

Econ 131
Spring 2019
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Midterm Solution

March 13

Student Name:

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Exam Instructions

- **Closed book/notes exam.** No computer, calculator, or any electronic device allowed.
- **No phones.** Turn them off and put them in your bag.
- **Explanation should be written using pens.** 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.
- This exam contains a total of 30 points.

Do NOT open this test until instructed to do so.

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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) The US poverty rate has been roughly stable in level over the last 50 years and hence there is no cause for alarm.

SOLUTION: True that poverty rate has been stable overall since 1970 at around 12% (see slide in classnotes). However, the US poverty rate measure is based on an absolute level (fixed in real terms). Hence, with economic growth, US poverty rate would be expected to fall over decades. Hence the fact that it has not fallen in serious cause for alarm and is due to various factors, the most important one being the increase in inequality (see class notes for details).

- (b) If society cares about people with no earnings, optimal tax theory tells us that the government should provide a basic transfer for those with no earnings but this transfer should be phased-out quickly as earnings increase.

SOLUTION: True in the basic optimal tax model where individuals respond along the intensive labor supply margin. However, if individuals respond primarily along the extensive margin (whether or not to work), that conclusion is overturned. In this case, it is desirable to have low phasing-out rates to provide strong incentives to work for low income workers (for example using EITC type transfers).

- (c) If high income earners can easily avoid or evade income taxes, the top income tax rate should be low.

SOLUTION: True in a narrow sense. If the tax system is taken as given and the only policy tool in changing the rate, high top income tax rates are not desirable if the elasticity due to tax avoidance/evasion is large. However, the government can reduce this tax avoidance/elasticity by eliminating tax loopholes. Once this is done, the tax base is less elastic and hence it might possible to tax the rich effectively.

- (d) Changes in value-added-tax rates in Europe show that consumers bear almost the full burden on these taxes.

SOLUTION: False, the recent study by Benzarti et al. (2018) that we discussed in class shows that for VAT decreases, producers are able to pocket a large fraction of the tax cut. In contrast for VAT increases, producers pass on most of the tax onto consumers through higher prices.

- (e) According to labor supply theory, the EITC should increase labor supply.

SOLUTION: Uncertain. The EITC increases labor supply along the extensive margin. But it 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).

- (f) In the basic economic model with perfect competition, the free market equilibrium with no government intervention maximizes total economic surplus and hence is the most socially desirable outcome.

SOLUTION: True that the free market equilibrium with no government intervention maximizes total economic surplus. However, this is the most socially desirable outcome only if society does not care about inequality (i.e \$1 to a rich person is viewed as as valuable socially as \$1 to a poor person). Libertarians tend to hold such views (people are fully entitled to their market incomes). However, if society cares about inequality, then doing redistribution with taxes, even if it reduces total social surplus, could be desirable. That's what we see governments doing in practice.

- (g) Goods whose demand is price inelastic 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. Exercise - Labor Income Taxation (16 points, 2 points per question)

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

$$U(c, l) = c - \frac{l^2}{2}$$

where c represents consumption and l represents hours of labor. 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 τ .

- (a) Write down and draw the budget constraint faced by the individual.

$$c = (1 - \tau)wl$$

- (b) Solve for the individual's optimal labor supply as a function of the wage w and the tax rate τ .

Plugging the budget constraint into the utility function we get

$$U = (1 - \tau)wl - \frac{l^2}{2}$$

Taking the first order condition and equalizing to 0 yields

$$(1 - \tau)w - l = 0$$

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

$$l^*(w, \tau) = (1 - \tau)w$$

- (c) Show that the revenue maximizing tax rate is $\tau^* = 0.5$.

Government's revenue (R) is equal to the tax rate times the tax base: $\tau \times wl$. We know that labor (l) is a function of τ , Using that information we get

$$R = \tau w[(1 - \tau)w]$$

Taking the first derivative and equalizing to zero yields:

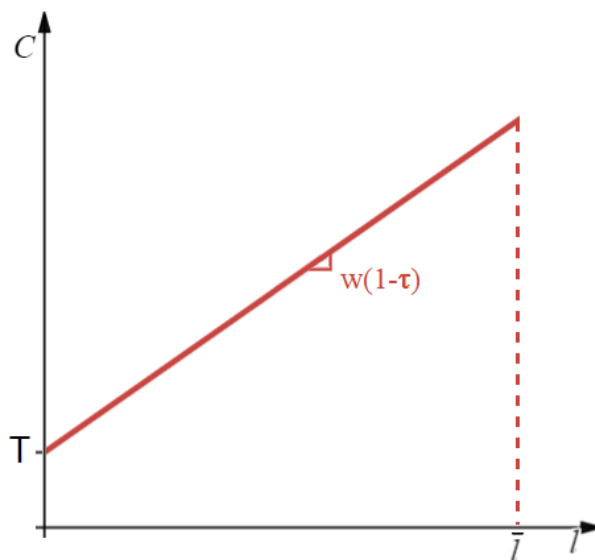
$$w^2(1 - 2\tau) = 0$$

Which implies that $\tau^* = 1/2$.

