

Econ 131
Spring 2020
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Midterm Solution

March 11

Exam Instructions are on the Answer Booklets.

[Do not write on this page.]

1. True/False/Uncertain (questions 1a-g) (14 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) Empirically, married women with high wage rates work more than married women with low wage rates. This implies that the labor supply of married women is very elastic with respect to their net-of-tax wage rate.

SOLUTION True: Empirical result is true based on OLS cross-sectional regressions from the 1960s to 1980s. This implies that married women labor supply is elastic if the OLS identification assumption holds: tastes for work do not differ for married women with high wages vs. married women with low wages. There are reasons to believe the assumption does not hold. For example, women with higher taste for work are likely to work harder at school, get a better education, and hence get higher wages. However, better identified studies (like the negative income tax experiments) have confirmed that married women in the 1970s were elastic to the net-of-tax wage. Finally, as the gender gap has declined, married women have become more like married men and less elastic with respect to the net-of-tax wage.

- (b) Pre-tax top incomes increased sharply in the US in the 1980s when the top tax rate was cut. Therefore, cutting the top tax rate was a desirable policy.

SOLUTION: Uncertain. It is true that the share of reported income earned by the top 1% increased sharply from 1986 to 1988 when the top income tax rate was cut from 50% down to 28%. However, a large fraction of this response was due to tax avoidance (a surge in business income as high income individuals switched their business from corporations to pass-through entities). Therefore, it is not clear that on net, this was a successful policy to stimulate more economic activity.

- (c) In the basic labor supply theory model we used in class, increasing the linear tax rate on earnings reduces labor supply.

SOLUTION: Uncertain: increasing the linear tax rate creates both substitution and income effects. Substitution effects discourage labor supply. Income effects encourage labor supply. The net effect depends on the sign of the uncompensated elasticity.

- (d) Policy A provides a fixed transfer of \$10K for all and it is funded by a 25-percent flat tax on income. Policy B provides a means-tested transfer of \$10K. The full amount goes to someone without any income. The transfer is then phased out. You lose 25 cents of it for every dollar of income you earn. These transfers are financed by a tax of 25 percent on income above \$40K. Are the two policies equivalent?

SOLUTION: Uncertain: the two policies are economically equivalent in the sense that they generate the same budget constraint. However, politically and socially, the two policies are likely to feel very different. Policy A will look like a universal transfer while Policy B will look like a give out to the poor and hence will be less sustainable politically. Policy A also increases taxes by a lot more than policy B and so will generate more resistance among those concerned about the size of government.

- (e) The US tax system is regressive at the top of the distribution even though the individual income tax is nominally progressive.

SOLUTION: True based on the recent estimates by Saez and Zucman (2019). The regressivity is only at the very top (above the top .01% and especially among the top 400 “billionaire class”). This regressivity happens in spite of a nominally progressive individual income tax because the very rich make income through corporate profits and this income is not taxed by the progressive individual income tax if the corporation does not pay dividend and the owner does not sell the stock.

- (f) The Earned Income Tax Credit is a desirable policy only if society values the welfare of low income workers more than the welfare of those with zero earnings.

SOLUTION: False: the EITC can also be desirable if society values the welfare of low income workers more than average and labor supply responses are concentrated along the extensive margin (working vs. non-working).

- (g) If Canada offered tax breaks to highly skilled foreigners who decide to move and work in Canada, it could attract a lot of highly skilled US workers.

SOLUTION: We have seen in class that Denmark did attract highly skilled foreign workers by offering tax breaks. However, the US income tax is based on citizenship so the Canada tax break would not work to attract very highly paid Americans. If the Canada income tax bill for US expats falls below the US income tax bill, then expats have to pay the difference to the US.

2. Exercise (2 Parts, 16 points total)

Part I: Incidence (3 Points)

Consider the market for t-shirts sold at the UC Berkeley campus store. Suppose that aggregate daily demand for shirts is given by $Q^D = 300 - 10P$, where P represents the price of a shirt and Q represents the quantity of shirts in a given day. Suppose aggregate supply is given by $Q^S = 5P$. The original pre-tax market equilibrium is thus given by $Q^* = 100$ and $P^* = 20$.

