University of California, Berkeley **Economics 230a**
Department of Economics **Fall 2009**

Problem Set #1

(due 10/13/09)

1. Consider an economy in which relative producer prices are fixed and a representative household maximizes the following utility function:

$$U(c_1, c_2, l) = (c_1 - a_1)^{\beta_1}(c_2 - a_2)^{\beta_2} l^{1-\beta_1-\beta_2}$$

(where c_1 and c_2 are consumption goods and l is leisure), subject to the budget constraint:

$$p_1c_1 + p_2c_2 + wl = w$$

A. Derive an explicit expression for the excess burden of taxes on c_1, c_2, and l as a function of the original prices of the two goods (p_1^0, p_2^0, and w^0), the distorted prices (p_1^1, p_2^1, and w^1) and a fixed utility level.

B. Compare the values of excess burden based on compensating and equivalent variations.

C. Using the measure derived in part A, show that the deadweight loss is positive for any tax *or* subsidy on good 2. (*Hint*: show that *marginal* deadweight loss has the same sign as $(p_2^1 - p_2^0)$.)

D. Now, suppose that the government wishes to impose taxes on labor income and good-1 consumption. Derive a condition, based only on prices and preference parameters, under which the optimal tax on good 1 will be positive.

2. There are several methods of imposing taxes on consumption. These methods can be evaluated and compared with the help of the national income identity, which states that

$$GDP = C + I + G + X - M = W + R$$

where C is consumption, I is domestic investment, X is net exports, M is imports, W is income from wages and salaries, and R is capital (i.e., all other) income.

A *value-added tax* (*VAT*) is typically imposed on all domestic value added and all imports, with rebates then given on sales for investment, government use or export. The *flat tax* consists of two pieces: (1) a "cash-flow" tax on all returns to capital, with an immediate deduction for investment, and (2) a tax on wages and salaries at the household level. For the remainder of this question, ignore the exemption level under the wage portion of the flat tax and assume that all wages are taxed at a single rate that is equal to the cash-flow tax rate.

A. Show that the flat tax differs from the *VAT* in two respects: (1) it includes government purchases in its base; and (2) it lacks "border adjustments," i.e., it does not tax imports and provides no rebate for exports.

B. Discuss what adjustment is necessary for the government budget in order for the inclusion of government purchases in the flat tax base to have no impact on government purchases.

C. Now, consider the remaining difference between the two tax bases. Suppose that trade is balanced, so that $X = M$ in every period. What will the revenue consequences of border adjustments be?

D. Suppose that the home country has a flat tax in place and introduces border adjustments to it. Continuing to assume balanced trade in each period, and also assuming that the domestic price level is fixed and the exchange rate is flexible, what will the impact on the exchange rate be? Suppose instead that the exchange rate is fixed and the price level is flexible. What will the impact on the price level be? (*Hint*: consider the adjustments needed to maintain the initial equilibrium.)

E. Now, suppose that trade is balanced in present value, but not in every period. How does this affect your answer to parts C and D? With trade deficits and surpluses in any given period, there will be offsetting capital flows and income flows, following the following identity relating the *capital account* to the *current account*:

$$I^f = X - M + Y^f,$$

where I^f is net foreign investment and Y^f is net income from foreign sources. Discuss the impact of border adjustments on the incentive to invest abroad, and on the value of foreign assets owned by domestic residents at the time the border adjustments are implemented.

3. In Harberger's model, capital bears all of the corporate (sector X) income tax if labor's share of *before-tax* income is unchanged as T_{KX} changes, that is, if the following ratio stays fixed:

$$\frac{wL}{wL + rK + (T_{KX} - 1)rK_X}$$

A. For K and L fixed and T_{KX} initially equal to 1, show that this implies that the following relationship holds for the relative changes in w and r, where $\lambda_{KX} = K_X/K$:

$$(*)\quad \hat{w} - \hat{r} = \lambda_{KX}\hat{T}_{KX}$$

B. Using the expression derived in class relating $\hat{w} - \hat{r}$ to $\hat{T}_{KX}$, show that (*) holds if X and Y have the same initial factor proportions and production elasticities of substitution.

C. Now suppose that X and Y have the same initial factor proportions but that the production elasticity of substitution in sector Y is zero. Show that capital bears more than 100% of the tax.