Econ 230B
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Problem Set 3

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1. Inequality and tax reform in the United States

This exercise uses the data in T. Piketty, E. Saez and G. Zucman Distributional National Accounts: Methods and Estimates for the United States, NBER working paper 2016, to study inequality and tax policy in the United States. A link to a Stata micro-file of synthetic adult-level observations representative of the U.S. economy for the year 2010 will be sent to you by e-mail. The variables are labelled in the Stata file (type describe in Stata); see also the Online Appendix of the paper available at [LINK]

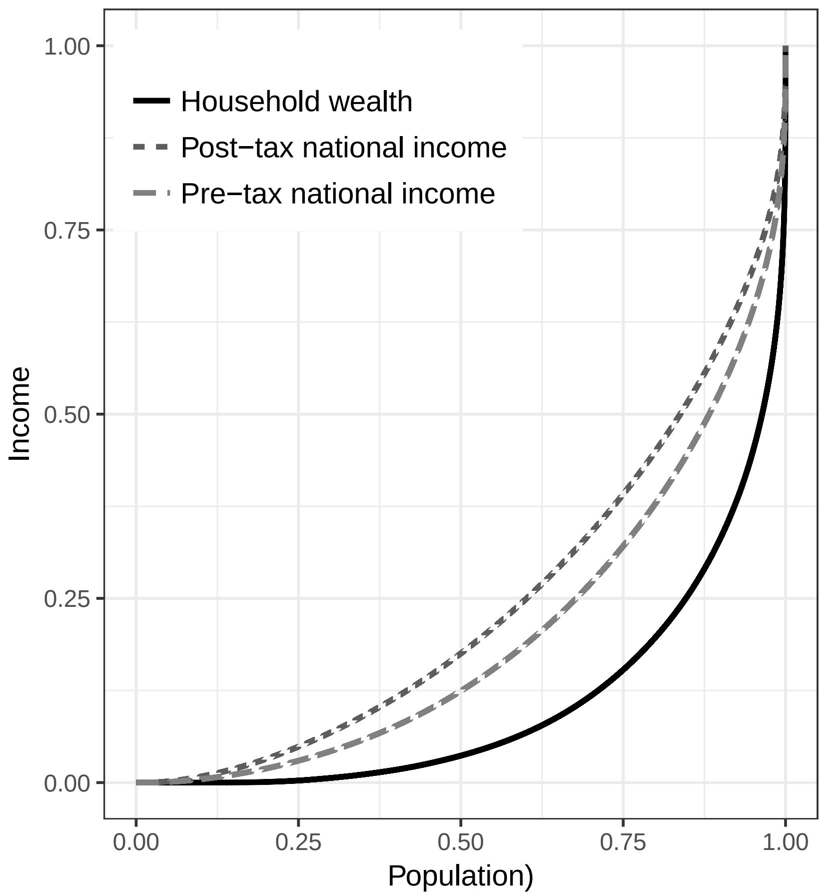
a) Define national income. What is the difference between pre-tax national income and post-tax national income?

National income is domestic output plus net foreign income. Pre-tax income is defined as income after social insurance (e.g., UI), and before income taxes for redistribution. Post-tax is a Pre-tax income after reducing also taxes for redistributive purposes.

b) Using the 2010 micro-file, compute the Gini coefficient among (equal-split) adults for pre-tax national income, post-tax national income, and household net wealth. Draw the corresponding Lorenz curves. Interpret the difference between the three Gini coefficients.

The pre-tab Gini coefficient is higher as we would expect. The household net-wealth has a much higher level of inequality, the Gini coefficient is much higher.

	Pre-tax national income	Post-tax national income	HH net wealth
Gini coefficient	0.60	0.51	0.79


Household wealth
Post−tax national income
Pre−tax national income
Income
1.00
0.75
0.50
0.25
0.00
0.00
0.25
0.50
0.75
1.00
Population)

c) Using Table B4 in [LINK], compute the Gini coefficient among (equal-split) adults for pre-tax national income in 2010. Can you recover the Gini coefficient computed using the 2010 micro-file? How are the results modified if you exclude adults with negative pre-tax national income (in the micro-file) and quantiles with negative average pre-tax national income (in the Excel file)?

