

Redistribution

E. Glen Weyl

University of Chicago

Lecture 11
Regular Section
Elements of Economic Analysis II
Fall 2011

Midterm reminder and introduction

The midterm exam is tonight 4:30-6 in SS122

- Open everything, no messaging, bring calculator (or equiv)

Today we'll apply monopoly theory to important social problem

- 1 Inequality growing in the US and other developed countries
- 2 Redistribution may be valuable even for libertarian
 - Provides insurance against risks faced before insurance
- 3 Redistribution thus aims to maximize average utility
- 4 Concavity of utility means poor value more
- 5 We'll build a framework for analyzing optimal tax
 - Linear "average rate" to most taxpayers
 - Calibrate with log-logistic distribution of income
 - Special surcharge for the super-rich
 - Calibrate using Pareto distribution at top end
- 6 Other concerns in redistribution this ignores

Types of inequality and measurement

Income inequality, differences in income, come in three forms:

1 Poverty

- Typically measured by fraction of population below line
- Also global poverty line, but US much higher
- *Has not* been growing significantly in recent years

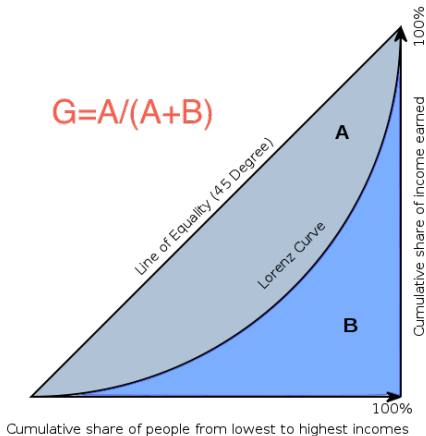
2 "Mid-range" inequality

- Typical measure is "Gini coefficient"
- Measures how far distribution is from perfect equality
- See graph below for illustration
- Has grown somewhat over time, but not a lot

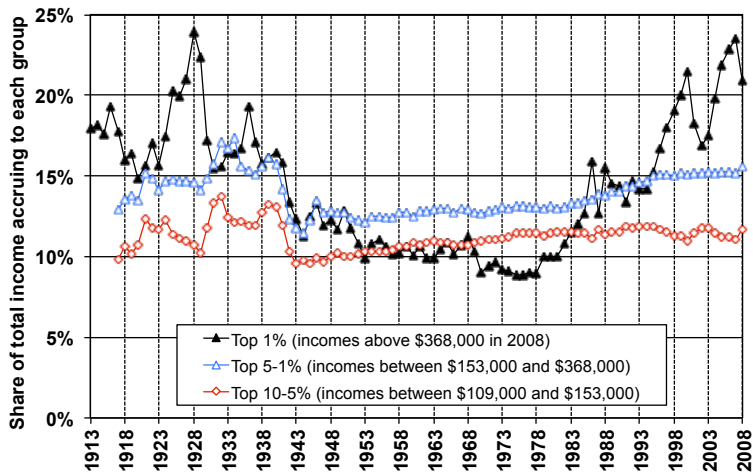
3 Top income share: what part to richest take?

- What fraction of total income from top 10%, top 1%?
- Measures concentration at the very top end
- Has been growing radically in recent years

