Microeconomics, Module 9, "Welfare Economics and the Gains from Trade" (Chapter 8)

(Overview and Concepts)

(See the attached PDF file.)

(Many parts of this chapter are not required for the homework assignments and are not tested on the final exam, such as Edgeworth boxes; see the comments in the PDF file. These topics are covered here only to assist candidates who want to read these sections.)

Measuring the Gains from Trade

Part 1: Consumers and producers surplus

- An item's *value* is the maximum that a consumer is willing to pay for the item.
- The *marginal value* decreases as consumption increases.
- The (compensated) demand curve is the marginal value curve. If the good is a small portion of income, the compensated demand curve is the demand curve.
- The total value of consumer purchases is the area *under the demand curve* and *out to the quantity demanded*. Total value differs from consumers' surplus (see below).
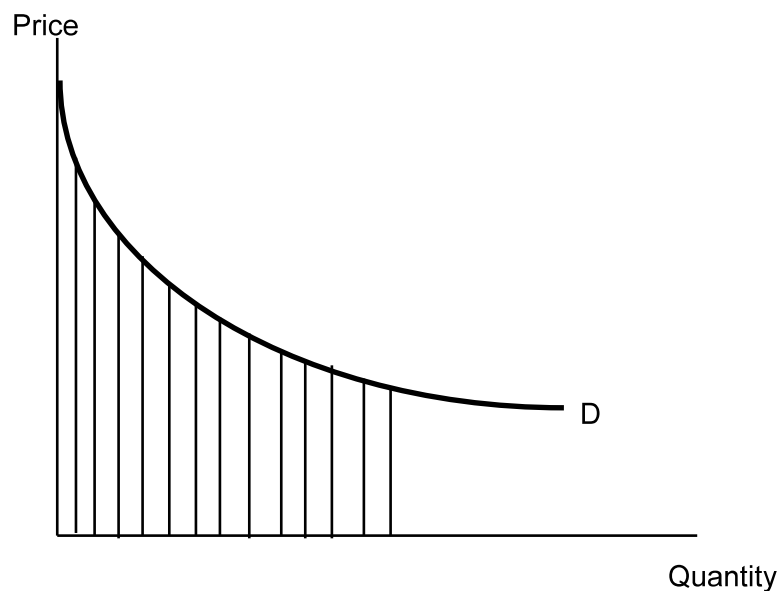
Quantity

- *Consumers' surplus (CS):* the area *under the demand curve*, *down to the price paid*, and *out to the quantity bought*.
- *Producers' surplus (PS):* the area *above the supply curve*, *up to the price received*, and *out to the quantity supplied*.

(For a non-competitive producer, producers' surplus is *above the marginal cost curve*.)

The social welfare gain is consumers' surplus (CS) + producers' surplus (PS).
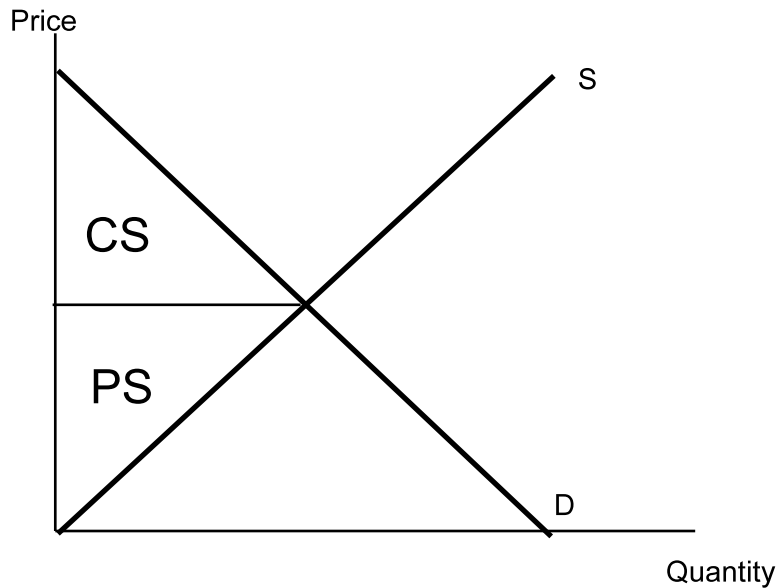
Exercise 9.1: Consumers' Surplus

(Adapted from question 14 of the November 1992 actuarial exam)

A consumer's demand curve is represented by the table below. What is the consumer's surplus if the market price of the good is $12?

Price	Quantity	Price	Quantity
20	1	10	6
18	2	8	7
16	3	6	8
14	4	4	9
12	5	2	10

Solution 9.1:

Consumers' surplus is what the consumer *is willing to pay* for a given quantity *minus the price actually paid*.

