

# EXERCISE 1:

Consider a  $2 \times 2$  exchange economy in which both agents have identical preferences represented by the utility function

$$u^i(x_1^i, x_2^i) = x_1^i x_2^i$$

a) draw an Edgeworth's box diagram for the case when there is a total of 1 units of good 1 and 2 units of good 2 in the economy.

b) compute and draw the contract curve

c) Suppose the initial endowments are  $w^1 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ ,  $w^2 = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$ . Calculate the competitive equilibrium allocation and price in this economy. Is the equilibrium allocation on the contract curve?

d) If the only policy tool you have is redistribution of initial endowments (in particular, you can't prevent people from trading or distort the market in which they trade in any way), which allocations would you be able to achieve? How? Explain.

2. Consider the  $2 \times 2$  economy in (1). In the utility space, plot the Pareto frontier and the utility possibility set. Mark the utility profile corresponding to the initial endowment of the economy. Is it on the Pareto Frontier? Repeat the exercise for the utility functions

$$u^i(x_1^i, x_2^i) = \sqrt{x_1^i x_2^i}$$

2. Consider a society of 4 people with incomes  $w_1 = 10, w_2 = 20, w_3 = w_4 = 40$ .

a) draw a Lorenz curve representing income inequality in this society

b) compute the Gini coefficient and Theil's entropy measures

c) will your answer change if instead  $w_1 = w_3 = 200, w_2 = 100, w_4 = 50$ . Explain your answer

3. Consider two societies of 10 people. In the first society income is distributed so that  $w_n = 100(n-1)$ ,  $n = 1, 2, \dots, 10$ . In the second society  $w_1 = w_2 = \dots = w_5 = 250$  and  $w_6 = w_7 = \dots = w_{10} = 750$ .

a) according to Lorenz criterion, which society is more unequal?

b) calculate the Gini and the Theil's entropy coefficients for each society

c) intuitively, which society seems to you more polarized among the "rich" and the "poor"? Explain.

3. Consider a society with the following income distribution:  $w_1 = 10, w_2 = w_3 = 20, w_4 = 100$ .

a) Compute the headcount poverty rate for the poverty line  $z = 21$ . Propose a redistribution policy that involves a net transfer from poor to rich, but registers as a decline in headcount poverty..

b) Compute instead the (non-normalized) poverty gap measure  $g = \sum_{i:w_i \leq z} (p - w_i)$  for the original distribution and for the distribution after the policy you proposed in (a)

c) Repeat (b) for the generalized poverty gap measure  $g^2 = \sum_{i:w_i \leq z} (p - w_i)^2$