

**M.A. Economics- SEM -2**

**CC-7, Module-4**

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## **THE PARETO-OPTIMALITY CRITERION**

This criterion refers to economic efficiency which can be objectively measured. It is called Pareto criterion after the famous Italian economist **Vilfredo Pareto (1848-1923)**. According to this criterion any change that makes at least one individual better-off and no one worse-off is an improvement in social welfare. Conversely, a change that makes no one better-off and at least one worse-off is a decrease in social welfare.

The criterion can be stated in a somewhat different way: a situation in which it is impossible to make anyone better-off without making someone worse-off is said to be Pareto-optimal or Pareto-efficient.

For the attainment of a Pareto-efficient situation in an economy three marginal conditions must be satisfied: *(a) Efficiency of distribution of commodities among consumers (efficiency in exchange); (b) Efficiency of the allocation of factors among firms (efficiency of production); (c) Efficiency in the allocation of factors among commodities (efficiency in the product-mix, or composition of output).*

Before examining these marginal conditions we discuss briefly the main weaknesses of the Pareto criterion.

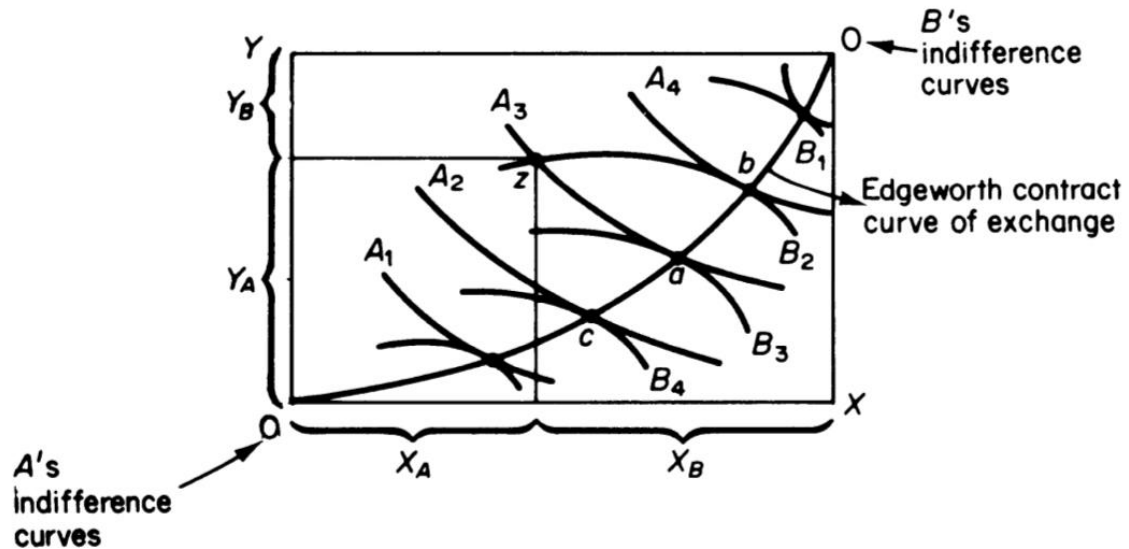
The Pareto criterion cannot evaluate a change that makes some individuals better-off and others worse-off. Since most government policies involve changes that benefit some and harm others it is obvious that the strict Pareto criterion is of limited applicability in real-world situations.

Furthermore, a Pareto-optimal situation does not guarantee the maximisation of the social welfare. For example, we know that any point on the production possibility curve represents a Pareto-efficient situation. To decide which of these points yields maximum social welfare we need an interpersonal comparison of the individual consumer's utility. In a subsequent section we will show that the Pareto-optimal state is a necessary but not sufficient condition for maximum social welfare. Let us examine now the three marginal conditions that must be satisfied in order to attain a Pareto-efficient situation in the economy.

### **(a) Efficiency of distribution of commodities among consumers**

Applying the Pareto optimality criterion to the case of distribution of commodities Y and X, we can say that a distribution of the given commodities X and Y between the two consumers is efficient if it is impossible by a redistribution of these goods to increase the utility of one individual without reducing the utility of the other. In the above figure, we show the Edgeworth box for the given commodities X and Y. We know that only points on the Edgeworth contract curve satisfy the Pareto-optimality condition. Any other distribution off the contract curve is inefficient. For example, point z is inefficient, since a redistribution of the commodities such as to reach any point between a and b increases the utility of both consumers. A movement to a increases the utility of B without reducing the utility of A. Similarly, the distribution implied by b increases the utility of A without reducing the utility of B. Thus all the points from a to b represent improvements in social welfare compared with the distribution at z. By reversing the argument it can be seen that a movement from a point on the contract curve to a point off it results in a decrease in social welfare. Thus the contract curve shows

the locus of Pareto-optimal or -efficient distribution of goods between consumers. This curve is formed from the points of tangency of the two consumers' indifference curves, that is, points where the slopes of the indifference curves are equal. In other words, at each point of the contract curve the following condition is satisfied