At a market price of $12, the consumer buys 5 units for a total price of 12 × 5 = $60.
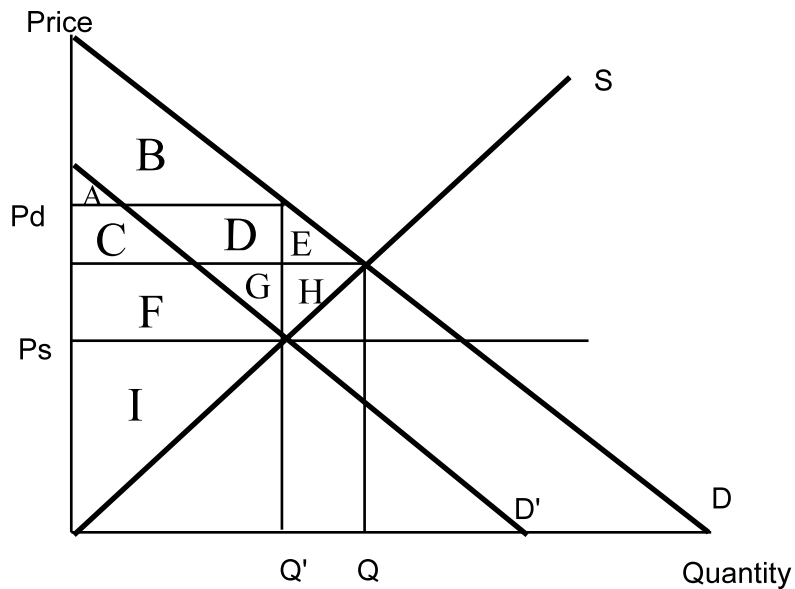
The consumer is willing to pay:

    $20 for the first unit
+ $18 for the second unit

+ $16 for the third unit
+ $14 for the fourth unit
+ $12 for the fifth unit
= $80 in total

Consumers' surplus is 80 – 60 = 20.

Part 2: Changes in Consumers and Producers Surplus

Sales tax

	Pre-Tax	After-Tax
Consumers' Surplus	A + B + C + D + E	A + B
Producers' Surplus	F + G + H + I	I
Tax		C + D + F + G
Social Gain	A+B+C+D+E+F+G+H+	A+B+C+D+F+G+
Wealth Transfer: C → G		C + D
Wealth Transfer: P → G		F + G
Dead Weight Loss		E + H

(C → G = consumers to government; P → G = producers to government)

● A tax changes the way wealth is distributed (wealth transfer).
● A tax changes the amount of wealth (dead weight loss)

Normative Criteria

- *Pareto criterion:* One policy is better than another if at least one person gains and no one loses.
- *Potential Pareto criterion:* Any scenario that can be defeated, even by a scenario not under consideration, should be rejected.
- *Efficiency criterion:* One policy is better than another if it creates more social gain.
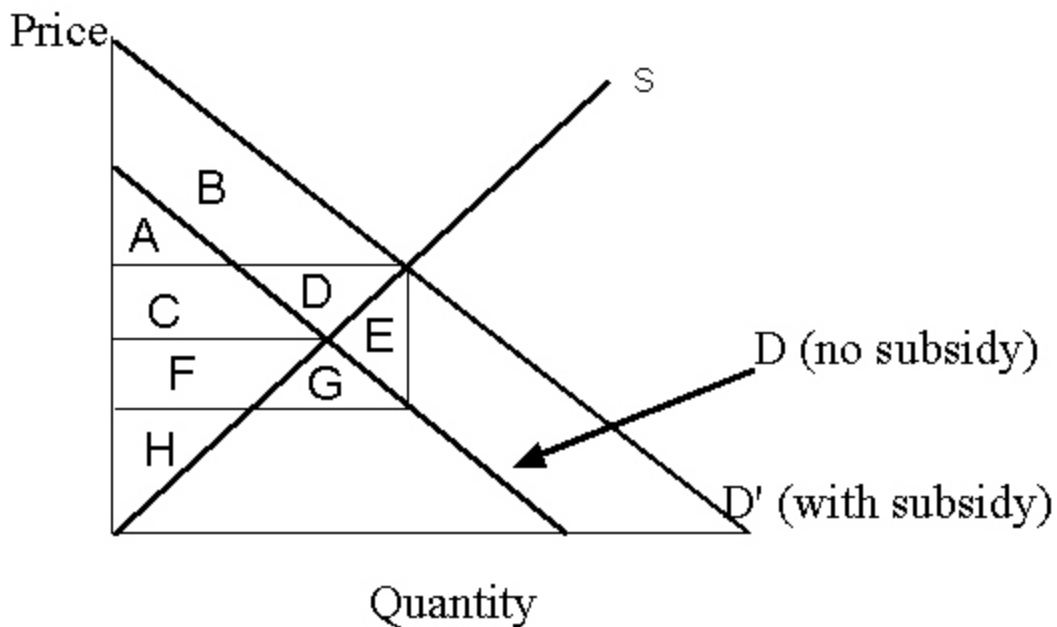
Potential Pareto is the same as Efficiency.

