POLITICAL ECONOMY AND THE SOCIAL MARGINAL COST OF PUBLIC FUNDS: THE CASE OF THE MELTZER-RICHARD ECONOMY

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In previous studies on the social marginal cost of public funds (SMCF), the existing tax system has been assumed to be either arbitrary or optimal. This note explores another possibility: the existing tax system itself represents a political equilibrium. Our exploration proceeds in Meltzer and Richard's (1981) political economy of redistributive taxation. An interesting feature of our finding is that the degree of income inequality as measured by the ratio of mean to median income can play an important role in estimating the SMCF and judging whether the level of redistribution is excessive or inadequate. (*JEL* D61, D72, H21)

I. INTRODUCTION

The marginal cost of public funds (MCF) is defined as the full cost to the private sector of raising an additional dollar of tax revenue, including deadweight loss or excess burden of taxation imposed on taxpayers. Much of the theoretical literature on the MCF is cast in the framework of a one-consumer economy. However, the main reason why we have distortionary taxes in the first place is precisely because of the need for redistribution or the existence of consumers with heterogeneity. In view of this inconsistency, several papers, including Dahlby (1998) and Sandmo (1998), have recently started addressing the so-called "social marginal cost of public funds" (SMCF) in models with heterogenous consumers.[1] These papers highlight how the redistributive concern may alter the calculation of the SMCF.[2]

In previous studies on the MCF or SMCF, the existing or status quo tax system has been assumed to be either arbitrary or optimal.[3] It is arguable, however, that the existing tax system is neither arbitrary nor optimal but rather represents a political equilibrium. The approach adopted by Hettich and Winer (1999) and Persson and Tabellini (2000) corroborates this argument. In surveying the political economy of public finance, the authors of these two books explicitly portrayed public policy as the equilibrium outcome of some specified political process.

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1. Following Dahlby (1998), we make a distinction between the MCF and the SMCF. The cost of raising an additional dollar of tax revenue is distributionally weighted in the latter term, while it is unweighted in the former. The distributional weights of the SMCF are derived from a social welfare function that reflects the society's distributional preferences.

2. Browning and Johnson (1984) and Ballard (1988) have estimated the so-called "marginal efficiency cost of redistribution" (MECR) for using "demogrants" to redistribute income in the United States. In words, the MECR is defined as the excess loss to other members of society when the low-income groups are made better off by a dollar. For the connection between the MCF and the MECR, see Ballard (1991) and Dahlby and Ruggeri (1996).

3. To our knowledge, Sandmo (1998) is the only paper that considers the possibility that the existing tax system is optimal.

ABBREVIATIONS

F-H: Fuest and Huber (2001)
MCF: Marginal Cost of Public Funds
MECR: Marginal Efficiency Cost of Redistribution
M-R: Meltzer and Richard (1981)
MUI: Marginal Utility of Income
RHS: Right Hand Side
SMCF: Social Marginal Cost of Public Funds

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In this note, we study the SMCF issue on the basis of the plausible premise that the existing tax system itself represents a political equilibrium. The calculation of the SMCF is basically a normative exercise. The premise that the existing tax system is a policy outcome in political equilibrium will enable us to exploit the positive property of political equilibrium in this normative exercise.

As an illustration of our approach, we revisit the political economy of redistributive taxation as set out in Meltzer and Richard (1981) (hereafter, M-R). The M-R model holds a prominent position in the redistribution literature and has been elaborated and extended in many directions (Persson and Tabellini 2000, Part II).[4] Section II overviews the M-R model. Sections III and IV derive and discuss the SMCF in the M-R economy. An interesting feature of our finding is that the degree of income inequality as measured by the ratio of mean to median income can play an important role in estimating the SMCF and judging whether the level of redistribution is excessive or inadequate.

II. THE M-R MODEL

A. Economy

Consider an economy in which there are $n < \infty$ individuals. Each individual is characterized by a wage rate w^i ($i = 1, \ldots, n$). There are two commodities in the economy: a consumption good c and leisure l. The consumption good is taken as the numeraire. The preferences of individuals qua consumers are represented by a common utility function:

$$(1) \qquad u^i = u(c^i, l^i), \quad i = 1, \ldots, n.$$

This utility function is assumed to be smooth and possess the usual properties.

