

# **GENERAL EQUILIBRIUM ANALYSIS AND WELFARE ECONOMICS**

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## **PARTIAL vs GENERAL EQUILIBRIUM ANALYSIS**

- **PARTIAL EQUILIBRIUM ANALYSIS : THE EFFECTS OF CHANGES IN A GIVEN MARKET CONFINED TO THAT MARKET.**
- \* **THUS IF MORE FIRMS ARE ATTRACTED TO A MARKET LIKE MONOPOLISTIC COMPETITION, DEMAND WILL DECREASE IN THE LONG RUN AND ECONOMIC (SUPER-NORMAL) PROFITS WILL DISAPPEAR**
- **GENERAL EQUILIBRIUM ANALYSIS IS A THEORETICAL MODEL WHICH ATTEMPTS TO TAKE INTO ACCOUNT THE IMPLICATIONS OF CHANGES IN ONE MARKET FOR OTHER MARKETS.**
- **GENERAL EQUILIBRIUM ANALYSIS ALSO ATTEMPTS TO ANSWER THE QUESTION WHETHER A PERFECTLY COMPETITIVE MARKET WILL YIELD A SET OF PRICES WHICH WILL CAUSE ALL MARKETS SIMULTANEOUSLY TO CLEAR**

## **GENERAL EQUILIBRIUM**

- **A GENERAL EQUILIBRIUM MODEL CONSIDERS INTER – RELATIONSHIPS BETWEEN VARIOUS SECTORS IN AN ECONOMY.**
- **ASSUME : A SIMPLE ECONOMY WITH TWO CONSUMERS – SMITH AND JONES**
  - **TWO GOODS – FOOD AND CLOTHING**
  - **TWO FACTORS OF PRODUCTION – LABOUR CAPITAL**

**THIS IS KNOWN AS THE 2 X 2 X 2 ECONOMY**

- **AIM :**

**TO INVESTIGATE WHEN CONSUMPTION EFFICIENCY WILL BE ACHIEVED FOR A GIVEN COMBINATION OF GOODS.**

- **CONSUMPTION EFFICIENCY REQUIRES THAT GOODS SHOULD BE DISTRIBUTED AMONG CONSUMERS IN SUCH A WAY THAT IT IS IMPOSSIBLE TO ENHANCE THE UTILITY (BENEFIT) OF ONE CONSUMER WITHOUT REDUCING THE UTILITY OF THE OTHER.**
- **PRODUCTION EFFICIENCY – ACHIEVED WHEN IT IS IMPOSSIBLE TO INCREASE THE PRODUCTION OF ONE GOOD WITHOUT REDUCING THE PRODUCTION OF THE OTHER.**
- **ESTABLISH WHEN PRODUCTION AND CONSUMPTION ARE COMPATIBLE WITH EACH OTHER ie. WHEN THE COMBINATION OF GOODS IS PRODUCED WHICH CONSUMERS ALSO WISH TO BUY.**

- **OTHER MORE EXPLICIT METHODS SUCH AS THE KALDOR – HICKS CRITERION.**
- \* **THE KALDOR – HICKS CRITERION PROPOSED THAT IF THE GAINERS COULD IN PRINCIPLE COMPENSATE THE LOSERS AND STILL ENJOY A NET INCREASE IN WELFARE THEN A PROJECT SHOULD GO AHEAD.**
- \* **THE KALDOR – HICKS CRITERION IS CONTROVERSIAL BECAUSE OFTEN THE LOSERS ARE THE POORER PEOPLE IN SOCIETY.**
- \* **SUGGESTIONS HAVE BEEN MADE THAT THE COSTS AND BENEFITS OF POORER PEOPLE SHOULD BE GIVEN HIGHER WEIGHTS TO REFLECT EQUITY VALUE JUDGEMENTS IN SOCIETY.**



## **FIRST PARETO CONDITION**

- THE EFFICIENT DISTRIBUTION OF GOODS REQUIRES THAT THE MARGINAL RATE OF SUBSTITUTION BETWEEN ANY TWO CONSUMER GOODS SHOULD BE EQUAL FOR ALL INDIVIDUALS USING THESE GOODS
- $(MRS_{xy})_a = (MRS_{xy})_b = (MRS_{xy})_n$  WHERE  $a, b$  INDICATE CONSUMERS AND  $x, y$  REFER TO GOODS.

