



## **AFRICAN ECONOMIC RESEARCH CONSORTIUM**

*Collaborative PhD Programme in Economics for Sub-Saharan Africa*

### **COMPREHENSIVE EXAMINATIONS IN CORE AND ELECTIVE FIELDS**

**FEBRUARY 11 – MARCH 2, 2015**

### **PUBLIC SECTOR ECONOMICS**

**Time: 08:00 – 11:00 GMT**

**Date: Monday, March 2, 2015**

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#### **INSTRUCTIONS:**

Answer a total of FOUR questions: ONE question from Section A, ONE question from Section B, and TWO questions from Section C.

The sections are weighted as indicated on the paper.

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#### **SECTION A: (15%)**

**Answer only ONE Question from this Section**

##### **Question 1**

- (a) State ways through which tax evasion is usually committed. **[7 Marks]**
- (b) Explain four strategies that can be employed to reduce tax evasion. **[8 Marks]**

##### **Question 2**

- (a) Define a pure public good and give an example. **[5 Marks]**
- (b) Using demand and marginal cost curves, illustrate how the efficient level of public good provision is determined. **[10 Marks]**



## SECTION B: (25%)

Answer only ONE Question from this Section

### Question 3

- (a) Explain at least five principles of a tax policy design. **[10 Marks]**
- (b) Given a level of government revenue  $R$  to be raised, which must be financed solely by taxes on commodities, derive the conditions for setting taxes that would minimize the cost to society of raising the required revenue and suggest policy implications based on:
- (i) The Inverse Elasticities rule (Baumol and Bradford, 1970) **[7 Marks]**
  - (ii) Ramsey rule (1927) **[5 Marks]**
  - (iii) The Corlett-Hague rule (1953) **[3 Marks]**

### Question 4

Firms A and B each produces 80 units of pollution. The federal government wants to reduce pollution levels. The marginal costs associated with pollution reduction are  $MC^A = 50 + 3Q^A$  for firm A and  $MC^B = 20 + 6Q^B$  for firm B, where  $Q^A$  and  $Q^B$  are the quantities of pollution reduced by each firm. Society's marginal benefit from pollution reduction is given by  $MB = 590 - 3Q^{\text{tot}}$ , where  $Q^{\text{tot}}$  is the total reduction in pollution.

- (a) What is the socially optimal level of each firm's pollution reduction? **[6 Marks]**
- (b) How much total pollution is socially optimum? **[3 Marks]**
- (c) Explain why it is inefficient to give each firm an equal number of pollution permits (if they are not allowed to trade them). **[6 Marks]**
- (d) Explain how the social optimum can be achieved if firms are given equal numbers of pollution permits but are allowed to trade them. **[6 Marks]**
- (e) Can the social optimum be achieved using a tax on pollution? **[4 Marks]**



## SECTION C: (60%)

Answer TWO Questions from this Section,

AT LEAST one of which MUST be Question 5 OR 6

### Question 5

- (a) Suppose you are a policy maker with the government and you are required to design and implement intergovernmental transfers, explain at least five principles that will guide you in the exercise. **[10 Marks]**

- (b) Consider a competitive industry producing with a constant marginal cost  $c$  whose output is subject to specific tax  $t$ . Each firm in the industry can choose to reveal only a fraction  $\phi$  of its sales to the revenue service. However, to conceal output requires use of resources by the firms. The resource cost of concealing each unit of output is determined by a convex function,  $G(1 - \phi)$ , of the proportion of sales concealed. The probability that evasion is detected is given by  $\rho$ . The penalty rate on evaded tax is given by  $(t - 1)$ . Denoting the market price of output as  $q$ , a firm in the industry maximizes expected profit given by:

$$\pi^e = [q - c - [1 - \phi]G[1 - \phi] - [1 - \rho]\phi t - \rho[t + [\tau - 1][1 - \phi]t]]y, \text{----- (1)}$$

where  $y$  is its output.