The income tax system consists of two parameters: a marginal tax rate t and a lump-sum grant a. The tax system pays the lump-sum grant or "demogrant" a to each individual and finances the payment by imposing the marginal tax rate t on all earned income.[5]

The budget constraint facing individual i is:

$$(2) \qquad c^i = (1-t)w^i L^i + a, \quad i = 1, \ldots, n.$$

where L^i denotes the labor supply with $L^i + l^i = 1$. From Equations (1) and (2), we can derive the indirect utility function:

$$(3) \qquad v^i = v((1-t)w^i, a) = u((1-t)w^i L^i + a, 1 - L^i), \quad i = 1, \ldots, n.$$

It is assumed that the government budget is balanced. Denoting per capita pretax income by y, we then have:

$$(4) \qquad ty = a$$

where $y = \sum y^i/n$ with $y^i = w^i L^i$.

B. Political Economy

The preferences of individuals qua voters over income tax policy are represented by the indirect utility function (3). Applying the envelope theorem to Equation (3), we obtain

4. The M-R model can be extended to the case where non-redistributive government expenditures are exogenously set. This extension will enable one to focus on the SMCF for redistributing income and, at the same time, incorporate other activities of government into the model. The focus on redistributive taxation may not be a bad research strategy in view of the fact that income redistribution constitutes the most dramatic rise in government activities during the past century (Tanzi and Schuknecht 2000).

5. This tax system is known as the "linear income tax" in the taxation literature. It is also referred to as a "demogrant policy" in Browning and Johnson (1984) and Ballard (1988). The redistribution through the linear income tax or the demogrant policy may be criticized for being unrealistic in that transfer receipts include the rich as well as the poor. Browning and Johnson (1984), however, emphasized that only the net effect of the taxes and transfers is crucial for redistribution. They provided evidence that the demogrant policy can have distributional implications similar to those resulting from the entire actual tax and transfer system. It should be noted that the demogrant policy may not be the most efficient way of redistributing income, since the demogrant is a work disincentive and the marginal tax rate may be likely to be so as well. Zeckhauser (1971) argued that the optimal scheme for income transfer requires a wage subsidy rather than a wage tax. Ballard (1988) found using U.S. data that the MECR through a wage subsidy is far less than that through a demogrant and can be negative. Both the U.S. Earned Income Tax Credit and the U.K. Working Families Tax Credit are wage subsidy programs designed to encourage work among welfare recipients. For the labor supply effect of various redistributive programs both theoretically and empirically, see Moffitt (2002).

the marginal rate of substitution between t and a for individual i:[6]

$$(5)\quad (\mathrm{d}a/\mathrm{d}t)_{v^i=\bar{v}^i} = -(\partial v^i/\partial t)/(\partial v^i/\partial a) = y^i.$$

From Equation (4), we also have the marginal rate of transformation between t and a:

$$(6)\qquad \mathrm{d}a/\mathrm{d}t = y + t(\mathrm{d}y/\mathrm{d}t),$$

where the second right-hand–side (RHS) term has to do with the change in the tax base. Note that if $\mathrm{d}y/\mathrm{d}t = 0$, then $\mathrm{d}a/\mathrm{d}t = y$, which indicates that an increase in the tax rate can accommodate an increase in the demogrant of the same proportion.

The individually preferred tax rate is implicitly determined by equating Equation (5) with Equation (6), that is:

$$(7)\qquad y^i - y = t(\mathrm{d}y/\mathrm{d}t).$$

Imposing the minor assumption that both consumption and leisure are normal goods, M-R were able to show that the voter with median income is decisive under simple majority voting. Thus, the political equilibrium is characterized by (M-R's Equation 13):

$$(8)\qquad y^m - y = t(\mathrm{d}y/\mathrm{d}t),$$

where y^m denotes the median income of the economy. The value of $y^m - y$ is negative for most societies since positively skewed income distributions are most often observed in the real world.[7]

In Equation (7), each voter trades off the marginal redistributive benefit from taxation (in the form of the deviation between his own income and the economy's mean income, the left hand side) against the marginal distortionary cost of taxation (in the form of a smaller tax base, the RHS). The political equilibrium (Equation 8) results from the balancing of this trade-off by the decisive median income voter. We exploit the property of this equilibrium in our calculation of the SMCF in the next section.