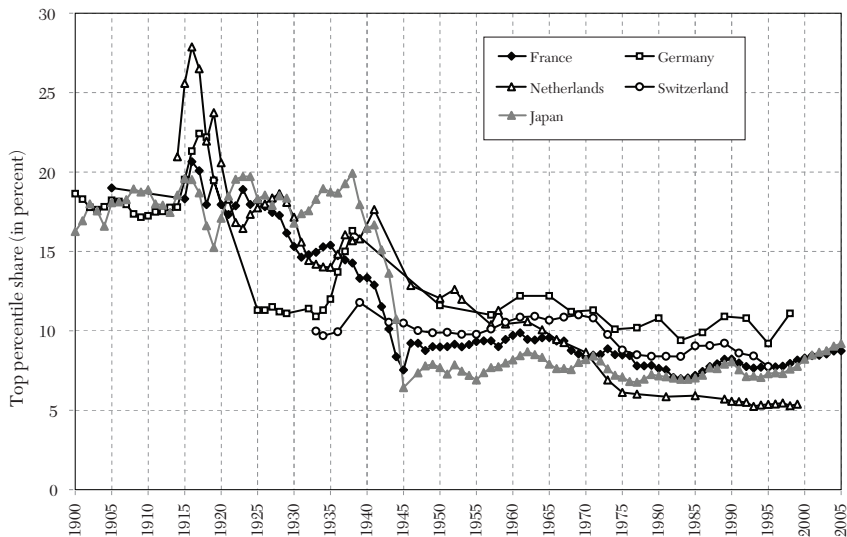
Graph of Gini coefficient



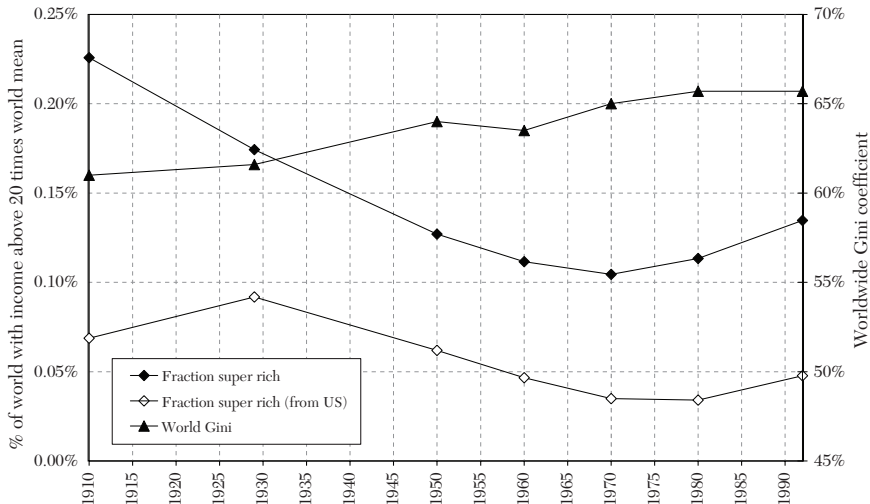
Growing inequality in the United States



Inequality in Europe: a contrast



Inequality within and across countries



Libertarian skepticism about redistribution

Many libertarians and conservatives oppose redistribution

- I used to be one, so I empathize:
 - 1 Rich earned their money, who has right to take away?
 - 2 Social darwinism: rich better people, need to be selected
 - 3 Nozick: if they got the money in fair way, then fair
 - 4 Protestant: wealthy are the chosen
 - 5 Rand: taxation is violence, property is inviolable
 - 6 Fascist: class resentment breeds social conflict
 - 7 Conservative: each part of society has its role to play
- Many of these powerful, return below
- Not all completely formalized, studied carefully
- However, compelling *libertarian* argument for redistribution
 - Idea similar to classic Christian saying from Bradford:
 - "There, but for the grace of God, go I."

The Harsanyi-Rawls response

- John Harsanyi, and Rawls, give strong argument against
- Idea: maintain libertarian, "choice-based" approach?
 - 1 People usually buy insurance against major risks in life
 - Medical insurance, auto insurance
 - Money is worth more when poor than when rich
 - 2 People would buy insurance about "position in life"
 - Which parents? What country and town are you born in?
 - 3 People cannot buy this insurance because too young
 - Or, for somethings, not even born yet!
 - 4 Thus the government should act as if they bought insurance
 - This is exactly what redistributive spending does

- ⇒ Policy to maximize *expected utility behind veil of ignorance*
- Policy everyone would choose before knowing who they are
 - Smith's perspective: policy of impartial outside observer

The utilitarian framework

Thus we should maximize the *average utility*

- This principle is called *Utilitarianism*
 - Bentham: “Greatest good for greatest number”
- Usually individual utility $u(I) + v(\mathbf{x})$ where I is income
 - \mathbf{x} many things like leisure, identity, enjoyable work, etc.
- For utilitarian, social welfare is sum of individual welfares:

$$U = \int_i u_i(I_i) + v(\mathbf{x}_i) f(i) di$$

- All people are weighted equally
 - Captures idea that we don't know identity behind veil
- Inequality is then just another form of inefficiency
 - Failure to provide insurance
 - Rich don't value also much as poor
 - Reason is risk-aversion, let's review

A refresher on risk-aversion

Utility is assumed to be concave in income

- This is the idea behind risk-aversion
- Run out of “good” uses of money, move onto less good
- Follows from same principle as, formalizes insurance
- If you think you might not be risk-averse, consider example:
 - Flip coin. If tails, you get \$2; if heads, flip again
 - If tails, you get \$4; if heads, flip again
 - \$8, \$16, \$32, ...
- How much would you be willing to pay for this?
- How much would a risk-neutral person be willing to pay?
 - $\frac{1}{2} \cdot 2 + \frac{1}{4} \cdot 4 + \dots = \infty!$
 - ⇒ Apparently you're not risk neutral
- Hard to imagine anyone paying much....
- ⇒ Reasonable to think almost everyone risk-averse

