ECONOMICS 2

Tutorial 8

Questions:2,5,8,9

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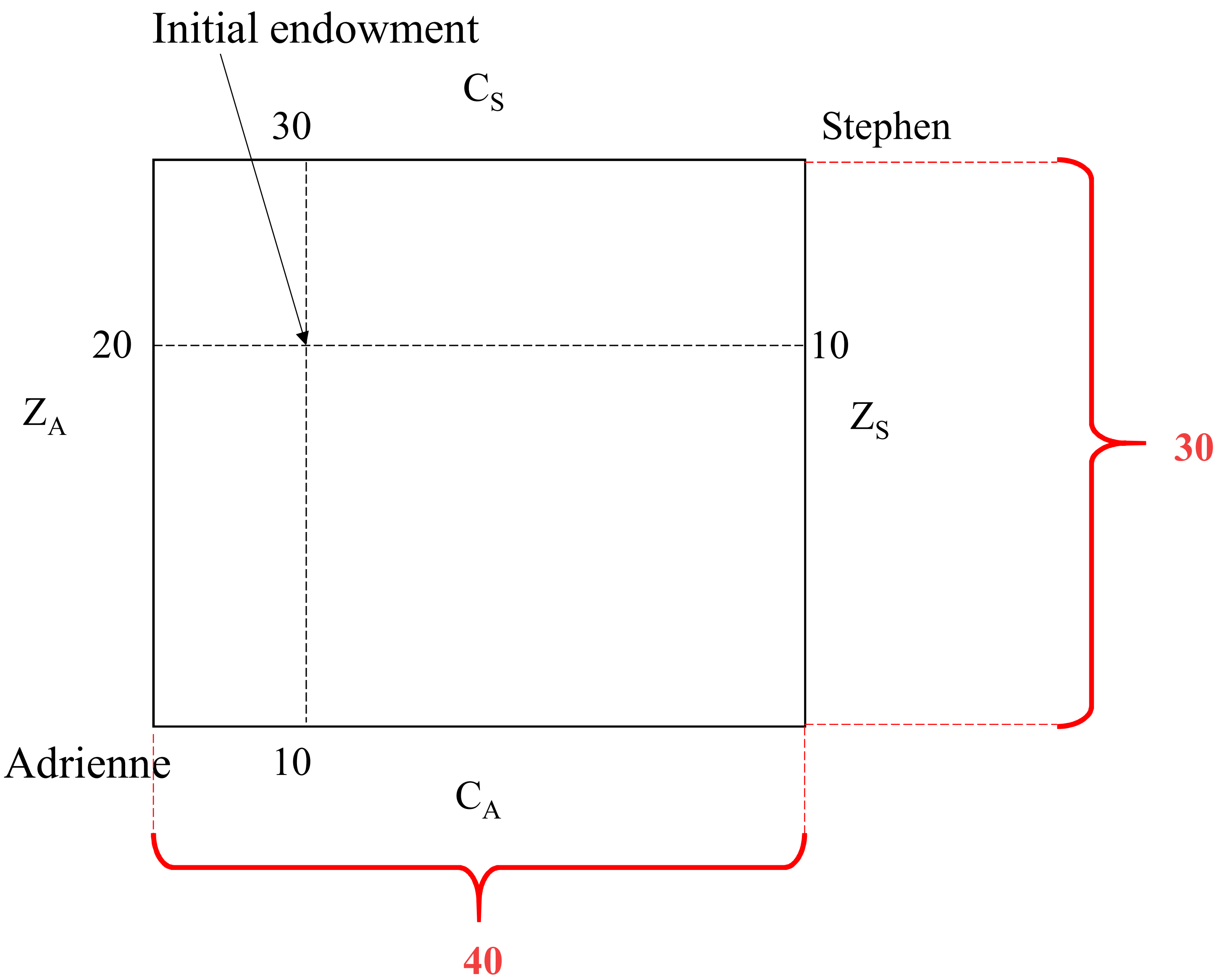
http://personal.lse.ac.uk/BATTISTO/T8_slides.pdf

Question 2

- 2 Individuals (Adrienne, Stephen) and 2 goods (Pizza, Cola)
- $U_A = Z_A C_A$
- $U_S = Z_S^{0.5} C_S^{0.5}$
- **Endowments:**
  - $Z_A = 20, \quad C_A = 10$
  - $Z_S = 10, \quad C_S = 30$

a) Draw Edgeworth box. Which allocations are feasible?

Any point inside the box is a feasible allocation → "non-wasteful" allocations



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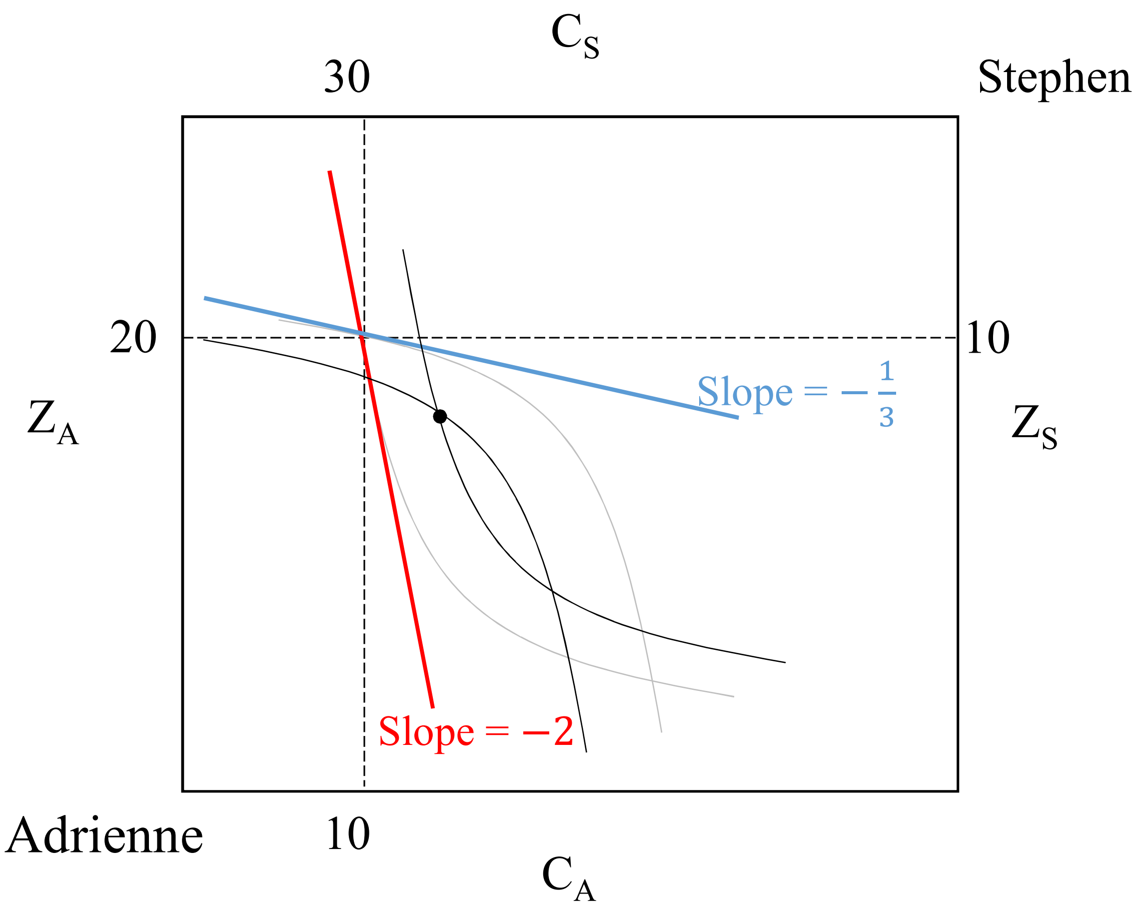
b) MRS of each person at the endowment

