Example on efficiency in exchange

Two goods, Food (F) and Clothes (C)

Two individuals, James and Karen with the following initial allocation:

Individual	Initial Allocation
James	7F, 1C
Karen	3F, 5C

James utility: $U_J = C^{\frac{2}{7}}F$ Karen utility: $U_K = C^{\frac{5}{9}}F$

We need to compute the MRS of food for clothing (MRS_{FC}) at the initial allocation

$$MRS_{FC} = \frac{dU}{dF} \bigg/ \frac{dU}{dC}$$

James ($U_J = C^{\frac{2}{7}}F$, 7F, 1C):

$$MRS_{FC} = \frac{C^{\frac{2}{7}}}{\frac{2}{7}C^{-\frac{5}{7}}F} = \frac{7C}{2F}$$

Replacing the initial allocation

$$MRS_{FC} = 0.5$$

To get one additional unit of food he is willing to pay a maximum of 0.5 units of clothing

To sell one unit of food he is willing to accept a minimum of 0.5 units of clothing

Karen ($U_J = C^{\frac{5}{9}}F$, 3F, 5C):

$$MRS_{FC} = \frac{C^{\frac{5}{9}}}{\frac{5}{9}C^{-\frac{4}{9}}F} = \frac{9C}{5F}$$

Replacing the initial allocation

$$MRS_{FC} = 3$$

To get one additional unit of food she is willing to pay a maximum of 3 units of clothing

To sell one unit of food she is willing to accept a minimum of 3 units of clothing

Karen $MRS_{FC} = 3$ James $MRS_{FC} = 0.5$

Is it possible a trade where James buys F and sells C and Karen sells F and buys C?

James is willing to pay a maximum of 0.5 units of C to get one unit of F while Karen is willing to sell one unit of F for at least 3 units of C.

Then this trade is not possible

Is it possible a trade where James buys C and sells F and Karen sells C and buys F?

James is willing to sell one unit of F for at least 0.5 units of C while Karen is willing to pay a maximum of 3 units of C to get an additional unit of food.

Then this trade is possible, for example 1F for 1C

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

Initial allocation:

James utility: $U_J = C^{\frac{2}{7}}F = 1^{\frac{2}{7}}7 = 7$

Karen utility: $U_K = C^{\frac{5}{9}}F = 5^{\frac{5}{9}}3 = 7.34$

After trading

James utility: $U_J = C^{\frac{2}{7}}F = 2^{\frac{2}{7}}6 = 7.31$

Karen utility: $U_K = C^{\frac{5}{9}}F = 4^{\frac{5}{9}}4 = 8.64$

After an additional trading (James: 5F 3C; Karen: 5F 3C)