$$MRS_{:y} = MRS_{:y}$$

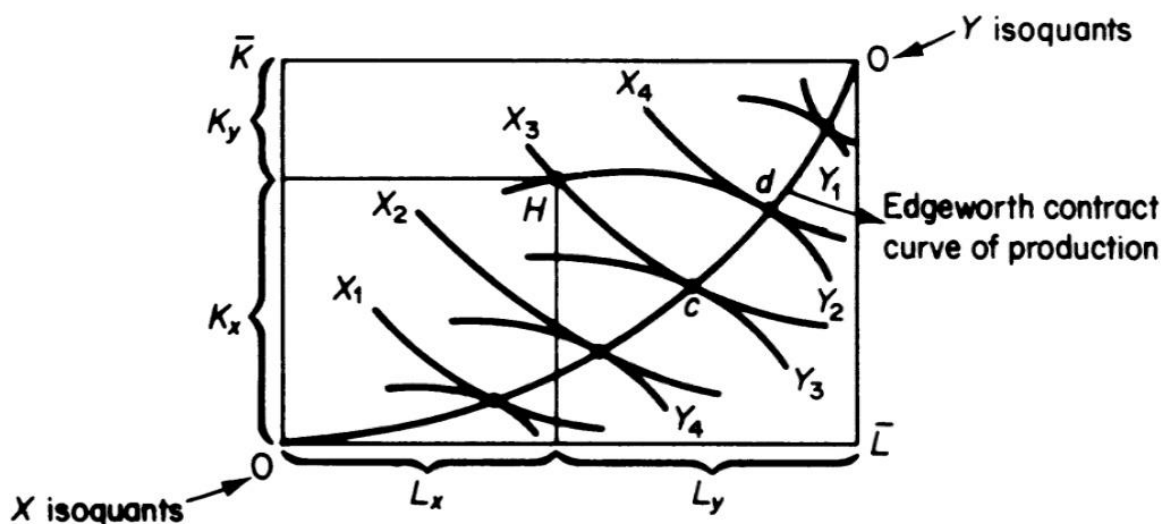
Therefore we may state the marginal condition for a Pareto-efficient distribution of given commodities as follows:

*The marginal condition for a Pareto-optimal or -efficient distribution of commodities among consumers requires that the MRS between two goods be equal for all consumers.*

**(b) Efficiency of allocation of factors among firm-producers**

To derive the marginal condition for a Pareto-optimal allocation of factors among producers we use an argument closely analogous to the one used for the derivation of the marginal condition for optimal distribution of commodities among consumers. In the case of allocation of given resources K and L we use the Edgeworth box of production shown in figure 2.

Only points on the contract curve of production are Pareto-efficient. Point H is inefficient, since a reallocation of the given K and L between the producers of X and Y such as to reach any point from c to d inclusive results in the increase of at least one commodity without a reduction in the other. The



contract curve is the locus of points of tangency of the isoquants of the two firms which produce X and Y, that is, points where the slopes of the isoquants are equal. Thus at each point of the contract curve the following condition holds

$$\text{MRTS}_{LK}^X = \text{MRTS}_{LK}^Y$$

Therefore we may state the marginal condition for a Pareto-optimal allocation of factors among firms as follows:

*The marginal condition for a Pareto-optimal allocation of factors (inputs) requires that the MRTS between labour and capital be equal for all commodities produced by different firms.*

### **(c) Efficiency in the composition of output (product-mix)**

The third possible way of increasing social welfare is a change in the product-mix. To define the third marginal condition recall that the slope of the PPC is called the 'marginal rate of (product) transformation' ( $\text{MRPT}_{xy}$ ), and it shows the amount of Y that must be sacrificed in order to obtain an additional unit of X. In other words the MRPT is the rate at which a good can be transformed into another.

The marginal condition for a Pareto-optimal or -efficient composition of output requires that the MRPT between any two commodities be equal to the MRS between the same two goods:

$$\text{MRPT}_{x,y} = \text{MRS}_{xy}^A = \text{MRS}_{xy}^B$$

Since the MRPT shows the rate at which a good can be transformed into another (on the production side), and the MRS shows the rate at which consumers are willing to exchange a good for another, the rates must be equal for a Pareto-optimal situation to be attained. Suppose that these rates are unequal. For example assume

$$\text{MRPT}_{x,y} = 2Y/1X \text{ and } \text{MRS}_{x,y} = 1Y/1X$$

$$\text{MRPT}_{x,y} > \text{MRS}_{x,y}$$

The above inequality shows that the economy can produce two units of Y by sacrificing one unit of X, while the consumers are willing to exchange one unit of Y for one unit of X. Clearly the economy produces too much of X and too little of Y relative to the tastes of consumers. Welfare therefore can be increased by increasing the production of Y and decreasing the production of X.

*In summary. A Pareto-optimal state in the economy can be attained if the following three marginal conditions are fulfilled:*

- 1. The  $\text{MRS}_{x,y}$  between any two goods be equal for all consumers.**
- 2. The  $\text{MRTS}_{LK}$  between any two inputs be equal in the production of all commodities.**
- 3. The  $\text{MRPT}_{x,y}$  be equal to the  $\text{MRS}_{x,y}$  for any two goods.**