Consumption allocation and Pareto optimality
(Efficiency of exchange)

According to Pareto optimal criterion any change that makes at least one individual better-off and no one worse-off is an improvement in social welfare.

Applying the Pareto optimality criterion to the case of distribution of commodities X and Y, 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. * To derive ----- [In fig () below, the Edgeworth box for the given commodities X and Y is shown].

The indifference curves of commodity X are Y are plotted in the south-west corner and the north-east corner origins respectively.

The locus of points of tangency of the X and

Fig 1

Edgeworth box of exchange.
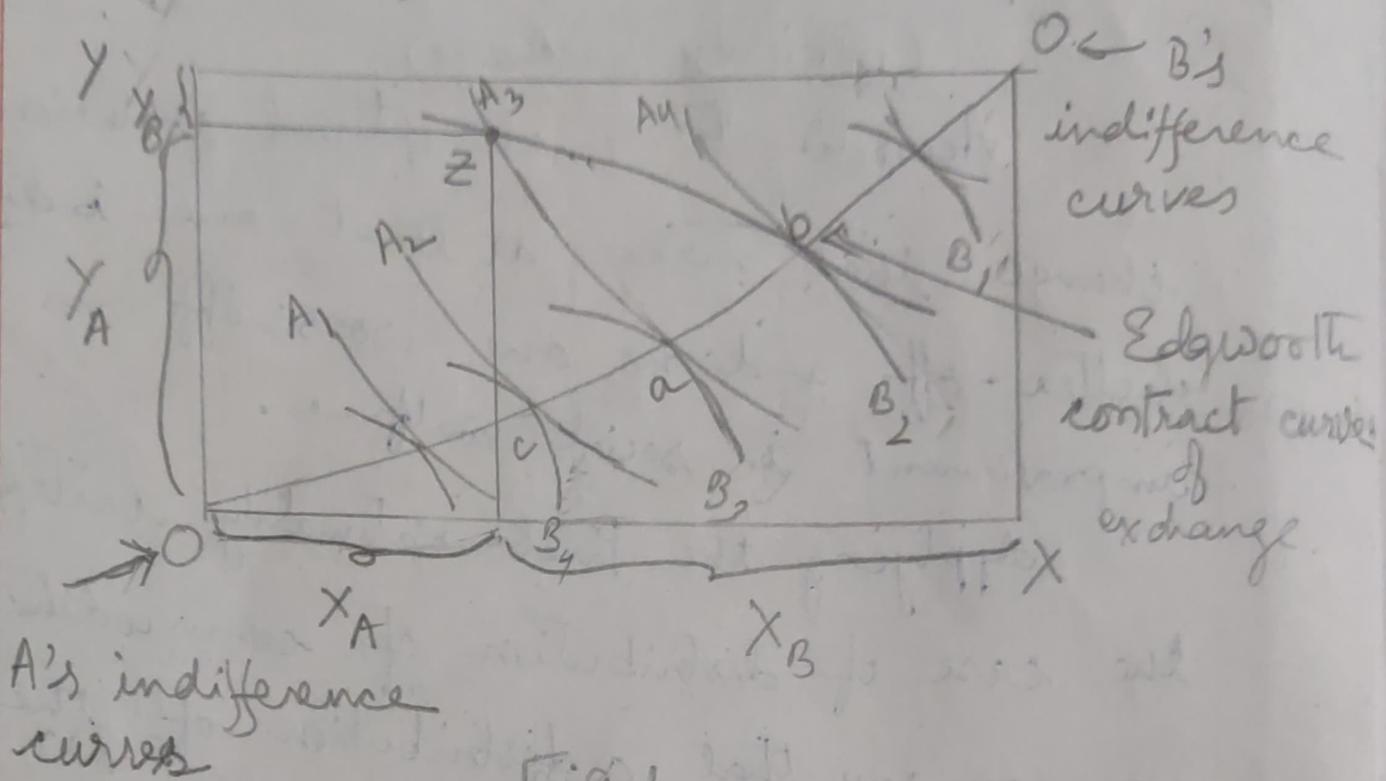
A's indifference curves

B's indifference curves

Edgeworth contract curve of exchange.

Y indifference curves is called the Edgeworth contract curve of exchange (consumption). Now we can show 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 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. Now since this curve is formed
from the points of tangency of the consumer's
indifference curves. therefore that is points where the slopes of the indifference curves are equal.
A; at each point of the contract
curve the following condition is satisfied

$$MRS^A_{X,Y} = MRS^B_{X,Y}$$

Thus we may state the marginal condition

for a Pareto-efficient distribution of given commodities among consumers as

 "The MRS between two goods be equal for all consumers".

*... to derive the marginal condition for a Pareto-optimal allocation of commodities among consumers we use the Edgeworth box of exchange with the given two commodities X and y, which is shown in fig ① below.