(The final exam questions deal only with the efficiency criterion.)
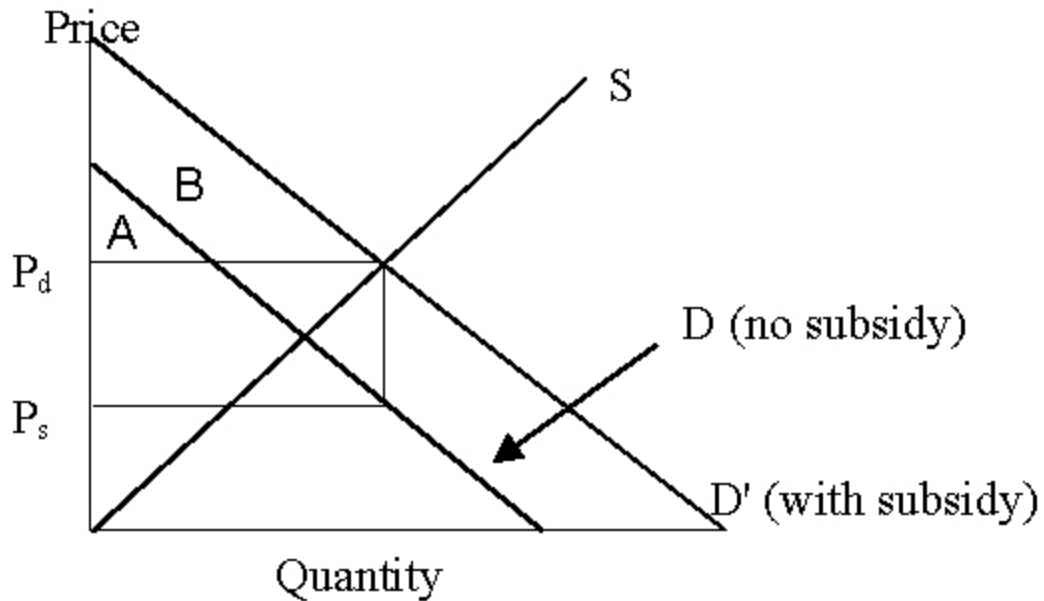
Part 3: Examples and Applications

3A: Subsidies

Consumers subsidized

	Pre-Subsidy	After-Subsidy
Consumers' Surplus	A + C	A + C + F + G
Producers' Surplus	F + H	C + D + F + H
Cost to Taxpayers		C + D + E + F + G
Social Gain	A + C + F + H	A + C + F + H − E
Wealth Transfer: G → C		F + G
Wealth Transfer: G → P		C + D
Dead Weight Loss		E

Alternative method:

Price

- The alternative method treats the subsidy as raising the marginal value.
- This perspective views each unit as being bought at the market price P_d.

Exercise 9.2: Price Subsidy

(Adapted from question 33 of the November 2000 Course 2 exam)

A new device reduces air pollution when attached to a vehicle's exhaust system. The supply and demand curves for the device are:

- Supply: $P = 0.0003\ Q$
- Demand: $P = 20 - 0.0002\ Q$

(P is Price and Q is Quantity)

To increase use of the device, the state gives a subsidy that increases quantity demanded by 25%.

A. What is the quantity produced before the subsidy?
B. What is the quantity produced before the subsidy?
C. What is the price after the subsidy?
D. What price would be needed with a subsidy to sell this quantity?
E. What is the cost to the state of this subsidy?
F. Why might the subsidy be a good idea despite the dead weight loss?

Solution 9.2:

Part A: We find the equilibrium quantity before the subsidy by setting supply = demand:

$$0.0003Q = 20 - 0.0002Q$$
$$\Rightarrow Q = 40{,}000$$

Part B: We find the equilibrium quantity after the subsidy by increasing the quantity 25%:

$$40{,}000 \times 1.25 = 50{,}000.$$

Part C: To get the price needed for a supply of 50,000, we use the supply curve:

$$P = 0.0003Q = 0.0003 \times 50{,}000 = 15.$$

Part D: To get the price needed for a demand of 50,000 units, we use the demand curve:

$$P = 20 - 0.0002\,Q = 20 - 0.0002 \times 50{,}000 = \$10$$

Part E: The subsidy per unit is \$15 – \$10 = \$5. The total cost to the state is

$$\$5 \times 50{,}000 = \$250{,}000$$

Part F: This pollution control device may not give much utility to its buyers, but it reduces pollution in the city and gives utility to all other residents. This positive externality creates a social gain, which simple supply and demand curves do not measure. We discuss externalities in a later module, showing how to adjust the supply and demand curves to consider the social gain, not the private gain.