## **SECOND PARETO CONDITION :**

- AN EFFICIENT ALLOCATION OF FACTORS OF PRODUCTION REQUIRES THAT THE MARGINAL RATE OF TECHNICAL SUBSTITUTION BETWEEN ANY TWO FACTORS OF PRODUCTION MUST BE EQUAL FOR ALL PRODUCTION PROCESSES USING BOTH INPUTS
- $(MRTS_{LK})_x = (MRTS_{LK})_y = (MRTS_{LK})_n$

WHERE  $x, y$  AND  $n$  INDICATE PRODUCTION PROCESS FOR FOOD, CLOTHING etc.

## **THIRD PARETO CONDITION :**

- SIMULTANEOUS CONSUMPTION AND PRODUCTION EFFICIENCY REQUIRE THAT THE MARGINAL RATE OF SUBSTITUTION BETWEEN ANY TWO CONSUMER GOODS FOR BOTH CONSUMERS SHOULD BE EQUAL TO THE MARGINAL RATE OF TRANSFORMATION BETWEEN THESE CONSUMER GOODS DURING THE PRODUCTION PROCESS.
- $(MRS_{xy})_a = (MRS_{xy})_b = \dots = (MRS_{xy})_n = MRT_{xy}$

WHERE  $a, b$ . REPRESENT CONSUMERS WHERE  $x, y$ , REFER TO GOODS

## **THE PARETO CRITERION**

- **A PRIMARY CONSIDERATION IN ECONOMIC ANALYSIS IS WHETHER ONE SITUATION IS BETTER THAN ANOTHER.**
- **THE REASON FOR SUCH CONSIDERATION IS BECAUSE OF SUBJECTIVE FACTORS THAT PLAY AN UNAVOIDABLE PART IN COMPARISONS**
- **EXAMPLE OF COMPARISONS :**
  1. **DOES CONSUMER A GET MORE SATISFACTION THAN CONSUMER B FROM A GOOD LIKE MILK**
  2. **DOES INCOME EARNER B GET MORE SATISFACTION FROM AN EXTRA R100 EARNED THAN INCOME EARNER C.**

## **PARETO OPTIMALITY**

- **QUESTION : WHEN IS AN ALLOCATION OF RESOURCES REGARDED AS EFFICIENT?**
- **ANSWER : WHEN IT IS IMPOSSIBLE TO REALLOCATE THE RESOURCES TO MAKE AT LEAST ONE PERSON BETTER OFF WITHOUT MAKING ANOTHER PERSON WORSE OFF.**
- \* **AN ALLOCATION OF RESOURCES IS INEFFICIENT IF IT IS POSSIBLE TO MAKE AT LEAST ONE PERSON BETTER OFF WITHOUT MAKING SOMEONE ELSE WORSE OFF**

## **CONCLUSION :**

- **ALLOCATIVE EFFICIENCY IS ONLY ATTAINED WHEN  $MC = P$**
- \* **WHEN  $MC \neq P$  RESOURCES CAN BE REALLOCATED TO MAKE AT LEAST ONE PERSON BETTER OFF WITHOUT MAKING ANOTHER PERSON WORSE OFF**
- **PRODUCTIVE EFFICIENCY OCCURS IN AN INDUSTRY WHEN ALL FIRMS PRODUCE AT THE LEVEL WHERE AC IS AT A MINIMUM.**
- **AT ANY OTHER LEVEL OF OUTPUT IT IS POSSIBLE TO REDUCE THE AC BY PRODUCING MORE OR LESS OF A GOOD.**
- **THE PARETO CRITERION IS NOT PERFECT**

## **EXAMPLE :**

**IT IS UNDECIDED ABOUT CHANGES WHICH MAKE SOME INDIVIDUALS BETTER OFF WHILE LEAVING OTHERS WORSE OFF.**

- \* **SINCE MOST ECONOMIC POLICY CHANGES PRODUCE RESULTS WHICH ARE INDECISIVE SHOWING HOW LIMITED PARETO EFFICIENCY IS.**

