14.41 Public Economics, 2002
Problem Set #5
Due: Friday, December 6, 2002

1) The city of Boston is considering a 10% tax on the revenues of all hotels/motels inside the city limits. While not completely different from hotels and motels in the nearby suburbs, the ones in Boston have a distinct advantage in their proximity to the interesting sights and convention centers. That is, individuals will pay some premium in order to stay in Boston rather than nearby.

Furthermore, all land is used equally well by hotels/motels and other forms of business; any Boston land not taken by a hotel/motel is readily absorbed by other forms of business.

Mayor Menino calls you in to advise him on the efficacy of such a tax. He is particularly concerned with who will bear this tax in the short run (ie. one month) and the long run (ie. five years).

a) What is the incidence of the tax in the short run? Answer intuitively, and use a diagram if possible.

b) What is the long run incidence? Once again, use a diagram if possible.

c) How would your analysis in (b) change if hotels/motels in the suburbs were perfect substitutes for those in Boston? What would happen to tax revenues?

d) How would your answer to (b) change if land were somewhat specialized to hotels, that is if business could not readily use land vacated by hotels? How would the equilibrium number of hotels compare to (b)? What if land were completely specialized to hotels?

2) Assume that an economy consists of 10 individuals with the following identical preferences:

$$U(C, A) = .25*\log C + .75*\log A$$

where C denotes cigarettes and A denotes apples.

Initially there is no commodity taxation in this economy and the price of a cigarette is $0.50. Assume that the elasticity of supply is 2 and that each individual has a fixed income of $100.

a) The government, having decided that it wants to discourage smoking, institutes a $0.50 per-unit tax on cigarettes. What is the dead weight loss (DWL) resulting from this tax? What is the ratio of the DWL to revenue? What is the ratio of marginal DWL to marginal revenue?

b) If the price of apples is $2, what does the Ramsey Rule suggest is the optimal commodity tax on apples?

c) Now assume that there is a $0.25 per pack negative externality associated with smoking and that cigarette supply is perfectly elastic. Re-calculate the DWL, the ratio of the DWL to revenue and the ratio of marginal DWL to marginal revenue.

3) Newly elected governor Mitt Romney has decided to upgrade the physical facilities of the Umass system (the state of Massachusetts university system). The total cost of the upgrade will be $500 million. He is considering several proposals to finance the capital improvements. For each of the proposals listed below, please discuss:

(i)   the equity consequences in both the short run (1 month) and the long run (10 years): what groups bears the tax, in what proportions?

(ii)   the efficiency consequences: does this tax have a lot or a little deadweight loss, relative to alternatives?

a) a new sales tax on food in Massachusetts

b) an increase in the corporate income tax in Boston

c) an increase in the state income tax in Massachusetts

4) Consider a model where individuals live for two periods and have utility functions of the form: $U = C_1^{1/2} C_2^{1/2}$. They earn income of $100 in the first period. They save S to finance consumption in the second period. The interest rate, r, is 10%. [Hint : you may want to take a transformation of the cobb-douglass utility function.]

a) Set up the individual's lifetime utility maximization problem. Solve for the optimal C_1, C_2, and S. Draw a graph showing the opportunity set.

b) The government imposes a 20% tax on labor income. Solve for the new optimal levels of C_1, C_2, and S. Explain any differences between the new level of savings and the level in part a, paying attention to any income and substitution effects.

c) Instead of the labor income tax, the government imposes a 20% tax on interest income. Solve for the new optimal levels of C_1, C_2, and S. [Hint: what is the new after-tax interest rate?] Explain any differences between the new level of savings and the level in part a, paying attention to any income and substitution effects.

d) Suppose now that the government decides it wants to encourage savings for retirement and decides to subsidize savings instead of taxing it. Specifically, the government now offers a one-to-one match of interest income (for every dollar of interest income that you earn, the government gives you another dollar). Based on your answer to c, how do you think this will affect the level of savings? Why? You need not solve for the new level of S, just explain your answer intuitively.