Economics 2450A: Public Economics and Fiscal Policy I

Section 10: Generalized Social Welfare Weights (Applications)

Michael Droste

Fall 2022

Outline

1. Looking Ahead: NDPF and Capital Taxation
2. Generalized Marginal Social Welfare Weights (Saez and Stantcheva 2016)
    - Setup (Review from last week)
    - Example: Equality of Opportunity
    - Example: Poverty Alleviation

Today and Next Month

- Today, we'll discuss some additional material from last week's lecture on the theory of social preferences. The key reading for this week is the same as last week: Saez and Stantcheva (2016).

- Two topics in the remainder of the course, new dynamic public finance and capital taxation.

- New dynamic public finance is probably the hardest theory element of the course: lots of open research questions here. So bring your thinking caps to class! Begins to bring in more complicated modeling elements to our tax problems: dynamics and shocks, general equilibrium.

- Capital taxation is fun, important, and highly related to the optimal taxation elements we've seen elsewhere in the course.

Setup

- Recall that the key thing that distinguishes 'generalized' marginal social welfare weights g_i from the marginal social welfare weights that appeared in the first few weeks of class is that they're not necessarily derived from a social welfare function.

- Otherwise, generalized marginal social welfare weights are given the same notation (g_i) and appear in exactly the same way that good old fashioned marginal social welfare weights do in our theories of optimal taxation.

- Key advantage is that they can be taken to data, i.e. through surveys to elicit *social preferences* from people. Today we'll try to walk through an example of this.

Generalizing the Marginal Social Welfare Weights

- This week's lecture and section follow Saez and Stantcheva (AER, 2016). This paper is super readable, and should be a good reference for you if any of this material needs further clarification. I also promise it's a fun paper to read. Read this paper!

- The objective of Saez and Stantcheva is to think about a broader class of g_i's in our optimal tax formulae that are potentially not defined in terms of the social welfare function. These 'generalized' weights will behave exactly like the g_i's we have seen before, and appear in our tax formulae in the same way.

- Generalized social welfare weights also exhibit some nice theoretical properties, like local Pareto optimality (review: what do you think this means?) when non-negative for all i.

Saez and Stantcheva (2016): Setup

- Unit mass of households indexed by i maximize utility functions of the form:

$$u_i = u\big(c_i - v(z_i; x_i^u, x_i^b)\big)$$

where c_i is household i's consumption, z_i is household i's earnings, and x_i^u, x_i^b are sets of individual-specific characteristics (more below).

- Functions u and v are common to all individuals; u assumed increasing and concave, v assumed increasing and convex, both differentiable everywhere.

- Characteristics x^u enter only in utility function, not in social welfare weights; characteristics x^b enter in both utility and social welfare weights.

Saez and Stantcheva (2016): Setup

- Define the generalized social marginal welfare weight as:

$$g_i = g(c_i, z_i; x_i^s, x_i^b)$$

where c and z are consumption and earnings, x_i^s represents individual-specific characteristics that only impact the social welfare weight (does not appear in previous slide!) and x_i^b are individual-specific characteristics that impact both the social welfare weight and utility.

Individual Characteristics

- We have three sets of individual-specific characteristics: x_i^s, x_i^u, x_i^b. It's worth reminding ourselves what each of these must satisfy:
- x_i^u: characteristics that impact utility, but not social welfare weights.
- x_i^b: characteristics that impact both utility and social welfare weights
- x_i^s: characteristics that impact social welfare weights, but not utility
- Naturally, we do not need to worry about characteristics that neither impact utility nor social welfare weights. Otherwise, these definitions form a partition over individual characteristics.

