Econ 131
Spring 2017
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Problem Set 2

DUE DATE: March 8

Student Name:

Student ID:

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- **You must submit your solutions using this template.**
- **Although you may work in groups**, each student must submit individual sets of solutions. You must note the names other students that you worked with. Write their names here:

1. Essay

Take a look at Trump's current tax plan at

`https://assets.donaldjtrump.com/trump-tax-reform.pdf`.

Based on what you learned from the lecture Taxes and Reported Income, explain how the Trump tax plan is going to affect how the rich are going to report their income. In particular, will it induce the rich to postpone realizing their incomes until 2017 and 2018 (income retiming)? Will it induce business owners to shift to the corporate tax base (instead of the individual tax base)?

More broadly, is the Trump tax plan going to increase or decrease the top 1% income share and why? In your answer, consider separately the top 1% after tax income share and the top 1% pre-tax income share.

2. True/False Statements

Determine whether each statement is true, false, or uncertain and explain why. Answers with no explanation will receive no points.

(a) Since soda demand is highly elastic, workers at soda shops and restaurants are likely to bear a high incidence from the Berkeley soda tax.

False: with highly elastic demand, the incidence is shifted on producers and ultimately factors of production: labor or capital. However, workers are likely to be fairly elastic relative to capital in the short-run because workers can work in Oakland. In that case, capital bears the burden in the short-run. In the long-run, land (in the form of lower rents and lower land prices) will bear the burden as capital structures are elastic (see class notes for details).

(b) A $1-per-gallon tax on gas sales (paid by the producer) causes the per-gallon price that consumers pay to rise by $1. This means that consumers bear the full incidence of the tax. [Draw a graph that is consistent with your answer]

True: recall the formula dp/dt and $dq/dt = 1 + dp/dt$ from class. Producers are no worse off (they pay the government $1 extra per gallon but get an $1 extra per gallon from consumers) while consumers are $1-per-gallon worse off (they pay an extra $1 per gallon). Producers therefore bear 0% of the tax while consumers bear 100%.

(c) The U.S. and France provide a different pattern of government transfers to people with low incomes.

True. You can see this in the optimal labor income tax lecture slides. France offers a large lumpsum grant (i.e. the net taxes T(z) due from someone with zero earnings z—T(0)—is very negative) with no EITC (so that T(z) rises monotonically with income z and thus government transfers decline monotonically with income). The U.S. offers a smaller lumpsum grant (i.e. T(0) is less negative) with an EITC (so that T(z) does not rise monotonically with income z, i.e. there are small positive income levels z' where T(z')¡T(0), indicating that government transfers to the poor rise with income at the lowest income levels).

(d) If income earners are very responsive to taxation, the tax rate should not be too high.

True: We have derived in class the formula $\tau^* = 1/(1+e)$ for the tax rate that maximizes tax revenue where e is the elasticity of pre-tax incomes with respect to $1-\tau$. The tax rate should not be higher that $1/(1+e)$.

(e) The EITC has a positive effect on labor force participation but reduces hours of work conditional on working.

Partly true: Yes, the EITC encourages labor force participation. Conditional on working, the EITC reduces hours of work in the plateau and phase-out ranges and has ambiguous effects in the phase-in region. See class notes.

3. Incidence of commodity taxation

Consider the following model for the toothbrush market in Berkeley. Suppose the aggregate demand for brushes in Berkeley is given by $Q^D = 900 - P/2$ where P denotes the price and Q denotes the quantity of brushes in terms of thousands of brushes demanded. The aggregate supply for brushes in Berkeley is given by $Q^S = P/4$.

1. Compute the toothbrush market equilibrium. What are the equilibrium price and quantity?

   Equating Supply and Demand:

   $$P/4 = 900 - P/2$$
   $$P^* = 1200 \text{ , } Q^* = 300$$

2. Now suppose a tax of $t = \$60$ is imposed on each brush that is purchased. Compute the brush market equilibrium with the tax. What are the equilibrium price and quantity?

   Remember that it does not matter who bears the statutory incidence of the tax. We add the tax on the demand side and therefore find the before tax price (faced by the supplier).

   $$P/4 = 900 - (P + 60)/2$$
   $$3P/4 = 870$$
   $$P^S = 1160, \; Q^* = 290$$
   $$P^D = 1160 + 60 = 1220$$

   The quantity exchanged in the market fell to 290 brushes, the price producers face is now \$1160 and the price consumers face is now \$1220.

3. Compute and graphically depict deadweight loss due to the tax.

   Deadweight loss is represented by a triangle. Its height is the tax of \$60 and its base is the distortion in the quantity exchanged: 300-290=10 units.

   $$DL = (10 \times 60)/2 = \$300$$

4. What is the incidence of the tax? Explain the intuition for the key factors that determine the incidence.

   Out of the \$60 tax, \$20 are born by consumers and \$40 by producers, therefore 33% is on the demand and 66% on the supply. The more inelastic side bears the largest incidence. In this case, you can see from the relative slopes, that supply is more inelastic than demand.

   Now suppose that consumers are inattentive to the tax and demand is given by

   $$Q^D = 900 - (P + \theta t)/2$$

where $\theta = 2/3$. Again, suppose that a tax of $t = \$60$ is imposed on each brush that is purchased.

