

**Econ 131**  
**Spring 2023**  
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**Problem Set 2 Solution**

**DUE DATE: March 22**

Student Name:

Student ID:

GSI Name:

- **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. Washington's Working Families Tax Credit

Read the following recent blog post discussing the new Washington's Working Families Tax Credit Post link:

<https://www.peoplespolicyproject.org/2023/02/15/washingtons-working-families-tax-credit/>

a) What are the expected labor supply responses generated by this new Washington's Working Families Tax Credit?

Intensive margin: Income effect leading to negative responses in the plateau range. Income+substitution effects leading to negative responses in the phase-out range (similar to EITC)

Extensive margin: makes work more attractive so increases likelihood of working.

Design flaw: just earning \$1 during the year is enough to qualify so it is easy to game the system by working just a tiny bit, and get the credit.

b) Suppose that the Washington's Working Families Tax Credit is extended to children living in families with \$0 of earnings. How would this change your answer in a)?

Intensive margin: same as a)

Extensive margin: Negative effect as some people above the phase-out range may decide to drop out of the labor force entirely.

The design flaw has been fixed.

c) Suppose that the Washington's Working Families Tax Credit is further extended to all children (regardless of family income): \$600 for families with 1 child, \$900 for 2 children, \$1200 for 3+ children. How would this change your answer in a)?

It is now a pure income effect generating a negative labor supply effect at all earnings levels.

d) Which system do you think is best: a), b), or c)? Explain briefly why.

No true/false answer here. If you like transfers to zero earners, then b)-c) is better than a). c) looks like you are giving to the rich (relative to b)) but makes the program simpler and more politically stable (as the rich feel included).

## 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) The 2013 top tax rate increase in the United States led to a surge in reported top incomes in 2012 implying that the rich can easily avoid higher taxes.

Solution: Empirical statement is true. We do observe a spike in 2012 top incomes due to retiming of realized capital gains from 2013 to 2012 to escape the higher 2013 rates. The second statement is not quite true

(b) 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).

- (c) 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.

- (d) 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 (Landais et al. 2014 study). 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).

### 3. Capital Income and Savings Taxation (15 points)

Consider a 2 period model where individuals earn labor income  $Y = 300$  from working in period 1 and do not work in period 2 (retirement). Individuals choose how much to consume in each period. Savings in period 1 earn an interest rate  $r = 30\%$ . Let  $C_1$  denote consumption in period 1 and  $C_2$  denote consumption in period 2. Suppose that individuals have a utility function  $U = C_1 C_2$ .

- (a) Set up the individual's lifetime utility maximization problem and solve for the optimal  $C_1$ ,  $C_2$ , and  $S$  in an economy without taxes. (2 points)

Consumption in the second period is savings from the first period plus interest.

Savings is just income from the first period minus consumption during the first period (the budget constraint here):

$$C_2 = (300 - C_1)(1 + 0.3)$$

We can use a log transform  $U = \log U$ , which simplifies the math, so that the utility maximization problem becomes:

$$\begin{aligned} & \max \ln C_1 + \ln C_2 \\ & s.t. \quad C_2 = (300 - C_1)(1 + 0.3) \end{aligned}$$

When the budget constraint is incorporated into the expression for  $C_2$ , as shown, the maximization problem is

$$\max \ln C_1 + \ln((300 - C_1)(1.3)) = \max \ln C_1 + \ln(390 - 1.3C_1).$$

Solving, the first-order condition w.r.t.  $C_1$  gives:

$$\frac{1}{C_1} = \frac{1.3}{(390 - 1.3C_1)} \quad \text{or} \quad 390 - 1.3C_1 = 1.3C_1$$

We get the following:

$$C_1 = 390/2.6 = 150.$$

$$S = 300 - 150 = 150.$$

$$C_2 = S(1 + r) = 150(1.3) = 195.$$

- (b) Now assume that a tax  $\tau = 50\%$  is imposed **only** on savings income. Find the optimal  $C_1$ ,  $C_2$ , and  $S$ . (2 points)

The 50% tax is imposed only on the interest earned from savings ( $rS$ ). The budget constraint is now:

$$C_2 = (300 - C_1)(1 + 0.3(1 - 0.50)) = (300 - C_1)(1 + 0.15)$$

The new optimization problem is

$$\max \ln C_1 + \ln(300 - C_1)(1.15) = \max \ln C_1 + \ln(345 - 1.15C_1)$$

The first-order condition is

$$\begin{aligned} 1/C_1 &= 1.15/(345 - 1.15C_1) \\ (345 - 1.15C_1) &= 1.15C_1 \\ 345 &= 2.3C_1 \end{aligned}$$

