

Midterm Examination
Economics 440: Public Finance
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Fall 2010

Instructions: You have 1 hour, 15 minutes. Show all work: numerical answers without work, or plots without formula and required work, will not receive credit. Good luck! **If there are sentence limits (e.g. maximum of 4), the grader will not grade beyond the limit (e.g. s/he will grade the first 4 sentences¹).**

1. (20) Answer “true”, “false” or “uncertain” to each statement, and give a brief, concise supporting argument for your answer. You cannot receive points if you do not provide an argument/reason (if a graph/proof are required, no points will be given without the graph/proof).
 - a. A payroll tax is inherently unfair because workers pay the entire tax.
 - b. If the allocation of goods for two traders lies on the contract curve, then another allocation exists that is Pareto improving.
 - c. A firm uses labor and capital inputs. Identical taxes on both inputs is equivalent to a sales tax.
 - d. A tax that generates zero tax revenues generates zero excess burden.

2. (30) Suppose $U(X,Y) = .5\ln(X) + .5\ln(Y)$, income $I = 60,000$, prices $P_x = 20$ and $P_y = 10$. Let $\tau_x = .25$.
 - a. Solve for pre- and post-tax $\{X,Y\}$.
 - b. Define Equivalent Variation (**max. 2 sentences**). Under what situation is $EV = 0$ (given an example with a graph)?
 - c. Solve for Tax Revenue, Equivalent Variation, and Excess Burden.
 - d. Graph and label everything: pre- and post-tax $\{X,Y\}$, TaR, EV, EB.

3. (30) Suppose the government levies a payroll tax 2τ . The tax is shared equally by workers and firm owners (each pays $\tau = .08$ on total worker earnings wL).

Assume labor *supply* is fixed at $L^* = 150$, capital is fixed at $K_0 = 1$, output is described by a Cobb-Douglas function: $Q(L) = 20L^{1/3}$, and the market price of the good is $P = 33$.

 - a. Solve for the pre-tax market demand (the firm's willing-to-pay for labor) for labor. Plot labor demand and supply (w on the Y-axis, L on the X-axis).
 - b. Write out the firm's profit optimization problem and the condition that must be satisfied for the equilibrium wage. Solve for the pre-tax equilibrium wage w_0 and denote it on the graph.
 - c. Now introduce the tax. Solve for the post-tax market demand for labor and plot it on the same graph as above. Show that the economic incidence falls entirely on the worker.
 - d. Solve for the post-tax equilibrium wage w_1 paid by the firm, the net wage paid by the firm, and the net wage received by the worker. Who actually pays the tax? Plot them on the graph above.

4. (20) Consider a parcel of land in a perfectly competitive market with annual returns A_t that are taxed at u_t . The discount rate is the 90 Treasury bill return r_t . Assume asset lasts T periods. Assume the supply of land is fixed.
 - a. Suppose $r_t = .02$ is constant and $T = 20$ years. Show the formula for the price at time t that reveals the capitalization of the tax. Use all available information. (Do **NOT** assume returns or taxes are constant).
 - b. Now suppose $A_t = 2500$, $u_t = 10\%$ of A_t , and $r_t = .02$, and as before $T = 20$. What is the *pre-tax* price of the land parcel P , and the value of the stream of taxes?
 - c. Who pays the tax? Explain why. Be very precise with your answer: **no more than 3 sentences**.

¹ A "sentence" is here defined as a grammatically correct string of words with meaning, that does *not* run on. Write well!