Is the initial endowment pareto efficient?

$$MRS_A = \frac{MU_A^C}{MU_A^Z} = \frac{Z_A}{C_A} = \frac{20}{10} = \mathbf{2}$$

$$MRS_S = \frac{MU_S^C}{MU_S^Z} = \frac{0.5Z_S^{0.5}C_S^{-0.5}}{0.5Z_S^{-0.5}C_S^{0.5}} = \frac{Z_S}{C_S} = \frac{10}{30} = \mathbf{\frac{1}{3}}$$

If MRS are different, there is always a reallocation that will make at least one individual (or both) better-off



Initial endowment NOT Pareto Efficient

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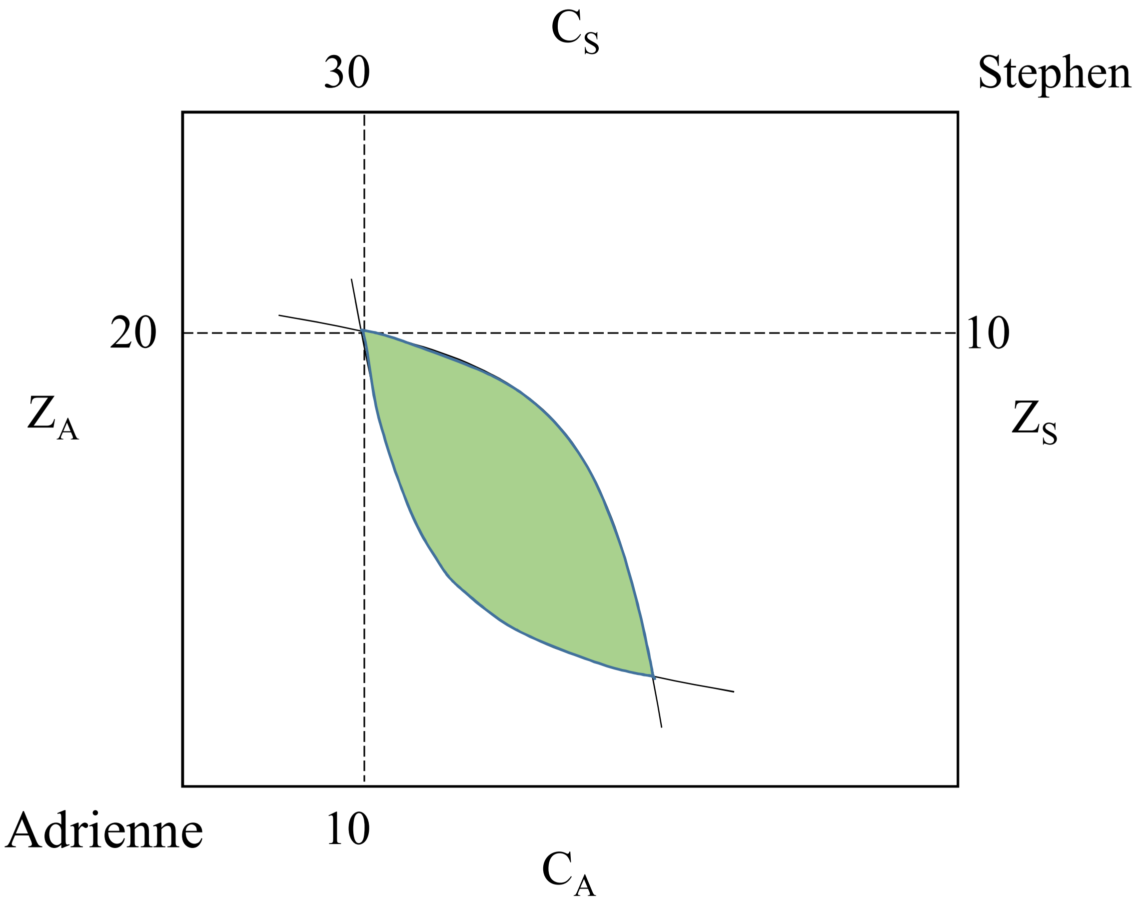
c) Draw Pareto Improving allocations



C_S
30
Stephen
20
10
Z_A
Z_S
Adrienne
10
C_A

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d) Derive Contract Curve Formula (and draw it)

Contract Curve:

$$MRS_A = MRS_S$$

$$\frac{Z_A}{C_A} = \frac{Z_S}{C_S}$$

We need to eliminate 2 variables so we can have a line ⇒ Use endowments

$$Z_S = 30 - Z_A \quad \text{and} \quad C_S = 40 - C_A$$

Replacing:

