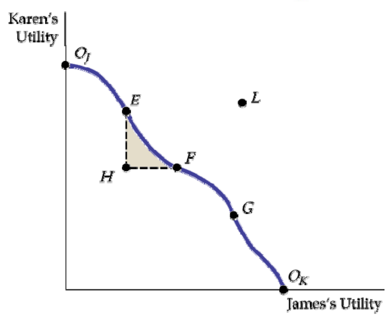
Figure 16.7

Competitive Equilibrium

The utility possibilities frontier shows the levels of satisfaction that each of two people achieve when they have traded to an efficient outcome on the contract curve.

Points *E*, *F*, and *G* correspond to points on the contract curve and are efficient.

Point *H* is inefficient because any trade within the shaded area will make one or both people better off.



Chapter 16: Information, Market Failure, and the Role of Government

16.3 EQUITY AND EFFICIENCY

The Utility Possibilities Frontier

- **utility possibilities frontier** Curve showing all efficient allocations of resources measured in terms of the utility levels of two individuals.

Social Welfare Functions

- **social welfare function** Measure describing the well-being of society as a whole in terms of the utilities of individual members.

TABLE 16.2 Four Views of Equity
1. Egalitarian—all members of society receive equal amounts of goods
2. Rawlsian—maximize the utility of the least-well-off person
3. Utilitarian—maximize the total utility of all members of society
4. Market-oriented—the market outcome is the most equitable

16.3 EQUITY AND EFFICIENCY

Equity and Perfect Competition

If individual preferences are convex, then every efficient allocation (every point on the contract curve) is a competitive equilibrium for some initial allocation of goods.

Literally, this theorem tells us that any equilibrium deemed to be equitable can be achieved by a suitable distribution of resources among individuals and that such a distribution need not in itself generate inefficiencies.

Unfortunately, all programs that redistribute income in our society are economically costly.

16.4 EFFICIENCY IN PRODUCTION

Input Efficiency

- **technical efficiency** Condition under which firms combine inputs to produce a given output as inexpensively as possible.

If producers of food and clothing minimize production costs, they will use combinations of labor and capital so that the ratio of the marginal products of the two inputs is equal to the ratio of the input prices:

$$\mathrm{MP}_L / \mathrm{MP}_K = w/r$$

But we also showed that the ratio of the marginal products of the two inputs is equal to the marginal rate of technical substitution of labor for capital MRTS_{LK}. As a result,

$$\mathrm{MRTS}_{LK} = w/r \qquad \textbf{(16.2)}$$

16.4 EFFICIENCY IN PRODUCTION

The Production Possibilities Frontier

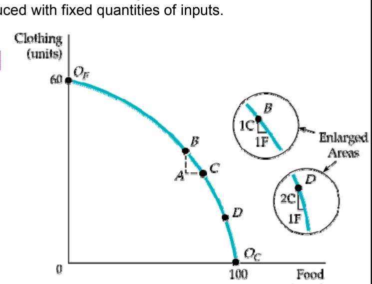
- **production possibilities frontier** Curve showing the combinations of two goods that can be produced with fixed quantities of inputs.

Figure 16.8

Production Possibilities Frontier

The production possibilities frontier shows all efficient combinations of outputs.

The production possibilities frontier is concave because its slope (the marginal rate of transformation) increases as the level of production of food increases.



16.4 EFFICIENCY IN PRODUCTION

The Production Possibilities Frontier

Marginal Rate of Transformation

- **marginal rate of transformation**
  Amount of one good that must be given up to produce one additional unit of a second good.

At every point along the frontier, the following condition holds:

$$\mathrm{MRT} = \mathrm{MC}_F / \mathrm{MC}_C \qquad \textbf{(16.3)}$$

16.4 EFFICIENCY IN PRODUCTION

Output Efficiency

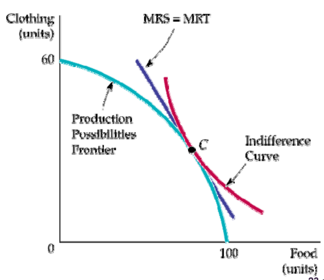
An economy produces output efficiently only if, for each consumer,

$$\mathrm{MRS} = \mathrm{MRT} \qquad \textbf{(16.4)}$$

Figure 16.9

Output Efficiency

The efficient combination of outputs is produced when the marginal rate of transformation between the two goods (which measures the cost of producing one good relative to the other) is equal to the consumer's marginal rate of substitution (which measures the marginal benefit of consuming one good relative to the other).



