Public Economics
(Econ 512)

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Answer all questions; each is worth 20 points. I wish everyone a wonderful summer.

1. (i) Define "Equivalent Variation", give a formula for it and illustrate through a diagram.

(ii) What is the problem of "path dependence"? Suppose prices of x and y increase from (p_x^0, p_y^0) to (p_x^1, p_y^1). Show that the EV measure of the welfare loss associated with this price change is path independent.

(iii) Suppose prices are initially (p_x^0, p_y^0). We are contemplating two policies that would change the prices to either (a): (p_x^1, p_y^1) or (b): (p_x^2, p_y^2). Suppose the EV measure of going from the initial situation to (b) is greater than the EV measure of going from the initial situation to (a). Can we deduce that (b) is "better" than (a)? Why or why not?

2. (i) In a one-consumer economy, the individual's preferences and budget constraint are given by

$$\begin{aligned} u &= \ln x + \ln(1-L), \\ x &= w(1-t)L, \end{aligned}$$

where x is a consumer good, L is the labor supply, w is the wage and t is the income tax rate. Derive the labor supply function and discuss if there is an excess burden associated with the wage tax here.

(ii) What is the "marginal cost of public funds"? Suppose a marginal increase in government spending of \$1.0 entails a benefit measured at \$1.0. If the tax required for financing this expenditure is distortionary, should we not raise it?

3. (i) Assume capital and labor, while elastically supplied, are perfect substitutes in production. Who would bear the burden of a general tax on capital. Why?

(ii) Show that a general tax levied at a uniform proportionate rate on all products is equal to a uniform tax on all factor incomes.

(iii) What is production efficiency? Does taxing a product violate production efficiency? Are there circumstances under which optimal taxation requires violation of production efficiency?

3. (i) Under what conditions on preferences the Samuelson's rule for optimal provision of public goods yields a solution for the public good independently of income distribution.

(ii) Assume there are the economy consists of three types of individuals (of equal size) with preferences:

$$\begin{aligned} u_1 &= x_1 + \ln g_1, \\ u_2 &= x_2 + 2\ln g_2, \\ u_3 &= x_3 + 3\ln g_3, \end{aligned}$$

where x denotes private and g public good. What is the optimal level of public good, if the price of the private good is one, and the (average=marginal) cost of production of a unit of public good is 2?

(iii) Given the above specifications, determine the Lindahl equilibrium.

(iv) Given the above specifications, determine the Nash equilibrium.

5. Consider an economy with N_1 individuals of type 1 and N_2 individuals of type 2. All individuals have identical preferences represented by:

$$u(x, y, L) = x^{3/8} y^{1/8} (16 - L)^{1/2},$$

where x and y are the respective consumption levels of two commodities, while L is labor supply. Individuals differ in their wage (productivity) with $w_2 > w_1$ (where w_i denotes the wage of type $i = 1, 2$). Individuals' incomes $I = wL$ and the consumption levels x and y are publicly observable. There is no exogenous revenue requirement (purely redistributive tax). The two goods are produced through a linear technology with labor as only input. Their producer prices (marginal and average costs) are normalized at one.

(i) Characterize the (constrained) Pareto efficient allocations that are feasible given the available information. For simplicity, you can restrict attention to the case where the incentive constraint from type 2 to type 1 is binding. In particular:

(a) State the government's problem (maximization of utility subject to resource and incentive constraints).

(b) Give the first-order conditions.

(ii) Examine if a (general) income tax is sufficient to implement such a (constrained) Pareto efficient allocation, or if commodity taxation is also needed.