$$\frac{Z_A}{C_A} = \frac{30 - Z_A}{40 - C_A}$$

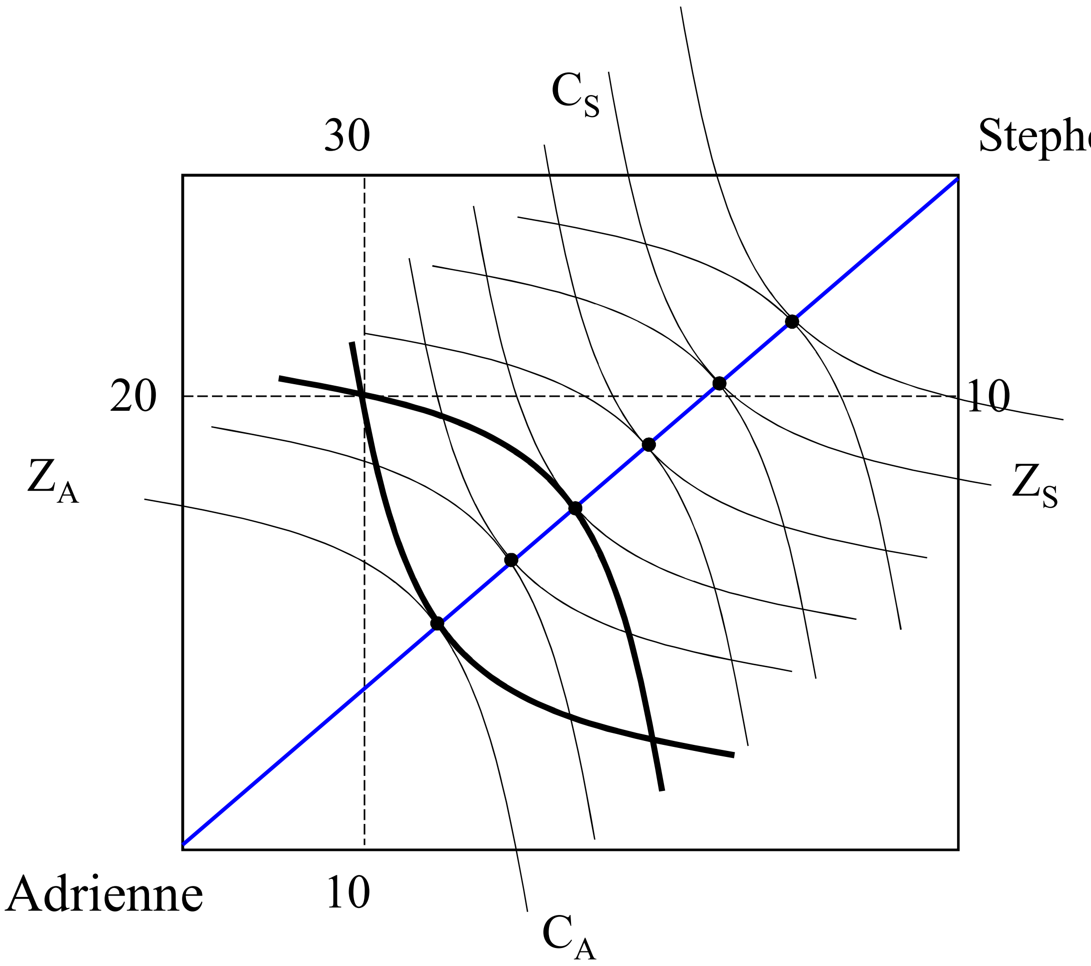
$$\downarrow$$

algebra

$$\downarrow$$

$$\boxed{Z_A = \frac{3}{4} C_A}$$

Contract Curve (Indifference Curves are tangent to each other)



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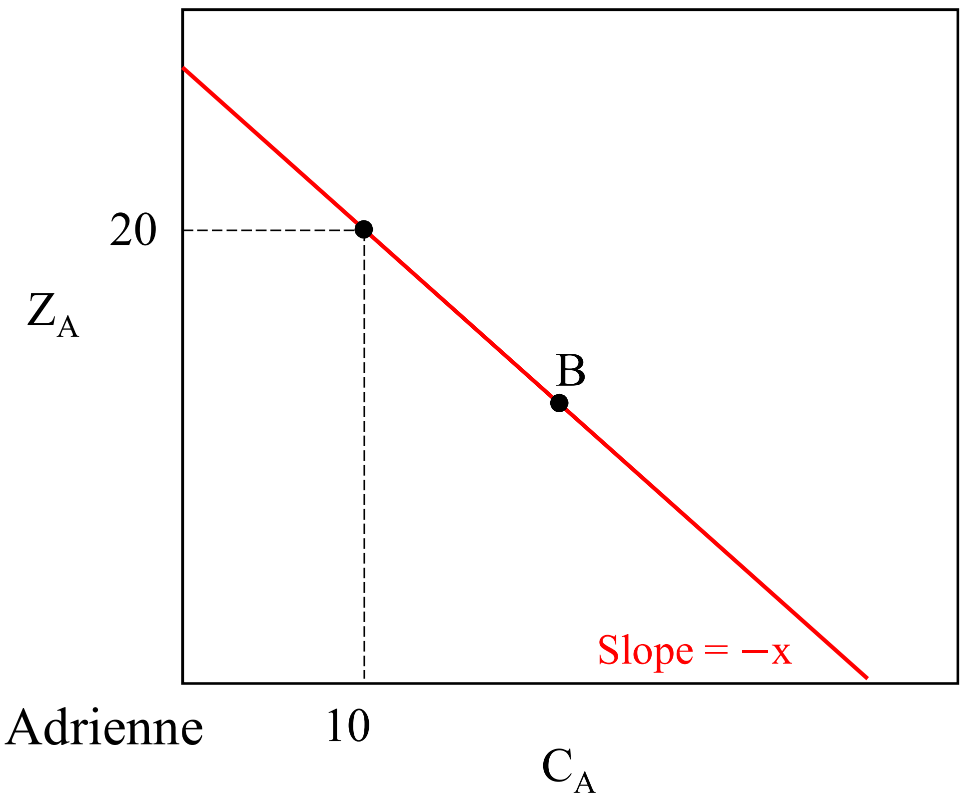
e) Equilibrium (allocation and prices) if markets are competitive

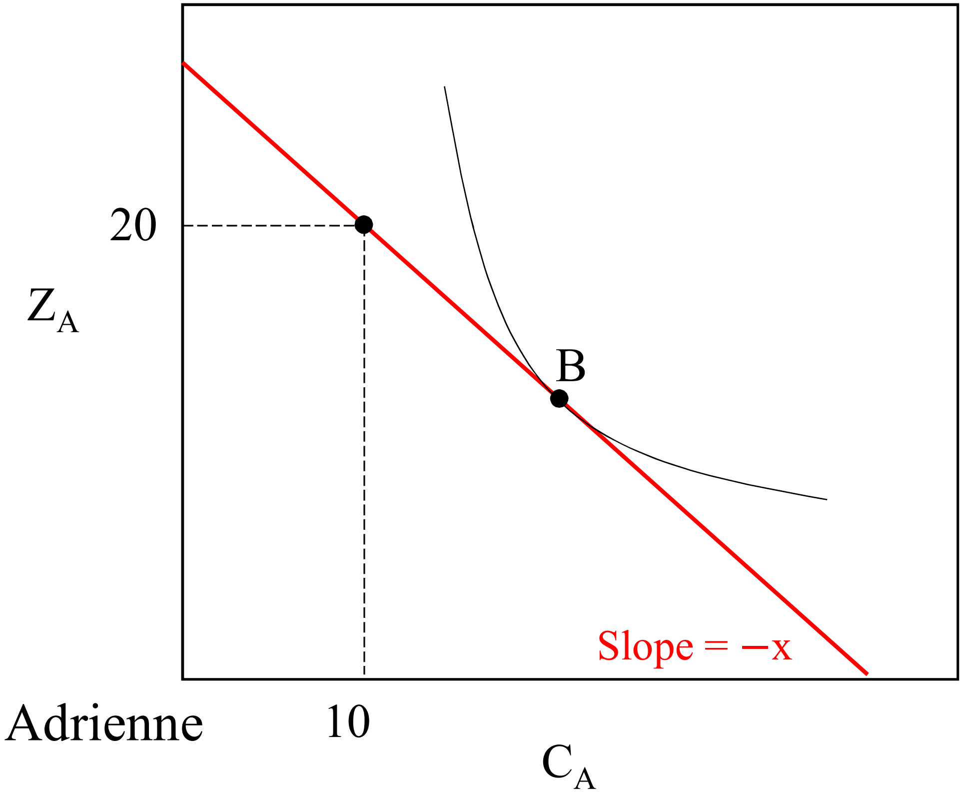
- **Graphically**
- **Numerically**

Assume $\frac{P_Z}{P_C} = x \quad \Rightarrow$ Adrienne can trade x units of Pizza for 1 units of Cola