- (i) Given that  $y$  is positive, derive the expression that characterizes the optimal fraction  $\phi$  of the firm's sales revenue that it chooses to reveal. **[3 Marks]**
  - (ii) Show the effect of tax rate increases on reported sales. Is this what you expect? Why or why not? **[3 Marks]**
  - (iii) Show the effect of tax rate increases on expected tax. **[3 Marks]**
  - (iv) Show the effect of tax rate increases on post-tax price. **[2 Marks]**
  - (v) Show the effect of probability of detection on reported sales, expected tax, and post-tax price. **[2 Marks]**
  - (vi) State the welfare implication of the effects derived and shown in (i) to (v), above. **[2 Marks]**
- (c) Suppose the structure remains as that of a competitive firm but with the addition that the practice is chosen by a profit-maximizing monopolist. Denoting the demand function by  $X(q)$ , the price and level of evasion are chosen to maximize:

$$p^e = X(q)\phi - c - g(1 - \phi) - [1 - \rho]\phi t - \rho[t + [\tau - 1][1 - \phi]t]] \text{----- (2)}$$

Show that the higher the rate of punishment the more likely is over shifting of taxation. **[5 Marks]**



## Question 6

- (a) You have just been appointed as the Head of the state owned Social Security Agency tasked with the responsibility of overhauling the entire social security system of your country. Armed with the tools of Public Sector Economics, explain how the following reforms you have proposed would lead to a better social security system than the one you inherited. Point out the pros and cons of each reform and pay attention to the efficiency implications (through potential behavioural responses to the change) and equity implications (who wins and who loses).
- (i) Increase the number of years used to calculate benefits from 35 to 40. **[5 Marks]**
  - (ii) Reduce benefits for beneficiaries with high asset levels (wealth). **[5 Marks]**
  - (iii) Add new state and local government workers to the pool of covered workers (i.e., they pay payroll taxes now and receive benefits when they are old). **[5 Marks]**
- (b) Many privately purchased health insurance plans have stringent “pre-existing conditions” exclusions, which deny coverage to insured persons for any health conditions that were known at the time of enrolment. Why does this exclusion reflect a market failure in the insurance market? **[15 Marks]**

## Question 7

- (a) Discuss at least four public debt management policy issues in Africa **[8 Marks]**
- (b) Critically examine the normative and positive theories of local public finance, in determining the optimal size of a jurisdiction. **[7 Marks]**
- (c) Suppose that in analyzing dynamic incidence of a tax on capital, you decide to use the Solow model of growth in which labour grows at rate  $n$ . Capital grows at rate  $g$  but the former goes in for depreciation. Hence, the effective growth rate of capital is also  $n$ . With both capital and labour growing at rate  $n$ , output also grows at rate  $n$ . Assume that the savings propensity is a function of the capital-labour ratio and a tax  $t_k$  on capital income. Further, assume that tax revenues are used by the government to finance exogenous government expenditure.
- (i) Show using algebra the steady-state condition with a tax on capital income and interpret the results. **[5 Marks]**
  - (ii) Using a diagram, depict the impact of a tax on capital on gross returns to capital and wages. **[5 Marks]**
  - (iii) What are the policy implications of this type of income tax? **[5 Marks]**



## Question 8

The city of Mombasa is considering whether to build a new public swimming pool. This pool would have a capacity of 800 swimmers per day, and the proposed admission fee is Ksh. 6 per swimmer per day. The estimated cost of the swimming pool, averaged over the life of the pool, is Ksh. 4 per swimmer per day. Mombasa city council has hired you to assess this project. Fortunately, the neighbouring identical town of Malindi already has a pool, and the town has randomly varied the price of that pool to find how price affects usage. The results from their study are as follows:

| Swimming pool price per day | Number of swimmer per day |
|-----------------------------|---------------------------|
| Ksh. 8                      | 500                       |
| Ksh. 10                     | 200                       |
| Ksh. 4                      | 1,100                     |
| Ksh. 6                      | 800                       |
| Ksh. 2                      | 1,400                     |

- (a) If the swimming pool is built as planned, what would be the net benefit per day from the swimming pool? What is the consumer surplus for swimmers? **[12 Marks]**
- (b) Given this information, is an 800-swimmer pool the optimally sized pool for Mombasa to build? Explain. **[12 Marks]**
- (c) Two city of Nairobi councillors are debating whether to pursue a new project. Councillor Ismail says it is only “worth it” to society if suppliers lower their costs to the city for the inputs to the project. Councillor Andoh disagrees, and says it doesn’t matter – society is no better off with these cost concessions than it would be without the concessions. Given your knowledge of cost-benefit analysis, what would be your opinion on this discussion and why? **[6 Marks]**

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