## **CONSUMPTION EFFICIENCY**

- **REFER P. 221 FIG. 8-1 AND 8-2**
- **FIG 8.1, 2 REPRESENT THE INDIFFERENCE MAPS OF THE TWO CONSUMERS, SMITH AND JONES.**
- **EDGEWORTH BOX DIAGRAM COMBINES THE TWO INDIFFERENCE MAPS.**
- **EDGEWORTH BOX ACHIEVED BY ROTATING INDIFFERENCE MAP OF JONES BY 180° AND LINKING THE TWO MAPS.**



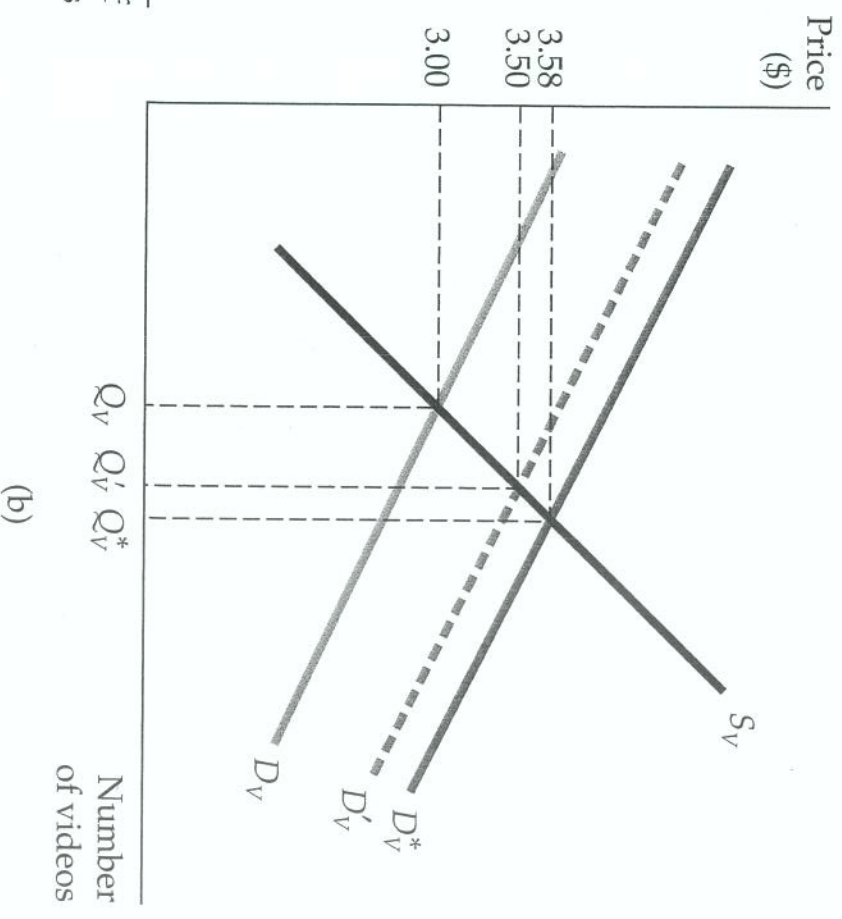
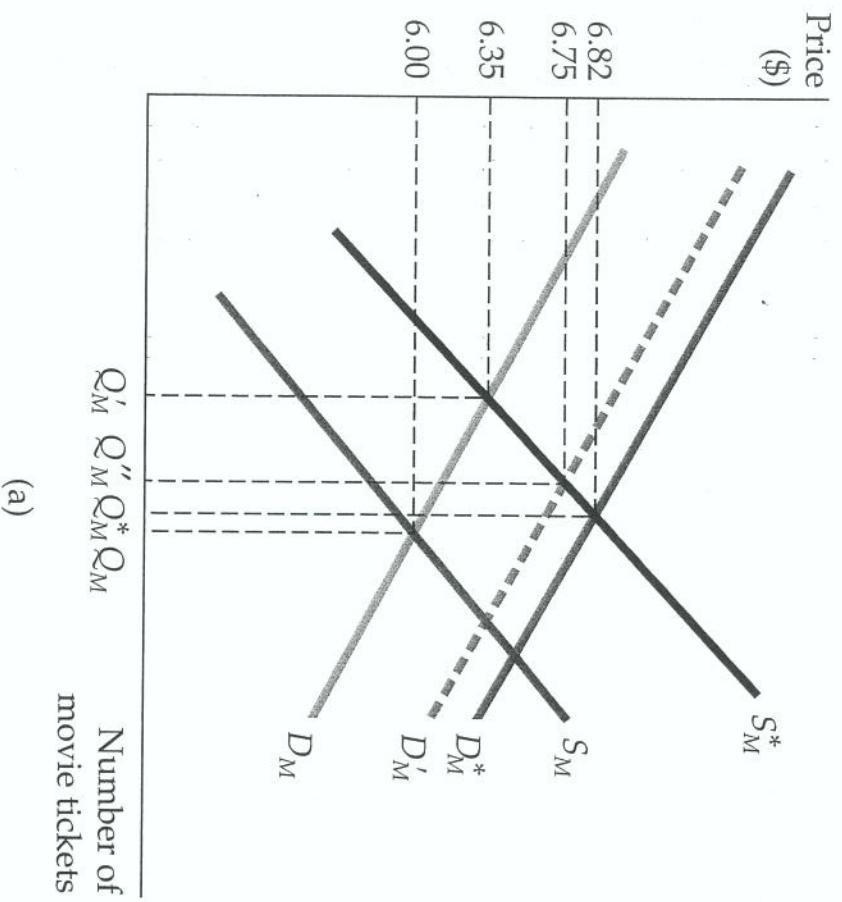
- **ALLOCATIVE EFFICIENCY IS ALWAYS AN ISSUE EXAMINED WHEN THERE IS IMPERFECT COMPETITION IN THE MARKET.**
- **PARETO EFFICIENCY OR ALLOCATIVE EFFICIENCY WAS FIRST FORMULATED BY VILFREDO PARETO AN ITALIAN ECONOMIST IN 1906.**
- **ALLOCATIVE EFFICIENCY IS ACHIEVED WHEN THE PRICE OF EACH PRODUCT IS EQUAL TO MARGINAL COST IN THE LONG-RUN.**
- **MC IS THE OPPORTUNITY COST OF PRODUCING AN EXTRA UNIT OR OUTPUT**
- **PRICE IS THE OPPORTUNITY COST OF CONSUMING AN EXTRA UNIT OF A GOOD**
- **SOCIETY'S WELFARE IS MAXIMISED WHEN THE  $MC = P$  AND  $AC \leq MC$  IN THE LONG-RUN.**
- **IF  $P > MC$  SOCIETY PLACES A HIGHER VALUE ON A ADDITIONAL UNIT OF A GOOD THAN THE RESOURCES REQUIRED TO PRODUCE IT.**
- **IF  $P < MC$  SOCIETY PLACES A LOWER VALUE ON AN ADDITIONAL UNIT OF A GOOD THAN THE COST OF PRODUCING IT.**



