

Problem Set II

Section I: Chapter 4

Question 1

Consider the simple model of consumer choice developed in class. The consumer is endowed with h units of time that can be allocated to work or leisure, i.e.,

$$h = N^s + \ell.$$

The budget constraint for the consumer is

$$C = wN^s + \pi - T,$$

where π represents firm profits and T is a lump-sum tax. Assume $\pi - T < 0$.

- a. Using a diagram, characterize and discuss the optimal consumer bundle under perfect substitutes preferences, i.e.,

$$U = aC + b\ell \quad \text{for } a, b > 0.$$

- b. Characterize and discuss the optimal consumer bundle under the following preferences:

$$U = C^\alpha \ell^{1-\alpha} \quad \text{for } \alpha \in (0, 1).$$

- c. Suppose the government is considering implementing two alternative tax policies for consumers: a lump sum tax T or a proportional tax τ on labor income (i.e., tax on wN^s). Assuming that each tax policy produces the same revenue for the government, which tax policy would be preferable for the consumer? Explain your answer.

Question 2

Suppose household preferences are described by the utility function

$$U(C, \ell) = 2\sqrt{C} + \alpha\ell$$

where C stands for consumption of market goods and ℓ stands for leisure.

Assuming the market (real) wage is w and the total amount of time available is h , derive expressions for the

household's consumption and labor supply decisions as a function of w and h . (For simplicity, assume the household has no nonmarket income). Does the income effect ever dominate the substitution effect? How would things change if the household had some nonmarket income? Explain intuitively.

Question 3

Suppose that a consumer cannot vary hours of work as he or she chooses. There is a standard working hour as $h-l$ hours per day (for example 8 hours). In particular, he or she must choose between working q hours and not working at all, where $q > 0$. Suppose that dividend income is zero, and that the consumer pays a tax T if he or she works, and receives a benefit b when not working, interpreted as an unemployment insurance payment.

- a. If the wage rate increases, how does this affect the consumer's hours of work? What does this have to say about what we would observe about the behavior of actual consumers when wages change?
- b. Suppose that the unemployment insurance benefit increases. How will this affect hours of work? Explain the implications of this for unemployment insurance programs.

Question 4

Suppose that a consumer can earn a higher wage rate for working overtime. That is, for the first q hours the consumer works, he or she receives a real wage rate of w_1 , and for hours worked more than q he or she receives w_2 , where $w_2 > w_1$. Suppose that the consumer pays no taxes and receives no non-wage income, and he or she is free to choose hours of work.

- a. Draw the consumer's budget constraint, and show his or her optimal choice of consumption and leisure.
- b. Show that the consumer would never work q hours, or anything very close to q hours. Explain the intuition behind this.
- c. Determine what happens if the overtime wage rate w_2 increases. Explain your results in terms of income and substitution effects. You must consider the case of a worker who initially works overtime, and a worker who initially does not work overtime.

Question 5

Suppose that the government subsidizes employment. That is, the government pays the firm s units of consumption goods for each unit of labor that the firm hires. Determine the effect of the subsidy on the firm's demand for labor.

Question 6

In the course of producing its output, a firm causes pollution. The government passes a law that requires the firm to stop polluting, and the firm discovers that it can prevent the pollution by hiring x workers for every worker that is producing output. That is, if the firm hires N workers, then xN workers are required to clean up the pollution caused by the N workers who are actually producing output. Determine the effect of the pollution regulation on the firm's profit-maximizing choice of labor input, and on the firm's labor demand curve.

Section II: Chapter 5

Question 7

Consider the closed-economy one-period macroeconomic model developed in class. The consumer is endowed with h units of time, and chooses consumption C and leisure ℓ to maximize $U = \log(C) + \theta \log(\ell)$, subject to the budget constraint $C = wN^s + \pi$. Production is described by $Y = zN^d$. Government spending G is financed with a proportional revenue tax (tax rate τ) on the firm.