6. Applying the envelope theorem to Equation (3) yields $\partial v^i/\partial t = -(\partial u/\partial c^i)w^iL^i$ and $\partial v^i/\partial a = \partial u/\partial c^i$.

7. The "median income" should more precisely be called the "median earning" since there are only earnings in the M-R model. Around the world, earnings primarily dominate income distributions.

III. SMCF FOR REDISTRIBUTION

The previous section has characterized the political equilibrium in the M-R model. How well or badly does this equilibrium perform? To answer this question, we clearly need some criterion to evaluate the performance. Our criterion is assumed to follow the Benthamite social welfare function:

$$(9)\qquad W = \sum v^i.$$

Adopting this criterion raises the question as to the compatibility of evaluating outcomes using a social welfare function when the median voter is decisive. Before proceeding to the SMCF calculation, we briefly justify the adoption of the welfare criterion (Equation 9) in the M-R model.

Following Buchanan and Tullock (1962) and Rae (1969), one may assume that, before the actual policy decision is made, there exists a constitutional stage at which individuals select the rules of public choice. The resolution of the redistribution issue then involves two steps: the selection of a decision rule at the constitutional stage and the actual redistributive policy decision under the chosen rule. Although useful in practice, this two-step approach to redistribution is the second-best solution when compared with the "ideal" that individuals *directly* determine the actual redistributive policy under the veil of ignorance at the constitutional stage. It can be shown à la Harsanyi (1955) that individuals will choose the actual redistributive policy that maximizes a Benthamite objective function as expressed in Equation (9) if it is assumed under the veil of ignorance at the constitutional stage that each individual has an equal probability of occupying any position in the distribution of endowments.[8] As such, the welfare evaluation

8. Each individual in the M-R economy is distinguished by a wage rate w^i (endowment). Under the veil of ignorance, individual i faces the $1/n$ probability of occupying w^j ($j = 1, \ldots, n$). This leads to the expected utility $(1/n)\sum v^i$. Given n, maximizing this expected utility is equivalent to maximizing Equation (9). In contrast to the Benthamite objective of maximizing the sum of individual utilities, the Rawlsian objective on the basis of Rawls' (1971) *Theory of Justice* is to maximize the welfare of the worst-off individual (the so-called max-min criterion). A possible interpretation of the max-min criterion is that individuals possess infinite risk aversion toward realized outcomes behind the veil of ignorance (Atkinson and Stiglitz 1980, 340).

of a median voter equilibrium need not be incompatible. On the one hand, a decision rule such as the simple majority will be selected at the constitutional stage so that the median voter is decisive in the actual redistributive policy decision. On the other hand, one can take the Benthamite welfare function (Equation 9) as a normative construct to evaluate the "second-best" median voter equilibrium.

A. Calculation

We turn to calculating the SMCF for increasing redistribution in the M-R economy.

Applying the envelope theorem to Equation (3), we have from Equation (9):

$$(10)\qquad dW = (\partial W/\partial a)da + (\partial W/\partial t)dt = \sum \lambda^i da - \sum \lambda^i y^i dt,$$

where λ^i denotes the marginal utility of income (MUI) for individual i. Dividing Equation (10) by da and then using Equation (6) yield:

$$(11)\qquad dW/da = \sum \lambda^i - \sum \lambda^i y^i \times [1/(y + t(dy/dt))].$$

The amount of public expenditure will increase \$$n$ in the M-R economy if the size of the demogrant is raised by \$1 (i.e., da = \$1). Since the SMCF is defined in terms of raising an additional dollar of tax revenue from the economy, we divide dW/da in Equation (11) by n. This leads to:

$$(12)\qquad (dW/da)/n = \sum \lambda^i/n - \sum (\lambda^i y^i/n)[1/(y + t(dy/dt))],$$

where the first RHS term is the social marginal benefit from increasing the lump-sum transfer a by \$(1/n) (SMB_a), as evaluated according to a utilitarian social welfare function, and the second RHS term is the associated SMCF from increasing the tax rate t ($SMCF_t$).