Parameterization of utility functions

Risk-aversion alone gives some motive for redistribution

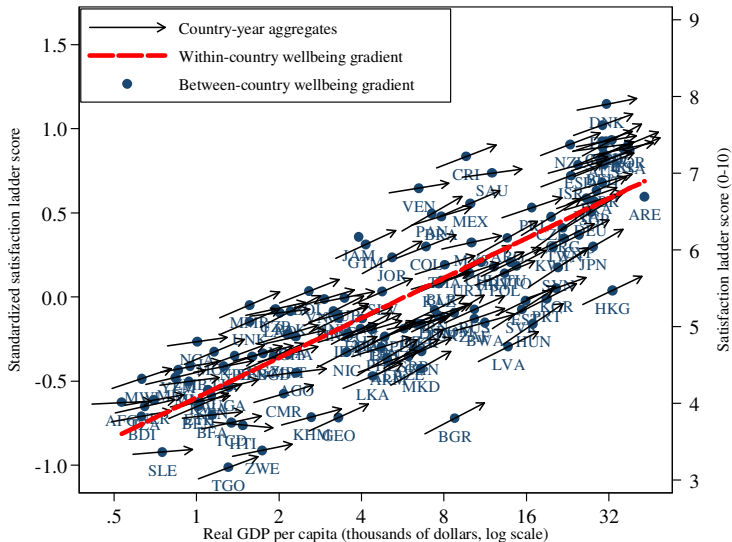
- But to get more specific, particular form of utility useful
- This will help us determine exactly how much redistribution
- Luckily, almost like Zipf's, good evidence about this

$$u(i) = \log(i)$$

- 1 Super intuitive: value of $x\%$ increase income constant
- 2 Mathematically very convenient as we'll see below
- 3 Most importantly, lots of empirical support
 - Most striking example is from Sacks et al. (2011) data
 - Study "subjective well-being" (questionable in many ways)
 - Ladder of life, 0 to 10 (worst to best life imaginable)
 - Letting h be well-being and I be income they find

$$h = .35 \log(i) + \epsilon$$

Sacks et al. (2011) data on happiness and income



Broad optimal taxation problem and our focus

Designing a tax system involves wide-range of issues:

- 1 Taxing income v. consumption v. capital income
- 2 How to redistribute money collected?
- 3 Deductions and the tax base
- 4 Special/targeted deductions or uniform
- 5 Inheritance taxes and inter-generational issues
- 6 How many brackets, where and at what rate?
- 7 Administrative process, monitoring, etc.
- 8 What programs should government spend on?
- 9 Earned Income Tax Credit and work subsidies

All of these issues important, but we focus on two

- These have been at top of news, economics agenda
 - 1 How high should overall tax rates be for most?
 - 2 Flat or progressive (surcharge for superrich)?

Framework for analyzing optimal taxation

Why not just redistribute so everyone's equal?

- The more you tax, the less people work
 - ⇒ Beyond so point, taxes counter-productive
 - ⇒ Fundamental *equity-efficiency trade-off*
- Goal: maximize average utility given that:
 - 1 Can only use simple instruments (linear tax + surcharge)
 - 2 Raising taxes causes less work by substitution effect
 - 3 All revenue raised given back as lump sum to all
- To keep simple, ignore income effects of lump sums
 - Can easily be done, but formulas a bit messier
 - Saez finds it does not matter much
- Reduction in work by *labor supply elasticity*
 - Percent fall in work when wages fall by percent
 - Those earning I have *average elasticity* $\bar{\epsilon}(I)$
 - After-tax+transfer income is $(1 - t)I + t\bar{I}$, \bar{I} average income

Calculating optimal linear tax

Post-tax wage $w(1 - t)$; what percent does t cause to fall?