- (a) The city of Berkeley imposes a \$6 tax (per shirt) on shirt sales. How is the incidence of the \$6 tax split between consumers and the supplier? (2 points)

Recall that the statutory incidence does not matter. So let's impose the tax on suppliers. So $Q_t^S = 5(P - 6)$, and thus: Set $Q^D = Q_t^S$:

$$300 - 10P = 5(P - 6)$$

$$P^C = 22$$

$$P^S = 16$$

And thus: Consumer Incidence = $22 - 20 = \$2$ of the \$6 (1/3) Supplier Incidence = $20 - 16 = \$4$ of the \$6 (2/3)

- (b) If the consumer demand changes to be $Q^D = 300 - 20P$, will the dead weight loss of the tax be larger or smaller? Why? (1 point)

Keep answers succinct. Hint: You do not need to do any calculations to answer this question correctly.

The consumers became more elastic, which means there will be a larger quantity response to the tax cut, which means deadweight loss will be larger.

Part II: Labor Income Tax (13 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 θ 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 .

- (c) Assuming the government imposes a tax on labor income at rate t , write down the budget constraint faced by the individual. (1 point)

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

- (d) Solve for the individual's optimal labor supply as a function of w , θ , and t . (2 points)
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

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

- (e) For this part (e) 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:

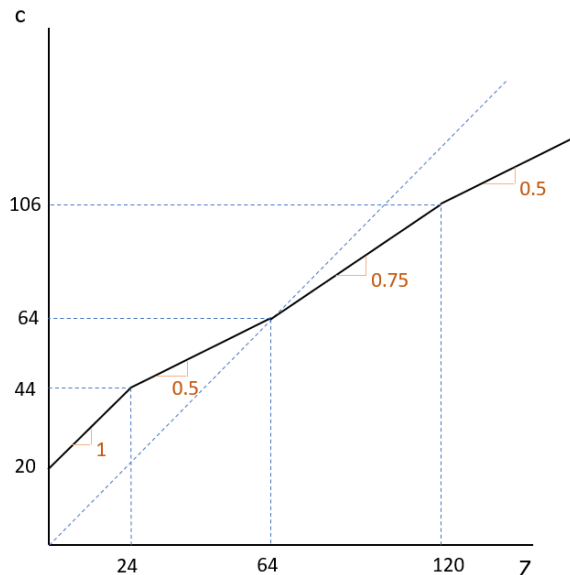
$$400 + 1,200 = 1,600$$

- (f) 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)



- (g) 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, ↓, ↓, ↓

IE: ↓, ↓, ↑, ↑

Tot: ↓, ↓, ?, ?

But with this specific utility function:

SE: 0, ↓, ↓, ↓

IE: 0, 0, 0, 0

Tot: 0, ↓, ↓, ↓

- (h) For this part (h) only, consider an individual with $\theta = 24$ and $w = 8$. Calculate this individual's optimal choice of hours of labor l under the UBI program you graphed in part (f). (2 points)

We know the optimal labor supply is given by:

$$l^* = 16 - \frac{\theta}{(1-t)w} = 16 - \frac{24}{(1-t)8}$$

We can solve for each of the four brackets under the UBI program:

$$l^1 = 16 - \frac{24}{8} = 13$$

$$l^2 = 16 - \frac{24}{4} = 10$$

$$l^3 = 16 - \frac{24}{6} = 12$$

$$l^4 = 16 - \frac{24}{4} = 10$$

Since $l = 13$ is beyond the first segment, and $l = 10$ is beyond the second segment, the worker will choose $l = 12$.

- (i) 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 extensive and intensive labor supply choices of individuals at and near the bottom of the income distribution? (2 points)

Keep answers succinct. No need for any calculations.

Extensive: 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:

Extensive: 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 θ to enter the labor force and work.

- (j) Next, the government raises the tax rate in the top bracket from 50% to 75%. If economists estimate that the elasticity of labor supply with respect to the after-tax rate for top earners in this society is equal to 1.5, show that this tax increase will not raise revenue. (1 point)

Hint: This is a self-contained question. You do not need to refer to any of your prior answers to answer this question.

Two methods are acceptable. First, we know $e = \frac{dL/L}{d(1-t)/(1-t)} = 1.5$, and we know $d(1-t)/(1-t) = (.25 - .5)/(.5) = -0.5$, so we know that labor supply will fall by 75% in the top bracket (i.e. 1.5×-0.5), while the tax rate is only going up by 50% (0.5 to 0.75). Thus revenue will fall.

Second, under a Rawlsian framework, we know that optimal taxation is given by:

$$t^* = \frac{1}{1 + e}$$

And since $e = 1.5$, thus $t^* = 0.4$, and so any tax rate above 40% in the top bracket will cause revenue to fall.