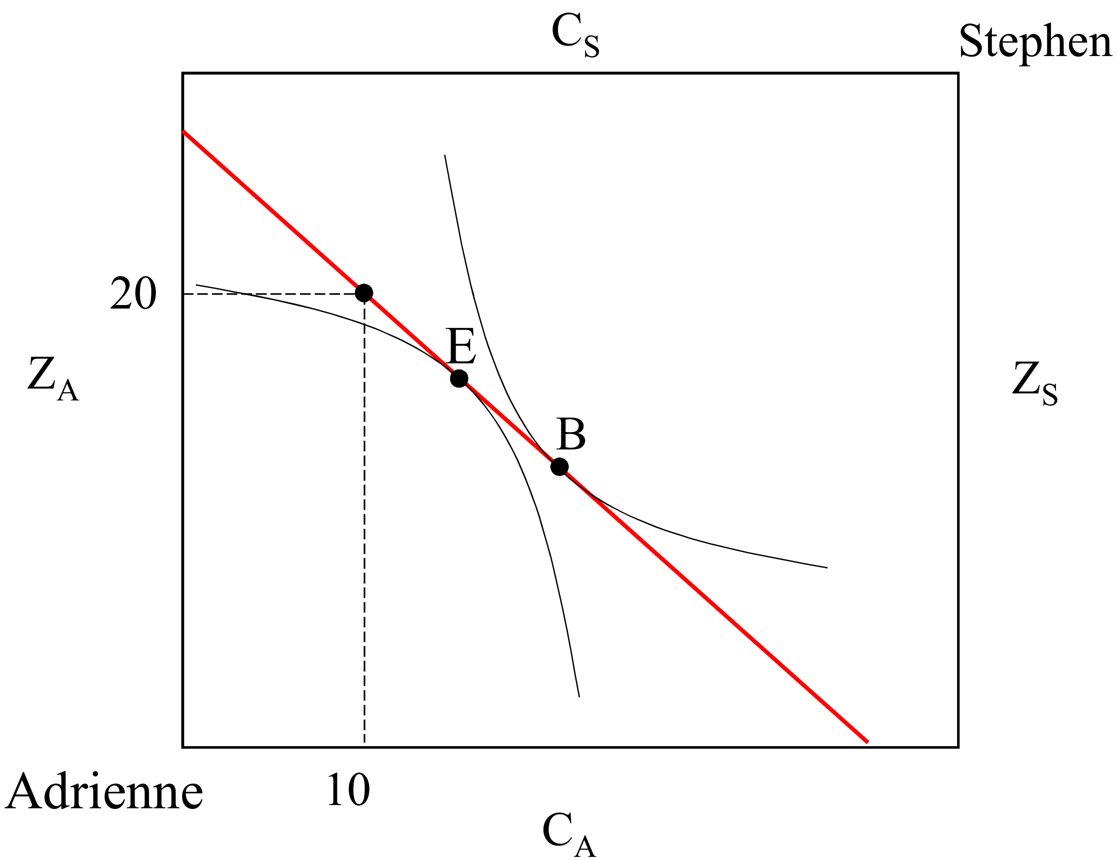
She could get an allocation like B by selling some Pizza and buying some Cola

