

Midterm Exam

Thursday, April 9

75 minutes

Name: _____

Instructions

1. This is closed book, closed notes exam.
2. No calculators of any kind are allowed.
3. Show all the calculations.
4. If you need more space, use the back of the page.
5. Fully label all graphs.

Good Luck ☺

1. (40 points). Consider the Classical model studied in class, and briefly described as follows. The consumer derives utility from consumption C and leisure l according to $U(C,l) = \alpha \ln C + (1 - \alpha) \ln l$. He is endowed with h hours which he can allocate between leisure and work L_S . The real wage is w . The consumer owns a firm and receives dividend income (profit) π . The firm produces output Y using technology $Y = AK^\theta L_D^{1-\theta}$, where A is productivity parameter (TFP), K is the capital owned by the firm, and L_D is labor employed by the firm. The government taxes labor income at the rate of t_w and dividend income at the rate of t_π .

- a. (5 points). Write the consumer's problem.

$$\begin{aligned} & \underline{\text{Consumer's problem}} \\ & \max_{C,l} \alpha \ln C + (1 - \alpha) \ln l \\ & s.t. \\ & C = w(h-l)(1-t_w) + \pi(1-t_\pi) \end{aligned}$$

- a. (5 points). Write the consumer's demand for consumption.

For finding the demand it is convenient to rewrite the budget constraint as follows:

$$C + w(1-t_w)l = wh(1-t_w) + \pi(1-t_\pi)$$

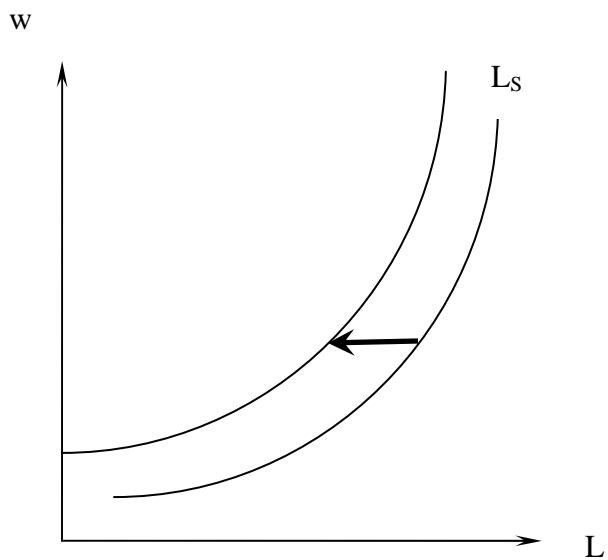
$$\text{Demand for consumption: } C = \alpha [wh(1-t_w) + \pi(1-t_\pi)]$$

- b. (5 points). Write the consumer's demand for leisure and his labor supply.

$$\text{Demand for leisure: } l = \frac{(1-\alpha)[wh(1-t_w) + \pi(1-t_\pi)]}{w(1-t_w)} = (1-\alpha) \left(h + \frac{\pi(1-t_\pi)}{w(1-t_w)} \right)$$

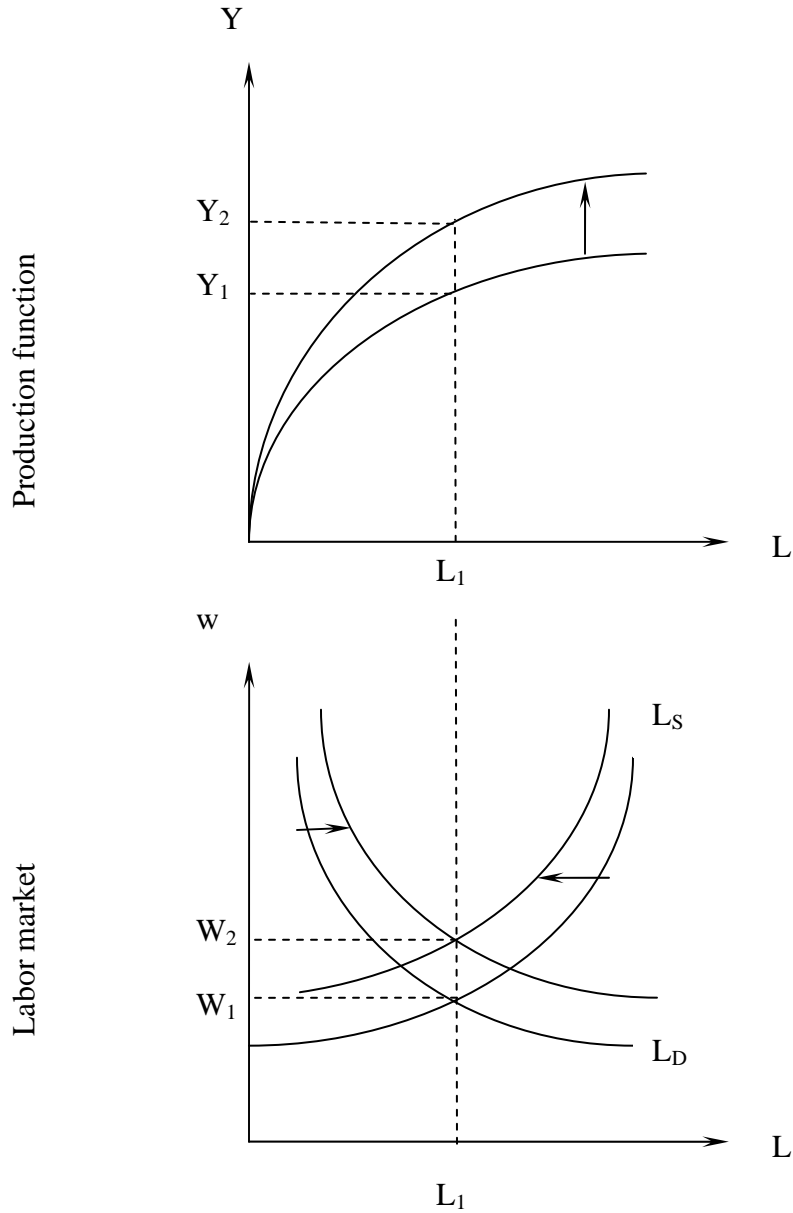
$$\text{Labor supply: } L_S = h - l = h - (1-\alpha) \left(h + \frac{\pi(1-t_\pi)}{w(1-t_w)} \right)$$