- Do you expect the competitive equilibrium of this economy to be Pareto Optimal? Explain why.
- Find the firm's optimal demand for labor N^d , as a function of w and τ .
- Find the consumer's optimal levels of consumption, leisure, and labor, given the real wage w and firm profits π .
- Solve for the equilibrium allocation (C, ℓ, Y, N) , equilibrium wage w , and equilibrium tax rate τ using the conditions that must be satisfied by an equilibrium: i) (C, ℓ, N) must be optimal for the consumer, given w and π ; ii) N must maximize the firm's profits, given w and τ ; iii) the government budget constraint is satisfied; iv) market clearing ($Y = C + G$, and $N^d = N^s$). Note: you should be solving for C, ℓ, Y, N, τ , and w as functions of exogenous variables and parameters.

Question 8

In the 1930s Keynes famously argued that the best way to stimulate employment was to pay people to dig holes and fill them up again. This question explores the logic behind that advice.

- Suppose households have the following preferences:

$$U(C, \ell, G) = \sqrt{C + G} + \sqrt{\ell}$$

where, as before, C is market consumption and ℓ is leisure. The new element here is government purchases, G . Note that the above preferences imply that government-provided goods are perfect substitutes for private consumption. Of course, the government must pay for the goods it buys, and suppose it does so by imposing lump-sum taxes, T , on the household. Since there is only one period, the government budget constraint is just $G = T$. Now the household's budget constraint is:

$$C + w \cdot \ell = w - T = w - G$$

For simplicity, suppose that the production takes the simple form:

$$Y = N \equiv 1 - \ell$$

so that the marginal product of labor (and therefore the wage) is constant and equal to one. Given this information, solve for the household's labor supply curve. Does it depend on G ? Why or why not? What happens to output, employment, and consumption when G increases?

- b. Now suppose the government buys useless things (e.g., holes in the ground), so that the household's utility function is as follows:

$$U(C, \ell) = \sqrt{C} + \sqrt{\ell}$$

In other words, government purchases do not provide utility to the household. Does labor supply now depend on G ? Why or why not? (*Hint: Your answer should refer to income and substitution effects.*) If G increases, how does output and employment respond? Was Keynes right? (*WARNING: This is a neoclassical economy. There is no unemployment! Keynes had in mind a different sort of economy, but this example sheds some light on his thinking.*)

Question 9

Suppose that government spending makes private firms more productive; for example, government spending on roads and bridges lowers the cost of transportation. This means that there are now two effects of government spending: the first being the standard effects of an increase in G , and the second being similar to the effects of an increase in the nation's capital stock K .

- Show that an increase in government spending that is productive in this fashion could increase welfare for the representative consumer.
- Show that the equilibrium effects on consumption and hours worked for an increase in government spending of this type are ambiguous, but that output increases. You must consider income and substitution effects to show this.

Question 10

In the simplified model proportional taxation there can be two equilibria, one with a high tax rate and one with a low tax rate. Now, suppose that government spending increases determine the effects of an increase in G on consumption, leisure, labor supply, real output and the tax rate in a high tax rate equilibrium and in a low tax rate equilibrium. How do your results differ? Explain why

Question 11

Consider the model of public goods in the last section of this chapter.

- a. Suppose that preferences over private consumption C and public goods G are such that these two goods are perfect substitutes; that is, the marginal rate of substitution of public goods for private goods is a constant $b > 0$. Determine the optimal quantity of public goods that the government should provide, and interpret your results. Make sure you show all of the relevant cases. What happens when b changes, or when q changes?
- b. Repeat part (a), except with perfect complements preferences; that is, for the case where the representative consumer always wishes to consume private consumption goods and public goods in fixed proportions, or $C = aG$, with $a > 0$.

Question 12

Suppose that the representative consumer's preferences change, in that his or her marginal rate of substitution of leisure for consumption increases for any quantities of consumption and leisure.

- a. Explain what this change in preferences means in more intuitive language.
- b. What effects does this have on the equilibrium real wage, hours worked, output, and consumption?
- c. Do you think that preference shifts like this might explain why economies experience recessions (periods when output is low)? Explain why or why not, with reference to the key business cycle facts in Chapter 3.