On the Political Economy of Nonlinear Income Taxation

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Department of the Treasury
Internal Revenue Service

Extra Simplified 1040 Form

Form **BH1040** U.S. Individual Income Tax **2005** Return

Taxpayer's name, address and ZIP code	Your Social Security Number
Income from all sources **1. How much money did you make last year? ....** ▶	
2. Send in this amount .... ▶	Enter total from line 1.

3. If you have any questions or comments, please write them below in the space provided.

▶ ☐

4. If you would like special government assistance, please check below.

Yes ▶ ☐ **No** ▶ ☐

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- It was part of Miguel's dissertation at Rochester. He is now a grandfather.
- John Weymark suggested that we resurrect it: The Lazarus paper
- My inference is that the literature has stalled, to a degree.

Related Literatures

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  4. Public goods

Outline of this Talk

I. Introduction (long)
II. The Model and Preliminaries (long)
III. Results (short)
IV. Complaints (short)

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- The standard optimal income tax model optimizes a utilitarian or Pareto criterion, subject to revenue and incentive constraints.
- We replace optimization with a voting mechanism.

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- The space of tax functions is infinite dimensional.
- The incentive constraints and revenue constraint from the optimal income taxation model provide some restrictions, but still...

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- Then the Condorcet winner is the tax function most preferred by the median voter.
- In the latter case, it can typically be majority defeated by increasing taxes on the median voter and decreasing taxes on everyone else (subject to IC constraints).
- The new tax function might not be best for anyone (but better for the extremes)

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- Huge quantity of literature: exogenous income, endogenous income
- For a long, boring, comprehensive literature review, see Berliant and Boyer, "Politics and Income Taxes: Progress and Progressivity," just appeared in *JPET*. Lengthy discussion there of dynamics.

Our Approach I

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- Suppose that a *finite* sample is drawn from this distribution.
- The finite sample will be the true economy, and the collective revenue requirement imposed by the government can depend on the draw.
- It seems natural for us to require that any proposed tax system must be *robust*: feasible (in terms of the revenue it raises) for *any* draw, as no player (including the government) knows the realization of the draw before a tax is imposed. Government commits to set of feasible tax systems.

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- For example, an abstract government planner might not know precisely the top ability of individuals in the economy, and therefore might not be able to follow optimal income tax rules to give the top ability individual a marginal rate of zero.
- The key implication of using finite draws as the true economies is that requiring *ex post* feasibility of any proposable tax system for any draw narrows down the set of alternatives, which we call the *feasible* set, to a manageable number. (Public finance literature on robustness of mechanism - see paper.)

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- The point of this work is that there is a natural structure and set of arguments that can be exploited in voting games over income taxes to obtain existence and sometimes uniqueness and characterization results.

Time Line

1. Feasible set is constructed
2. Each consumer learns their type
3. Voting over feasible income taxes (knowing their future labor supply under each tax system)
4. Consumers work, pay taxes, and consume, receiving utility.
5. Pareto efficient public good level is implemented.

Preview of Results

- Using the standard optimal income tax model of Mirrlees, under certain (sufficient) conditions on utility and production of the public good, the minimal feasible (for all draws of a given size) income taxes are single crossing, and there is a majority rule equilibrium tax for each draw at the favorite tax system of the median voter of the draw. Depends on draw.

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- Examples satisfying the restrictions are provided.
- The collective revenue requirement is derived from a model of public good provision.
- No time for proofs and the underlying structure...

The Model - Consumer Types

- The paper contains great detail about an *endowment economy* (rather than an economy with endogenous labor supply), where consumers are endowed with a single consumption good. Taxes are lump sum, consumers know their own endowment and prior distribution of endowments. Formally, this is necessary before proceeding to the optimal income tax economy. We employ implementation results. Revelation/Taxation Principles.

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- A consumer's type, their wage, is described by $w \in W \equiv [\underline{w}, \overline{w}]$, where $[\underline{w}, \overline{w}] \subseteq \mathbb{R}_{++}$ is an interval contained in the positive real line (Lebesgue measure).

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- The distribution of consumers' endowments has a measurable density $f(w)$, where $f(w) > 0$ *a.s.*

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- Formally, a *draw* is an element $(w_1, w_2, ..., w_k) \in \mathcal{A}$.

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- For example, if the revenues from the income tax are used to finance a good such as schooling, then $R(w_1, w_2, ..., w_k)$ can be seen as: the per capita revenue requirement for providing schooling to the draw $(w_1, w_2, ..., w_k)$ multiplied by k.

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- Although we shall begin by taking revenue requirements as a primitive, in the end we will justify this postulate by deriving revenue requirements from the technology for producing a public good.

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- $u(c, l, x, w)$ is the utility function of all consumers, where u is twice continuously differentiable.
- The parameter w, an agent's type, can be interpreted as the wage rate or productivity of an agent. Thus w_i is the value of agent i's endowment of labor.
- The gross income earned by agent i is $y_i = w_i \cdot l_i$ and it equals consumption when there are no taxes.

Optimization Problem of Consumers

- Let $y \in \mathbb{R}$ be individual gross income. A *tax system* is a function $\tau : \mathbb{R} \to \mathbb{R}$ that takes y to tax liability. A *net income function* $\gamma : \mathbb{R} \to \mathbb{R}$ corresponds to a given τ, x by the formula $\gamma(y) \equiv y - \tau(y)$.

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- For fixed τ and x, we call arguments that solve this optimization problem $c(w)$ and $l(w)$ (omitting τ and x) as is common in the literature. Define $y(w) \equiv w \cdot l(w)$.

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- **Definition:** The basic set of tax systems is defined to be

$$T \equiv \{\tau : \mathbb{R} \to \mathbb{R} | \tau \text{ is measurable}\}$$

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- Let the cost function for the public good in terms of consumption good be $H(x)$, which is assumed to be C^2.