- $\frac{dw(1-t)}{dt} \frac{1}{w(1-t)} = -\frac{w}{w(1-t)} = -\frac{1}{1-t}$
- So average income falls by $\frac{d\bar{l}}{dt} \frac{1}{\bar{l}} = \frac{\int_{l=0}^{\infty} l \frac{\bar{\epsilon}(l)}{1-t} f(l) dl}{\int_{l=0}^{\infty} l f(l) dl} \equiv \frac{\bar{\epsilon}}{1-t}$
 - *Income-weighted average labor supply elasticity, density f*

Ignore income effect of lump-sum transfer

- Total welfare is $\int_{l=0}^{\infty} \log((1-t)l + t\bar{l}) f(l) dl$
- By envelope, treat each individual as if own l constant
- Derivative $\int_{l=0}^{\infty} \frac{\bar{l}(1-\frac{t\bar{\epsilon}}{1-t})-l}{(1-t)l+t\bar{l}} f(l) dl = \left(1 - \frac{t\bar{\epsilon}}{1-t}\right) \bar{l}\bar{w} - \bar{l}\bar{w}$
 - w is *welfare weight* $\frac{1}{(1-t)l+t\bar{l}}$, $\sigma(t) \equiv -\text{Cov}\left[\frac{l}{\bar{l}}, \frac{w}{\bar{w}}\right] = \frac{\bar{l}\bar{w} - \bar{l}\bar{w}}{\bar{l}\bar{w}}$

Linear tax formula

- Optimum then requires $1 - \frac{t\bar{\epsilon}}{1-t} = \sigma(t) \implies$

$$t^* = \frac{\sigma(t)}{\bar{\epsilon} + \sigma(t)}$$

- $\sigma(t) > 0$ because wealthier have lower welfare weight
- Tax increasing in $\sigma(t)$, declining in $\bar{\epsilon}$; equity v. efficiency?
 - 1 $\sigma(t)$ measures inequality of incomes, falls with t
 - 2 ϵ is efficiency cost: more response, more loss

\implies Simple formalization of equity-efficiency trade-off

- As $\sigma(t) \rightarrow \infty$ except t near 1, $t^* \rightarrow 1$
- As $\epsilon \rightarrow 0$, $t^* \rightarrow 1$
- And vice-versa

\implies The more inequality, less elasticity, higher tax is

Model of top income taxes

So that covers the tax for most Americans

- But Obama recently proposed surcharge for the rich
- When taxing rich, their welfare does not matter much
 - Welfare weight is $\frac{1}{l}$ and $\frac{1}{1,000,000} \approx \frac{1}{20} \frac{1}{46000}$

⇒ Simplification: just try to maximize revenues

- Suppose we raise t_{10^6} tax on income over $\$10^6$
- Let \bar{l}_{10^6} be average income of those over 10^6 ; two effects?
 - 1 Mechanically increases revenue from l by $l - 10^6$
 - 2 Income of $l > 10^6$ falls by $\frac{l\bar{\epsilon}(l)}{1-t}$, reducing taxes $\frac{t\bar{\epsilon}(l)}{1-t}$

⇒ Total effect on revenue from l is $l \left(1 - \frac{t_{10^6} \bar{\epsilon}(l)}{1-t_{10^6}} \right) - 10^6$

- Optimal tax equates this to 0 on average above 10^6

Saez (2001) formula for top income taxes

Taking the average, becomes $\bar{I}_{10^6} \left(1 - \frac{t_{10^6} \bar{\epsilon}_{10^6}}{1 - t_{10^6}} \right) - 10^6$

- $\bar{\epsilon}_{10^6}$ is *income-weighted* among those *with* $I > 10^6$
- \bar{I}_{10^6} is average income of those earning above \$1,000,000
- Letting $\alpha = \frac{\bar{I}_{10^6}}{I_{10^6} - 10^6}$, by same logic we obtain?

$$t_{10^6}^* = \frac{\frac{1}{\alpha}}{\frac{1}{\alpha} + \bar{\epsilon}_{10^6}}$$

- α measures inverse upper-tail inequality as we'll see
- Thus, again, equity-efficiency trade-off emerges
- Taxes should be progressive if
 - 1 $\frac{1}{\alpha} > \sigma(t^*)$ (at optimum)
 - 2 Rich have lower average elasticity than most Americans