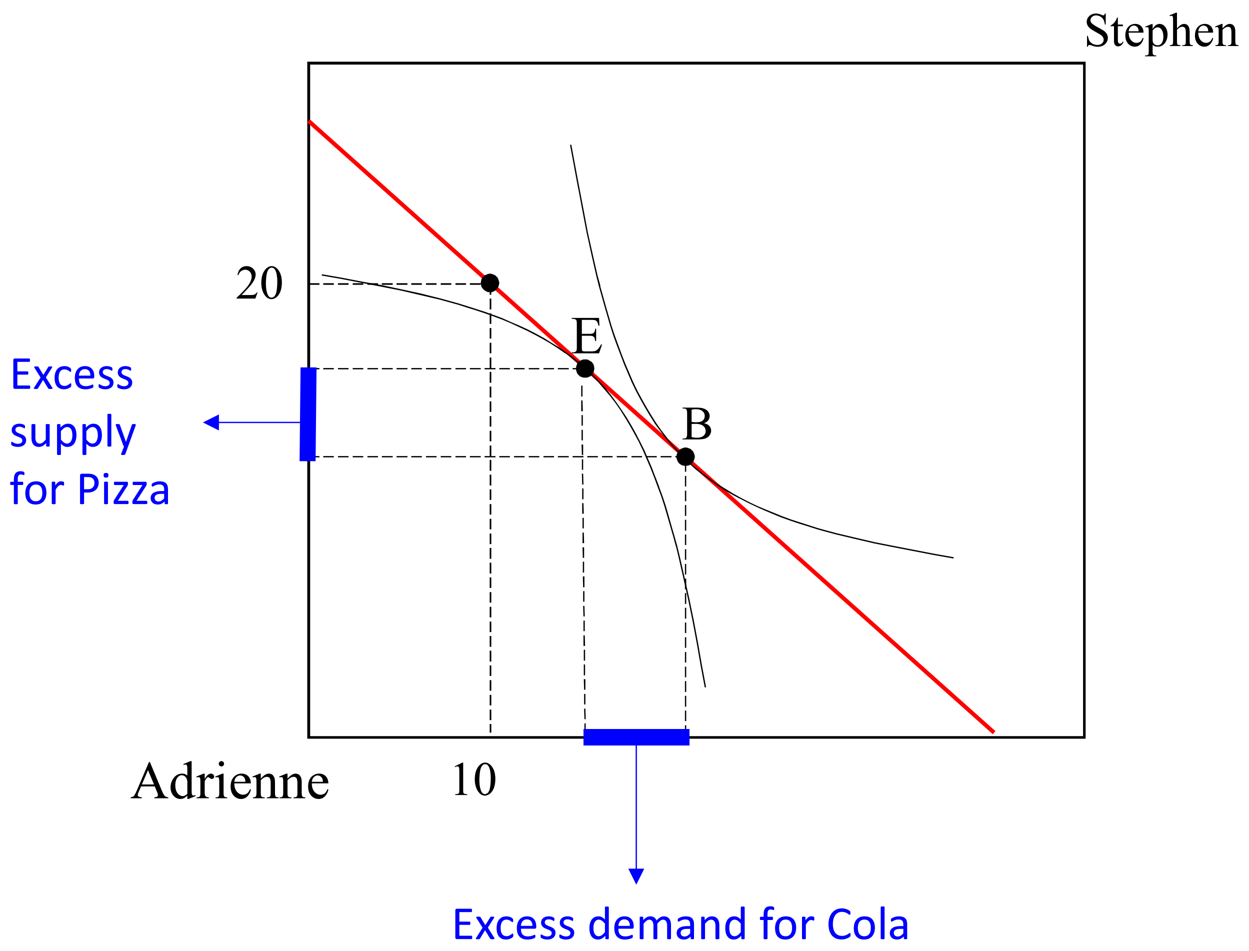


At these prices B maximizes Adrienne's utility



But this is not an equilibrium, because Stephen would like to get E at these prices

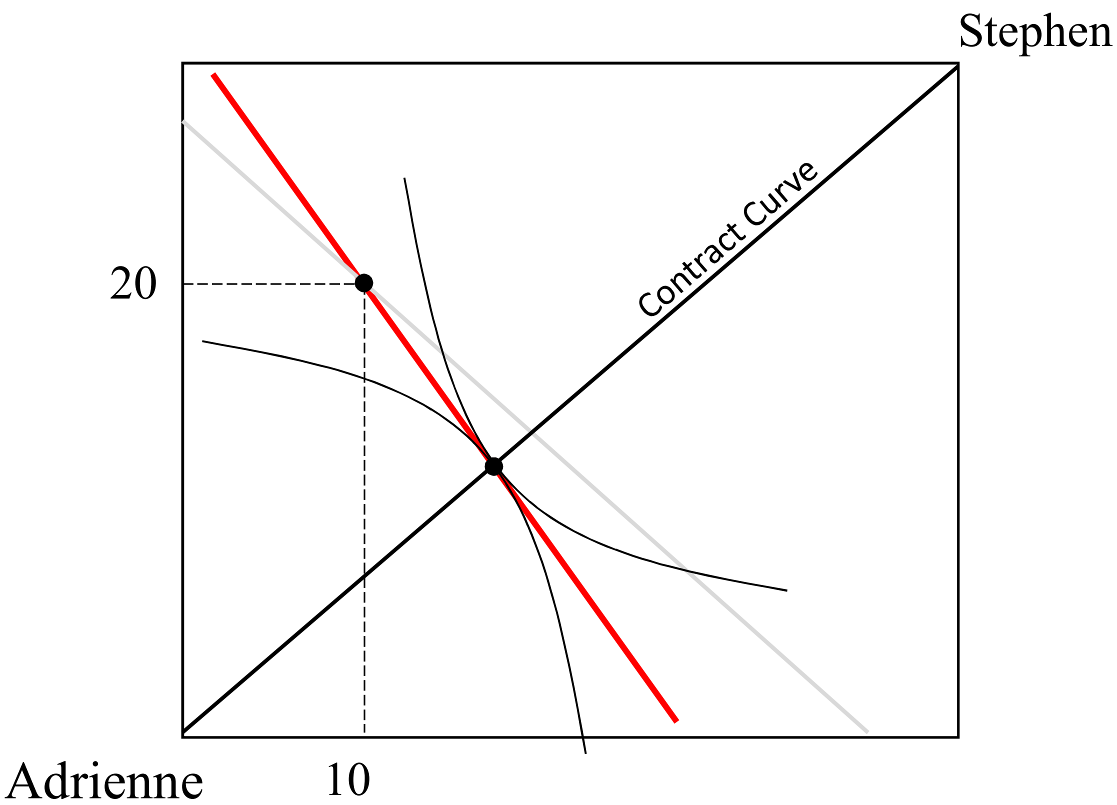




Stephen
20
E
B
Excess
supply
for Pizza
Adrienne
10
Excess demand for Cola

Price would adjust ($\downarrow \frac{P_Z}{P_C}$) up to the point when the sum of demands = endowment of each good

Naturally, this point is on the Contract Curve



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e) Equilibrium (allocation and prices) if markets are competitive

- Graphically
- **Numerically**

Think about the graph, in equilibrium we have

- **TANGENCY CONDITION (e.g. Adrienne)**

$$MRS_A = \frac{Z_A}{C_A} = \frac{P_Z}{P_C}$$

- **CONTRACT CURVE**

$$Z_A = \frac{3}{4} C_A$$

$$\frac{P_Z}{P_C} = \frac{3}{4}$$

- **BUDGET CONSTRAINT (e.g. of Adrienne)**

$$Total\ Expenditure = Value\ of\ Endowment$$

$$P_Z Z_A + P_C C_A \quad = \quad P_Z 20 + P_C 10$$

$$\frac{P_Z}{P_C} Z_A + C_A \quad = \quad \frac{P_Z}{P_C} 20 + 10$$

$$\frac{3}{4} Z_A + C_A \quad = \quad \frac{3}{4} 20 + 10$$

$$\frac{3}{4}\frac{3}{4} C_A + C_A \quad = \quad \frac{3}{4} 20 + 10 \longrightarrow \boxed{C_A = 18.33}$$

With $C_A = 18.33$ we can get all the other values:

$$Z_A = \frac{3}{4} C_A \longrightarrow \boxed{Z_A = 13.75}$$

The values for Stephen are just residual (total endowment in the economy minus what Adrienne consumes)

$$Z_S = 30 - Z_A \longrightarrow \boxed{Z_S = 16.25}$$

$$C_S = 40 - C_A \longrightarrow \boxed{C_S = 21.33}$$

Note: There are different ways of solving this exercise

Try at home:

1) Find the demands Z_A, C_A, Z_S, C_S as function of generic $\frac{P_Z}{P_C}$
   - You know how to do this from Econ 1

2) Replace the 4 demands into the conditions:
   - $Z_A + Z_S = 30$
   - $C_A + C_S = 40$