Using the first-order condition, we get

$$\begin{aligned} C_1 &= 150\$ \\ S &= 300 - 150 = 150 \\ C_2 &= S(1 + (1 - \tau)r) = 150(1 + (1 - 0.50) \cdot 0.3) = 150 \cdot 1.15 = 172.5\$ \end{aligned}$$

- (c) Compare the ratio of consumption  $C_2/C_1$  in (a) and (b). Does the tax distort consumption choices? If yes, imagine the government can force individuals to save (imagine a compulsory pension plan) which level of savings should the government impose to restore pre-tax consumption choices (i.e. the ratio of  $C_2/C_1$  under no taxes)? (2 points)

Under no taxation  $C_2/C_1 = 195/150 = 1.3$  while under comprehensive taxation the ratio is  $C_2/C_1 = 172.5/150 = 1.15$ , which means that this form of taxing income distorts individual's intertemporal consumption decisions. In order for the consumption ratio to remain the same individuals the government would then have to force individuals to save:

$$C_2/C_1 = S(1 + r(1 - \tau))/Y - S = 1.3$$

$$S(1 + 0.3(0.5))/300 - S = 1.3$$

$$S(1.15)/300 - S = 1.3$$

$$S(1.15) = 1.3(300 - S)$$

$$S(1.15) = 390 - 1.3S$$

$$S(1.15) = 390 - 1.3S$$

$$2.45S = 390$$

$$S = 390/1.45$$

$$S \approx 159 .$$

- (d) Explain how the income and substitution effects affect consumption choices in the two periods. (2 points)

Consumption in period 1 is the same before and after-tax. This means that the substitution and income effects cancel out. Consumption in period 2 decreases after-tax. This is due both because of the income and substitution effect. The income effect makes me consume less because now that I am taxed I feel poorer. The substitution effect makes me consume less in  $C_2$  because consumption is now cheaper in period 1 as it is not taxed.

- (e) How much revenue does the government collect from each individual under the tax system described in (b)? (1 point)

$$\text{Revenue} = \tau r S = 0.50 \cdot 0.3 \cdot 150 = 22.5\$$$

Suppose now that the government is considering switching to a system where instead the labor income is taxed.

- (f) Find the labor income tax  $\tau_L$  that would raise as much revenue as is collected under the capital income tax system. (1 point)

This new tax must collect \$22.5 from each individual. In other words,  $\tau_L Y = 22.5$ . Which implies that  $\tau_L = 22.5/300 = 0.075$ .

- (g) Find the optimal  $C_1$ ,  $C_2$ , and  $S$ . (2 point)

The 7.5% tax is imposed only on the entire \$300 earned in the first period. The budget constraint is now:

$$C_2 = (300(1 - 0.075) - C_1)(1 + 0.3) = (277.5 - C_1)(1 + 0.3)$$

The new optimization problem is

$$\max \ln C_1 + \ln(277.5 - C_1)(1.3) = \max \ln C_1 + \ln(360.75 - 1.3C_1)$$

Solving, the first-order condition w.r.t.  $C_1$  gives:

$$\frac{1}{C_1} = \frac{1.3}{(360.75 - 1.3C_1)} \quad \text{or} \quad 360.75 - 1.3C_1 = 1.3C_1$$

We get the following:

$$C_1 = 360.75/2.6 = 138.75\$$$

$$S = 277.5 - 138.75 = 138.75\$$$

$$C_2 = S(1 + r) = 138.75(1.3) = 180.375\$$$

- (h) Compare the ratio of consumption  $C_2/C_1$  in (a) and (f). Does the Labor income tax distort consumption choices? (1 point)

Under no taxation and under labor taxation the ratio is  $C_2/C_1 = 138.75/180.375 = 1.3$ . Which means that just taxing labor income doesn't distort individual's intertemporal consumption decisions.

Consider now that individuals have the opportunity of declaring their labor income as savings income.

- (i) What kind of tax system (i.e. one that taxes only capital income, one that taxes only labor income, or one that taxes both) would the government choose in order to raise a certain amount of revenue while minimizing the distortion to intertemporal consumption choices? If it's a mixed system (i.e with both capital and labor taxes), how would the two tax rates compare? Explain **in 5 sentences or less**. (*2 points*)

If individuals can declare their labor income as savings income a labor tax on its own will raise no revenue (as individuals will report all of their labor income as savings income that is not taxed). However, as seen in (c) capital income tax distorts the intertemporal consumption choice. The optimal policy will therefore be to tax both capital and labor income. Since individuals can report labor income as savings income, the government cannot enforce any labor income tax rate that is higher than the capital income tax. The optimal tax on labor will therefore be anywhere at or below the capital income tax rate.