

## Public economics (Prof. Parisi, academic year 2023-24)

### Exercises: monopoly pricing, public goods.

1. Consider a monopolistic market where the demand function is  $p = 10 - q$  and the marginal cost and the average cost are both equal to 2 Euros. Calculate:
  - a) the optimal quantity and price;
  - b) the optimal quantity and price if the firm applies the competitive price;
  - c) the change in welfare for consumers due to monopoly pricing;
  - d) the change in welfare for the producer due to monopoly pricing;
  - e) the welfare loss due to monopoly pricing.

Represent the equilibrium on a graph.

**Results:** (a)  $q=4, p=6$ ; (b)  $q=8, p=2$ ; (c) 24; (d) 16; (e) 8.

2. Consider data of the previous exercise but now assume the marginal cost is given by the following function:  $CM = 2q$ . For simplicity, we do not consider the average cost function. Calculate:
  - a) the optimal quantity and price;
  - b) the optimal quantity and price if the firm applies the competitive price;
  - c) the welfare loss due to monopoly pricing;
  - d) how to you compare the welfare cost due to monopoly pricing with the previous case?

Represent the equilibrium on a graph.

**Results:** (a)  $q=2,5$  and  $p=7,5$ ; (b)  $q=3,3$  and  $p=6,6$ ; (c) 1.

3. Consider two consumers with the following demand functions for a public good  $G$ :  $p_1 = 10 - 1/10G$ ;  $p_2 = 20 - 1/10G$  where  $p_i$  is the price that  $i$  is willing to pay for quantity  $G$ . Calculate:
  - a) the optimal level of  $G$  if the marginal cost (MC) is 5 Euros;
  - b) the optimal level of  $G$  if the (MC) is 25 Euros;
  - c) the optimal level of  $G$  if the marginal cost (MC) is 40 Euros;

Represent the equilibrium for each case on a graph where you have reported the individual demands and the collective demand for the public good. Use the graph to interpret the results obtained.

**Results:** (a)  $G=150$ ; (b)  $G=25$ ; (c)  $G=-50$  therefore the optimal value of  $G$  is zero.

4. Consider again the data of the previous exercise. Calculate the price paid by each individual when  $MC=25$  and when  $MC=25$ .

**Results:** (a)  $p_1=0, p_2=5$  (b)  $p_1=7,5$  and  $p_2=17,25$ .

5. There are three consumers of a public good. The demands for consumers are as follows:  $p_1 = 50 - G$ ;  $p_2 = 110 - G$ ;  $p_3 = 150 - G$  where  $G$  measures the number of units of the public good and  $p_i$  is the price that  $i$  is willing to pay for quantity  $G$ . The marginal cost is 190. Calculate the optimal provision of the public good. Moreover, represent the individual demands and the collective demand on a graph and interpret the result obtained.

**Results:**  $G=40$ .

6. Consider again the data of the previous exercise. Calculate the price paid by each individual in equilibrium. **Results:**  $p_1=10, p_2=70, p_3=100$ .

7. Consider again the data of exercise 5 and assume that all individuals act as free riders. Calculate the deadweight loss arising from the market failure if the good is not provided at all because of the free rider problem.

**Results:**  $DWL=2400$ .