

ECON 3003 Advanced Public Economics
Fall 2022 – Prof. Dario Tortarolo

Tutorial 2

Labor Income Tax and Transfer

Assume people 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 .

- (a) Assuming the government imposes a tax on labor income at rate t , write down the budget constraint faced by the individual. (1 point)
- (b) Solve for the individual's optimal labor supply as a function of w , θ , and t . (2 points)
- (c) For this part (c) 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 flat 25% labor income tax ($t = 0.25$) on all 100 individuals. (2 points)

- (d) 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)

- (e) 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)
- (f) For this part (f) 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 (d). (2 points)
- (g) 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 labor earnings with a new credit that pays £0.50 per pound 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 the change 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.

- (h) 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.