## **GENERAL EQUILIBRIUM AND ECONOMIC EFFICIENCY**

- Reference to equilibrium generally refers to partial equilibrium analysis.
- In partial equilibrium analysis the assumption is that one market has little or no effect on other markets.
- This is not a correct assumption because goods are related as substitutes or as complementary goods.
- General equilibrium analysis attempts to determine the prices and quantities in all markets simultaneously.
- General equilibrium takes the feedback effects into consideration.
- Feedback effect is a price or quantity adjustment in one market caused by price and quantity adjustments in related markets.
- Example: If the government imposes a tax on imported oil.
  - the price of oil will increase
  - the supply curve for oil would shift to the left
  - the increased price of oil would increase the demand for a substitute oil like natural gas
  - eventually the price of natural gas would also increase
  - the oil and gas markets will interact until a new equilibrium is attained.

T-293 Figure 16.1



## TWO INDEPENDENT MARKETS-MOVING TO GENERAL EQUILIBRIUM

- In practice it is not feasible to evaluate the change of one market on all other markets.
- It is possible to confine the change to two or three markets.
- Example: the market for DVD rentals and movie theatre tickets.
- The two goods could be regarded as substitutes.
- A change in the price of one market will have a feedback effect on the other market.
- Refer to Fig. 1601 p. 581 Pindyck.
- In Fig. 16.1(a) the price of movie tickets is R6.00 and the market equilibrium is at the intersection of  $D_M$  and  $S_M$ .
- In Fig. 16.1(b) the equilibrium price for DVD's is at R3.00 where  $D_V$  and  $S_V$  intersect.
- Suppose government levies at R1.00 tax on each movie ticket bought.
- Partial equilibrium will see a shift upwards in the S-curve for movies from  $S_M$  to  $S_M^*$ .
- Initially the price of movie tickets will increase to R6.35 and the quantity of movie tickets demanded will fall from  $Q_M$  to  $Q_M^1$ .
- General equilibrium will allow a study of the markets for movie ticket price will shift the demand for DVD's from  $D_V$  to  $D_V^1$ .
- In turn the rental price for DVD's will increase from R3.00 to R3.50.



- **Note:** The imposition of a tax on one good can affect the price and quantity demanded of another good.
  - Policy makers should heed this feedback effect when designing tax policies.
- In the movie theatre market, the demand for movies will shift upwards from  $D_M$  to  $D_M^I$ .
- The new equilibrium price for movie tickets will be R6.75 and not R6.35.
- The equilibrium point is at the intersection of  $S_M^*$  and  $D_M^I$  curves.
- The quantity of movie theatre tickets would increase from  $Q_M^I$  to  $Q_M^{II}$ .
- Partial equilibrium analysis would have underestimated the effect of the tax on the price of movie tickets.
- General equilibrium analysis as to what effect the tax will have in both the market for DVD's and for movie tickets.
- General equilibrium is a concept usually attributed to the Italian economist Vilfredo Pareto.
- Pareto's concept has become known as Pareto efficiency because it deals with the concept of efficiency in exchange.

# CONSUMER AND PRODUCER SURPLUS

- ♦ It is normal in a market with no government intervention that consumers and producers will buy and sell goods at the market price.
- ♦ For some goods for some consumers the value of the goods will exceed the market price thus such consumers are prepared to pay above the market price.
- ♦ **CONSUMER SURPLUS** = the total benefit a consumer gets what is paid for a good.
- ♦ Refer to p. 310 – Fig 9.1
  - Market price = R5.00.
  - If consumer A values the benefit from this good at R10.00.
  - If consumer A pays R5.00 he/she will derive extra benefit of up to R10.00 from the good.
  - Thus consumer surplus is R7.00.
  - Consumer B will rate the benefit from the good at R7.00.
  - Consumer B will pay R5.00 but will realise R2.00 consumer surplus.
- ♦ **PRODUCER SURPLUS** = the difference between what the market price and the price (MC) the producer pays to produce a unit of a good.
- ♦ Refer to p. 310 – Fig 9.1 – Producer Surplus – the area shaded in green.
- ♦ Together consumer and producer surplus measure the welfare benefit of a competitive market.

# APPLICATION OF CONSUMER AND PRODUCER SURPLUS

- ♦ Consumer and producer surplus may be used to evaluate the welfare effects of government intervention in the market.
- ♦ QUESTION: Who gains and who loses from government intervention?
- ♦ If government forces producers to charge a price below the market clearing price by setting a ceiling price below the market price.
- ♦ This will result in a shortage or excess demand.
- ♦ Refer to p. 59 – Fig 2.24 – the quantity supplied will decrease to  $Q_1$  to  $Q_2$ .
- ♦ This creates a shortage  $Q_1 - Q_2$ .
- ♦ Fig 9.2 shows the changes in consumer and producer surplus that result from the price-control policy of government.
- ♦ There will be THREE changes:
  1. Change in consumer surplus.
    - ♦ Some consumers are worse off and others better off as a result of price controls imposed by government.
    - ♦ The consumers who have been rationed out of the market will be worse off.
    - ♦ This is caused by a reduction in production and sales from  $Q_1$  to  $Q_2$ .
    - ♦ There will be consumers who will still be able to buy the good at a lower price  $P_{\max}$  not  $P_o$  thus they will be better off.



