Public Economics

Final exam

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

Question 1

4 points

Comment on the following statement: "Since pollution is bad, it would be socially optimal to prohibit the use of any production process that creates pollution."

Question 2

4 points

Assume that, thanks to high-altitude winds, all our polluting emissions are blown into neighboring countries. Can our national economy be efficient? Discuss depending on whether polluting emissions have world-wide environmental consequences (e.g. unpleasant climatic change) or only local ones.

Exercise 1

6 points

Consider an individual with preferences over consumption in two periods given by:

$$V(C_1, C_2) = \log(C_1) + \frac{1}{1+\delta}\log(C_2),$$

where C_1 and C_2 denote consumption in periods 1 and 2, respectively, and δ is the rate of time preference. This individual receives labor income Y_1 in period 1, and Y_2 in period 2. Labor income is taxed at rate τ_1 in period 1, and at rate τ_2 in period 2. The individual can borrow or lend at rate r. She also have access to a tax avoidance technology that allows her to shift labor income from period 1 to period 2. If the individual chooses to shift $A \in [0, Y_1]$ euro from period 1 to period 2, her taxable income in the first period will be $Y_1 - A$ and that in period 2 will be $Y_2 + A$. Shifting A euro costs $\beta(A)$ euro, with $\beta'(A) > 0$, $\beta''(A) > 0$, $\beta(0) = 0$, and $\beta'(0) = 0$. This cost must be paid in period 1.

1. Remember that, in the absence of both taxes and tax avoidance technology, the individual's intertemporal budget constraint would be:

$$C_1 + \frac{1}{1+r}C_2 \leq Y_1 + \frac{1}{1+r}Y_2.$$

   Determine the individual's intertemporal budget constraint with taxes and tax avoidance technology. 1

2. Write down the individual's maximization program. Explain why the optimal level of shifting chosen by the individual will not depend on the utility function. 1

3. The first order optimality condition that defines A^*, the optimal level of income shifting, can be written as:

$$\beta'(A^*) = \frac{1-\tau_2}{1+r} - (1-\tau_1).$$

Comment. 1

4. In what case will there be no tax avoidance? Was this to be expected? 1

5. Consider the case in which $\beta(A) = \gamma A^2$, with $\gamma > 0$. Further assume that $r = 0$, and note that government' total tax revenues are equal to:

$$R = \tau_1(Y_1 - A^*) + \tau_2(Y_2 + A^*).$$

What are the implications on tax revenues of raising τ_1 or τ_2? Discuss the mechanisms at play in both cases. 2

Exercise 2

6 points

We consider an economy made of individuals who receive the same hourly wage w but have different preferences. Specifically, individual i's preferences over consumption c and labor l are given by:

$$u_i(c,l) = c - \frac{l^{1+\mu_i}}{1+\mu_i},$$

where $\mu_i > 0$. An individual with wage w supplying labor l, earns $z = wl$ (pre-tax earnings) and consumes $c = z(1-\tau)$, where τ is the tax rate on labor income.

1. Compute the optimal labor supply that individual i makes. 1

Assume that the government is able to set a different tax rate τ_i for each individual i.

2. Show that total tax revenue will be maximized if the government set tax rates such as:

$$\forall i,\ \tau_i = \frac{1}{1+\frac{1}{\mu_i}}.$$

1

3. What does $\frac{1}{\mu_i}$ represent? Comment on the above formula. 2

For some technical reasons, the government is not able to set a different tax rate for each individual i. Accordingly, the government decides to set a common tax rate $\overline{\tau}$ such as:

$$\overline{\tau} = \frac{1}{1+\mathbb{E}\left(\frac{1}{\mu}\right)},$$

where $\mathbb{E}\left(\frac{1}{\mu}\right)$ is the average of $\frac{1}{\mu}$ over the whole population.

4. Comment on this solution. 2