Now, assume that the status quo tax system represents a political equilibrium resulting from simple majority voting. This assumption implies that Equation (8) is satisfied at the status quo. Using Equation (8), $SMCF_t$ as defined in Equation (12) can be expressed as:

$$(13)\qquad SMCF_t = \sum (\lambda^i y^i/ny)(y/y^m).$$

The intuition behind Equation (13) obviously has to do with the political equilibrium characterized by Equation (8). We shall elaborate on it later.

Let us define the normalized covariance between λ^i and y^i in a way similar to that in Sandmo (1998, Equation 21):

$$(14)\qquad \delta = -\mathrm{Cov}(\lambda^i, y^i)/\lambda y = 1 - \sum \lambda^i y^i/n\lambda y,$$

where $\lambda = \sum \lambda^i/n$, the average MUI. Sandmo interpreted δ as the distributional characteristic of the marginal tax rate, measuring the correlation between the tax base y^i and the MUI λ^i. The sign of δ is positive, since y^i is increasing in w^i but λ^i is decreasing in w^i. The value of δ is strictly smaller than 1 since from Equation (14): $1 - \delta = \sum \lambda^i y^i/n\lambda y > 0$.[9]

Note that the $SMCF_t$ in Equation (13) is expressed in terms of utility. Normalizing the $SMCF_t$ by the average MUI and using Equation (14), we obtain:[10]

$$(15)\qquad SMCF_t/\lambda = SMCF_t/SMB_a = \sum (\lambda^i y^i/n\lambda y)(y/y^m) = (1 - \delta)(y/y^m).$$

The first equality results because the average MUI $\lambda = \sum \lambda^i/n$ happens to represent the SMB_a according to Equation (12). For ease of exposition, we shall call the term $SMCF_t/\lambda$ the "normalized" $SMCF_t$. On the basis of Equation (15), we have:

PROPOSITION 1. *The normalized* $SMCF_t$ *for increasing redistribution in the M-R economy will be greater than/smaller than/equal to 1 according to whether the ratio of median income to mean income in the economy is smaller than/greater than/equal to* $1 - \delta$.

It is clear that the *optimal* utilitarian redistribution is determined by dW/da = 0 in Equation (12) so that $SMCF_t/SMB_a = 1$. Since the normalized $SMCF_t$ equals $SMCF_t/SMB_a$, Proposition 1 thus provides a way of telling whether the redistribution through a lump-sum transfer in the M-R economy is excessive

9. See Sandmo (1998) for a more detailed discussion on the value of δ.

10. Sandmo (1998) also normalized or divided the SMCF in his model by the average MUI.

(i.e., $SMCF_t/SMB_a > 1$) or inadequate (i.e., $SMCF_t/SMB_a < 1$).

M-R (1981) regarded the deviation between mean and median income as a metaphor for income inequality in the economy. Following M-R and viewing the ratio y/y^m as a metaphor for income inequality, we see from Proposition 1 that a high (low) y/y^m tends to be associated with excessive (inadequate) redistributive taxation from a utilitarian social welfare perspective.

In what follows, we illustrate the application of Proposition 1 through an example. According to Equation (15), to calculate the normalized $SMCF_t$, we need to know both the ratio y^m/y and the value $1 - \delta$. The ratio y^m/y is readily available. However, the calculation of δ requires the estimation of the MUI across income classes.[11]

B. An Illustrative Example

Blue and Tweeten (1997) constructed a quality of life index as a proxy for utility from social-psychological variables. They considered four functional forms (quadratic, Cobb-Douglas, square root, and semilog) to examine how utility will respond to changes in income and other sociodemographic variables empirically. Normalizing MUI to unity at the mean income, the MUI formulas estimated by Blue and Tweeten are as follows (see their Figures 1–4):

$$\text{Quadratic: MUI} = 1.5065 - 0.5065(y^i/y);$$

$$\text{Cobb-Douglas: MUI} = (y^i/y)^{-0.9073};$$

$$\text{Square root: MUI} = -0.4242 + 1.4242 \times (y^i/y)^{-0.5};$$

$$\text{Semilog: MUI} = 1/(y^i/y).$$

Blue and Tweeten found that the quadratic equation has the best fit of the data, but it is theoretically implausible for high incomes because the MUI becomes zero or negative beyond a certain point. On the other hand, the other three equations exhibit theoretically plausible MUI curves for high incomes but implausibly assume infinite utility from the first unit of income. Since the square root function is slightly preferred to measure MUI at higher income levels than the Cobb-Douglas and the semilog function in terms of goodness of fit, Blue and Tweeten (1997, 169) suggested an option for practitioners: "weight dollars by income groups with MUIs from the quadratic function for income below the mean and from the square root function for income above the mean." Our calculation of δ follows their suggestion.