With 1) and 2) you can solve the equilibrium

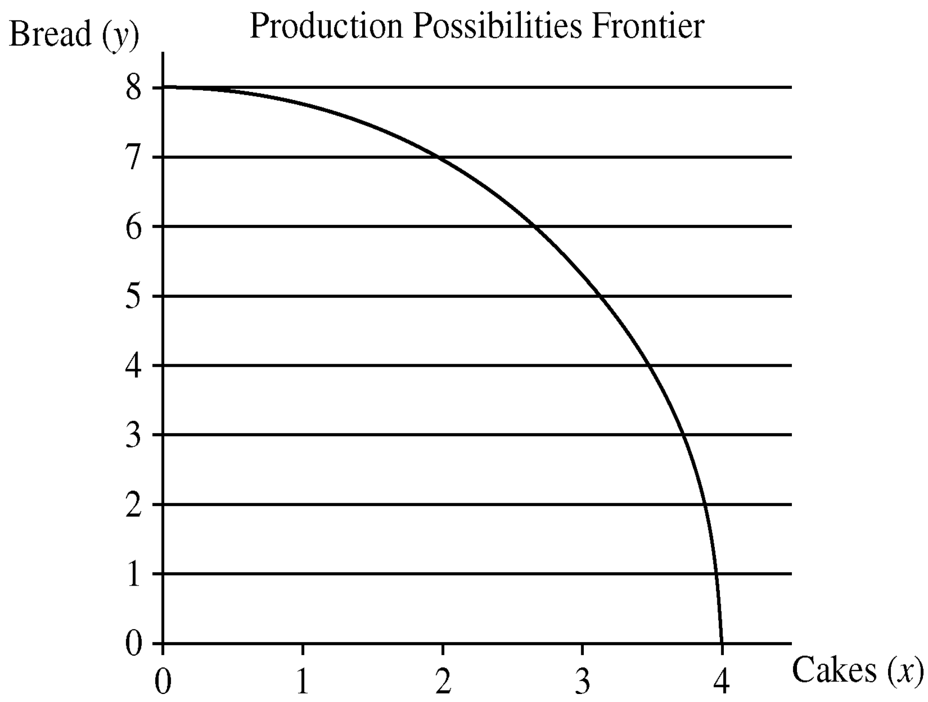
Question 5

- Bakery has 16 employees
- Can be bread bakers (B) or cake bakers (C), so $B + C = 16$
- Draw the production possibilities frontier for bread (y) and cakes (x)

a) Production functions are $\boldsymbol{y = 2B^{0.5}}$ and $\boldsymbol{x = C^{0.5}}$

$B = \frac{y^2}{4}$ and $C = x^2$

$B + C = 16 \quad \Rightarrow \quad \frac{y^2}{4} + x^2 = 16$



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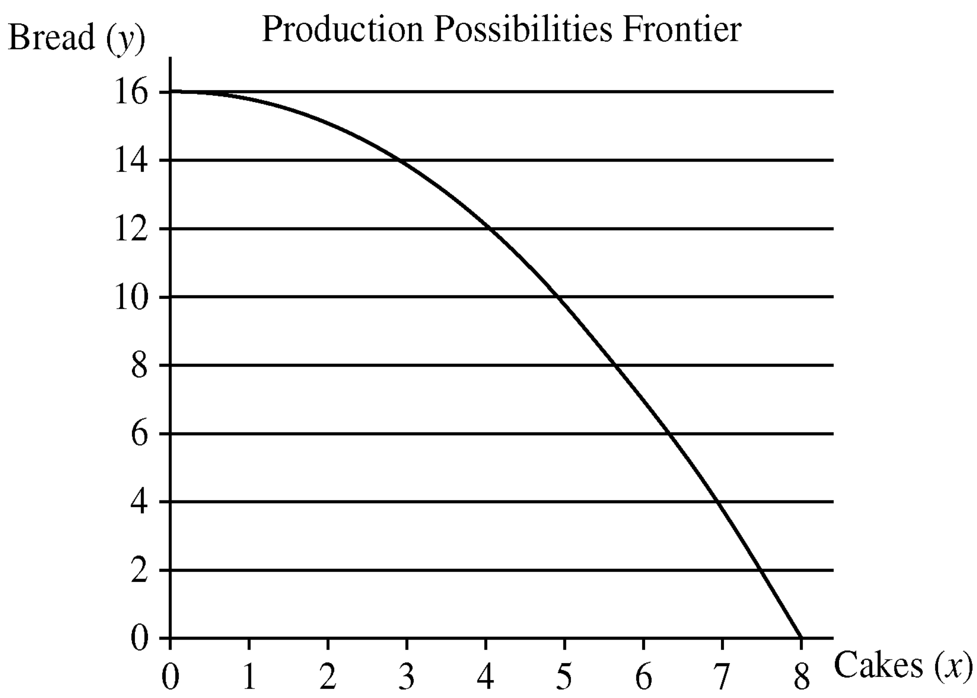
b) $\boldsymbol{y = B}$ and $\boldsymbol{x = 2C^{0.5}}$

$B = y$ and $C = \frac{x^2}{4}$

$$B + C = 16 \quad \Rightarrow \quad y + \frac{x^2}{4} = 16$$

$$\Rightarrow \quad y = 16 - \frac{x^2}{4}$$



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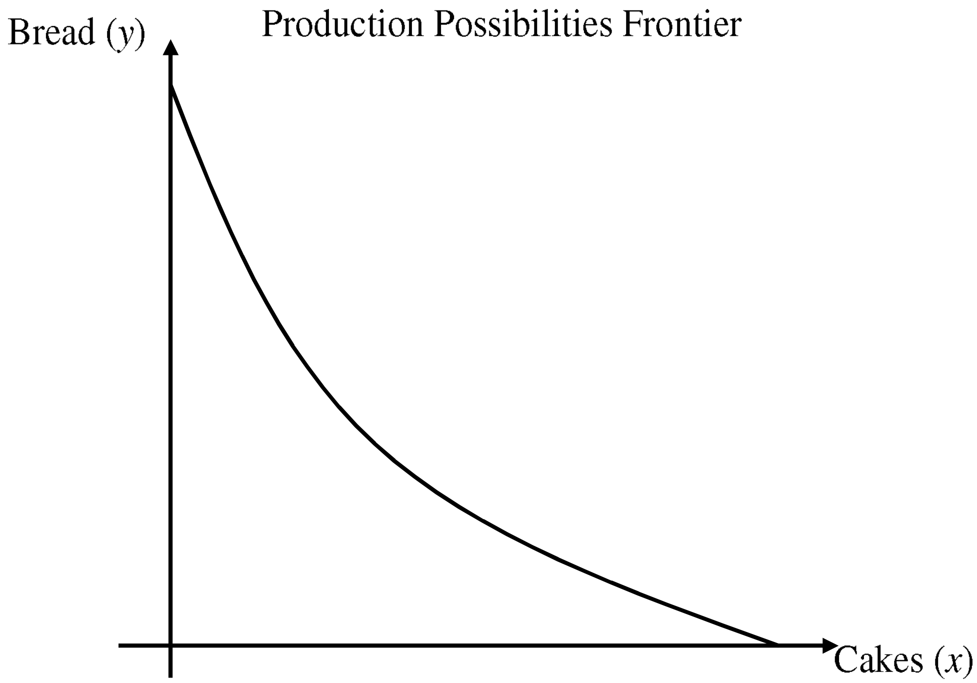
c) Give an example of conditions when the production possibilities frontier might not be concave.

