Econ 131 Spring 2025 Emmanuel Saez

Midterm Exam Solutions

March 12

**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-f) (12 points, 2 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) If US economic growth continues, the fraction of people living in poverty in the United States (as defined by the official US poverty measure) will eventually fall to zero in coming decades. This implies that the analysis of inequality will become an obsolete topic for economists.

FALSE: The first statement is correct only if economic growth is widely shared so that low income earners see their income increase. This has not been in the case in the US since 1970 so not certain US economic growth will be widely shared in coming decades. However, this does not mean that poverty does not remain an issue. For example, the US does not have poor people according to the World Bank definition (living on less than 2/day) and yet the issue of poverty and inequality is still very present in the US political debate.

(b) A means-tested transfer program that offers a maximum benefit to people with no earnings and then reduced benefits by 50 cents for each dollar of earnings has ambiguous effects on labor supply because income and substitution effects go in opposite directions.

FALSE: Such as transfer unambiguously reduces labor supply through both income effects (the person receives an extra transfer from the government) and through substitution effects (the person's budget has a lower slope due to the phasing out of benefits with earnings).

(c) Suppose two individuals are out of work and receive the same means tested benefit of \$1000/month. One would be able to work while the other is not. Are they both equally deserving of support?

UNCERTAIN. It depends on the social justice criterion used. Under a utilitarian social welfare criterion, they are both equally deserving because they have the same income and hence same marginal utility. However, most people social justice principles do not follow utilitarianism. Saez and Stantcheva '16 show that in surveys, people will overwhelmingly find that the person not able to work is more deserving. That's why transfers to groups unable to work (the disabled or the elderly) are in practice much more generous than those deemed able to work.

(d) Under the new Trump 2017 corporate tax reform, thanks to the minimum tax on foreign profits, US multinational corporations have no incentives to shift profits to tax havens anymore.

FALSE: The minimum tax rate on foreign profits is only 10.5% while the tax rate on US profits is 21%. Therefore, a US multinational is better off shifting profits away from the US toward a tax haven (or shifting profits away from a high tax country such as Germany toward a tax haven).

(e) The top income tax rate decrease of 1986-1988 in the United States was a supply-side success because it led to a huge increase in pre-tax incomes reported by the top 1%.

FALSE: It is true that top income tax rate decrease of 1986-1988 led to a huge increase in pre-tax incomes reported by the top 1%. However, a large fraction of that extra income came from income shifting from the corporate tax base to the individual tax base so that this is not a supply-side story whereby the rich worked more and produced more following the tax cut.

(f) Denmark has a very progressive tax system but can still attract top talent from abroad by offering tax discounts on highly skilled immigrants. Therefore, mobility of top talent does not threaten tax progressivity.

Solution: True that Denmark has a very progressive tax system but can still attract top talent from abroad by offering tax discounts on highly skilled immigrants. So it does not hinder overall tax progressivity in Denmark (as the number of foreign immigrants at the top is very small relative to the domestic population). However, from a multi-country perspective, such schemes do threaten tax progressivity in every country if they proliferate. E.g., high income Danes might move abroad if Sweden/Germany offer such schemes as well forcing Denmark to reduce its own tax progressivity. This is "tax competition". In principle, countries could fight such competition by taxing expatriates as the US does (but the US is exceptional and no European country does this).

## 2. Tax Incidence (3 Points)

Let's consider the following model for the bubble tea market in Berkeley. Suppose the aggregate demand for bubble tea is given by  $Q^D = 900 - 20P$ , where P denotes the price and Q denotes the quantity of bubble tea demanded. The supply for bubble tea is given by  $Q^S = 80P$ . The original pre-tax market equilibrium is thus given by  $Q^* = 720$  and  $P^* = 9$ .

(a) The city of Berkeley imposes a \$2 tax on each bubble tea that is purchased. How is the incidence of the \$2 tax split between consumers and producers? (2 Points)

Recall that the statutory incidence does not matter, so let's impose the tax on consumers, such that  $Q^D = 900 - 20(P+2)$ . Therefore,  $Q^D = Q_t^S$ :

$$900 - 20(P + 2) = 80P$$
  
 $P^{S} = 8.60$   
 $P^{D} = 10.60$ 

And,

Consumer Incidence = 10.60 - 9 = \$1.60 of the \$2 (80%) Supplier Incidence = 9 - 8.60 = \$0.40 of the \$2 (20%)

(b) If the consumer demand changes to be Q<sup>D</sup> = 900 - 10P, will the deadweight loss of the tax be larger or smaller? Why? Keep answers succinct. (1 point) Hint: You do not need to do any calculations to answer this question correctly.

The consumers became less elastic, which means there will be a smaller quantity response to the tax, resulting in the deadweight loss being smaller.