TABLE 1
Pretax Income Distribution

Year	Lowest Fifth	Second Fifth	Third Fifth	Fourth Fifth	Highest Fifth
1976	$3,278	$7,780	$12,762	$18,521	$32,320
1981	4,836	11,589	19,141	28,512	49,942
1986	5,944	14,961	24,979	37,622	70,340
1990	7,195	18,030	29,781	44,901	87,137

Notes: Entries represent mean household income received by each fifth; data are from *Current Population Survey, Annual Social and Economic Supplements* of U.S. Census Bureau (2004).

The data used to construct the measure of utility in Blue and Tweeten (1997) are obtained from personal interview surveys conducted in selected years from 1976 to 1990 by the National Opinion Research Center. To be consistent with their study, we pick four years (1976, 1981, 1986, and 1990) for our calculation of δ. Table 1 lists the pretax income distributions for these 4 yr. On the basis of Table 1, the value of $1 - \delta$ according to Equation (14) is found to be 0.804 (1976), 0.797 (1981), 0.780 (1986), and 0.774 (1990). Table 2 lists the ratio y^m/y for each of these 4 yr, which equals 0.850 (1976), 0.837 (1981), 0.809 (1986), and 0.801 (1990).[12] Since the ratio y^m/y is greater than the value $1 - \delta$ for each of them, we may conclude based on Proposition 1 that the level of redistribution is inadequate in the U.S. economy in these years.

C. Arbitrary vs. Nonarbitrary Tax System

A tax system can be arbitrary or nonarbitrary. In terms of the M-R economy, an arbitrary tax

11. See Blue and Tweeten (1997) for an overview of the empirical work on this issue.

12. This widening inequality in the U.S. income distribution is consistent with the pattern documented in Levy and Murnane (1992).

TABLE 2
Median and Mean Income

Year	Median	Mean	Median/Mean
1976	$12,686	$14,922	0.850
1981	19,074	22,787	0.837
1986	24,897	30,759	0.809
1990	29,943	37,403	0.801

Note: Data are from *Current Population Survey, Annual Social and Economic Supplements* of U.S. Census Bureau (2004).

system is associated with any tax rate t and demogrant a that satisfy the budget-balanced constraint Equation (4), while a nonarbitrary tax system is associated with some particular tax rate t and demogrant a that satisfy the budget-balanced constraint Equation (4). In this subsection, we elaborate on our previous finding in light of the differences between the arbitrary and the nonarbitrary tax system.

According to Equation (12),

$$(12-1)\quad \text{SMCF}_t = \sum(\lambda^i y^i/ny)[1/(1-\varepsilon)]$$

where $\varepsilon = -(\mathrm{d}y/\mathrm{d}t)(t/y)$, the elasticity of the per capita tax base with respect to the tax rate. Normalizing the SMCF_t in Equation (12-1) by the average MUI gives:

$$(16)\quad \begin{aligned}\text{SMCF}_t/\lambda &= \text{SMCF}_t/\text{SMB}_a \\ &= \sum(\lambda^i y^i/n\lambda y)[1/(1-\varepsilon)] \\ &= (1-\delta)/(1-\varepsilon),\end{aligned}$$

where the last equality results because of Equation (14). Now, suppose that the government did not have any distributional preferences so that a dollar is a dollar whoever it goes to or comes from. Since $\lambda^i = 1$ for all i in this case, we obtain $\lambda = \lambda^i = 1$, and $\delta = 0$ from Equation (14). According to Equation (16), we then have:

$$(16-1)\quad \begin{aligned}\text{SMCF}_t &= \sum(y^i/ny)[1/(1-\varepsilon)] \\ &= 1/(1-\varepsilon) \equiv \text{MCF}_t,\end{aligned}$$

where MCF_t denotes the *distributionally unweighted* MCF. That is, the SMCF_t would be reduced to the MCF_t if the government did not have any distributional preferences. On the basis of this result, one can interpret the normalized SMCF_t in Equation (16) as the *distributionally weighted* MCF_t and the weight attached to individual i is given by $\lambda^i y^i/n\lambda y$.