Part 2: Price ceilings

A price ceiling is *effective* if it is below the equilibrium price.
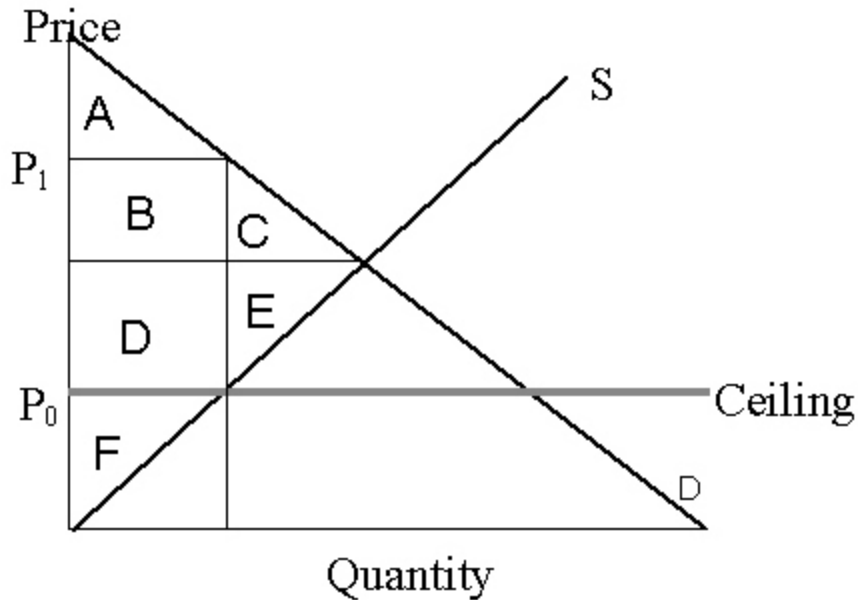
The price ceiling is P_0. Consumers compete for the scarce supply (e.g., standing in line), pushing the full price up to P_1.

Two parts of the deadweight loss:

● C + E: social loss because quantity is reduced
● B + D: value of time spent waiting in line

♦ Consumers' surplus is CS = A
♦ Producers' surplus is PS = F

The difference between a price control that increases the full price to P_1 and a tax that increases the full price to P_1 is that the tax revenue is a wealth transfer, not a social loss.

{The rest of this module is not required for the homework assignments and is not tested on the final exam. The explanations and graphics below and solely for candidates who wish to read this chapter of the text.}

