

Econ 131
Spring 2023
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Midterm Exam

March 8

Exam Instructions:

- **Explanation should be written using pens (we recommend black or blue ink, as these often scan the best).** No pencils, except for graphs.
- **You must submit your solutions using the exam packet provided.** If you need more room to write your answers or need to re-draw a graph use the extra pages at the end. Make sure to note it clearly and accurately if your solutions continue on a different page.
- **Do not write your solutions on pages that say “Do not write on this page”.** Answers written on these pages will not be graded.
- **When time is called, STOP** writing, immediately **CLOSE** your exam packet and hold it up until it is collected by one of the GSIs.
- **Show your work.** Credit will only be awarded on the basis of what is written on the exam.
- **Sign the academic honesty pledge.** Cheating will be punished.

Student Name:

Student ID Number:

Affirm the academic honesty pledge below. For those writing on a non-printed copy, please just write “Academic Honesty Pledge as on exam”, and sign your name.

If you do not affirm this pledge, your exam will be marked invalid.

0. ACADEMIC HONESTY PLEDGE

I confirm that I have abided by all academic honesty rules for UC Berkeley and Economics 131. I confirm that I did not see this exam before my official exam start time. I confirm that I have not shared and will not share this exam with anyone else. I confirm that I haven't copied from anybody else's exam.

Signature: _____

1. True/False/Uncertain (Questions 1a-e) (15 points, 3 points per question.)

Explain your answer fully based on what was discussed in class, since all the credit is based on the explanation. Your grade depends entirely on the substance of your justification, not on whether you are correct in writing “True” or “False”. Note that it is possible to answer each question for full credit with three sentences or fewer, and answers longer than ten lines long will not be graded.

- (a) With a Rawlsian social welfare objective, the income tax rate should be set to maximize tax revenue.

Solution: TRUE: Rawlsian social welfare aims at maximizing the welfare of the worst-off individuals who are people with no ability to earn income on their own. Therefore, raising as much taxes as possible to make the transfer as large as possible is the goal of the Rawlsian social welfare objective.

- (b) Means-tested transfers combined with taxes on the rich only is more redistributive than universal transfers combined with taxes on everybody.

UNCERTAIN: As we saw in class from the Mankiw quiz, universal transfers combined with taxes on everybody can be replicated with means-tested transfers combined with taxes on the rich only. While the two systems can be strictly equivalent in terms of budget sets, means-tested transfers combined with taxes on the rich only seem more redistributive (as reflected by the results of the quiz in class). But because of this appearance, they are less politically stable and hence lead to an overall smaller social state. The US uses means-tested transfers combined with taxes on the rich and has a smaller social state than Europe that uses universal transfers combined with broader taxes on everybody.

- (c) Evidence from lottery winners shows implies that taxes can have a positive effect on labor supply.

UNCERTAIN: Evidence from lottery winners demonstrates that there are negative income effects on labor supply. Taxes reduce income and hence generate a positive effect on labor supply through income effects. However, taxes also generally create negative substitution effects on labor supply so that the net effect is uncertain.

- (d) According to labor supply theory, the EITC should decrease labor supply along the intensive margin.

SOLUTION: Uncertain. The EITC likely decreases labor supply along the intensive margin: Definite decrease in plateau (income effects) and phase-out (income+substitution effects), uncertain effects in the phase-in (as income and substitution effects go in opposite directions).

- (e) Taxing goods whose demand is price inelastic has low efficiency costs and therefore these goods should be taxed more.

SOLUTION: A tax on a good whose demand is inelastic produces relatively less deadweight burden. Hence, if the goal is to raise taxes to minimize deadweight burden, then indeed goods whose demand is price inelastic should be taxed more. However, this “Ramsey tax rule” does not take into account redistributive considerations. Goods whose demand is inelastic tend to be necessities. In this case, it would not necessarily be a good idea to tax inelastic goods more.