Individual Characteristics and Redistribution

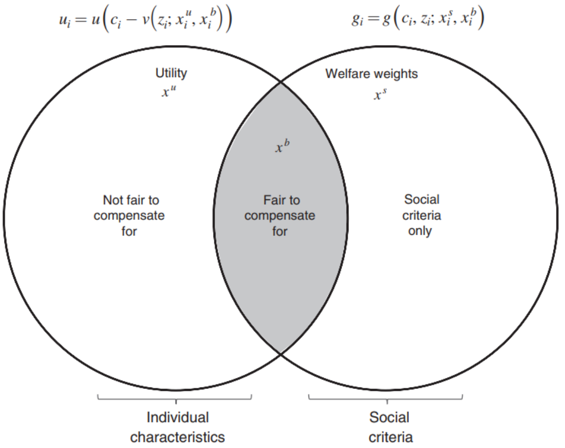

FIGURE 1. GENERALIZED SOCIAL WELFARE WEIGHTS APPROACH

Notes: This figure depicts the three sets of individual characteristics x^b, x^u, and x^s. Characteristics x^u enter solely the utility function (i.e., they affect individual utilities and choices). Characteristics x^s enter solely the generalized social welfare weights (i.e., they affect how society values marginal transfers to each individual). Characteristics x^b enter both the utility function and social weights.

Individual Characteristics: Aggregation

- Suppose that x_i^b includes, for instance, height (like the Mankiw paper about Talls vs. Shorts we discussed for tagging/commodity taxation.

- If the government can observe height: construct average social welfare weights by aggregating at each (z, x^b)

- If the government cannot observe height (just earnings), construct average social welfare weights by aggregating at each z instead.

Example: Equality of Opportunity

- This example is lifted from Saez and Stantcheva (2016), Section III, Part A.

- Suppose that there are a large number of households indexed by i with utility:

$$u\big(c_i - v(z_i/w_i)\big)$$

  where c_i and z_i represent i's consumption and labor supply, and w_i is ability to earn.

- Suppose that w_i is determined by two things:
  1. Family background $B_i \in \{0, 1\}$ (poor = 0, rich = 1), which individuals cannot control
  2. Merit r_i, which individuals can control in some way

  also assume that $w_i(r_i, B_i = 1) > w_i(r_i, B_i = 0)$ for all r_i.

- Review question: In words, what does the inequality above mean?

Example: Equality of Opportunity

- Define average consumption at rank r:

$$\bar{c}(r) = \frac{1}{Pr(r_i = r)} \cdot \int_{i:r_i=r} c_i di$$

- Equality of opportunity captured by the generalized social marginal welfare weights:

$$g_i = g\left(c_i; \bar{c}(r)\right) = \mathbb{1}\left(c_i \leq \bar{c}(r_i)\right)$$

  where $\mathbb{1}$ is an indicator function = 1 if $c_i \leq \bar{c}(r_i)$ and 0 otherwise.

- Review question: In what sense do the weights capture equality of opportunity in this setting? Who are the weights concentrated on? How does this relate to B_i?

- Review question: Recall that in the generalized marginal social welfare weights framework, 3 types of individual characteristics: x^s, x^u, x^b. Where does $\bar{c}(r_i)$ belong? What about w_i?

Example: Equality of Opportunity

- Suppose government does not observe B_i; taxes/transfers based only on earnings z.
- For any $T(z)$ with $T'(z) < 1$, conditional on rank r, individuals with $B_i = 1$ (advantaged) earn and consume more than individuals with $B_i = 0$ (disadvantaged). So $g_i = 1$ for $B_i = 0$, $g_i = 0$ for $B_i = 1$.
- Aggregate the weights at each level of z: $\bar{G}(z)$ is the fraction of individuals from disadvantaged background earning at least z relative to population share of disadvantaged. This is known as the representation index.
- Equality of opportunity therefore provides a rationale for social welfare weights that decrease with income: completely independent of the standard utilitarian channel of decreasing marginal utility of consumption!