- (d) Suppose that the government uses all the collected revenue to give people universal basic income (ie a lump sum transfer $T > 0$ per person). How is the individual's optimal labor supply affected? Discuss the income and substitution effects, and draw their new budget constraint.

A lump sum transfer doesn't affect wages then the substitution effect is zero. Since the utility function is quasi-linear the income effect is also zero, then the lump transfer sum doesn't affect labor decisions.

The following is the graph for the new budget constraint.



Now imagine there are two individuals in the economy: one earns a wage of \$20/hour and one earns a wage of \$100/hour.

- (e) Solve for each individual's utility-maximizing labor supply under the revenue-maximizing tax at rate $\tau^* = 0.5$, and calculate the revenue generated by the government. What is each individual's post tax earnings if the government evenly divides tax revenue to provide universal basic income? Using the formula derived in (b) we know that

$$l_1^*(20, 1/2) = (1 - 1/2)20 = 10$$

$$l_2^*(100, 1/2) = (1 - 1/2)100 = 50$$

Government's revenue is given by

$$R = (1/2)(10 * 20 + 50 * 100) = 2600$$

And post tax earnings under evenly divided UBI are:

$$E_1 = (2600/2) + (1/2)(10 * 20) = 1400$$

$$E_2 = (2600/2) + (1/2)(50 * 100) = 3800$$

(f) Suppose there is an election, and the new government administration abandons universal basic income, and changes the tax schedule so that:

- There is a 100% subsidy on the first \$1,000 of labor income (this means that if you earn up to \$1000, the government provides you with a transfer equal to your earnings).
- All labor income above \$1,000 is then taxed at rate 50%

Find each individual's new labor supply and after tax earnings.

Detailed solution

The budget constraint is given by the following piecewise function

$$c = \begin{cases} 2wl & \text{if } l \leq \frac{1000}{w} \\ 2000 + \frac{w}{2}(l - \frac{1000}{w}) & \text{if } l > \frac{1000}{w} \end{cases}$$

Solving the maximization problem for the lower range of the budget constraint delivers $l = 2w$ which will be the optimal labor choice as long as $w * 2w \leq 1000$. In turn, solving for the upper range of the budget constraint delivers $l = w/2$ which will be the optimal labor choice as long as $w * w/2 > 1000$. If none of these conditions holds, the optimal solution will be at the kink. That is $l = 1000/w$. Following this procedure we find that individual 1 would choose to work $l_1 = 2 * w_1 = 40$ hours and individual 2 would work $l_2 = w_2/2 = 50$ hours (same than before). Under this choices after tax earnings are given by $E_1 = 2(40 * 20) = 1600$ and $E_2 = 2000 + (100/2)(50 - 10) = 4000$.

(g) Discuss how the substitution and income effects influence their optimal labor supply relative to the previous tax scheme.

Again, since individuals have a quasi-linear utility, income effect plays no role here. Under the new scheme the low wage individual, who is far below the \$1000 threshold, gets multiplied his wage by two, which makes working relatively more attractive (Positive substitution). Individual 2, whose labor income is far above the 1000 threshold, faces a MTR of 50% similar to the flat tax rate under the previous scheme, the substitution effect for this individual is therefore zero as well as the income effect.

(h) Is the low wage individual better off under the tax scheme from question (f) or under the tax scheme from question (e)? Is the high wage individual better off under the tax scheme from question (f) or under the tax scheme from question (e)? Is society better off under the tax scheme from question (f) or under the tax scheme from question (e)?

Under the new scheme the low wage individual gets higher earnings but her utility goes from 1350 ($u(1400, 10)$) to 0 ($u(1600, 40)$). the earnings for the high wage individual get also increased and her utility went from 2550 ($u(3800, 50)$) to 2750 ($u(4000, 50)$). If

we value both individuals' utilities equally, we can say that the new scheme increases redistribution but decreases welfare.

Midterm grades statistics

Mean	S.D.	Percentiles				
		<i>10</i>	<i>25</i>	<i>50</i>	<i>75</i>	<i>90</i>
19.59	4.68	14.0	16.0	20.0	23.0	25.0

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