

INTERMEDIATE MACROECONOMICS

Econ 3102-003

University of Minnesota

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STUDENT ID _____

NAME _____

1 Competitive Equilibrium with distortionary taxes

Imagine the real economy where all variables are expressed in terms of consumption good. you have a representative household with the following utility function

$$u(c, l) = c^\alpha l^{1-\alpha}$$

where c represents consumption of goods and l represents hours of leisure. This representative household has a budget constraint that looks like

$$c \leq \omega n + \pi - T$$

where ω , T , and π represent the wages, the lump-sum taxes, and the profits of a representative firm in terms of consumption good respectively. Finally, the representative household have a total amount of \bar{H} hours that can distribute between working, (n) or enjoying leisure time, (l): $l + n = \bar{H}$.

Let a representative firm in the economy have the following profit function

$$\pi = Y - \omega N$$

where Y represents output and N stands for amount of hours of labor hired. In addition, the production function of this firm has following form:

$$Y = zN$$

Finally, the government has to provide G amount of public good to public, and they have balanced budget constraint.

However, the government decided to change its tax policy from lump-sum tax to labor income tax. Thus, in this problem the **the consumer pays labor income tax, τ_N , to the government.**

a) Here is the definition of competitive equilibrium in this economy. Fill out the blank under the definition.

The competitive equilibrium is a set of household allocation {_____}, a set of firm's allocation {_____}, a set of government allocation {_____} and a set of prices {_____}, given {_____}.

Consumer : Given {_____}, the consumer chooses {_____} to solve

Firm : Given {_____}, the firm chooses {_____} to solve

Government : Given {_____}, the government chooses {_____} to keep balanced budget

Market clearing :

b) Set up the Lagrangian. Find the n^* in the consumer problem.

c) Fill out the following blank.

To find a Competitive Equilibrium we need to find _____ that clears the labor market and the good market so a CE is determined at the point where the PPF curve meets the Indifference curve.

d) Characterize the competitive equilibrium(8equations). Reduce it to 2 equations.

Apply $G = \frac{1}{6}$, $z = 1$, $H = 1$, $\alpha = \frac{1}{2}$ **for the question (e) and (f).**

e) What is the tax revenue function ? What is the optimal income tax rate (τ_N^*)?

f) Continue to (d), suppose that G is increased by $\frac{1}{6}$ (Thus, $G' = \frac{2}{6}$). How much does c^* change? (you need to calculate it) Explain crowding out effect with comparing the magnitude of the changes in c and G .

g) State social planner's problem.

h) State First Welfare Theorem. Does First Welfare Theorem hold in this problem? Briefly explain your answer in words. (not need to show it mathematically.)

cont problem 1

cont problem 1

cont problem 1

2 Two-period model

Imagine the real economy where all variables are expressed in terms of consumption good and the agents live only for 2 period. There are N number of identical households in this economy and each household i has the following utility function

$$u(c_i, c'_i) = \ln c_i + \beta \ln c'_i$$

where c_i and c'_i represent i 's consumption in the first period and in the second period respectively. Each household is endowed every period and has a budget constraint in each period.

$$\begin{aligned} c_i + s_i &\leq y_i - t \\ c'_i &\leq y'_i - t' + (1 + r)s_i \end{aligned}$$

where y , t and r represent the endowment, the lump-sum taxes, and the real interest rate that is associated with saving (borrowing). Finally, the government has to provide G amount of public good to public in the first period, and G' in the second period. Also, the government can issue the government bonds, denoted by B . **The government collects taxes in the second period, twice as much as the first period tax.** The government budget constraints are following:

$$\begin{aligned} G &= \mathbf{T} + B \\ G' + (1 + r)B &= \mathbf{2T} \end{aligned}$$

- a) Express the life time budget constraint in terms of future value (value in the second period) for the government by using two budget constraints.

From now, solve the questions assuming all consumers are identical.

- c) Clearly write down endogenous variables and exogenous variables in this model.
- d) Characterize the CE allocations. (6 equations) When you find the first equation, you need to set up the Lagrangian and obtain the equation.
- e) Suppose that the consumers face lower endowment today (low y), circle the right answers.

The consumers in this economy will consume (more / less) today due to (assumption 1 / assumption 2 / assumption 3) and the consumers will consume (more / less) tomorrow due to (assumption 1 / assumption 2 / assumption 3).

- f) Suppose the government has a new tax policy which is (today tax, tomorrow tax) = $(T, 3T)$. Does the consumers change optimal consumption bundle? Justify your answer.

cont problem 2

cont problem 2