Example: Equality of Opportunity

- How do we take this to data (e.g. Raj's intergenerational mobility statistics)?
- Define low background as having parents from the bottom half of the parental income distribution.
- $\bar{G}(z)$ is simple to compute: share of below-median parental income parents at each income level z times two (share of low-income kids is 0.5).
- Fraction of kids from below-median parental income at the 99.9th percentile of income distribution is 0.165, so $\bar{G}(z)$ for z corresponding to 99.9th percentile is $0.165 \times 2 = 0.33$.
- Plugging this into our optimal top tax formula, $\tau^* = \frac{1-\bar{G}}{1-\bar{G}+\alpha \cdot e}$ for $e = 0.5$, $\alpha = 1.5$ (calibrated from tax data on income distribution), we get $\tau^* = \frac{1-1/3}{1-1/3+0.5 \cdot 1.5} = 0.47$ at the top (99.9th percentile).

Example: Equality of Opportunity

Table 2—Equality of Opportunity versus Utilitarian Optimal Tax Rates

	Equality of opportunity			Utilitarian (log-utility)	
	Fraction from low background (= parents below median) above each percentile (1)	Implied social welfare weight $\bar{G}(z)$ above each percentile (2)	Implied optimal marginal tax rate at each percentile (in percent) (3)	Utilitarian social welfare weight $\bar{G}(z)$ above each percentile (4)	Utilitarian optimal marginal tax rate at each percentile (in percent) (5)
Income percentile					
z = 25th percentile	0.443	0.886	53	0.793	67
z = 50th percentile	0.373	0.746	45	0.574	58
z = 75th percentile	0.303	0.606	40	0.385	51
z = 90th percentile	0.236	0.472	34	0.255	42
z = 99th percentile	0.170	0.340	46	0.077	54
z = 99.9th percentile	0.165	0.330	47	0.016	56

Notes: This table compares optimal marginal tax rates at various percentiles of the distribution (listed by row) using an equality of opportunity criterion (in column 3) and a standard utilitarian criterion (in column 5). Both columns use the optimal tax formula $T'(z) = [1 - \bar{G}(z)]/[1 - \bar{G}(z) + \alpha(z) \cdot e]$ discussed in the text where $\bar{G}(z)$ is the average social marginal welfare weight above income level z, $\alpha(z) = (zh(z))/(1 - H(z))$ is the local Pareto parameter (with $h(z)$ the density of income at z, and $H(z)$ the cumulative distribution), and e the elasticity of reported income with respect to $1 - T'(z)$. We assume $e = 0.5$. We calibrate $\alpha(z)$ using the actual distribution of income based on 2008 income tax return data (and ignoring the effects of changing taxes on $\alpha(z)$). For the equality of opportunity criterion, $\bar{G}(z)$ is the representation index of individuals with income above z who come from a disadvantaged background (defined as having a parent with income below the median). This representation index is estimated using the national intergenerational mobility statistics of Chetty et al. (2014) based on all US individuals born in 1980–1981 with their income measured at age 30–31. For the utilitarian criterion, we assume a log-utility so that the social welfare weight $\bar{g}(z)$ at income level z is proportional to $1/(z - T(z))$.

Example: Poverty Gap Minimization

- Suppose we define an exogenous level of consumption $\bar{c}$ as the poverty threshold. Anyone with disposable (after-tax) income $< \bar{c}$ is poor.

- Again, assume utility is $u_i = u(c_i - v(z_i/w_i))$.

- Natural way to minimize poverty in our generalized social welfare weight framework is to simply set $g_i = 1$ if $c < \bar{c}$ and $g_i = 0$ if $c \geq \bar{c}$.

- Review question: Recall our three types of individual characteristics, x^s, x^u, x^b. Where do w_i and $\bar{c}$ belong?