- ♦ **QUESTION:** By how much will the consumers be better or worse off?

- ♦ **ANSWER:**

1. The consumers who can buy the good will have an increase in consumer surplus, shown by rectangle A in Fig 9.2.
2. Consumers who are no longer able to buy the good will lose their surplus.
  - ♦ The loss is shown by the triangle B.
3. The net change in consumer surplus will be  $A - B$ .
4. Because rectangle A is larger than triangle B, the net change in consumer surplus will be positive.

## 2. Change in Producer Surplus

- ♦ When price controls are imposed, the lower cost producers will stay in the market but will receive a lower price.
- ♦ Other producers will leave the market.
- ♦ Both types of producers will lose producer surplus.
- ♦ Fig 9.2 – those who remain in the market and produce  $Q_1$  will receive a lower price ( $P_{\max}$  is lower than  $P_o$ )
- ♦ They would lose the producer surplus shown by rectangle A.
- ♦ Total production would also have decreased.
- ♦ The change in producer surplus is  $-A - C$ .
- ♦ Thus producers lose as a result of price controls.

## 3. Deadweight Loss

- ♦ This is the net loss of total surplus ie. consumer plus producer surplus.
- ♦ Refer p. 312 – Fig 9.2 – shows that price controls imposed by government results in a net loss of total surplus = deadweight loss.
- ♦ The change in consumer surplus is  $A - B$ .
- ♦ The change in producer surplus is  $-A - C$ .
- ♦ The total change in surplus is the total of consumer surplus and producer surplus ie.  $(A-B) - (-A-C) = -B-C$
- ♦ In Fig 9.2 the deadweight loss is represented by the two triangles B and C.

## THE EDGEWORTH BOX DIAGRAM

### 3 QUESTIONS:

- If trade is beneficial, which trade could take place?
- Which trade will allocate goods?
- How much better off will consumers be?

### ANSWERS:

The answers could be found in a 2x2x2 model using two goods, two people and two inputs.

EDGEWORTH BOX DIAGRAM = a diagram showing all possible allocations of two goods between two people or of two inputs between two production processes.

Horizontal axis: units of food.

Vertical axis: units of clothing.

Fig. 16.3 = an Edgeworth Box

10 units of food

6 units of clothing

- Each point describes the market baskets of both consumers.
- James' holdings are read from  $O_J$ .
- Karen's holdings are read from  $O_K$ .
- Point A = James: 7 units of food and 1 unit of clothing.

Karen: 3 units of food

5 units of clothing.

### EFFECT OF TRADE BETWEEN KAREN AND JAMES

- James sacrifices 1 unit of food to gain 1 unit of clothing.
- Karen gives up 1 unit of clothing to gain one unit of food.
- Moving from point A to B = B represents the market baskets of both James and Karen after mutually beneficial trade.
- Trade from A to B made both Karen and James both better off.

Fig. 16.4 shows an indifference map (a series of curves) for Karen and James.

- Both the MRS for James and Karen are not the same and the allocation is not of necessity efficient.
- Even if a trade from an inefficient allocation makes both consumers better off, the new allocation is not necessarily efficient.
- If from point B an additional trade is made to point C.
- Point C gives the new allocation.
- At C the MRS is identical for both consumers.
- The trade could be such that the allocation is at D where indifference curve  $U_J^3$  is tangent to indifference curve  $U_K^J$ .



THE CONTRACT CURVE = shows all efficient allocations of goods between two consumers or of two inputs between two production functions 2x2x2 model. (Fig. 16.5)

- The contract curve shows all allocations from which no mutually beneficial trade can be made.
- These allocations are efficient because the goods cannot be allocated to make somebody better off without making another person worse off.
  
- Properties of the contract curve:
  - A point, like point E, will be regarded as a point that will not allow movement to point F, for example so that one person better off without making another person worse off.
- Points E and F can not be compared.
- Both E and D are points of efficiency.
- Rare to efficiency is about mutually beneficial exchanges.
- A point that improves efficiency must be supported.