Public Economics

Lecture 5: Taxation of labor

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Taxation (and transfers) can be used to:

- Raise public revenue;
- Alter the distribution of income.

Simple model

- Utility $u(c)$ is strictly increasing and concave.
- Everybody has the same utility function.
- c is after tax income.
- Before tax income is z and is fixed for each individual, such that
$$c = z - T(z),$$
where $T(z)$ is tax on z.
- Before tax income z has density distribution $h(z)$

- Government chooses function $T(z)$ in order to maximize an utilitarian welfare function:

$$\mathbb{W} = \int_0^\infty u(z - T(z))h(z)dz,$$

subject to the following budget constraint:

$$\int_0^\infty T(z)h(z)dz \geq E.$$

- This corresponds to the following Lagrangian:

$$\mathbb{L} = \int_0^\infty u(z - T(z))h(z)dz + \lambda \left[\int_0^\infty T(z)h(z)dz - E \right].$$

- First order condition with respect to $T(z)$ is:

$$\frac{\partial \mathbb{L}}{\partial T(z)} = 0 \Rightarrow u'(z - T(z)) = \lambda.$$

- Thus, $z - T(z) =$ is constant for all z. An increase in z is perfectly offset by an increase in $T(z)$.
- Marginal tax rate is 100%. After tax income is equal among individuals. They all consume the same quantity, whatever their before tax income.
- Here, utilitarianism and decreasing marginal utility lead to egalitarianism.

Key limitations of this simple model:

- No behavioral responses:
  100% redistribution would destroy incentives to work; accordingly, the assumption that z is exogenous is unrealistic.
- Issue with utilitarianism:
  Even absent behavioral responses, many people would object to 100% redistribution (perceived as confiscatory); citizens' views on fairness impose bounds on redistributive policies the government can implement.

Warning for next models in this lecture:

- We will only consider the intensive margin of labor supply (all individuals are working, they choose only the *time* they work).
- Opposite is extensive margin (individuals also choose to work or not).

Mirrlees model

Mirrlees, James A, 1971. "An Exploration in the Theory of Optimum Income Taxation," Review of Economic Studies, Wiley Blackwell, vol. 38(114), pages 175-208, April.

- Standard labor supply model:
  Each individual maximizes $u(c, l)$ subject to $c = wl - T(wl)$ where c is consumption, l is labor supply, w is wage rate, and $T(.)$ is nonlinear income tax. Individuals' labor supply l depends on $T(.)$
- Individuals differ in ability w which distributed with density $f(w)$ in the population.

Individuals' problem

- Individuals choose labor supply that maximizes

$$u\left(wl - T(wl), l\right).$$

- First order condition corresponds to:

$$w\left(1 - T'(wl)\right)\frac{\partial u}{\partial c} + \frac{\partial u}{\partial l} = 0.$$

- At the optimum, marginal rate of substitution is equal to marginal after tax income.

Government's problem

- Given individuals' choices, the government chooses $T(.)$ in order to maximize the following general social welfare function:

$$\mathbb{W} = \int_0^{\infty} G(u(c,l))f(w)dw,$$

subject to

$$\int_0^{\infty} T(wl)f(w)dw \geq E.$$

- $G(.)$ is increasing an concave:
Concavity means that additional social welfare derived from increasing utility is decreasing in utility, i.e. a marginal increase in utility for "rich" individuals is less valuable than a marginal increase in utility for "poor" individuals. This corresponds to a taste for redistribution.

Results

- Complex formulas, not much can be said about how tax rates should vary by income level.
- Other approach by Diamond (1998) and Saez (2001) relying on the following requirements:
  - Results should be based on empirically relevant and first order object;
  - Results should be robust to changes in modeling assumptions;
  - Results need to be practical: implementable and socially acceptable.

Beyond Mirrlees model

Diamond, Peter A, 1998. "Optimal Income Taxation: An Example with a U-Shaped Pattern of Optimal Marginal Tax Rates," American Economic Review, American Economic Association, vol. 88(1), pages 83-95, March.

Saez, Emmanuel, 2001. "Using Elasticities to Derive Optimal Income Tax Rates," Review of Economic Studies, Wiley Blackwell, vol. 68(1), pages 205-29, January.

- Reposing Mirrless' problem using elasticities.
- Practical value: direct link to empirical estimations of labor supply.