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Basic Assumptions - Motivation

- *These basic assumptions will be maintained throughout the remainder of this paper.*
- We will now use ideas inspired by Bergstrom and Cornes (1983) to obtain a unique Pareto optimal level of public good for each draw, so the revenue requirement function is well-defined.
- The major assumption that we make to obtain results, beyond requiring sufficient revenue to finance the public good for each draw, is that utility is quasi-linear and separable to a certain degree (examples will follow main theorem):

Basic Assumptions

- *Assumptions:*

$$u(c, l, x, w) = c + b(l, w) + r(x, w)$$

We assume throughout that $\partial b / \partial l \leq 0$ a.s., $\partial^2 b / \partial l^2 < 0$, $\left.\frac{\partial b(l, \overline{w})}{\partial l}\right|_{l=1} \leq -\overline{w}$, $b(1, \underline{w}) - b(0, \underline{w}) \geq -\underline{w}$, $\frac{\partial b(l, w)}{\partial l}$ is weakly increasing in w, $\partial r / \partial x > 0$, $\partial^2 r / \partial x^2 < 0$; $dH(x) / dx > 0$ and $d^2 H(x) / dx^2 \geq 0$.

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2. If MWTP for public good depends on c or l $\Longrightarrow$ R depends on τ, τ depends on R
3. H is not CRS $\Longrightarrow$ $\pi > 0$. But utility is quasi-linear, so profit distribution doesn't matter.

Boundary Conditions on the Cost Function for the Pure Public Good

For all $w \in [\underline{w}, \overline{w}]$, $\partial r(x, w)/\partial x \mid_{x=0} > dH(x)/dx \mid_{x=0}$, *and* $k \cdot \partial r(x, w)/\partial x \mid_{x=H^{-1}(k\underline{w})} < dH(x)/dx \mid_{x=H^{-1}(k\underline{w})}$.

Pareto Optimal Pure Public Good Provision

- **Lemma 1:** Under the basic assumptions listed above, for any given draw $(w_1, w_2, ...w_k)$, there exists an interior Pareto optimal allocation; moreover, for all interior Pareto optimal allocations, the public good level x^* is the same.

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- **Proof:** Lindahl-Samuelson Condition:

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- $$R(w_1, w_2, ..., w_k) \equiv H(x^*(w_1, w_2, ..., w_k)).$$

The Feasible Set

Let $F \subseteq T$ be the *feasible set* defined by:

$$F \equiv \left\{ \quad \tau \in T \mid \text{a.s. for } (w_1, w_2, \ldots, w_k) \in \mathcal{A}, \right.$$
$$\left. \sum_{i=1}^{k} \tau(y(w_i)) \geq R(w_1, w_2, \ldots, w_k) \right\}.$$

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- Outcome is dependent on draw.

The Game

- Our game is as follows. First, the government constructs the set of feasible tax systems, namely those that will fund every Pareto optimal level of public goods without knowledge of types in the draw, and commits to not using information it receives from voting over this set in later stages of the game. Then the types are drawn and each person learns their type. The players in the draw vote over income taxes, choosing a majority rule winner. Then the income tax is implemented, workers choose their labor supplies, and

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- the public good level is selected as the one that is Pareto optimal.
- The government is passive. It doesn't remember revelations from previous stages of the game. For example, it doesn't remember how you voted when determining your income tax liability. It doesn't remember your income tax liability or how you voted when determining the public good level.

Why focus on efficient public good provision?

In general, since the income tax is distorting labor supply, it might be better to have a lower level of public good provision and lower distortion (particularly for draws consisting of all lower types). However, in that case, some might wish to raise the level of public good through voluntary contributions.

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Additional Assumptions

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- Since R is derived from efficient levels of public good production, assumptions on both the consumer and producer side of the model are required.
- A complicating factor is that aggregate revenue requirements derived here depend not only on the first derivative of the cost function, but on its level as well.

Main Result

- **Definition:** A utility function - production function pair (u, H) is called *manageable* if the following conditions hold:

$u(c, l, x, w) = c + b(l, w) + w \cdot s(\widehat{r}(x))$, $H(x) = m \cdot \widehat{r}(x)$, where $\widehat{r}'(x) > 0$, $\widehat{r}''(x) \geq 0$, $s'(r) > 0$, $s''(r) < 0$, $2s''(r)^2 > s'''(r) \cdot s'(r)$, $m > 0$.

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- **Theorem 1:** Let $k \geq 2$ and let (u, H) be manageable. Then there exists a majority rule equilibrium that is the favorite tax system of a median of the draw.

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- Government doesn't remember revelations from previous stages of the game. It's passive.
- Assume Pareto efficient level of public goods provision is implemented. V**C**G or renegotiation proof.

Examples

- A. $u(c, l, x, w) = c + b(l, w) + w \cdot s(x)$, $H(x) = m \cdot x$, where $\widehat{r}(x) = x$, $s'(x) > 0$, $s''(x) < 0$, $s'''(x) \leq 0$, and $m > 0$.

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- B. $u(c, l, x, w) = c + b(l, w) + \phi \frac{w}{1-\alpha} x^{1-\alpha}$, $H(x) = \frac{m}{\beta} \cdot x^{\beta}$, with $\alpha > 1$, $\beta \geq 1$, $\phi > 0$.

Complaints

- Remark on the literature: Linear taxes aren't second best P.O. unless they are lump sum taxes: Top MR=0. They are Pareto dominated, so worse for *all* draws.

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- Using likelihood of draws. Robustness?
- Excess Revenues
- As in the rest of the literature, we use Condorcet winner / voting core in the context of asymmetric information. Better - equilibrium of a noncooperative game.

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