

Problem Set 3

Capital Taxation in a Two-Period Model

Question 1:

Consider the problem of a household who lives for two periods and has preferences:

$$u(c_1, c_2) = u(c_1) + \beta u(c_2).$$

The household earns w_1 in the first period and w_2 in the second period. There is a perfect capital market in which the household can borrow and lend at the interest rate r (i.e., saving s results in a total return of $(1+r)s$). Write down the budget constraints of the household in the first and the second period, and write down the present-value budget constraint. Write down the maximization problem of the household, and find the first-order conditions of the problem. Express the first-order conditions in the form “marginal rate of substitution = relative price.”

Question 2:

Now assume that the government levies a proportional tax τ_c on consumption in both periods. Write down the new optimization problem of the household, and find the first-order condition. Is the optimality condition different from the case without taxation?

Question 3:

Now assume the government levies no consumption tax, but a proportional income tax τ_I on all income, including the interest income in the second period. Write down the maximization problem, and derive the optimality condition as before. Is it different now?

Question 4:

Now assume that there is still the same income tax. However, savings are treated differently: savings are tax-exempt in the first period (they can be subtracted from w_1 before taxation), but are taxed (including the principal) in the second period. This is called “savings in pre-tax dollars,” and is about what happens in 401k-plans. What is the new maximization problem? Does the optimality condition change?

Question 5:

Show that the last tax scheme (income taxation with savings in pre-tax dollars) is equivalent to a consumption tax.

Question 6:

Assume that $u(c_i) = \ln(c_i)$, $\beta = .8$, $w_1 = w_2 = 1$, and $r = .25$. Also assume that the government has to raise tax revenue in the amount of 0.5 in each period. Compute the necessary tax rates for a consumption tax and for an income tax (there may be different tax rates in the two periods). Which taxation scheme makes the consumer better off? Explain.

The Grabbing Hand

As an introduction, read the “Grabbing Hand” article from the Economist magazine, and Casey Mulligan’s article on the flat tax (there is a link from the course home page to both pieces). The articles are about attempts to understand the government as composed of self-interested, utility maximizing individuals, as opposed to benevolent social planners. As an example, consider a world with a single consumer who has the utility function:

$$u(c, l) = 20c - (l^s)^2.$$

There is a single firm in the economy with the production function:

$$y = l^d.$$

There are two different possibilities how to tax the consumer. The first possibility is a proportional income tax. The second possibility is a proportional income tax with a minimum consumption $\bar{c} = 2$ being exempt. That is, in the first case the tax bill is τwl^s , while in the second case the tax bill is $\tau(wl^s - \bar{c})$. The following questions ask you to compare the two taxation schemes.

Question 7:

Assume that the government needs to finance expenditures in the amount of 1 unit of the consumption good, and wants to get just enough taxes to finance this expenditure. Assume that the exempt minimum consumption is $\bar{c} = 2$. What is the tax rate if all income is taxed, and what is the tax rate if the minimum consumption is exempt? How does the utility of the consumer differ in the two cases? Which tax regime is better for the consumer?

Question 8:

Now assume that a self-interested politician wants to set the tax rate such that revenue is maximized. Which tax rate would he choose if no income is exempt? What is the tax rate if some income is exempt? How do the utilities of the consumer differ in the two cases? Which tax regime is better for the consumer?

The Political Economy of the Budget Surplus

Read the article “The Political Economy of the Budget Surplus in the U.S.” by Alberto Alesina. You can get a copy from the web at:

<http://www.nber.org/papers/w7496/>

Question 9:

Outline the main options for using the current and future budget surpluses.

Question 10:

Following Alesina’s arguments and from what you know from class, what is the optimal use for the surpluses from a traditional optimal policy perspective (i.e., assuming that politicians are willing to follow the policy recommendations made by economists)? What is the optimal use for the surpluses taking political economy considerations into account? Explain how and why your answer differs under these two assumptions.