Elasticity concepts and notations

- Static labor supply model where individuals maximize utility function $u(c, z)$, with c consumption and z before tax labor income ($\partial u / \partial z < 0$ because of labor disutility).
- To analyze z is equivalent to analyze pure labor supply l is wages are constant ($z = wl$).
- Individuals face the following budget constraint: $c \leq z(1-\tau)+R$, where R is non-labor income and τ is the linear tax rate.
- Individual optimization leads to:
    - Marshallian labor supply:

$$z = z\left(1-\tau, R\right);$$

    - Hicksian labor supply:

$$z^c = z^c\left(1-\tau, u\right);$$

- Uncompensated (Marshallian) elasticity:

$$\varepsilon^u = \frac{(1-\tau)}{z} \frac{\partial z}{\partial(1-\tau)}$$

- Compensated (Hicksian) elasticity:

$$\varepsilon^c = \frac{(1-\tau)}{z^c} \frac{\partial z^c}{\partial(1-\tau)}$$

- Income effect:

$$\eta = (1-\tau)\frac{\partial z}{\partial R} \leq 0$$

- Slutsky equation:

$$\frac{\partial z^c}{\partial(1-\tau)} = \frac{\partial z}{\partial(1-\tau)} - z\frac{\partial z}{\partial R} \Rightarrow \varepsilon^c = \varepsilon^u - \eta$$

Optimal linear tax rate to maximize public revenue

- Given τ, individual earnings $z(1-\tau, R)$ aggregate into economy wide earnings $Z(1-\tau)$.
- Total tax revenue raised by the government is

$$\mathbb{R} = \tau \times Z(1-\tau).$$

- The Laffer curve, $\mathbb{R}$, is bell-shaped:

$$\mathbb{R} = 0 \text{ if } \tau \in \{0, 1\}.$$

- Optimal tax rate maximizing government revenue is such that:

$$\frac{\partial \mathbb{R}}{\partial \tau} = Z - \tau \frac{\partial Z}{\partial (1-\tau)} = 0,$$

That is:

$$\tau^* = \frac{1}{1+e},$$

where $e = \frac{1-\tau}{Z} \frac{\partial Z}{\partial (1-\tau)}$ is the elasticity of earnings with respect to net of tax rate.

- Also possible to derive optimal linear tax rate with public good provision.

Optimal non linear tax rate

- Non-linear tax rate:

$$c = z - T(z).$$

- In reality, marginal tax rate τ is constant inside earnings brackets.

Perturbation method

- Effects of a (small) increase of tax rate on social welfare:
  - Positive mechanical effect on public revenue: Holding constant individual behavior, an increase in tax rate increases public revenue.
  - Negative behavioral effect on public revenue: An increase in tax rate will reduce labor supply and public revenue.
  - Positive utility effect: Change in public revenue may be used to finance public goods or transfers (arguably zero if the increase in tax is small).
  - Negative utility effect: Loss in utility for those who bear the increase in tax (same remark may apply).
- Starting from the optimal tax rate, all effects must sum to zero for a small change in tax rate.

Optimal tax rate for top income earners

- Start with a simpler problem: What is the optimal tax rate for top earnings?
- Look for optimal tax rate for incomes above threshold $\bar{z}$.

Mechanical effect:

- A taxpayer with income $z > \bar{z}$ has to pay $(z - \bar{z})d\tau$ additional taxes when tax rate increases by $d\tau$.
- Thus, increase in government revenue from $d\tau$ is:

$$M = [z_m - \bar{z}]\, d\tau,$$

where z_m is average income of population (whose size is normalized to one) with earnings above $\bar{z}$.

Behavioral effect:

- The change in behavior following an increase $d\tau$ is :

$$dz = -\frac{\partial z}{\partial(1-\tau)} d\tau = -\varepsilon^u \frac{z}{(1-\tau)} d\tau.$$

- This reduction in earnings implies a reduction in tax receipts equal to τdz.
- Total decrease in government revenue from $d\tau$ is:

$$B = -\bar{\varepsilon} z_m \frac{\tau}{(1-\tau)} d\tau,$$

where $\bar{\varepsilon}$ is the average of uncompensated elasticity (weighted by income) among top-income earners.