Part 4: Theories of Value

● Value is the willingness to pay, so price is the marginal value.
● Diamond-water paradox: price reflects marginal value, not average value.
● Labor theory of value: Value is the amount of labor needed for production.
● The book value of a firm assumes the labor theory of value; it measures what it cost to build up the firm.
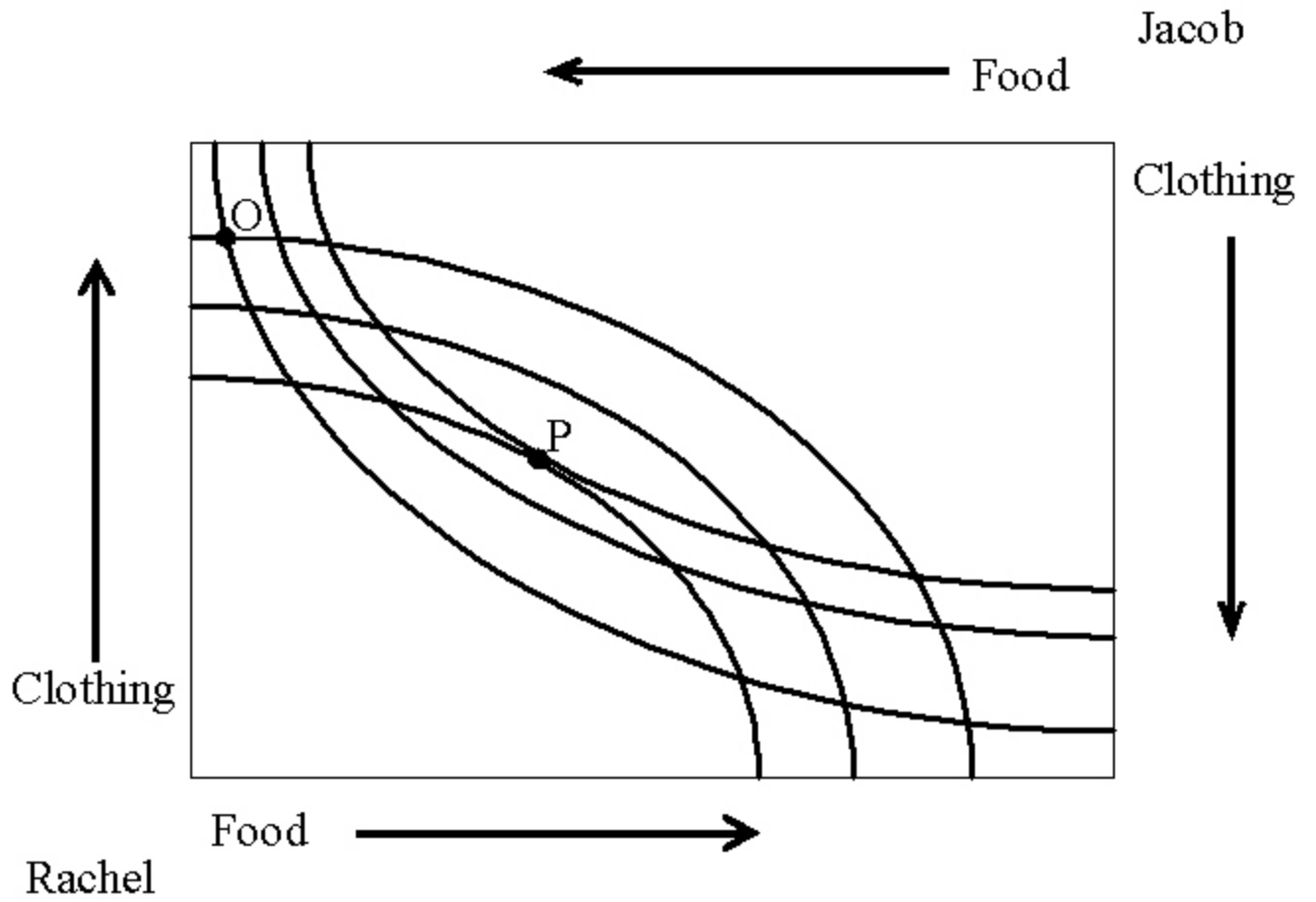
First Fundamental Theorem of Welfare Economics: (Invisible Hand Theorem)

A competitive equilibrium is Pareto Optimal: the market achieves the maximum possible social gain.