(b) Pareto efficiency with production

    To derive the marginal condition for a Pareto-optimal allocation of factors among producers we use the Edgeworth box of production with the given two resources k and L (capital & labour) which is shown below in fig ②)
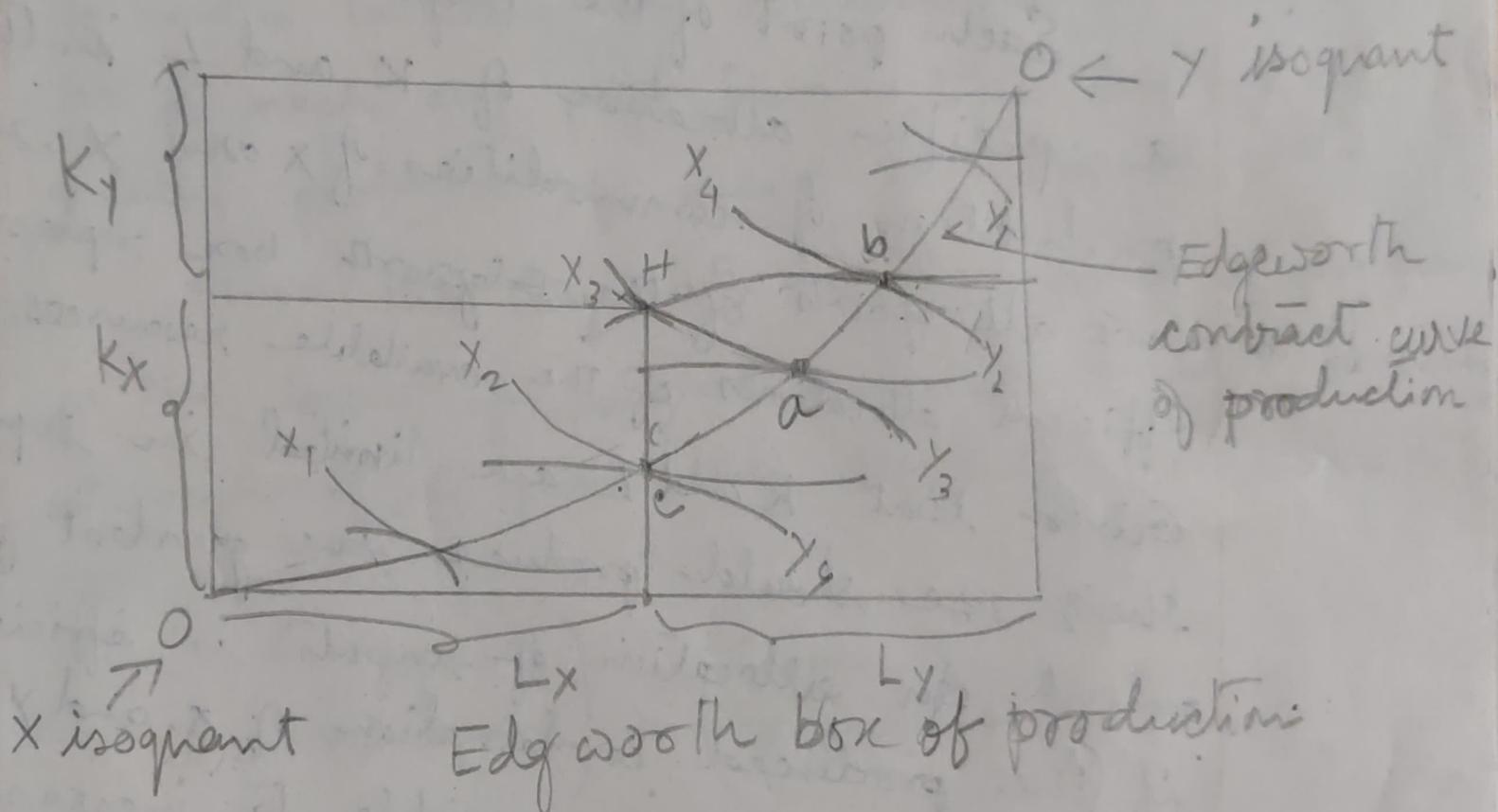

Fig (2).

The isoquant of commodities, X and Y are plotted in the south-west and north-east corner's origin respectively. The locus of points of tangency of the X and Y isoquants is called the Edgeworth contract curve of production.

Each point of the Edgeworth box shows a specific allocation of K and L in the production of commodities X and Y. However, not all points of the Edgeworth box represent efficient allocations of the available resources. Given that K and L are limited in supply, their use should produce the greatest possible output. An allocation of inputs is efficient if (the produced combination of X and Y is such that) it is impossible to increase the production of one commodity without decreasing the quantity of the other. This is known as Pareto efficiency or Pareto optimality.

From the figure, we see that efficient production takes place on the Edgeworth contract curve. It is impossible to move to a point off this curve without reducing the quantity of at least one commodity. Point z is a point of inefficient production, since a reallocation of K and L between the commodities (or firms) such as to reach any point from a to b leads to a greater production of one or both commodities.

Since the Edgeworth contract curve of production is the locus of tangencies of the X and Y isoquants, at each of its points the slopes of the isoquants are equal:

$$\left(\begin{array}{c} \text{Slope of} \\ X \text{ isoquant} \end{array} \right) = \left(\begin{array}{c} \text{Slope of} \\ Y \text{ isoquant} \end{array} \right)$$

or

$$MRTS^X_{L,K} = MRTS^Y_{X,Y}$$

Therefore we may state the marginal condition for a Pareto-optimal allocation of factors

among firms as : the MRTS between factors labour and capital be equal for all commodities produced by different firms.