Public Economics

Optional intermediary exam

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The exam lasts 90 minutes. Documents are not allowed. The use of a calculator or of any other electronic devices is not allowed. You can answer either in French or in English.

Exercise 1

8 points

In a *transferable voting system* each voter provides a ranking of options. If no option achieves the majority, the option with the lowest number of first-choice votes is eliminated and the votes that were attached to it are transfered to the second-choice options (for voters who first-choice was eliminated). This process proceeds until an option achieves a majority.

1. Define what is a Condorcet winner. 1

2. Is it possible for an option that is no one's first choice to win under a transferable voting system? 2

Consider the following preferences of five voters $i = 1, \ldots, 5$ over three alternatives a, b, and c:

	1	2	3	4	5
Most preferred alternative	a	b	b	c	c
	b	a	a	a	a
Least preferred alternative	c	c	c	b	b

3. Assume that voters truly express their preferences. What will be the selected option under a transferable voting system? Is this the Condorcet winner? 2

4. Show how strategic voting can affect the outcome of the vote. What will be the outcome of the vote if voters vote strategically? 3

Exercise 2

6 points

Let us consider an economy populated by 2 individuals—A and B—who consume 2 goods—1 and 2. Individuals' utility function are:

$$U^A = \log(x_1^A) + \log(x_2^A) + \frac{1}{2}\log(x_1^B),$$

and

$$U^B = \log(x_1^B) + \log(x_2^B) + \frac{1}{2}\log(x_1^A),$$

where x_j^i is the quantity of good j consumed by individual i. Each individual is endowed with 1 unit of income. Let the unit prices of both goods be 1.

1. Calculate the decentralized equilibrium situation of this economy. 1
2. Calculate the social optimum if the social welfare function is the sum of individuals' utility functions. 1
3. Compare quantities of good 1 under both situations. Comment. 2
4. Show that the social optimum can be reached in a decentralized framework thanks to a subsidy s placed on good 1 (so, the price of this good is now $1 - s$), with the cost of this subsidy covered by a lump-sum tax T on each consumer. 2

Exercise 3

6 points

This exercise describes what is known as the *tragedy of the commons*. Consider a lake that can be freely accessed by a potentially infinite number of fishermen. The cost of sending a boat out on the lake is $r > 0$. When b boats are sent out onto the lake, $f(b) = \sqrt{b}$ fishes are caught in total. So, each boat catches $f(b)/b$ fishes. The unit price at which fishermen can sell fishes is $p > 0$, it is not affected by the level of the catch from the lake (i.e. we are reasoning in partial equilibrium). Fishermen's outside option is 0 if they do not fish.

1. Show that the equilibrium number of boats sent out on the lake if fishermen take decentralized decisions can be expressed a: 1

$$b^* = \left(\frac{p}{r}\right)^2$$

2. Determine b^o, the number of boats that maximizes total social surplus. 1
3. Compare b^o and b^*. Why don't the two values coincide? 2
4. What per-boat tax t would allow to restore efficiency? 2