General Equilibrium Without Production: Edgeworth Boxes

Jacob

← Food

Clothing

O (endowment point)
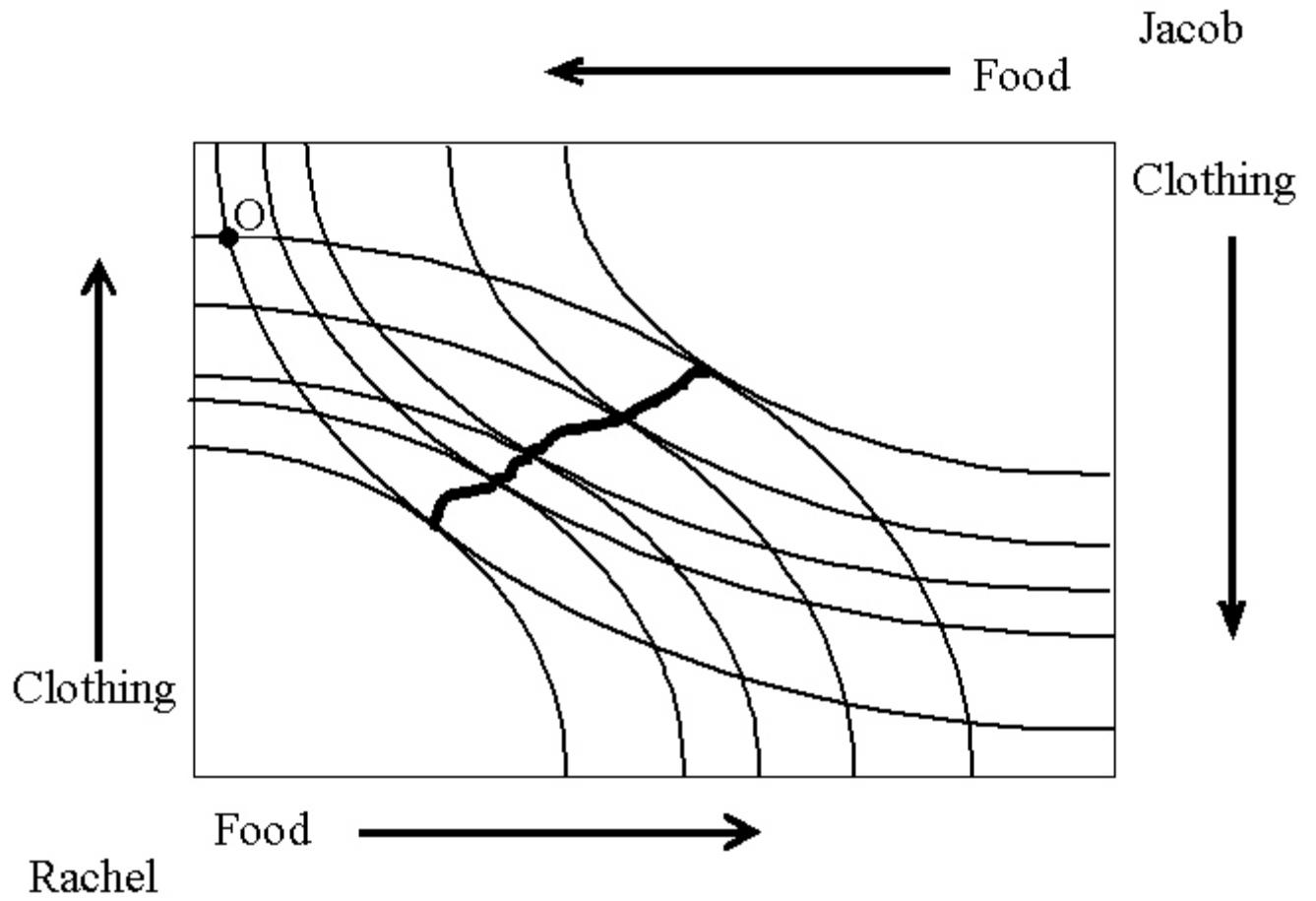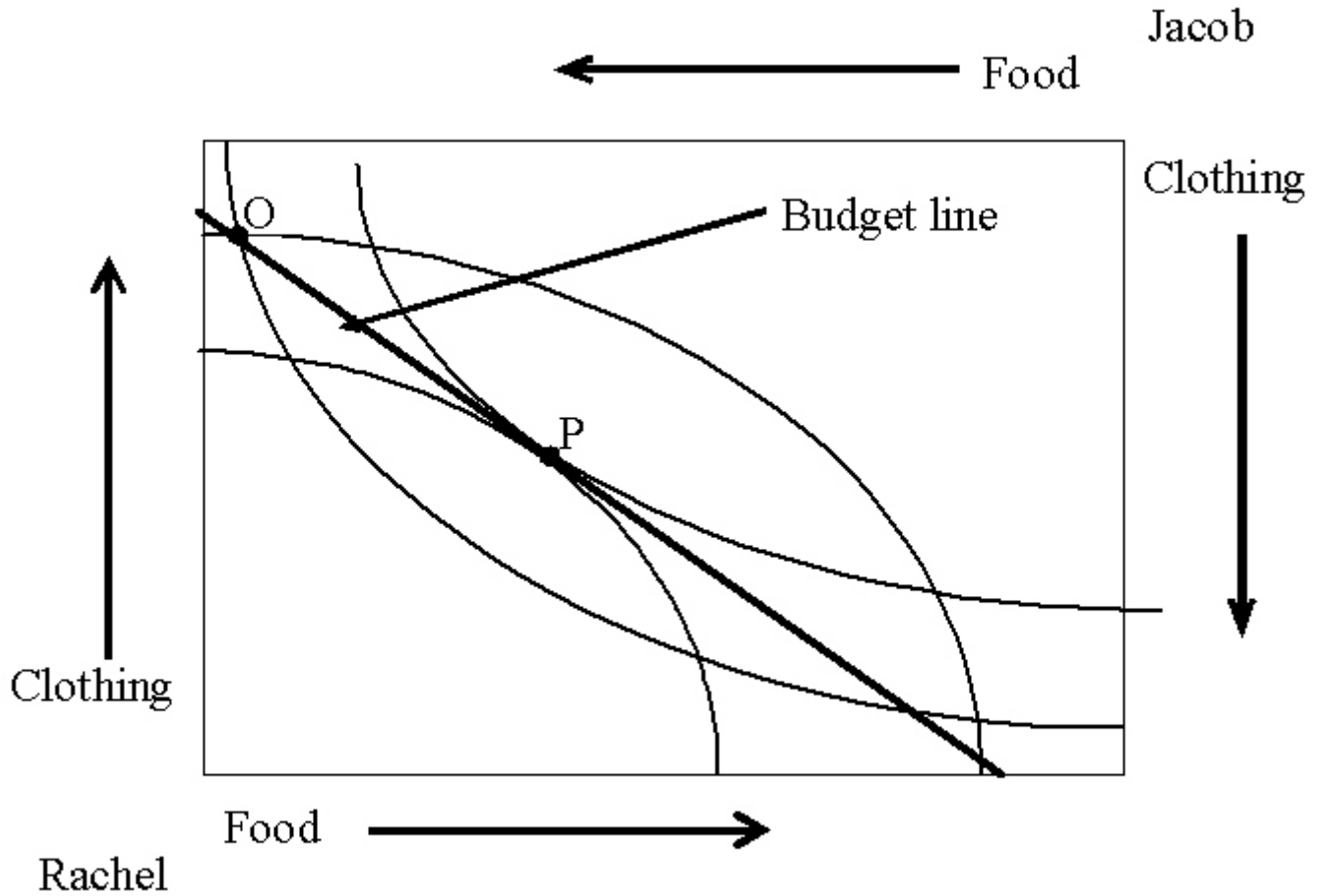
Region of
mutual
advantage