- b. (5 points). Illustrate graphically the impact on the labor supply of a decline in the tax on dividend income ($t_\pi \downarrow$), and provide economic intuition for it.



Higher net-of-tax non-labor income reduces the incentives to work, so the labor supplied at any given wage decreases.

- c. (10 points). Using fully labeled graphs of the production function and labor market, illustrate the effect of productivity growth ($A \uparrow$) on equilibrium output (Y^*), equilibrium real wage (w^*) and equilibrium employment (L^*).



2. (5 points). In the classical model, unemployment rate is (circle the correct answer):
- a. always zero
 - b. always positive
 - c. can be positive
 - d. none of the above
3. (5 points). **"In the classical model the government cannot affect output and employment with fiscal policies"**. This statement is (circle the correct answer):
- a. always true
 - b. true if labor and non-labor income are taxed at different rates
 - c. true if labor and non-labor income are taxed at the same rate
 - d. never true

4. (15 points). Consider the Keynesian model discussed in class. Suppose that the economy is characterized by the following behavioral functions:

Consumption: $C = 10 + 0.5(Y - T)$

Investment: $I = 40$

Government spending: $G = 30$

Taxes: $T = 10 + 0.5Y$

Full employment output: $Y_f = 107$

- a. Solve for the Keynesian equilibrium in the goods market.

$$\begin{aligned}
 Y &= E \\
 Y &= 10 + 0.5(Y - 10 - 0.5Y) + 40 + 30 \\
 Y &= 10 - 0.5 \cdot 10 + 70 + 0.5 \cdot (1 - 0.5)Y \\
 Y^* &= \frac{75}{0.75} = 100
 \end{aligned}$$

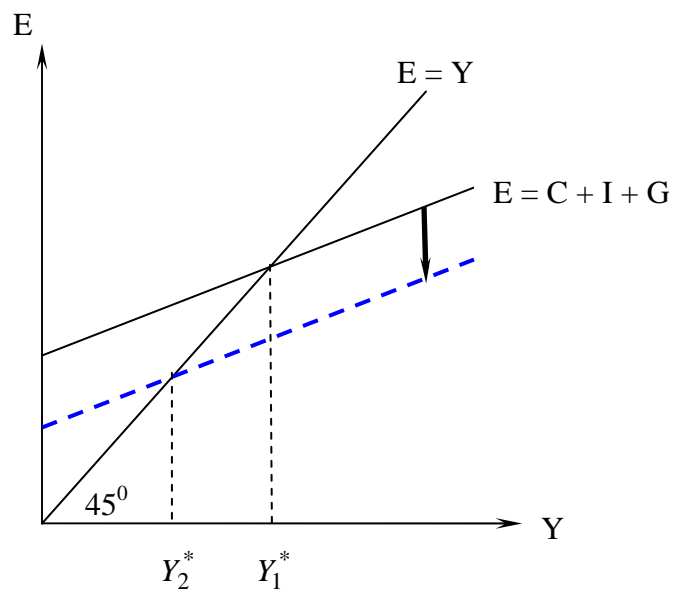
b. Find the personal saving in equilibrium.

$$DI = Y - T = 100 - 10 - 0.5 \cdot 100 = 40$$

$$C = 10 + 0.5 \cdot DI = 30$$

$$\Rightarrow S_P = DI - C = 10$$

c. On a fully labeled graph illustrate the Keynesian equilibrium in the goods market before and after an increase in lump sum tax. No numbers are required.



