

Econ 230B
Spring 2019
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Problem Set 1

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1. Lorenz Curve and Gini Coefficient

The IRS posts online tabulations of the distribution of annual individual incomes based on Federal Individual Income Tax data. We will focus on statistics for years 2003 and 2016 available online in Table 1.1 posted at ([link here](#)).

a) Using excel or STATA, draw the empirical Lorenz curve for the Adjusted Gross Income (AGI) distribution for all returns (but excluding returns with no AGI). For this, use columns (1) and (3) of the excel Table 1.1 for the two years 2003 and 2016.

Compute the Gini coefficient from the Lorenz curve. Has inequality increased or decreased from year 2003 to year 2016?

b) Using realistic interpolation, compute the following inequality statistics: top 10% income share, top 1% income share, percentile 90 to percentile 50 ratio (P90/P50). Has inequality increased or decreased from 2003 to 2016?

c) Use a Pareto interpolation to compute the top 10% income share, top 1% income share, percentile 90 to percentile 50 ratio (P90/P50). How different are your results compare to part (b)? (See [Atkinson \(2005\)](#) for a description of the Pareto interpolation procedure with tabulated data)

d) Table 1.1 also provides in column (14) in 2016 (find the same column in 2003) the income tax paid by bracket (non-taxable returns pay by definition zero tax). Assume that the ranking of individual tax filers is the same when using AGI (col. (3)) and after-tax income (col. (3)-(14)). Redo a) and b) for after-tax income. Can you conclusively say that the Federal income tax reduces inequality?

Has tax progressivity increased or decreased from 2003 to 2016?

e) In reality, the ranking of individuals by after-tax incomes is not strictly the same as the ranking by pre-tax income. In that case, did you over-estimate or under-estimate the Gini coefficients in question c)?

2. Chasing Natural Experiments within a Country

As seen in class, many of the best papers on labor supply responses to taxes and transfers exploit a policy change (a so-called “Natural Experiment”) in order to obtain convincing estimates. This exercise asks you to find a Natural Experiment and propose an estimation methodology.

Download the pdf copy of the OECD annual publication *Taxing Wages* for years 2010 and 2018. Those publications are available online (link here) in pdf format (when connected through UC Berkeley). Part III of this publication describes the tax/benefits systems (including payroll taxes, income taxes, and various benefits) faced by wage income earners for each OECD country. Note that recent changes in the tax/benefit system are explicitly described in Section 4 for each country.

a) Find one reform in one country which took place between 2010 and 2018 that could be used to estimate labor supply responses to taxes or transfers for some group of interest in the population. Make sure the reform is large enough to be useable for compelling identification. Describe the reform you have picked.

b) Describe the methodology you would use to estimate such labor supply responses. In particular, make sure to be fully explicit about the assumptions you need to identify the labor supply response parameters. Try to explain whether your estimates capture participation versus intensive elasticities, uncompensated versus compensated elasticities, income effects, etc.

c) Describe the data you would need to carry out the analysis. Survey or administrative data, variables, realistic sample size, time period, panel or repeated cross section, etc. Search online to investigate whether such data exist and how they could be obtained for the research analysis you are proposing.

d) (FOR FUTURE WORK): If you find a really promising Natural Experiment, the next step is to look for the related literature (you want to be the first to analyze this change!) and then try and get the data to carry out the research project.

3. Optimal Top Income Tax Rate with Income Effects

Consider a population of individuals with individual i utility equal to $u^i(c, z)$ increasing in consumption c and decreasing in earnings z . We consider a nonlinear tax system $T(z)$ with a constant marginal tax rate τ above a fixed threshold z^* (the “top bracket”). The tax system below z^* is irrelevant in what follows and is kept constant. We assume that the government wants to choose τ to maximize tax revenue raised from top bracket earners.

a) We saw in class that the tax rate τ maximizing tax revenue takes the simple form $\tau^* = 1/(1 + a \cdot e)$ with $a = z^m/(z^m - z^*)$ the Pareto parameter (z^m is the average income in the top bracket) and e the elasticity of top bracket incomes. Explain intuitively why e is a mix of substitution effects and income effects.

b) Let $z^i(1 - \tau, R)$ be the earnings supply function obtained from solving the individual utility maximization problem under a linear tax:

$$\max_{c,z} u^i(c, z) \text{ st } c = (1 - \tau)z + R$$

We denote by e_u^i the uncompensated elasticity of z^i with respect to $1 - \tau$ and by $\eta^i = (1 - \tau)\partial z^i/\partial R$ the income effect parameter.

Considering the small tax reform $d\tau$ in the top bracket (keeping z^* fixed) as we saw in class, show that the response dz^i to the small reform can be expressed in terms of e_u^i and η^i .

c) Use b) to express e in function of the average of the uncompensated elasticities and income effect parameters among top bracket earners, along with the Pareto parameter $a = z^m/(z^m - z^*)$. Explain intuitively why uncompensated elasticities are weighted by incomes z^i while the income effect parameters are not.

d) Suppose, each individual utility takes the form $u^i(c, z) = \log c - a^i \cdot z^{1+1/\varepsilon}$ with a^i is a parameter (that can vary across individuals). Solve the individual maximization problem under a linear tax

$$\max_{c,z} u^i(c, z) \text{ st } c = (1 - \tau)z + R$$

to obtain the uncompensated elasticity, income effect, and compensated elasticity parameters e_u^i, η^i, e_c^i for such utility functions.

e) Show that, when a^i becomes small (i.e. when z^i is large), we have $\eta^i \simeq -\varepsilon/(\varepsilon + 1)$ and $e_u^i \simeq 0$. Use c) to obtain an optimal top tax rate formula as a function of ε and the Pareto parameter a in that case.

This class of utility functions is widely used in macro-economics and ε is known as the Frisch elasticity. Suppose that $a = 1.5$ and $\varepsilon = 1$ (macro models use in general large Frisch elasticities). How large is the optimal τ in that case? What is the optimal τ when ε is very large? Explain why the optimal tax rate is high even with such a large Frisch elasticity?