Clothing

Food →

Rachel
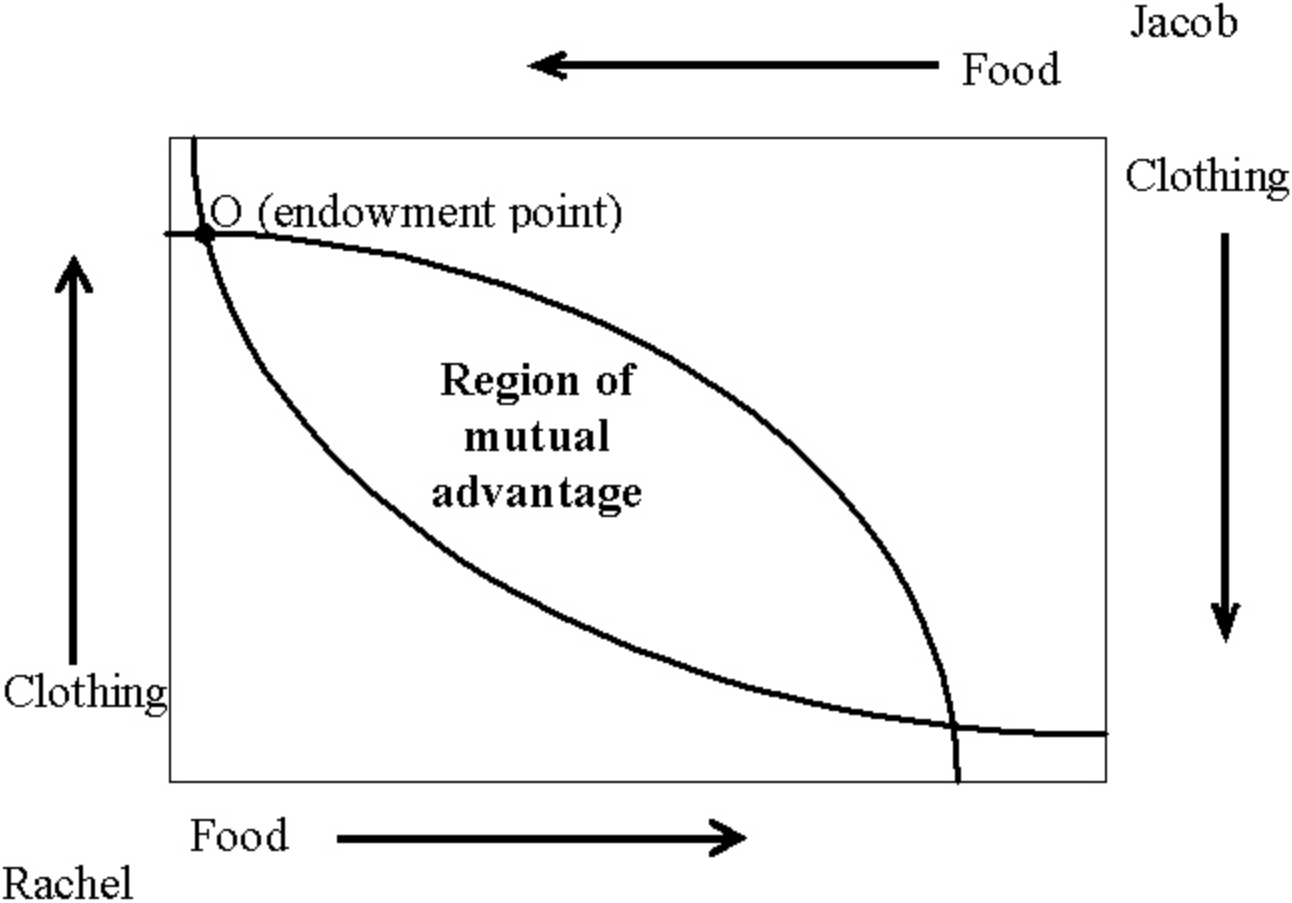
Trade continues until there is no mutual advantage left; that is, a point of tangency between indifference curves.