16.4 EFFICIENCY IN PRODUCTION

Efficiency in Output Markets

When output markets are perfectly competitive, all consumers allocate their budgets so that their marginal rates of substitution between two goods are equal to the price ratio. For our two goods, food and clothing,

$$\mathrm{MRS} = P_F / P_C$$

At the same time, each profit-maximizing firm will produce its output up to the point at which price is equal to marginal cost. Again, for our two goods,

$$P_F = \mathrm{MC}_F \quad \text{and} \quad P_C = \mathrm{MC}_C$$

Because the marginal rate of transformation is equal to the ratio of the marginal costs of production, it follows that

$$\mathrm{MRT} = \mathrm{MC}_F / \mathrm{MC}_C = P_F / P_C = \mathrm{MRS} \qquad \textbf{(16.5)}$$

16.4 EFFICIENCY IN PRODUCTION

Efficiency in Output Markets

Figure 16.10

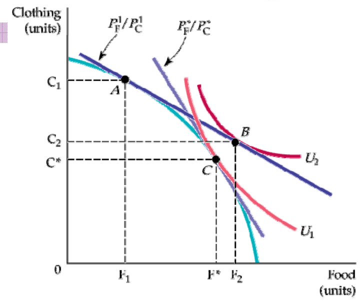
Competition and Output Efficiency

In a competitive output market, people consume to the point where their marginal rate of substitution is equal to the price ratio.

Producers choose outputs so that the marginal rate of transformation is equal to the price ratio.

Because the MRS equals the MRT, the competitive output market is efficient.

Any other price ratio will lead to an excess demand for one good and an excess supply of the other.



16.5 THE GAINS FROM FREE TRADE

Comparative Advantage

- **comparative advantage** Situation in which Country 1 has an advantage over Country 2 in producing a good because the cost of producing the good in 1, relative to the cost of producing other goods in 1, is lower than the cost of producing the good in 2, relative to the cost of producing other goods in 2.
- **absolute advantage** Situation in which Country 1 has an advantage over Country 2 in producing a good because the cost of producing the good in 1 is lower than the cost of producing it in 2.

TABLE 16.3 Hours of Labor Required to Produce Cheese and Wine

	Cheese (1 *LB*)	Wine (1 *GAL*)
Holland	1	2
Italy	6	3

16.5 THE GAINS FROM FREE TRADE

Comparative Advantage

What Happens when Nations Trade

The comparative advantage of each country determines what happens when they trade.

The outcome will depend on the price of each good relative to the other when trade occurs.

16.5 THE GAINS FROM FREE TRADE

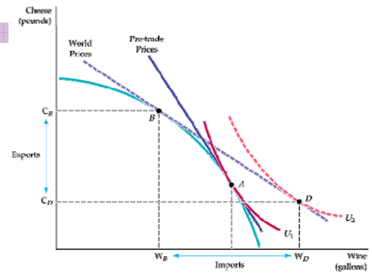
An Expanded Production Possibilities Frontier

Figure 16.11

The Gains from Trade

Without trade, production and consumption are at point *A*, where the price of wine is twice the price of cheese.

With trade at a relative price of 1 cheese to 1 wine, domestic production is now at *B*, while domestic consumption is at *D*. Free trade has allowed utility to increase from U_1 to U_2.



16.5 THE GAINS FROM FREE TRADE

EXAMPLE 16.2 Trading Tasks and iPod Production

TABLE 16.4 Different Tasks in iPod Production

Component	Company	Manufacturing Location	Price ($)	% of Retail Price
Product Design / Concept	Apple (U.S.)	U.S.	79.85	26.7
Hard Drive (30GB)	Toshiba (Japan)	China	73.39	24.6
Display	Matsushita & Toshiba	Japan	20.39	6.8
Video Processor	Broadcom (U.S.)	Taiwan or Singapore	8.36	2.8
Central Processor	PortalPlayer (U.S.)	U.S. or Taiwan	4.94	1.7
Unit Assembly	Inventec (Taiwan)	China	3.70	1.2
All other parts (about 450)	-	-	33.62	11.2
Total Parts	-	-	144.40	48.3
Distribution and Retail	-	U.S.	74.75	25.0
Final Retail Price (2005)			299.00	100.0

16.5 THE GAINS FROM FREE TRADE

EXAMPLE 16.3 The Costs and Benefits of Special Protection

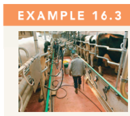


TABLE 16.5 Quantifying the Costs of Protection

Industry	Producer Gains[a] ($ Millions)	Consumer Losses[b] ($ Millions)	Efficiency Losses[c] ($ Millions)
Book manufacturing	305	500	29
Orange juice	390	525	130
Textiles and apparel	22,000	27,000	4850
Carbon steel	3800	6800	330
Color televisions	190	420	7
Sugar	550	930	130
Dairy products	5000	5500	1370
Meat	1600	1800	145

[a]Producer gains in the tariff case are defined as the area of trapezoid A in Figure 9.15.
[b]Consumer losses are the sum of areas A, B, C, and D in Figure 9.15.
[c]These are given by triangles B and C in Figure 9.15.