- Total effect on public revenues:

$$M + B = \left[\frac{z_m}{\bar{z}} - 1 - \frac{\tau}{1-\tau} \bar{\varepsilon} \frac{z_m}{\bar{z}} \right] \bar{z} d\tau.$$

- The tax change raises revenue if and only if the expression in square brackets is positive.
- To obtain the optimal tax rate, the total revenue effect must be equal to the welfare (utility) effect due to the small tax reform.

- Assuming that there are no utility changes arising from changes in government revenues:

$$M + B = 0 \Leftrightarrow \frac{\tau^*}{1-\tau^*} = \frac{1}{\bar{\varepsilon}} \frac{z_m/\bar{z} - 1}{z_m/\bar{z}}.$$

- Assuming that $\bar{g}$ is the marginal social value derived from consumption for top income taxpayers relative to public revenues:

$$M + B - \bar{g}M = 0 \Leftrightarrow \frac{\tau^*}{1-\tau^*} = \frac{1-\bar{g}}{\bar{\varepsilon}} \frac{z_m/\bar{z} - 1}{z_m/\bar{z}}.$$

- Optimal tax rate on high income is:
  - decreasing in $\bar{g}$: the lower social weight put on high income earners, the lower $\bar{g}$ (redistributive taste);
  - decreasing in $\bar{\varepsilon}$, the elasticity of labor supply among high income earners (efficiency);
  - increasing in $z_m/\bar{z}$ (thickness of tail, potential for revenue).
- Estimated optimal tax rate on high income is around 75% in the United States.

General optimal non linear tax rate

- Method is similar.
- First order condition for optimal marginal tax rate at income level z is:

$$\frac{T'(z)}{1-T'(z)} = \frac{1-G(z)}{\varepsilon}\left(\frac{1-H(z)}{z \times h(z)}\right),$$

where:
- $H(z)$ is the cumulative distribution function of income (density is $h(z)$);
- $g(z)$ denotes the social marginal value of consumption for tax-payers with income z (in terms of public funds);
- $G(z)$ denotes the social marginal value of consumption for tax-payers with income above z.

- Optimal marginal tax rate $T'(z)$ is determined by:
  - Labor supply elasticity;
  - Shape of income distribution;
  - Social marginal weights.
- The difference between this formula and the one derived for the top income earners is that a change in marginal tax rate at income level z does not impact only individuals with income z, but also those with incomes above this level.

- Labor supply elasticity:
    - $T'(z)$ is decreasing with average elasticity at income level z;
    - Pattern of optimal marginal tax rates depends on the pattern of elasticities by income level. This pattern is not well known empirically.
- Shape of income distribution;
    - At each level z, the size of the behavioral effect depends on the density of individuals at this level and on their income: $z \times h(z)$;
    - Gain in tax receipts is proportional to the number of people above level z: $1 - H(z)$.
    - Optimal marginal tax rate is higher where density of taxpayers is low relative to the number of taxpayers with higher income.
- Social marginal weights:
    - If the government has redistributive tastes, then $G(z)$ is decreasing in income and $1 - G(z)$ is increasing in income; in such a case, optimal tax system will be progressive.

Supplementary reading

Peter Diamond & Emmanuel Saez, 2011. “The Case for a Progressive Tax: From Basic Research to Policy Recommendations,” Journal of Economic Perspectives, American Economic Association, vol. 25(4), pages 165-90, Fall.

Large number of empirical questions:

- Estimate labor supply elasticities.
- Are negative tax programs efficient?
- Reaction to tax rates.
- ...

Taxation of top income earners

Austan Goolsbee, 2000. "What Happens When You Tax the Rich? Evidence from Executive Compensation," Journal of Political Economy, University of Chicago Press, vol. 108(2), pages 352-378, April.

Objectives of the paper:

- Estimate elasticity of taxable income to marginal tax rate.
- Separate temporary and permanent responses to changes of marginal tax rate.

- Data: Publicly available data on top five executives compensation for firms listed in $S\&P500$ index (more than $20,000$ individuals observed).
- Observable income components: salary, bonus, options, multi-year bonuses, etc.
- Clinton tax increase on top income earners in 1993:
    - Tax rate jumped from 31% to 39.6% for yearly income $\geq \$250,000$ and from 31% to 36% for income between $\$140,000$ and $\$250,000$);
    - Elimination of some tax rebates for the same categories.
- Identification strategy:
    - Use groups that experienced smaller tax changes as control group.
    - Compare behavior before and after the reform.