It should be emphasized that the result of Equation (16) will hold as long as the existing tax system satisfies the balanced-budget constraint Equation (4). In other words, this result is associated with an arbitrary tax system. By contrast, the result of Equation (15) will not hold in general for an arbitrary tax system. It will be true for the nonarbitrary tax system that satisfies the political equilibrium characterized by Equation (8).

In appearance, the normalized SMCF_t formula in Equation (15) differs substantially from that in Equation (16). Is there any connection between them? The answer becomes obvious once we rewrite the political equilibrium characterized by Equation (8) as:

$$(17)\quad 1-\varepsilon = y^m/y.$$

This equality establishes the connection between the normalized SMCF_t formula in Equation (15) (which is derived under the assumption that the existing tax system is a simple majority equilibrium) and the normalized SMCF_t formula in Equation (16) (which is derived under the assumption that the existing tax system is arbitrary). The nonarbitrary tax system distinguished by Equation (8) constrains the variation of ε according to Equation (17).

Besides the existing tax system itself representing a majority voting equilibrium, there are other nonarbitrary tax systems. For example, consider the case where the existing tax system happens to be optimal so that $\mathrm{d}W/\mathrm{d}a = 0$ in Equation (12). This zero condition indicates that the normalized SMCF_t for increasing redistribution must equal 1 if the status quo tax system is optimal. As a result, we have the following relationship from Equation (16):

$$(18)\quad \varepsilon = \delta.$$

This equality establishes the connection between the formula $\text{SMCF}_t/\text{SMB}_a = 1$ (which is derived under the assumption that the existing tax system is optimal) and the formula in Equation (16) (which is derived under the assumption that the existing tax system is arbitrary). The nonarbitrary tax system distinguished by its optimality constrains the variation of ε according to Equation (18).

We obtain $\varepsilon = 1 - (y^m/y)$ from Equation (17), while we obtain $\varepsilon = \delta$ from Equation (18). There is no reason to expect that the equality $1 - (y^m/y) = \delta$ will hold in general. Indeed, according to Proposition 1, the equality will hold if and only if the level of redistribution from majority voting is neither excessive nor inadequate. From the viewpoint of political economy, the probability that a political equilibrium will coincide with the welfare maximization seems small, if not infinitesimally small. Our previous example attests to this claim to some extent.

Since the normalized SMCF_t formula in Equation (16) is derived under the assumption that the existing tax system is arbitrary, it is clearly applicable to any status quo tax system, including the one resulting from simple majority voting and the one associated with optimality. The two equalities, Equations (17) and (18), merely reveal the fact that the value of the elasticity ε in Equation (16) will differ as the existing tax system varies. This fact in turn reveals that additional information regarding the status quo tax system, if it is available, may be used to infer the *equilibrium* value of ε. Just as the optimal tax system will constrain the value of ε to satisfy the equality (18), the value of ε will be constrained to satisfy Equation (17) if the existing tax system itself represents a simple majority equilibrium.

The above analysis suggests two possible ways of estimating the SMCF for increasing redistribution in practice. One is to assume that the existing tax system is arbitrary. This approach requires the use of the formula in Equation (16), and the MCF of taxation is measured by the term $1/(1 - \varepsilon)$. This is so because we know from our previous analysis that the normalized SMCF_t in Equation (16) can be understood as the *distributionally weighted* MCF_t, and that $\text{MCF}_t = 1/(1 - \varepsilon)$. Alternatively, it may be assumed that the existing tax system is not arbitrarily determined but possesses some additional property such as being a simple majority equilibrium. This property concerning the status quo tax system will enable us to invoke the RHS term of Equation (17) to infer the equilibrium value of the elasticity ε. In this case, the ratio y/y^m can replace $1/(1 - \varepsilon)$ as far as the estimation of the MCF is concerned. This leads to the following interesting result:

PROPOSITION 2. *The income inequality y/y^m can act as a proxy for the MCF of taxation in the M-R economy.*

Since positively skewed income distributions are most often observed in the real world, we have $y/y^m > 1$. This indicates that the MCF exceeds 1 with the level of redistribution supported by majority voting.