James utility: $U_J = C^{\frac{2}{7}}F = 3^{\frac{2}{7}}5 = 6.84$

Karen utility: $U_K = C^{\frac{5}{9}}F = 3^{\frac{5}{9}}5 = 9.21$

16.2 EFFICIENCY IN EXCHANGE

The Edgeworth Box Diagram

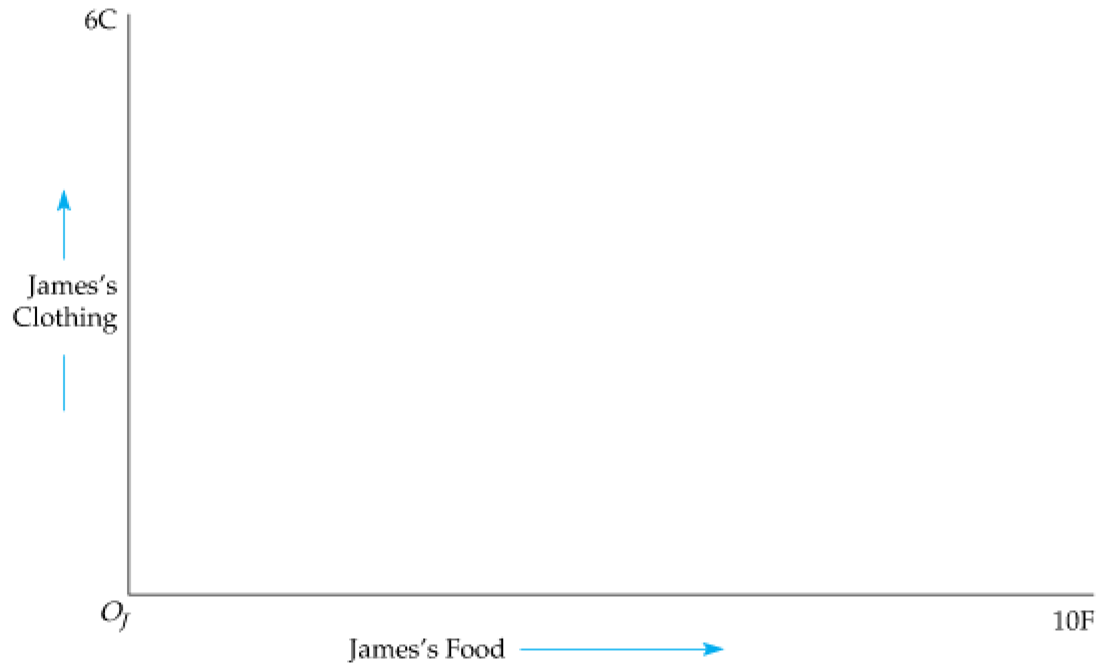
Figure 16.3

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

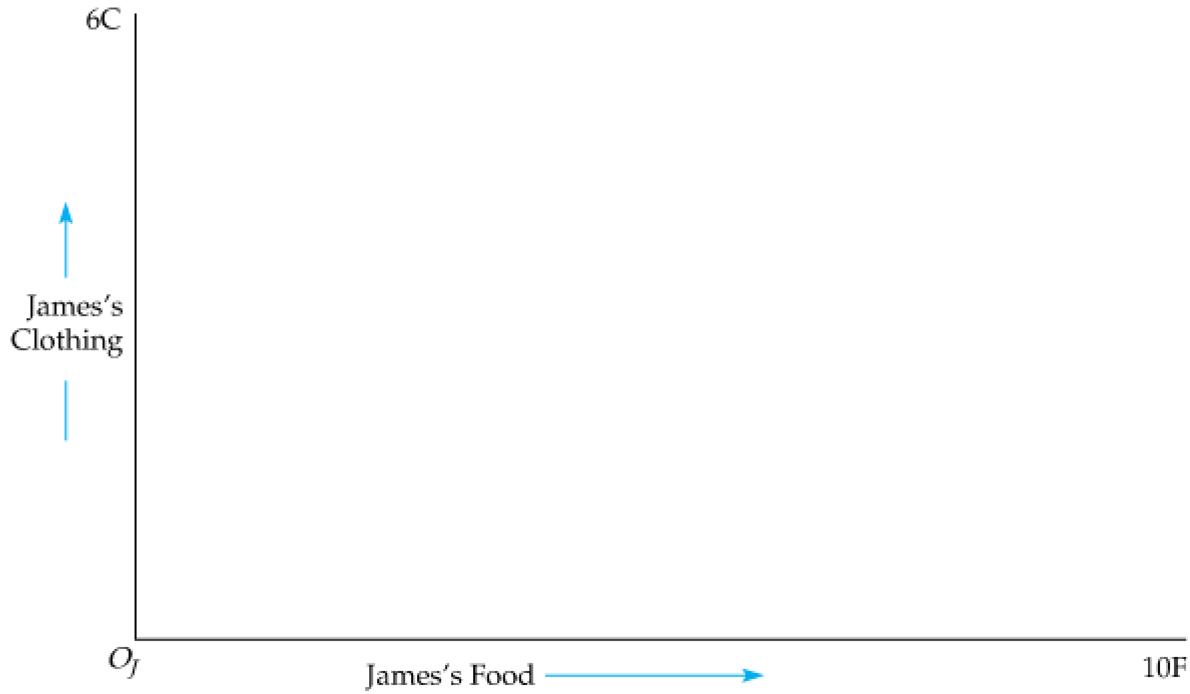
Efficient Allocations

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.



The contract curve is the set of points where the MRS of James and Karen are equal

James: $MRS_{FC} = \frac{7C_J}{2F_J}$ Karen: $MRS_{FC} = \frac{9C_K}{5F_K} = \frac{9(6-C_J)}{5(10-F_j)}$

Because in total there are 6 units of C and 10 units of F

On the contract curve is satisfied the following relation:

$$\frac{9(6-C_J)}{5(10-F_j)} = \frac{7C_J}{2F_J}$$

Solving by C_J we get:

$$C_J = -\frac{108F_J}{17F_J - 350}$$