# Empirical Research on Economic Inequality Top tax rates and optimal taxation 

Maximilian Kasy

Harvard University, fall 2015

## Redistribution through taxation

- Important policy tool to deal with inequality
- How to choose a tax and transfer system, tax rates?
- $\Rightarrow$ Theory of optimal taxation
- Key assumptions:

1. Evaluate individual welfare in terms of utility.
2. Take welfare weights as given.
3. Impose government budget constraint.

## Feasible policy changes

- Consider small change of tax rates.
- Has to respect government budget constraint $\Rightarrow$ zero effect on revenues.
- Total revenue effect:

1. Mechanical part: accounting; holding behavior (tax base) fixed.
2. Behavioral responses: changing tax base.

## When are taxes optimal?

- Optimality: no feasible change improves social welfare.
- This implies:
zero effect on social welfare for any feasible small change
- $\approx$ first order condition
- Effect of change on social welfare:

1. Individual welfare: equivalent variation
2. Social welfare: sum up using welfare weights

## Effect on social welfare SWF

- Small change $d \tau$ of some tax parameter
- Effect on social welfare:

$$
d S W F=\sum_{i} \omega_{i} \cdot E V_{i}
$$

- $\omega_{i}$ : value of additional $\$$ for person $i$
- $E V_{i}$ : equivalent variation - cf. last class
- By the envelope theorem:
$E V_{i}$ is mechanical effect on $i$ 's budget, holding all choices constant.
- e.g., $E V_{i}=-x_{i} \cdot d \tau$ for $\operatorname{tax} \tau$ on $x_{i}$


## Effect on government budget $G$

- Mechanical effect plus behavioral effect
- For instance for a tax $\tau$ on $x_{i}$,

$$
d G=\sum_{i} x_{i} \cdot d \tau+d x_{i} \cdot \tau
$$

- Estimating $d x_{i}$ part is difficult, the rest is accounting.
- Possible complication: effect of tax change on market prices.
- This complication is often ignored.


## Top income taxes

- Optimal top income taxes?
- Suppose welfare weights (value of additional \$) are very small for the very rich, relative to the average.
- Then optimal top income taxes maximize revenue - simpler problem.
- Tax rate $\tau$ for incomes above cut-off $\underline{y}$
- Tax revenues from top bracket, per tax payer:

$$
G(\tau)=\tau \cdot(E[Y \mid Y \geq \underline{y}]-\underline{y})
$$

## First order condition for maximizing revenue

- Mechanical and behavioral effect:

$$
\partial_{\tau} G(\tau)=(E[Y \mid Y \geq \underline{y}]-\underline{y})+\tau \cdot E\left[\partial_{\tau} Y \mid Y \geq \underline{y}\right]=!
$$

- Remember the Pareto distribution?

$$
\begin{aligned}
P(Y>y \mid Y \geq \underline{y}) & =(\underline{y} / y)^{\alpha} \\
E[Y \mid Y \geq \underline{y}] & =\frac{\alpha}{\alpha-1} \cdot \underline{y} .
\end{aligned}
$$

## Tax elasticity of income

- Elasticity notation:

$$
\begin{aligned}
\eta & =\frac{\partial \log (Y)}{\partial \log (1-\tau)} \\
& =-\frac{\partial Y}{\partial \tau} \cdot \frac{1-\tau}{Y}
\end{aligned}
$$

- Elasticity of income with respect to net-of-tax rate $(1-\tau)$
- In this notation:

$$
E\left[\partial_{\tau} Y \mid Y \geq \underline{y}\right]=-\frac{\eta}{1-\tau} E[Y \mid Y \geq \underline{y}]
$$

## Questions for you

Solve for the optimal $\tau$, using

1. The first order condition

$$
(E[Y \mid Y \geq \underline{y}]-\underline{y})+\tau \cdot E\left[\partial_{\tau} Y \mid Y \geq \underline{y}\right]==^{!} 0,
$$

2. the property of the Pareto distribution that

$$
E[Y \mid Y \geq \underline{y}]=\frac{\alpha}{\alpha-1} \cdot \underline{y}
$$

3. and the elasticity notation,

$$
E\left[\partial_{\tau} Y \mid Y \geq \underline{y}\right]=-\frac{\eta}{1-\tau} E[Y \mid Y \geq \underline{y}] .
$$

## Solution

- Plugging 2 and 3 into the FOC:

$$
\begin{align*}
\partial_{\tau} G(\tau) & =(E[Y \mid Y \geq \underline{y}]-\underline{y})-\frac{\tau}{1-\tau} \cdot \eta \cdot E[Y \mid Y \geq \underline{y}] \\
& =\underline{y} \cdot\left(\frac{\alpha}{\alpha-1} \cdot\left(1-\frac{\tau}{1-\tau} \cdot \eta\right)-1\right)=!0 \tag{1}
\end{align*}
$$

- After some algebra,

$$
\tau^{*}=\frac{1}{1+\alpha \cdot \eta}
$$

## Questions for you

How do optimal tax rates depend on the amount of income inequality, and on the elasticity of taxable income?

## Plugging in some numbers

- Reasonable estimate of the Pareto parameter: $\alpha=2$ (cf. Atkinson et al. 2011)
- Reasonable estimate of the elasticity: $\eta=0.25$
- Then

$$
\tau^{*}=\frac{1}{1+\alpha \cdot \eta}=\frac{1}{1+0.5}=67 \%
$$

## References

Saez, E. (2001). Using elasticities to derive optimal income tax rates. The Review of Economic Studies, 68(1):205-229.

Chetty, R. (2009). Sufficient statistics for welfare analysis: A bridge between structural and reduced-form methods. Annual Review of Economics, 1(1):451-488.