## 3. Labor Income Tax (10 Points)

Assume that all individuals have the same utility function over consumption and **labor** given by:

$$U(c,l) = c + \theta \ln(16 - l)$$

where c represents consumption, l represents hours of labor, and  $\theta$  is a constant parameter that reflects an individual's distaste for labor hours. Also, ln() denotes the natural logarithm (this can also be denoted by log()). Suppose the only income that individuals have is from labor income, and that they work at an hourly wage w which is taxed at rate t.

(a) Assuming the government imposes a tax on labor income at rate t, solve for the individual's optimal labor supply as a function of w,  $\theta$ , and t. (2 Points)

The budget constraint is given by

$$c = (1 - t)wl$$

Plugging the budget constraint into the utility function we get

$$U = (1-t)wl + \theta \ln(16-l)$$

Taking the first order condition:

$$\frac{\partial U}{\partial l} = (1-t)w - \frac{\theta}{16-l} = 0$$

From here we can isolate the optimal labor supply as a function of the wage and the tax rate

$$l^*(w,t) = 16 - \frac{\theta}{(1-t)w}$$

(b) For this part (b) only, assume the following:

- There are 100 individuals in this society with the utility function given above.
- All individuals have  $\theta = 24$ .
- There are 50 low-wage individuals and 50 high-wage individuals. The low-wage individuals earn wage w = 4, while the high-wage individuals earn wage w = 8.

Calculate how much revenue the government will raise if it imposes a 25% labor income tax (t = 0.25) on all 100 individuals. (2 Points)

Government's revenue (Rev) is equal to the tax rate times the tax base:  $\tau \times wl$ . We previously solved for optimal labor supply  $(l^*)$ . Using that information we get:

$$Rev = \tau w \left[ 16 - \frac{\theta}{(1-\tau)w} \right]$$

Calculating the fifty with w = 4.

$$Rev = 50 \times (0.25)(4) \left[ 16 - \frac{24}{(1 - .25)(4)} \right] = (50)(1)(8) = 400$$

Calculating the fifty with w = 8.

$$Rev = 50 \times (0.25)(8) \left[ 16 - \frac{24}{(1 - .25)(8)} \right] = (50)(2)(12) = 1,200$$

So the total tax revenue is:

$$400 + 1,200 = 1,600$$

(c) The government creates a universal basic income (UBI) program to support individuals with low or zero labor income, where the UBI phases out after a certain threshold of income. The program is financed by imposing a labor tax on higher earners.

More specifically:

- The UBI program provides all individuals a lump-sum grant of \$20.
- The grant does not phase out for the first \$24 of labor income.
- After the first \$24 of labor income, the grant is phased out at a 50% rate.
- After the grant phases out entirely, labor income from that point up to \$120 is taxed at a 25% rate.
- After \$120, any additional labor income is taxed at a 50% rate.

Graph the budget constraint (*Hint: there are four brackets*). Put pre-tax income (Z = wl) on the x-axis and after-tax income c = Z - T(Z) on the y-axis. Label the x and y values of each kink point, and the slope of each of the four segments of the graph. (2 Points)



(d) For each of the four brackets in your budget constraint, indicate the sign (direction) of the substitution and income effects on an individual's choice of labor supply. Also indicate the sign (direction) of the total (combined) effect of the two, if it is possible to know for certain, or indicate with a question mark if the total effect is uncertain. (2 Points)

	Bracket 1	Bracket 2	Bracket 3	Bracket 4
Substitution Effect:				
Income Effect:				
Total Effect:				

The general effects are: SE:  $0, \downarrow, \downarrow, \downarrow$ IE:  $\downarrow, \downarrow, \uparrow, \uparrow$ Tot:  $\downarrow, \downarrow, \uparrow, \uparrow$ But with this specific utility function: SE:  $0, \downarrow, \downarrow, \downarrow$ IE: 0, 0, 0, 0Tot:  $0, \downarrow, \downarrow, \downarrow$ 

- (e) A new administration is elected and they change the UBI policy:
  - The grant is cut from \$20 to \$8.
  - Workers are subsidized on the first \$24 of earnings with a new credit that pays \$0.50 per dollar of pre-tax labor income. This new credit phases out at a 50% rate after the first \$24 of income.
  - All else stays the same.

Theoretically, how do you expect this policy change (i.e. moving from the old UBI policy to this new policy) to affect the <u>extensive</u> and <u>intensive</u> labor supply choices of individuals at and near the bottom of the income distribution? (2 Points) Keep answers succinct. No need for any calculations.

<u>Extensive</u>: The grant is reduced and the first bracket is steeper (higher after-tax wage), so we expect non-workers to enter the labor force.

Intensive: Since the first bracket is steeper (higher after-tax wage) and below the old

bracket, we expect higher labor supply among workers in the first bracket. And if you answered using the utility function given, Intensive is the same, but: <u>Extensive</u>: Since there are no income effects, the grant reduction has no income effect. But the substitution effect of the higher after-tax wage on the phase-in portion will induce individuals with higher  $\theta$  to enter the labor force and work. [Do not write on this page.]

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