

# Master APE: Public Economics

Final Exam, January 10, 2016 - 2 hours

*The exam is 2 hours long and can be done either in French or English. **No** document whatsoever is allowed.*

## 1 Income taxation (7 points)

We consider an economy made up of individuals who have identical preferences. An individual earns  $z_i$  and consumes  $c_i = z_i - T(z_i)$  where  $T(\cdot)$  is the (possibly nonlinear) income tax.

Suppose that individual  $i$  has a utility function of the form :

$$u_i(c, z) = c - \frac{z_i^0}{1 + \frac{1}{e}} \cdot \left( \frac{z}{z_i^0} \right)^{1 + \frac{1}{e}}$$

where  $e > 0$  is a parameter (the same for all individuals) and  $z_i^0$  is a parameter specific to individual  $i$ . Suppose there is a distribution of  $z$  with density  $f(z) > 0$  over  $[0, \infty)$ . The total population is normalized to one so that  $\int_0^\infty f(z) dz = 1$ .

1) What is the economic meaning of  $e$  and  $z_i^0$ ? (0.5 point)

2) Consider a linear income tax system  $T(z) = -R + \tau \cdot z$  where  $R > 0$  is the demogrant and  $\tau$  is a flat tax rate. Solve the individual maximisation problem and show that individual  $i$  earns  $z_i = z_i^0 \cdot (1 - \tau)^e$  when the tax rate is  $\tau$ . (1 point)

3) Suppose taxes collected are all rebated through the demogrant so that  $R = \tau Z$  where  $Z$  is average earnings. Solve for the Rawlsian optimal tax rate  $\tau$  (i.e, the tax rate that maximises the utility of the worst-off individual). Solve for the utilitarian optimal tax rate  $\tau$  (i.e, the tax rate that maximises the sum of utilities). In both cases, explain the intuition behind the results. (1.5 points)

4) The government asks you to estimate  $e$  using two cross-section random sample of individual earnings (this is not panel data) for two consecutive years : year 1 and year 2. In year 1, the tax rate is  $\tau_1$ . In year 2, the tax rate increases to level  $\tau_2$ . How would you proceed to estimate  $e$  from this data? Provide the regression specification that would allow you to estimate  $e$ . State clearly what assumptions would be needed to estimate  $e$  without bias. (1.5 points)

5) Let us now assume that the government sets a two bracket tax schedule with a zero marginal tax rate for incomes below  $z^*$  and a marginal tax rate for incomes above  $z^*$  in year 1. The government increases the marginal tax rate above  $z^*$  from  $\tau_1$  in year 1 to  $\tau_2$  in year 2 (the tax rate below  $z^*$  remains at zero). You have access to panel earnings data following the same  $n$  individuals in year 1 and year 2. Explain how you could identify  $e$  exploiting this reform and doing a difference-in-difference analysis. Provide the regression specification that would allow you to estimate  $e$ . What are the key identification assumptions needed? Discuss the potential biases that arise when applying this method to real world data. (1.5 points)

6) In a very influential paper, Feldstein (1999) stated that the elasticity of taxable income was a sufficient statistic to estimate the efficiency costs of taxation. Is it true? What are the strong assumptions required to apply it? (1 point)

## 2 Public goods (5 points)

Consider  $N$  identical consumers indexed by  $i = 1, \dots, N$  with the same utility function :

$$U_i = \log(x_i) + \log(G)$$

where  $x_i$  is the consumption of a private good by individual  $i$ , and  $G$  is a pure public good. For simplicity, we assume that individual earnings and the price of the private good are equal to 1 such that each consumer's budget constraint can be written as :

$$x_i + g_i = 1$$

where  $g_i$  is the contribution to the public good if individual  $i$ . Total available quantity of the public good is the sum of individual contributions, i.e.  $G = \sum_{i=1}^N g_i$ .

1) What are the two properties of a public good and explain why it can cause a market failure. (1 point)

2) Calculate  $G^d$ , the equilibrium public good provision when individuals make decentralized decisions. In answering this question, you will assume an interior solution, i.e., that every individual contributes to the public good in equilibrium (1.5 points)

3) Calculate  $G^o$ , the optimum public good provision when a social planner chooses the level of public good such that each individual contributes equally and the following social welfare function is maximized (1.5 points) :

$$SWF = \sum_{i=1}^N U_i$$

4) Without any computations, explain how could the optimum public good provision be obtained through a decentralized mechanism? (1 point)

### 3 Questions (8 points)

1) Atkinson and Stiglitz (1980) argues that the person who effectively pays a tax is not necessarily the person upon whom the tax is levied. Without any computations, show graphically the impact of the introduction of a Value Added tax rate  $\tau$  on the consumer and producer surplus. (1 point)

2) Apart from econ grad students, individuals tend to free-ride much less than the theory predicts in public good games. How can you explain that? (1 points)

3) If society cares about redistribution, it is desirable to have lower VAT rates on goods that are disproportionately consumed by low income families? (1 point)

4) Evaluate the following claims by determining whether each claim is true or false and present a concise explanation for your answer :

- i) The empirical observation that those receiving unemployment insurance (UI) benefits remain unemployed longer than those not receiving UI benefits, conditional on unemployment, indicates that UI causes longer unemployment spells. (0.75 point)
- ii) Assuming that UI causes longer unemployment spells, this clearly indicates that generosity of the program should be reduced. (0.75 point)

5) The traditional approach to measuring the impact of the generosity of disability insurance on labor force participation has been to estimate the following linear probability model through OLS, using cross-sectional data on men aged 45-64 :

$$LFP_i = \alpha + \beta \cdot RR_i + \gamma \cdot X_i + \varepsilon_i$$

Where  $LFP_i$  is a dummy variable equal to 1 if individual  $i$  is in the labor force and zero otherwise,  $RR_i$  is the potential disability insurance replacement rate that the individual faced while working and  $X_i$  is a vector of covariates such as age, region of residence, etc.

- i) How do you interpret  $\beta$ ? What is its expected sign? (0.5 point)
- ii) In the context of disability insurance, why are replacement rates usually larger for low-wage workers than for high-wage workers? How might this bias the estimation of  $\beta$  in the above specification? (0.5 point)
- iii) What estimation strategy would you advocate to recover a causal estimate of the generosity of disability insurance on labor force participation? (0.5 point)

6) In the presence of uncertainty about the marginal cost of pollution reduction, which policy instrument should the government favor to control pollution? (1 point)

7) Some economists have discussed the possibility of taxation based on height. Explain the rationale for such a tax and the issues related to its implementation. (1 point)