$y = B^2$ and $x = C$

$$B + C = 16 \quad \Rightarrow \quad \sqrt{y} + x = 16$$

$$\Rightarrow \quad y = (16 - x)^2$$



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Discussion: What does it means that the PPF is convex?

Concave: Specialization is bad because decreasing returns

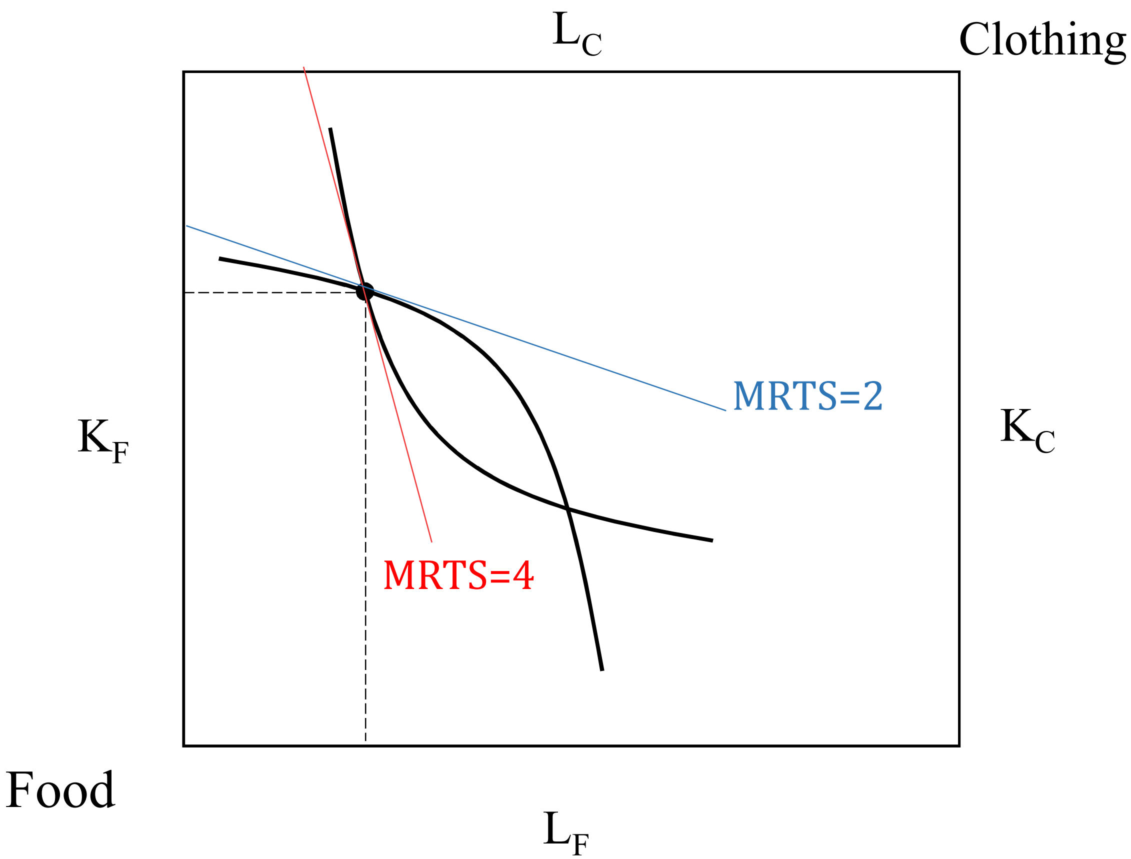
Convex: Specialization is good if there are increasing returns

Question 8

- An economy produces two goods, food and clothing,
- Two inputs, capital and labour
- MRTS in food = 4
- MRTS in clothing = 2

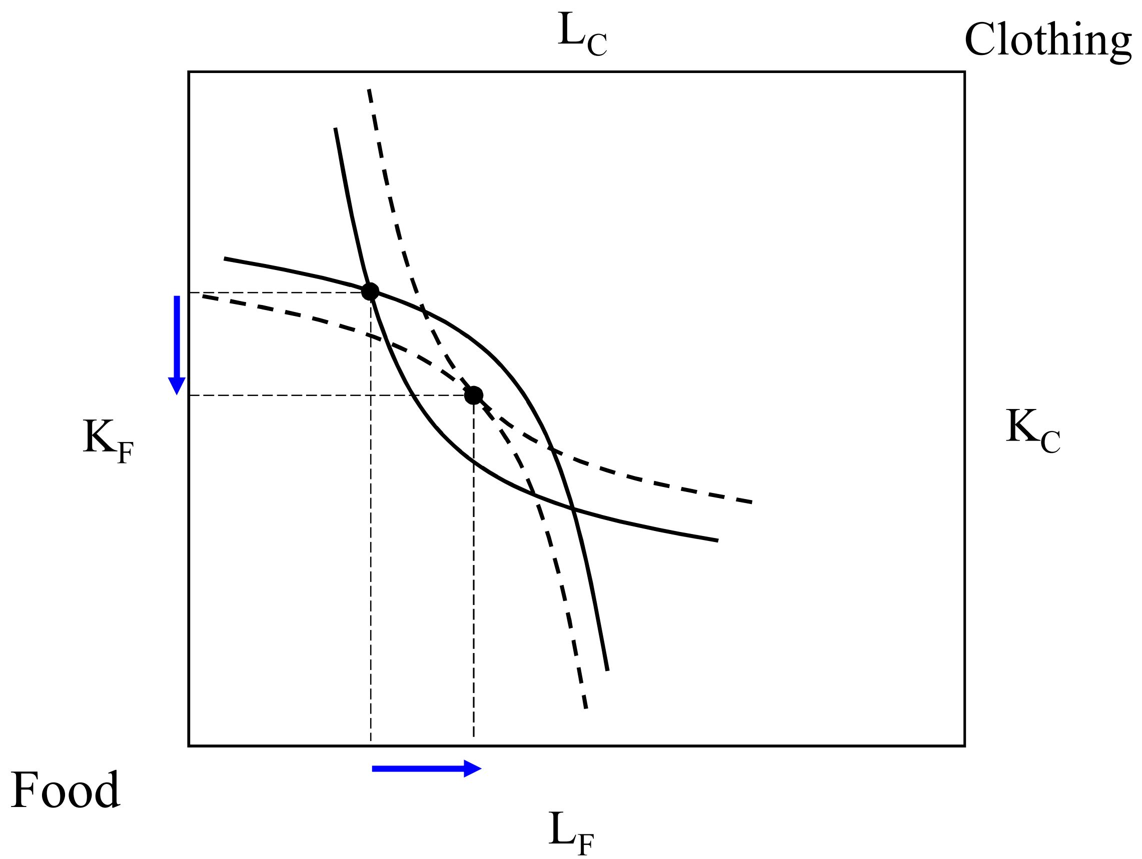
Is this situation Pareto Efficient?