16.6 AN OVERVIEW—THE EFFICIENCY OF COMPETITIVE MARKETS

It is essential to review our understanding of the workings of the competitive process. We thus list the conditions required for economic efficiency in exchange, in input markets, and in output markets.

1. *Efficiency in exchange:* All allocations must lie on the exchange contract curve so that every consumer's marginal rate of substitution of food for clothing is the same:

$$\mathrm{MRS}^{J}_{\mathrm{FC}} = \mathrm{MRS}^{K}_{\mathrm{FC}}$$

A competitive market achieves this efficient outcome because, for consumers, the tangency of the budget line and the highest attainable indifference curve assure that:

$$\mathrm{MRS}^{J}_{\mathrm{FC}} = P_F/P_C = \mathrm{MRS}^{K}_{\mathrm{FC}}$$

16.6 AN OVERVIEW—THE EFFICIENCY OF COMPETITIVE MARKETS

2. *Efficiency in the use of inputs in production:* Every producer's marginal rate of technical substitution of labor for capital is equal in the production of both goods:

$$\mathrm{MRTS}^{F}_{\mathrm{LK}} = \mathrm{MRTS}^{C}_{\mathrm{LK}}$$

A competitive market achieves this efficient outcome because each producer maximizes profit by choosing labor and capital inputs so that the ratio of the input prices is equal to the marginal rate of technical substitution:

$$\mathrm{MRTS}^{F}_{\mathrm{LK}} = w/r = \mathrm{MRTS}^{C}_{\mathrm{LK}}$$

16.6 AN OVERVIEW—THE EFFICIENCY OF COMPETITIVE MARKETS

3. *Efficiency in the output market:* The mix of outputs must be chosen so that the marginal rate of transformation between outputs is equal to consumers' marginal rates of substitution:

$$\mathrm{MRT}_{\mathrm{FC}} = \mathrm{MRS}_{\mathrm{FC}} \quad \text{(for all consumers)}$$

A competitive market achieves this efficient outcome because profit-maximizing producers increase their output to the point at which marginal cost equals price:

$$P_F = \mathrm{MC}_F, \qquad P_C = \mathrm{MC}_C$$

As a result,

$$\mathrm{MRT}_{\mathrm{FC}} = \mathrm{MC}_F/\mathrm{MC}_C = P_F/P_C$$

But consumers maximize their satisfaction in competitive markets only if

$$P_F/P_C = \mathrm{MRS}_{\mathrm{FC}} \quad \text{(for all consumers)}$$

Therefore,

$$\mathrm{MRS}_{\mathrm{FC}} = \mathrm{MRT}_{\mathrm{FC}}$$

16.7 WHY MARKETS FAIL

Market Power

Suppose that unions gave workers market power over the supply of their labor in the production of food.

Too little labor would then be supplied to the food industry at too high a wage and too much labor to the clothing industry at too low a wage.

In the clothing industry, the input efficiency conditions would be satisfied. In the food industry, the wage paid would be greater than the wage paid in the clothing industry.

The result is input inefficiency because efficiency requires that the marginal rates of technical substitution be equal in the production of all goods.

16.7 WHY MARKETS FAIL

Incomplete Information

If consumers do not have accurate information about market prices or product quality, the market system will not operate efficiently.

This lack of information may give producers an incentive to supply too much of some products and too little of others.

In other cases, while some consumers may not buy a product even though they would benefit from doing so, others buy products that leave them worse off.

16.7 WHY MARKETS FAIL

Externalities

Sometimes, however, market prices do not reflect the activities of either producers or consumers.

There is an *externality* when a consumption or production activity has an indirect effect on other consumption or production activities that is not reflected directly in market prices.

16.7 WHY MARKETS FAIL

Public Goods

Market failure arises when the market fails to supply goods that many consumers value.

- **public good** Nonexclusive, nonrival good that can be made available cheaply but which, once available, is difficult to prevent others from consuming.