2. Incidence of Commodity Taxation (5 Points)

Consider the following market for brownies at Yali's. Suppose the demand for brownies is given by $Q^D = 500 - 30P$, where P denotes the price and Q denotes the quantity of brownies demanded. The supply for brownies is given by $Q^S = 20P$.

- (a) Compute the brownies market equilibrium. What are the equilibrium price and quantity? (1 Point)

Equating Supply and Demand:

$$20P = 500 - 30P$$

$$P^* = 10, Q^* = 200$$

- (b) Calculate the elasticity of demand ε^D and the elasticity of supply ε^S at the market equilibrium price and quantity. If a tax is imposed on brownie purchases, do you expect consumers or producers to bear more of the tax burden? (2 Point)

$$\varepsilon_D = \frac{P}{Q^D} \frac{dQ^D}{dP} = \frac{10}{200} \times (-30) = -3/2$$

$$\varepsilon_S = \frac{P}{Q^S} \frac{dQ^S}{dP} = \frac{10}{200} \times 20 = 1$$

- (c) Now suppose a tax of $t = \$5$ is imposed on each brownie that is purchased. Compute the brownie market equilibrium with the tax. What are the new equilibrium price and quantity? (1 Point)

$$P_D = P_S + t \tag{1}$$

$$20P_S = 500 - 30(P_S + 5) \tag{2}$$

$$50P_S = 350 \tag{3}$$

$$P_S = \$7, Q^* = 140 \tag{4}$$

$$P_D = 7 + 5 = \$12 \tag{5}$$

- (d) What is the deadweight loss associated with the tax? How much revenue does the government raise? (1 Points)

The deadweight loss is:

$$DWL = \frac{1}{2}dQ^* \times t = \frac{1}{2}60 \times \$5 = \$30$$

The government raises:

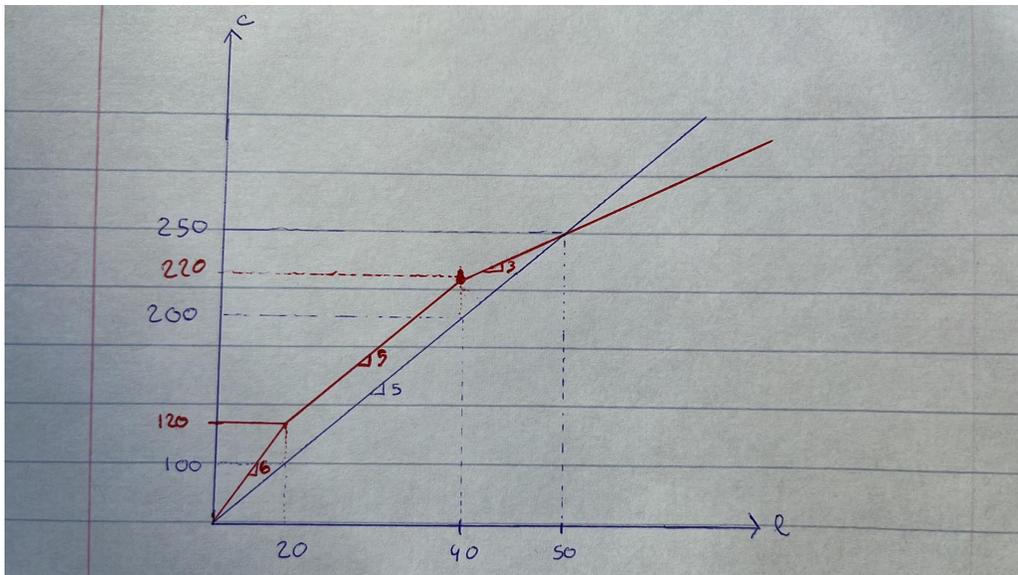
$$G = Q^* \times t = 140 \times \$5 = \$700$$

3. Labor Income Tax (10 Points)

Suppose we are in a country where there have historically been no taxes. After a long strike in which participants asked for more redistribution, the government implements the following reform:

- Income up to \$100: Subsidized at 20%
- Income between \$100 and \$200: Exempt from taxes
- Income above \$200: Taxed at 40%

(a) In this country, we assume that everyone receives 5\$ per hour. Graph the budget constraint before and after the reform is implemented (Hint: there are three brackets). Put labor (in hours per week) on the x-axis and consumption on the y-axis. Label the x and y values of each kink point, and the slope of each of the three segments of the graph. At how many hours of work is your pre-tax (and transfers) income the same as your post-tax (and transfers) income? (2 Points)



When working 50 hours per week, pre-tax (and transfers) income is the same as post-tax (and transfers) income and is equal to 250\$.