Example: Poverty Gap Minimization

- Again assume that government can only base a nonlinear tax system on earnings z.
- Notation: let $\bar{z} = \bar{c} + T(\bar{z})$ implicitly define $\bar{z}$, pretax income needed (given tax schedule) for poverty threshold consumption $\bar{c}$. Let h and H denote pdf and cdf of pretax income distribution.
- Normalizing social welfare weights so they integrate to 1 ($\int_i \bar{g}(z_i)di = 1$) implies $\bar{g}(z) = 1/H(\bar{z})$ for $z \leq \bar{z}$, 0 otherwise. This is just for convenience; social welfare weights are only unique up to multiplicative constant.
- Aggregating from z to ∞ to define average generalized social welfare weight above z, $\bar{G}(z) = \int_z^{\infty} \bar{g}(s)dh(s)/(1 - H(z))$, yields $\bar{G}(z) = \frac{(1-H(z)/H(\bar{z}))}{1-H(z)}$ for $z \leq \bar{z}$ and 0 otherwise.

Example: Poverty Gap Minimization

- Optimal nonlinear tax generically satisfies:

$$T'(z) = \frac{1 - \bar{G}(z)}{1 - \bar{G}(z) + \alpha(z) \cdot e(z)} \quad \text{for all } z$$

- Last slide, found $\bar{G}(z)$ is piecewise. Plugging it in yields piecewise optimal nonlinear tax:

$$T'(z) = \frac{1}{1 + \alpha(z) \cdot e(z)} \qquad \text{if} \quad z \geq \bar{z}$$

$$T'(z) = \frac{[1/H(\bar{z}) - 1]H(z)}{[1/H(\bar{z}) - 1]H(z) + \alpha(z)[1 - H(z)] \cdot e(z)} \qquad \text{if} \quad z < \bar{z}$$

- Review question: Is the optimal tax continuous at $\bar{z}$?

Example: Poverty Gap Minimization

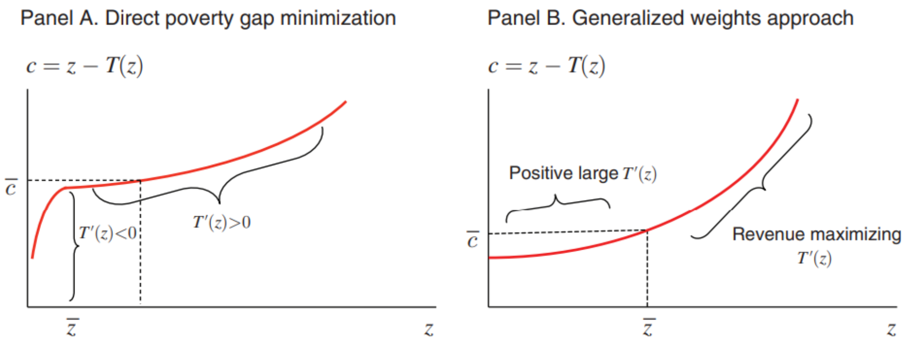

FIGURE 2. OPTIMAL POLICIES FOR POVERTY GAP MINIMIZATION

Notes: The figure displays the optimal tax schedule for poverty gap alleviation in a (pretax income z, posttax income $c = z - T(z)$) plane. Panel A plots the schedule for the approach that consists of directly minimizing the poverty gap (Kanbur, Keen, and Tuomala 1994). The marginal tax rate is negative below the poverty threshold $\bar{z}$. Panel B plots the schedule derived using generalized welfare weights concentrated on those in poverty. The optimal tax schedule is similar to the standard utilitarian case with high marginal tax rates at the bottom.

Taking Stock

- A huge benefit of the Saez (2001) framework for optimal taxation is that the equity-efficiency trade-off is captured robustly by an aggregated social welfare weight (equity) and the relevant taxable income elasticity (efficiency).
- Saez and Stantcheva (2016) point out that the social welfare weights need not be derived from an underlying social welfare function, and can capture preferences for redistribution very generally while accounting for behavioral responses / efficiency costs of taxation.
- You can be creative! Nice project for final paper in this course is to think about different environments where we could imagine applying this framework.