The Gini coefficient from Table B4 is slightly lower, 0.58. Removing negative values makes the gap from the micro data smaller, but it still does not make the two estimates coincide.

d) Congress is considering introducing a federal tax on household net wealth (total household assets net of debts) at a marginal rate of 0.01% for wealth below $20 million, and 1.0% for wealth above $20 million. Assuming no behavioral responses in the first year of implementation, use the micro-file to compute how much revenue would have been collected by such a tax if it had been imposed in 2010 for the first time. Is the assumption of no behavioral response in year 1 justifiable?

It will generate revenues of $65.25 billion. How realistic if the assumption of no behavior responses depends on whether the tax was expected or not, whether individuals had time to respond to it. An unexpected tax will be less likely to trigger a behavioral response.

e) Congress is considering using all the revenue from the wealth tax to fund a payroll tax cut for wage earners. More specifically, the marginal payroll tax rate (employer + employees) would become 0 below wage income T, 13% in between T and $106,800, and 0 above $106,800. Find what is the exemption threshold T for wage (variable *flwag*) such that the revenue from the new payroll tax plus the revenue from the wealth tax would have equalled the revenue from the old payroll tax (variable *ssuicontrib* in the microfile) in 2010.

The desired T is: $T = 16,473.44$

f) In light of theory and available empirical evidence, what would be the overall growth and distributional impacts of the combined tax reform described in d. and e.? How would it affect the overall tax burden of bottom 50% pre-tax income earners?

We assume that growth is not affected and examine the effects on redistribution. The tax reform discussed above generates a slight decreases in inequity (smaller Gini coefficient by 0.0053) and the bottom %50 has slightly more income. An increase of 0.4% in the income of the bottom 50%.

2. Tax Enforcement

We consider a linear individual income tax at flat rate t. We denote by w real income and $\underline{w}$ reported income. We assume that $w \geq 0$ and $\underline{w} \geq 0$.

If individuals are caught evading taxes, the government forces them to pay the evaded tax due, $t \cdot (w - \underline{w})$, and further imposes a fine proportional to taxes evaded. The fine is equal to $f \cdot t \cdot (w - \underline{w})$, where f is the fine factor parameter. We assume that individuals are **risk neutral** with utility equal to income net of taxes and penalties if caught evading taxes. Assume that individuals who cheat are caught with exogenous probability p

a) Suppose p and f are constant parameters. Solve for the optimal tax-evading behavior of the individual as a function of p and f. Suppose that $f = 0.2$ (a realistic number). Discuss what a realistic p would be in the United States. Does the model generate a realistic prediction of the actual level of tax evasion in the United States given the actual audit rate in the United States?

The individual maximizes his expected utility:

$$\begin{aligned} &\max_{\underline{w}} p\left[w - \underline{w} \cdot t - (1+f) \cdot t \cdot (w - \underline{w})\right] + (1-p) \cdot \left[w - \underline{w} \cdot t\right] \\ &\quad = p\left[-(1+f) \cdot t \cdot (w - \underline{w})\right] - \underline{w} \cdot t + w \end{aligned}$$

The F.O.C are:

$$\frac{\partial}{\partial \underline{w}} = -t + (1+f) \cdot t \cdot p = t \cdot ((1+f) \cdot p - 1)$$

therefore we have a corner solution to the individual's tax compliance problem. She will either report $\underline{w} = 0$ or $\underline{w} = w$, or will be indifferent when $f \cdot p = 1$:

$$\underline{w}^* = \begin{cases} w, & (1+f) \cdot p > 1 \\ 0, & (1+f) \cdot p < 1 \\ [0, w], & (1+f) \cdot p = 1 \end{cases}$$

For $f = 0.2$ the model generates an unrealistic prediction that everybody will fully evade taxes.

b) Suppose now that f is constant but that p depends on the level of evasion. Assume that p is an increasing function of unreported income $w - \underline{w}$. Derive the optimal reporting behavior w in that case for the individual. Express this as a function of the elasticity e of p with respect to $w - \underline{w}$. Explain why in that situation even with no fines ($f = 0$), it may not be optimal for the individual to report $\underline{w} = 0$

The individual maximizes his expected utility:

$$\max_{\underline{w}} p(w - \underline{w})\left[-(1+f) \cdot t \cdot (w - \underline{w})\right] - \underline{w} \cdot t + w$$