(b) One of the strike participants chooses how many hours she wants to work. Her preferences over aggregate consumption, c , and labor, ℓ , are represented by the following utility function:

$$U(c, \ell) = c + \theta \ln(31 - \ell)$$

θ is a parameter reflecting drudgery of work (i.e. how painful the work is). Assuming $\theta=60$ for the strike participant, solve for her optimal choice of labor before and after the

redistributive reform is implemented. Please explain your reasoning. *Hint: you can use any method of optimization discussed in class. (4 Points)*

The budget constraint is $c = wl$. By substitution, we obtain $\mathcal{U}(c, \ell) = wl + \theta \ln(31 - \ell)$.

Taking the first order conditions with respect to ℓ :

$$\begin{aligned} w - \frac{\theta}{(31-\ell)} &= 0 \\ w &= \frac{\theta}{(31-\ell)} \\ 31 - \ell &= \frac{\theta}{w} \\ \ell^* &= 31 - \frac{\theta}{w} \end{aligned}$$

Before the reform:

$$\theta = 60 \quad w = 5, \quad \ell^* = 31 - \frac{60}{5} = 19$$

After the reform:

$$\theta = 60 \quad w = 6, \quad \ell^* = 31 - \frac{60}{6} = 21$$

$$\theta = 60 \quad w = 3, \quad \ell^* = 31 - \frac{60}{3} = 11$$

$$\theta = 60 \quad w = 5, \quad \ell^* = 31 - \frac{60}{5} = 19$$

Since option 2 and 3 are not feasible, the striker participant will bunch at the first kink of the budget constraint, choosing $\ell^* = 20$.

- (c) Was the striker's decision to join the strike justified (i.e. is she better off after the strike)? Explain how you would proceed to answer this question without necessarily making the actual computations. *Hint: $\ln(12) \approx 2.5$ and $\ln(11) \approx 2.4$. (2 Points)*

To answer this question you can compare the utility levels of the striker before and after the strike. Before the reform, we have $\ell^* = 19$ $c^* = 95$ and after the reform we have $\ell^* = 20$ $c^* = 120$.

$$U(95, 19) = 95 + 60 \ln(31 - 19) \approx 244$$

$$U(120, 20) = 120 + 60 \ln(31 - 20) \approx 264$$

$$U(120, 20) > U(95, 19)$$

The striker is better off after the strike.

- (d) Assume there are ten individuals in this economy. Nine identical strike participants who choose the same ℓ^* after the reform (same ℓ^* found in (b)) and one high earner person working enough hours to be affected by the top marginal tax rate (i.e. this person has an income above \$200). How much this person must earn before taxes (and transfers) for the reform to be budget balanced? (1 Points)

The nine strikers choose the same $\ell^*=20$. They each make 100\$, and hence each receive a 20\$ subsidy. Yet, the other person also receive a subsidy on the first \$100 she makes. The total size of the subsidy is thus $20 \times 10=200$ \$.

To recover this amount of money, the government taxes income above \$200 at a rate of 40%. To recover exactly the amount of the subsidy, the high earner person will have therefore to make at least \$700 (\$500 taxed at 40%).

- (e) Assuming that the budget is balanced, what is the high earner person post-tax (and transfers) income ? (*1 Points*)

If budget is balanced, the high earner person has a pre-tax (and transfers) income of \$700 as found in (d). Her post-tax (and transfers) income is therefore \$520 (she receives a \$20 subsidy on the first \$100 she earns, and deduces \$200 of taxes on her income above \$200).

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