All such points are Pareto optimal.

The *contract curve* is the set of Pareto optimal points.

*Relative Prices in the Edgeworth Box economy*

Jacob and Rachel trade to competitive equilibrium, at appropriate market prices.

The budget line goes through the endowment point and is tangent to both indifference curves.

Both indifference curves are tangent to the same budget line, so they must be tangent to each other; that is, they are on the contract curve, and the equilibrium is Pareto optimal.

Equilibrium with production but no trade: Production possibility curve

Good Y

Good X
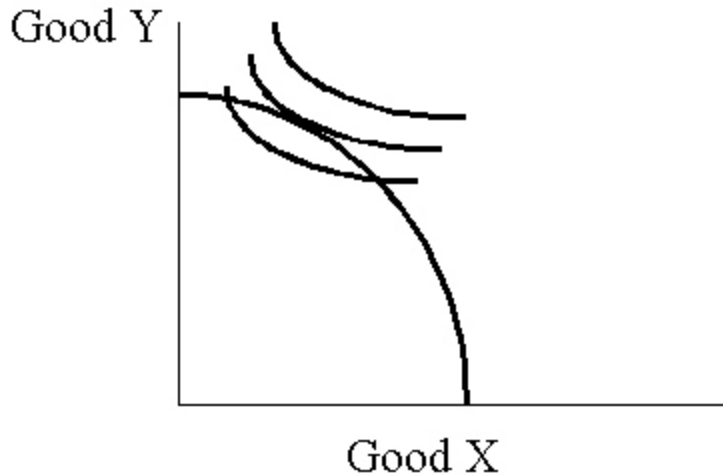
The *production possibility curve* is all baskets of goods that can be produced.

Its slope shows the tradeoff of one good for the other. Its slope is analogous to relative prices. Workers produce where the production possibility curve is tangent to their indifference curves.

Production and consumption with trade

Good Y

Good X
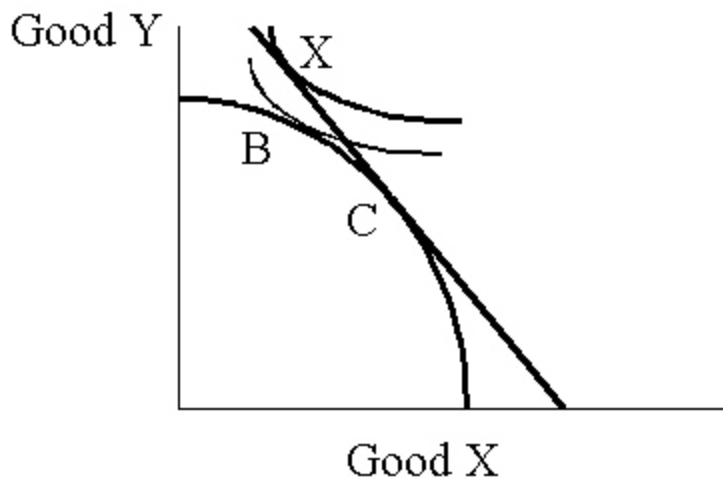
Production occurs at point C, where the production possibility curve is tangent to the line with slope P (the price). This line is the budget line, because consumers can sell at that price. They consumer at X, not at C.

● Autarkic relative price: the price if there is *no* foreign trade
● World relative price: the price if there *is* foreign trade
♦ If the autarkic price is the same as the world price, there is no gain from trade.

♦ The larger the difference between the autarkic price and the world price, the greater is the gain from trade.

Normative Criteria

1. Majority rule
2. Kaldor-Hicks potential compensation:
   a. Winners could compensate losers and still be better off
   b. Same as efficiency criterion
   c. Issues if there are large income effects
3. Veil of ignorance:
   a. Decide without knowing position in life
4. Maximin:
   a. Prefer outcome that maximizes welfare of worst-off member of society.
   b. Often same as veil of ignorance
5. Ideal participant criterion:
   a. Imagine living many lives in succession, one each in the circumstances of every person on earth. Right outcome is the one we'd choose before living all these lives.
6. Utilitarianism:
   a. Maximize sum of everyone's utility
7. Fairness:
   a. Envy-free allocation: no-one would prefer to trade baskets with anyone else.