- Econometric specification:

$$\text{Income}_{it} = \alpha_i + \beta\left(1 - \text{Tax}_{i,t+1}\right) + \gamma\left(1 - \text{Tax}_{i,t}\right) + \ldots$$

  where individual fixed effect α_i takes unobservable heterogeneity in preferences into account.
- Takes reform's anticipation into account by including future tax rate in regressions.
- Expectations:
  - $\beta < 0$ because of anticipation: if an increase in taxes is anticipated, individuals may "move" tomorrow's taxable income to today;
  - $\gamma > 0$ because of current behavioral reaction.

Results:

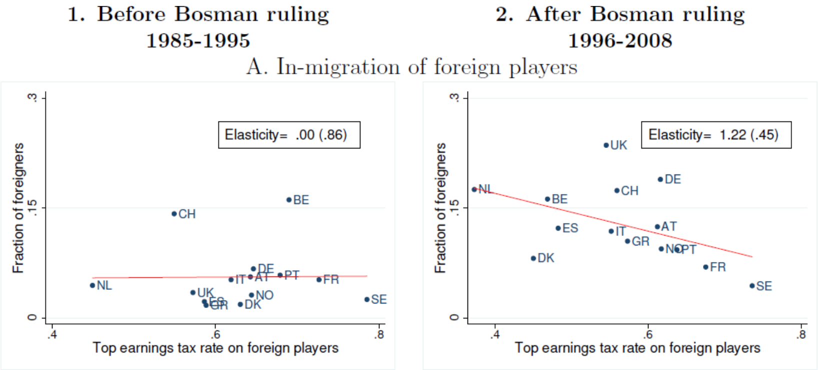
- Expected signs.
- Small total effect (combining anticipation and current responses): after one year, elasticity is close to zero.
- Short term response is highly heterogeneous: those with available stock-option use it intensively by anticipation, others (who cannot use such tools) are much less responsive.

Taxation and international migration

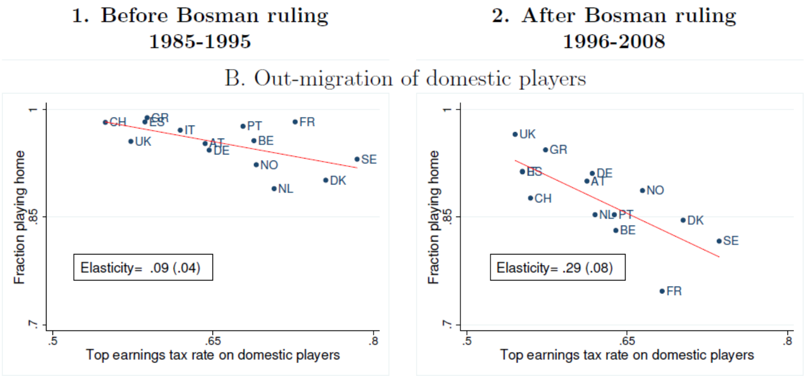
Henrik Kleven & Camille Landais & Emmanuel Saez, 2012. "Taxation and International Migration of Superstars: Evidence from the European Football Market," American Economic Review, forthcoming.

- Basic question: How do people react to changes in tax rates in terms of localization?
- This paper studies a very specific group: European football players (high wages, very mobile, short careers).
- Likely to give an upper bound for mobility responses to tax rates.

- Idea: use differences in top tax rates across countries and time, as well as the Bosman ruling.
- Before Bosman ruling by the European Court of Justice (1995): Three-player rule (no more than three foreign players could be aligned during any game in the UEFA club competitions (was also applied in most national competitions) and transfer-fee rule (allowed clubs to require a transfer fee even at the end of a player's contract). The Bosman ruling eliminated both rules (foreign-player quotas still apply to non-European players).
- Big shock on mobility possibilities.



Source: Kleven, Landais and Saez (2012)



Source: Kleven, Landais and Saez (2012)

Main results:

- The elasticity of the number of foreign players with respect to the net-of-tax rate on foreigners is around one.
- Location elasticities are largest at the top of the ability distribution and negative at the bottom due to ability sorting effects.
- Displacements effects.
- All in all, upper bound for location elasticity suggesting that mobility could be an important constraint on tax progressivity.

End of lecture.

Lectures of this course are inspired from those taught by R. Chetty, G. Fields, N. Gravel, H. Hoynes, and E. Saez.