The F.O.C are:

$$\begin{aligned} \frac{\partial}{\partial \underline{w}} = -t + (1+f) \cdot t \cdot p(w - \underline{w}) + p'(w - \underline{w}) \cdot (1+f) \cdot t \cdot (w - \underline{w}) = 0 \\ \Rightarrow (1+f) \cdot p \cdot (1+e) = 1 \\ \Rightarrow p = \frac{1}{(1+e)(1+f)} \end{aligned}$$

were $e \equiv \frac{p'(w-\underline{w})}{p(w-\underline{w})} \cdot (w - \underline{w})$. Even when $f = 0$ the individual might not choose $\underline{w} = 0$, as increasing $(w - \underline{w})$ also increases the probability of an audit.

c) Explain (informally) what third-party-reporting means in the context of tax enforcement and how it affects the likelihood p of being caught when evading. Discuss briefly empirical evidence on the evasion rate of income that is third-party reported versus income that is not third-party reported. Explain the shape that the function $p \cdot (w - \underline{w})$ from question b. is expected to take in that case and whether the model generates realistic predictions.

Individuals will report the third party reported income and will evade in self reported income. This generates a See Kleven et al. (2010) for a detailed explanation.

d) Suppose the individual earns wage w and can deduct charitable giving d from income so that the tax rate t applies to net reported income $\underline{w} - \underline{d}$. The individual reports $\underline{w}$ and $\underline{d}$ to the government. Assume $w \geq 0$, $\underline{w} \geq 0$, $\underline{d} \geq 0$, $d \geq 0$, $w - d \geq 0$, and $\underline{w} - \underline{d} \geq 0$. Fines for tax evasion apply to underreported net income $[w - d - (\underline{w} - \underline{d})]$. Suppose that the probability of being caught underreporting w is p_w while the probability of being caught over-reporting d is p_d. Suppose p_w and p_d are constant parameters such that $p_w > p_d$. Derive the optimal reporting behavior of the individual as a function of p_w, p_d, and f.

The individual maximizes his expected utility:

$$\max_{\underline{w},\underline{d}} \; - p_w(1+f) \cdot t \cdot (w - \underline{w}) - p_d(1+f) \cdot t \cdot (\underline{d} - d) - (\underline{w} - \underline{d}) \cdot t + w$$

The F.O.C are:

$$\frac{\partial}{\partial \underline{w}} = -t + (1+f) \cdot t \cdot p(w - \underline{w}) + p'(w - \underline{w}) \cdot (1+f) \cdot t \cdot (w - \underline{w}) = 0$$

$$\Rightarrow (1+f) \cdot p_w \cdot (1+e) = 1$$

$$\Rightarrow p_w = \frac{1}{(1+e_w)(1+f)}$$

$$\frac{\partial}{\partial \underline{w}} = -t + (1+f) \cdot t \cdot p(d - \underline{d}) + p'(d - \underline{d}) \cdot (1+f) \cdot t \cdot (d - \underline{d}) = 0$$

$$\Rightarrow (1+f) \cdot p_d \cdot (1+e) = 1$$

$$\Rightarrow p_d = \frac{1}{(1+e_d)(1+f)}$$

It follows directly from the F.C.C that:

$$\frac{p_w}{p_d} = \frac{1+e_d}{1+e_w}$$

the individual will choose $\underline{w}$ and $\underline{d}$ such that the ratio of detection probabilities will be proportional to the elasticities of detection for each type of evasion behavior.

e) Suppose that $p_d \cdot (1+f) < 1$ and $p_w \cdot (1+f) > 1$. Discuss why this is a realistic assumption in the United States. What is the prediction from part d. in that case? Is this a realistic prediction? If not, what is the key factor that is missing from the model?

The prediction is that individuals will shift tax evasion to charitable donations rather than income reporting.

f) Suppose the government wants to improve enforcement by increasing scrutiny of individuals who report charitable giving larger than 10 percent of income. As a result, for those reporting more than 10 percent of income, over-reported d is now caught with probability p_w (instead of p_d). What happens to optimal evasion behavior in that case? (Consider the case where $p_d \cdot (1+f) < 1$ and $p_w \cdot (1+f) > 1$ as in part e.).

It will generate an excess mass of charitable donations at 10 percent of income. Above that individuals will divide income that they would like to evade equally between reported income and over reporting of charitable donations.

g) Suppose instead that the government only allows charitable deductions up to 10 percent of earnings. Does this generate the same outcome as in part f.?

This will also generates an excess mass at 10 percent donations. The excess mass will be larger than in part (f). However, now individuals cannot deduct more than 10 percent of income, so they will be forced to take more risk and to under report more. The prediction will be of of more under reporting than in (f), but less over all evasion.