Let's draw the isoquants in the Edgeworth box



L_C
Clothing
MRTS=2
K_F
K_C
MRTS=4
Food
L_F

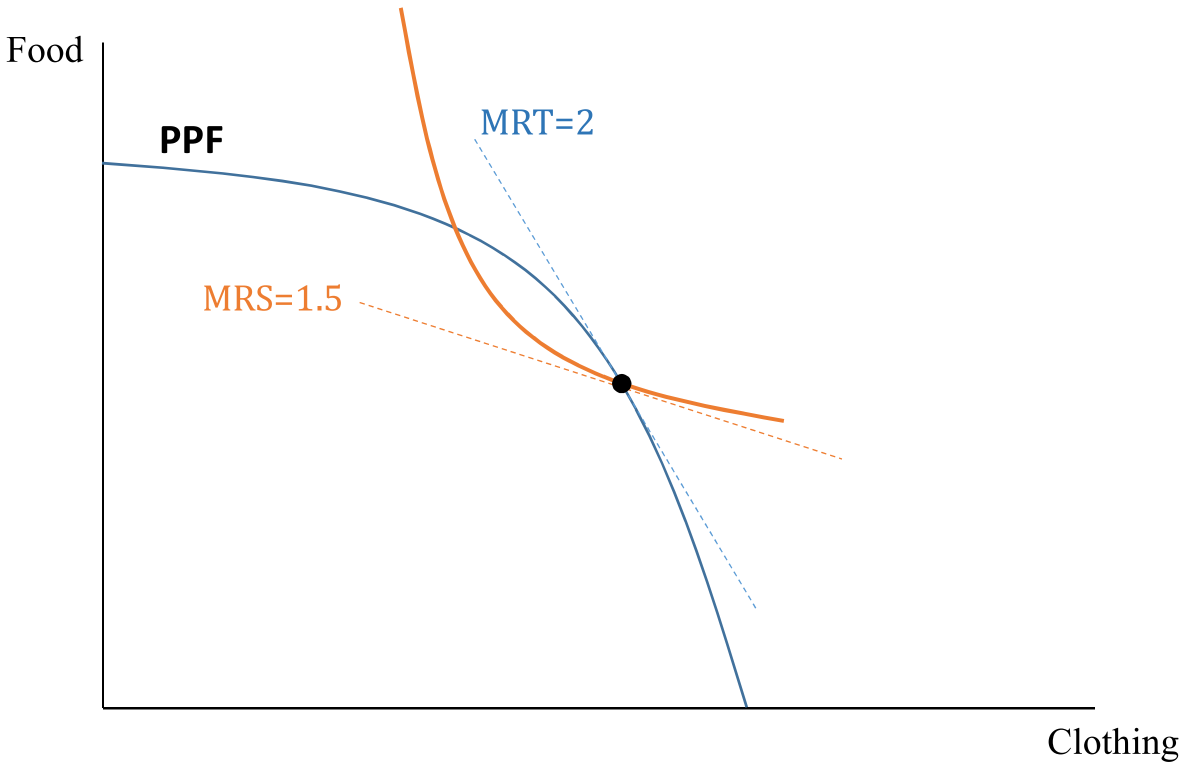
If we reallocate L from Clothing to Food and K from Food to Clothing, we can increase the production of both sectors

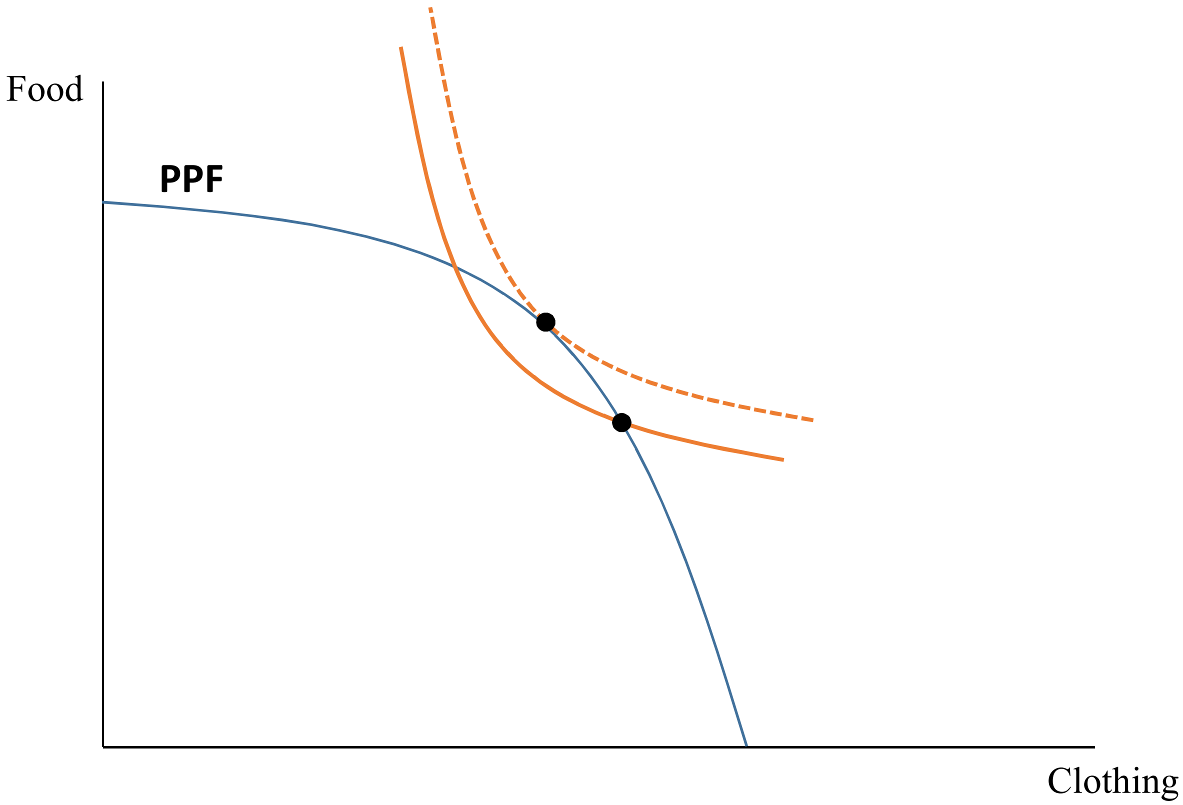


Question 9

- An economy produces two goods
- Consumers have preferences for the goods
- MRT food for clothing = 2
- MRS (of consumers) = 1.5

Is this situation Pareto Efficient?


Food
PPF
MRT=2
MRS=1.5
Clothing



If we reallocate inputs to produce more food and less clothing, consumers are better