

**SEMESTRE 6**  
**LICENCE 3 mention ECONOMIE**

**Topics in modern economics / code :  
L3S662**

**Lundi 1<sup>er</sup> juillet 2013**

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→ durée conseillée pour traiter ce sujet : 1 heure

→ **ATTENTION** : le nom de la matière et son code doivent être **IMPERATIVEMENT** recopiés sur la copie d'examen

**PLEASE USE TWO SEPARATE SET OF SHEETS FOR THE TWO PARTS.**

**PLEASE PICK A QUESTION AND AN EXERCICE THAT YOU DID NOT PICKED AT THE FIRST SESSION.**

Problem 1 : Emmanuelle Auriol

A regulator overlooks a public service (e.g., an hospital). The gross surplus of consumer is fixed denoted  $S > 0$ . The cost function to produce the service is  $C(\beta, e, K) = \beta - e + \psi(e) + K$  where  $e \geq 0$  and

$$\psi(e) = \frac{e^2}{2}$$

denotes the disutility of effort. The fixed cost level  $K > 0$  and the shape of the function  $\psi$  are common knowledge.

1) The regulator wants to produce the public service at the lowest possible cost, as the cost is directly financed by public funds. She faces the constraint that the firm must break even. Write the objective function of the regulator. We neglect the fact public funds are costly by setting  $\lambda = 0$ .

2) We initially assume that the regulator can separately observe  $\beta$  and  $e$ . Compute the optimal effort function. Comment.

3) Now we turn to the more realistic case of asymmetric information. The regulator does not observe  $\beta$ , nor  $e$ , but she can observe the final cost through an audit  $C = \beta - e$ . Moreover we assume that  $\beta$  is drawn from  $\{\underline{\beta}, \bar{\beta}\}$  according to the probability  $Prob(\beta = \underline{\beta}) = \nu$  (and  $Prob(\beta = \bar{\beta}) = 1 - \nu$ ).

By virtue of the revelation principle the regulator restricts herself to direct truthful mechanisms. Characterize these contracts (i.e. the constraints that asymmetric information impose on the regulator).

4) Write the optimization problem of the regulator under asymmetric information.

5) Solve the regulation problem under asymmetric information neglecting second order incentive compatibility constraint.

6) Check that the solution of question 5 satisfy the second order incentive compatibility constraint.

**Jean TIROLE**

**Short question.** Please answer *concisely* and *precisely*. Pick one of the following three short questions, a), b), or c) (answering more than one won't bring you any extra points)

- a) Explain how a market breakdown can occur under adverse selection.
- b) Explain how a notion of "opportunity cost" applies in Lerner's (monopoly) pricing formula in two-sided markets.
- c) How is an optimal layoff tax determined?

**Longer question.**

Pick one of the following two questions (answering more than one won't bring you any extra points):

(1) *Calvo model*

There are two periods,  $t = 0$  and 1. The country's utility is

$$u = Rb + \left[ c_1 - x\Phi \right],$$

where  $R > 1$ ,  $b$  is the amount borrowed (collected) at date 0,  $c_1$  the date 1 consumption,  $x = 1$  if the country reneges on its liability at date 1 and  $x = 0$  otherwise, and  $\Phi$  is an exogenous cost of default. The foreign investors are risk neutral and don't discount the future (so they demand a return of 1 on average for a unit investment; i.e. the market interest rate is  $r = 0$ ).

- (i) Suppose that the country fixes at date 0 its date-1 reimbursement/debt  $d$ . How much does the country borrow if  $R > 1$ ? [Hint: from risk neutrality, the solution is either 0 or the maximum credible reimbursement.]
- (ii) Add a second country (the "European Community"), that suffers a cost  $\phi$  in case of default. Show that the country may borrow even if  $R < 1$  (namely, as long as  $R > \Phi / (\Phi + \phi)$ ). Can you identify a desirable international agreement?
- (iii) Suppose that, instead of fixing the amount to be reimbursed, the country tries to achieve some borrowing target  $b < \Phi$ . The market then determines the borrowing interest rate through a breakeven condition. Show that there are three rational-expectations equilibria. [Hint: there is a mixed-strategy one in which the market demands rate of interest  $r$  given by  $b(1 + r) = \Phi$  and the country reimburses its debt with probability less than 1. What is this probability?]

## (2) *Pigovian taxation*

Consumers have a linear demand function for a good

$$q = D(p) = 1 - p,$$

where  $p$  is the consumer price and  $q$  is quantity.

This good is produced by a competitive industry with cost  $C(q) = q^2 / 2$ , and marginal cost  $q$ .

- (i) Consider a unit tax  $\tau$  on consumption of the good. Show that the equilibrium output and consumer price are equal to

$$q = \frac{1-\tau}{2} \quad \text{and} \quad p = \frac{1+\tau}{2}$$

and that consumers' utility plus producer profit is

$$\frac{(1-\tau)^2}{4} + \frac{\tau(1-\tau)}{2}$$

where the last term is the tax proceeds rebated to the consumers.

- (ii) Suppose that each unit of output generates a pollution with social cost  $e$  for the consumers. Assume that the social planner maximizes welfare (consumer net surplus plus producer profit). Demonstrate that the optimal tax is  $\tau = e$ .
- (iii) Compare this Pigovian prescription with the optimal pollution tax when the planner cares only about consumer welfare (i.e., does not internalize the profits). Compute the latter tax and explain.