

INTERMEDIATE MACROECONOMICS

Econ 3102-003

University of Minnesota

Department of Economics

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Problem Set 2

Problem 1

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

$$u(c, l) = \ln c + \eta \ln l$$

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

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

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:

$$Y = zK^\alpha N^{1-\alpha}$$

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

$$G = T$$

- a) Define the competitive equilibrium of this economy. (You must start from introduction of the variables (endogenous and exogenous) and specify problems of all agents)
- b) Set up the Lagrangian for consumer problem and find the tangency condition between consumption and leisure.
- c) Characterize the competitive equilibrium. You need to specify which equation is derived by who's problem.
- d) Clearly draw the link between the possibility production frontier, the indifferent curve, and the real wage.
- e) State social planner's problem. You need to specify which variables are given and which variables are choice variables for the social planner.
- f) Characterize the Pareto optimal allocation.
- g) State the first welfare theorem and check if the first welfare is hold in this economy.

Problem 2

Suppose that we have the same economy that stated above expect tax policy. In this economy, the government imposes a proportional tax τ_c on consumption and τ_w on wages paid by the firm for each hour of work hired. Note that consumption taxes are paid by the consumer and the government have balanced budget constraint.

- a) Define the competitive equilibrium in this economy. Mark the equations that you need to change compared to the answer in (a) in the problem1.
- b) Characterize the competitive equilibrium.
- c) Is social planner's problem different from the one in part (e) in the problem 1? If yes, how does it change? If not, explain why?
- d) Is the Competitive Equilibrium Pareto Efficient? Show it.

Problem 3

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

$$u(c, l) = \ln c + \ln l$$

where c represent consumption of goods and l represent hours of leisure. This representative household has to pay proportional labor income tax, τ_N . 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:

$$Y = zKN$$

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

- a) Write down consumer's problem and firm's problem.
- b) Characterize the competitive equilibrium.
- c) What is the labor demand function? Draw labor demand curve.
- d) What is the revenue function? (Revenue is function of τ_N).
- e) Draw Laffer curve when $z = 1$, $\omega = 1$, and $\bar{H} = 1$.
- f) What is the τ_N when $G = \frac{1}{4}$.