5. How can we interpret θ ?

   θ represents the inattentiveness of consumers. As Chetty et al. (2009) paper shows, consumers don't fully internalize sales tax. The 2/3 coefficient implies that 1/3 of consumers are inattentive to the sales tax.

6. What are the new equilibrium price and quantity?

$$P/4 = 900 - [P + 60 \times 2/3]/2$$
$$3P/4 = 880$$
$$P^S = 1173.33,\ Q^* = 293.33$$
$$P^D = 1173.33 + 60 = 1233.33$$

7. Compute and graphically depict deadweight loss arising due to the tax. How does your answer compare to your answer from part (3)? Explain.

   The height of the triangle is \$40 but the base is reduced in 300-293.33=6.66 units.

$$DWL = (6.66 \times 40)/2 \approx \$133$$

   With a 1/3 of inattentive consumers the demand curve faced by the supply is not as elastic as before. Therefore, the deadweight loss is smaller, as less distortion in terms of quantity exchanged has happened. Notice also that the incidence of the tax has changed, consumers now bear a larger share of the incidence (33.33/60) than producers (26.67/60).

4. Optimal income tax

The new President of the United States has decided that the deficit has become too large. He is trying to figure out how to maximize the amount of tax revenue collected so he hires you to compute the tax rate that will maximize tax revenues from the workers. Suppose all agents in the economy have the following utility function:

$$U(c, l) = \frac{c^{1-\theta}}{1-\theta} - l$$

where c is consumption, l is labor supply, and θ is a fixed parameter. Assume also that the only income that individuals have is labor income, with an hourly wage rate given by w taxed at rate t.

1. Write the budget constraint faced by the individual.

$$w(1-t)l = c$$

2. Set up the maximization problem and solve for the optimal labor supply function. [Note: it should depend on w and t. The fixed parameter θ will be there too.].

   Taxpayers solve the following:

$$\max_{c,l} \frac{c^{1-\theta}}{1-\theta} - l \quad \text{subject to:} \quad w(1-t)l = c$$

   Plugging the B.C. and taking the FOC with respect to l yields

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

3. We define the net-of-tax rate as $1-t$. Using the function you found in part 2, show that the elasticity of labor supply with respect to the net-of-tax rate is $(1-\theta)/\theta$.

   The elasticity of labor supply is given by:

$$\frac{dl}{d(1-t)}\frac{1-t}{l} = \frac{1-\theta}{\theta}[w(1-t)]^{\frac{1-\theta}{\theta}-1} w \frac{1-t}{[w(1-t)]^{\frac{1-\theta}{\theta}}} = \frac{1-\theta}{\theta}$$

4. Estimate $(1-\theta)/\theta$ from the following data, stating precisely the assumption you are making to identify this estimate.

	United States		Canada	
year	tax rate	hours worked	tax rate	hours worked
2015	35%	2000	35%	2000
2017	28.5%	2300	35%	2100

Canada is the control group. We notice that even though the tax rate does not change, the hours worked increase by 100. Assuming the U.S. has a similar economy to Canada, the hours worked in the U.S. will grow by 100, irrespective of the effect of the decrease in tax rate. Overall, the hours worked in the U.S. increase by 300. This means that only 200 hours are attributable to the decrease in tax rate. Plug in these numbers in the labor supply equation to get an estimate of $(1-\theta)/\theta$

In 2015: $2000 = [0.65w]^{\frac{1-\theta}{\theta}}$

In 2017: $2300 - 100 = [0.715w]^{\frac{1-\theta}{\theta}}$

Solve these two equations for w to get that:

$\frac{2000^{\frac{\theta}{1-\theta}}}{0.65} = \frac{2200^{\frac{\theta}{1-\theta}}}{0.715} \implies \left(\frac{2200}{2000}\right)^{\frac{\theta}{1-\theta}} = \frac{0.715}{0.65} \implies \frac{\theta}{1-\theta} = 1$ or equivalently $\frac{1-\theta}{\theta} = 1$

Note: this exercise can also be solved by using our "clean" measure of hours worked in the US, $l_1 = 2000$, that we get from the DiD. Then compute the elasticity as the percentage change

$\frac{1-\theta}{\theta} = \frac{(l_1 - l_0)/l_0}{[(1-t_1)-(1-t_0)]/(1-t_0)}$

5. Solve for the tax rate that maximizes tax revenue given this estimate of $(1-\theta)/\theta$. Explain to the President why the revenue-maximizing tax rate is strictly less than 100%, even though he would like to take away all of the workers income.

   Now the problem is:

   $\max_t(t \cdot wl)$ subject to: $l = [w(1-t)]^{\frac{1-\theta}{\theta}}$

   Plugging the constraint and using the result $(1-\theta)/\theta = 1$, yields

   $\max_t\ t \cdot w[w(1-t)]$

   The first order condition gives that $t = 50\%$. If the tax rate was 100%, nobody would work and the President would not be able to raise any revenue.

   Note: there is a short cut. If you remember the revenue-maximizing formula from lecture you can use it. Recall this is given by $t^* = 1/(1+e)$. Plug your result from part (4) and you get $t^* = 50\%$.