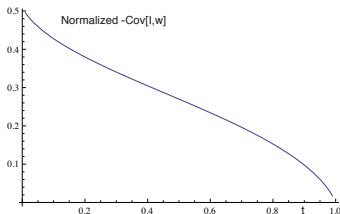
Calculating welfare weights

Now let's try to get a sense for $\alpha, \sigma(t)$

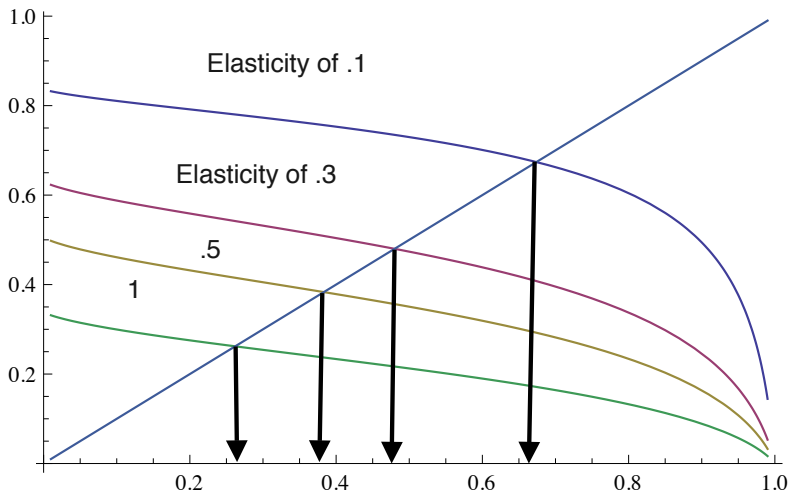
- To calculate $\sigma(t)$, useful approximation is log-logistic

$$f(l) = \frac{\beta \left(\frac{l}{\alpha}\right)^{\beta-1}}{\alpha \left[1 + \left(\frac{l}{\alpha}\right)^\beta\right]^2}$$

- $\beta = \frac{1}{G}$ where G is Gini, .45 in US
- Mean is \$46,000 or $\frac{\alpha\pi}{\beta \sin\left(\frac{\pi}{\beta}\right)}$ gives $\alpha \approx 32,168$
- Throw $\sigma(t)$ at Mathematica, graph as a function of t



Graphical optimal linear tax



Pareto distribution and top tax rates

Calculating α is even easier

- Upper part of income distribution is Pareto with tail $\alpha = 1.5$
- Calculate:

$$\bar{l}_{10^6} = \frac{\int_{10^6}^{\infty} \frac{\alpha}{l} l \left(\frac{l}{l}\right)^{-\alpha-1} dl}{\int_{10^6}^{\infty} \frac{\alpha}{l} \left(\frac{l}{l}\right)^{-\alpha-1} dl} = \frac{\alpha l^{\alpha+1} \int_{10^6}^{\infty} l^{-\alpha} dl}{\alpha l^{\alpha+1} \int_{10^6}^{\infty} l^{-\alpha-1} dl} =$$

$$\frac{-\frac{1}{\alpha-1} l^{-(\alpha-1)} \Big|_{10^6}^{\infty}}{-\frac{1}{\alpha} l^{-\alpha} \Big|_{10^6}^{\infty}} = \frac{\frac{10^{-6(\alpha-1)}}{\alpha-1}}{\frac{10^{-6\alpha}}{\alpha}} = 10^6 \frac{\alpha}{\alpha-1}$$

- So that $\frac{\bar{l}_{10^6}}{\bar{l}_{10^6} - 10^6} = \frac{\frac{\alpha}{\alpha-1}}{\frac{\alpha}{\alpha-1} - 1} = \alpha \implies$ not coincidence $\alpha!$

- Thus $\alpha \approx 1.5$

\implies With elasticities .1, .3, .5, 1, $t_{10^6}^* = .87, .69, .57, .4$

- Compares to $t^* = .67, .48, .38$ and $.26$ for same elasticities

\implies Elasticities crucial, but leans towards progressive

- If so, gradual ramp-up likely

Evidence about elasticities

Evidence on elasticities extensive, but complex

- Almost all evidence based on short-term changes
 - ① Biases upwards taxable income (substitute across years)
 - ② Downward labor supply (no time to change careers, etc.)
 - Rich: labor supply low ($< .1$), but taxable i large (1); why?
 - Tons of tax cheating, loopholes, shifting
 - Much of this could be addressed by closing bad loopholes
 - Cross-year, charitable donations, etc. shouldn't matter
 - Thus right number likely .3 at highest, closer to .1
 - Middle class: labor supply and taxable income both $\approx .5$
 - Less shifting, avoiding; same indicates about right
 - Most comes from women's labor supply in married couples
- ⇒ 40% average income tax, rising to 80%! Very progressive
- Major reform: is analysis or current tax system wrong?

Some other concerns in optimal taxation

Elegant analysis, but leaves out many issues from before:

- 1 Rich may be rich because they value money more
- 2 People may not be all the same behind veil
- 3 Which people (born? unborn?) exist behind the veil?
- 4 Who do we care about? Nearby people or far away?
- 5 Wealthy may be smarter, better at allocating capital
- 6 Inequality undermines social order, cause crime or unrest
- 7 EITC may help avoid labor force dropouts
- 8 Professions may create externalities (see problem set)

Just a small sample of the issues:

- All of these very open, great areas for research, thesis
- Can you think of other important omitted issues?