5. (15 points). The following table contains data from the labor market of some country (in millions).

Civilian noninstitutional population	100
Civilian labor force	50
Employed	40
Unemployed	10
Not in the labor force	50

- a. Complete the above table.
b. Find the unemployment rate in this country.

$$\text{Unemp. Rate} = \frac{\#Unep}{\#Labor Force} = \frac{10}{50} = 0.2 = 20\%$$

- c. Find the labor force participation rate in this country.

$$\text{Labor Force Participation rate} = \frac{\#Labor Force}{\#Civilian Noninst. Pop.} = \frac{50}{100} = 0.5 = 50\%$$

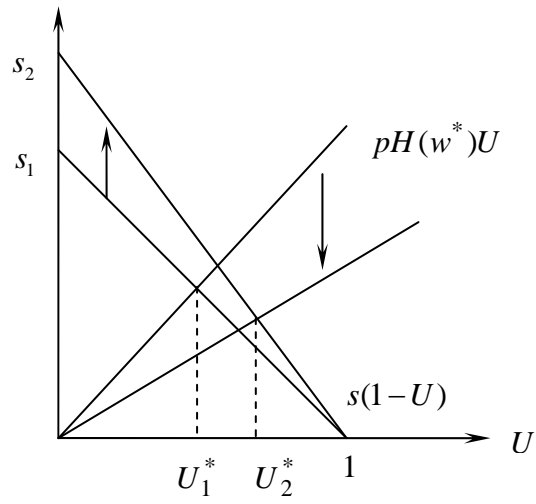
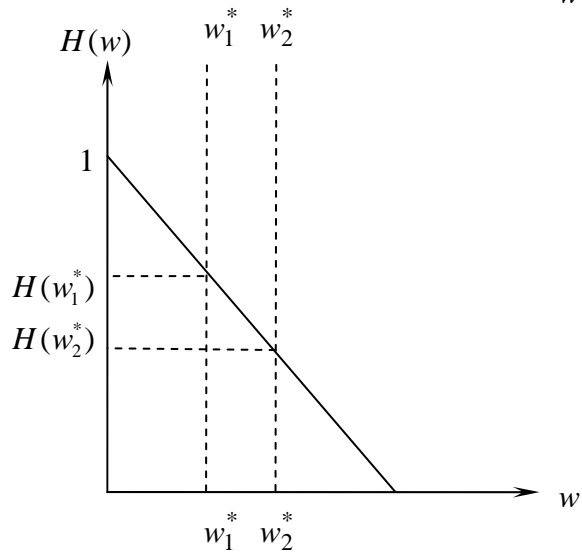
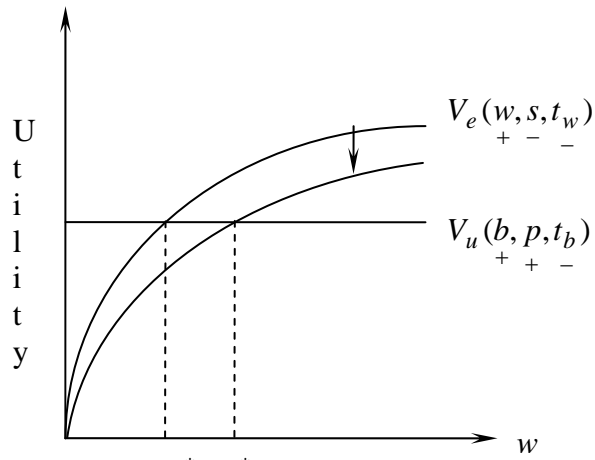
6. (15 points). Consider the search model of unemployment, briefly described as follows.

	Unemployed	Employed
Fraction in population	U	$1 - U$
Utility	$V_u(b, p, t_b)$ + + -	$V_e(w, s, t_w)$ + - -
	b – unemployment insurance benefit p – probability of receiving a job offer t_b – tax on b	w – real wage s – separation rate (probability of losing the job) t_w – tax on w

The symbols “+” under variable of the utility function indicates the assumption that the utility is increasing in that variable, and “-” under a variable indicates that the utility is decreasing in that variable.

Distribution of wage offers: $H(w)$ gives the probability that an offer is at least w .

Illustrate with 3 fully labeled graphs the impact of an increase in separation rate ($s \uparrow$) on: (1) reservation wage w^* , (2) probability of acceptance of job offers $H(w^*)$, and (3) steady-state unemployment rate U^* .



7. (10 points). Suppose that in some economy the private saving is 100, the domestic investment is 100, and the trade deficit is 11. What must be the government budget deficit in that country? Show your calculations.

$$\underbrace{S_P}_{100} + \underbrace{S_G}_{?} = \underbrace{I}_{100} + \underbrace{NX}_{-11}$$
$$S_G = -11$$

Government budget deficit is **11**.