The key to Proposition 2 lies in the property that the decisive voter in the M-R economy will trade off the redistributive benefit from taxation against the distortionary cost of taxation at the margin so as to uphold the equality (17) in equilibrium. Obviously, this equality will not hold in general for an arbitrary tax system.

C. Comparisons with Usher (2002, 2005) and Fuest and Huber (2001)

In the context of public good provision with distortionary taxes, Usher (2002, 2005) derived the same result as our Equation (17) under two main assumptions: (i) the allocation of the MCF among taxpayers is proportional to their pretax incomes[13] and (ii) the will of the median income voter prevails in political economy.[14] Putting Assumptions (i) and (ii) together, the personalized MCF facing the decisive voter becomes (y^m/ny)MCF. Usher's argument for the establishment of the equality Equation (17) is basically as follows. If the value of (y^m/ny)MCF is greater than $1/n$, the decisive voter will introduce the uniform lump-sum taxation to reduce the extent of the distortionary taxes until the restoration of the equality $(y^m/ny)\text{MCF} = 1/n$. This is true because a one-dollar increase in the lump-sum taxation of the economy costs $1/n$ dollars to the decisive voter (and to everybody else as well) when there are n individuals in the

13. This is an assumption made in Usher (2002). Usher (2005) derived this as a result of a more primitive assumption that the full cost of a proportional income tax to individuals is proportional to their pretax incomes. However, the idea and argument with regard to the derivation of Equation (17) remain basically the same across these two versions of the paper.

14. Usher (2002, 2005) also made other assumptions to determine the level of the public good provision; see Usher's papers for the detail.

economy. On the other hand, if the value of (y^m/ny)MCF is less than $1/n$, the decisive voter will introduce the uniform lump-sum transfer to increase the extent of the distortionary taxes until the restoration of the equality (y^m/ny)MCF $= 1/n$. This is true because a one-dollar increase in the lump-sum transfer of the economy has a benefit of $1/n$ dollars to the decisive voter (and to everybody else as well) when there are n individuals in the economy. In equilibrium, the decisive voter must be indifferent to a one-dollar increase in the distortionary taxes with a one-dollar increase in the lump-sum taxation or with a one-dollar increase in the lump-sum transfer. The equality (y^m/ny)MCF $= 1/n$ implies that MCF $= y/y^m$.

The two main assumptions made by Usher happen to be the two results derived in the M-R economy. From Equation (12), we have:

$$(12-2) \qquad (dv^i/da)(1/n) = \lambda^i/n - (\lambda^i y^i/n) \times [1/(y + t(dy/dt))] = \lambda^i/n - (\lambda^i y^i/ny)[1/(1-\varepsilon)].$$

For simplicity, let $\lambda^i = 1$ for all i. Since MCF$_t = 1/(1 - \varepsilon)$, we immediately see from Equation (12-2) that the personalized MCF facing individual i is (y^i/ny)MCF$_t$. We know that the will of the median income voter prevails in the M-R model. This implies that Equation (17) holds, and therefore, the personalized MCF facing the decisive voter equals

$$(y^m/ny)\mathrm{MCF}_t = (y^m/ny)(y/y^m) = 1/n.$$

This result is intuitive: the decisive median income voter in the M-R economy will choose the tax rate t such that the marginal cost facing him (i.e., (y^m/ny)MCF$_t$)) equals the marginal benefit (i.e., da = \$1/n).

It is important to recognize that the lump-sum taxation is not available in the M-R economy. By contrast, the move from the inequality (y^m/y)MCF > 1 to the equality (y^m/y) MCF $= 1$ in the Usher economy will become problematic if the lump-sum taxation is not available. In discussing his finding, Usher (2002, 2005) pointed out an asymmetry between the lump-sum taxation and the transfer: the supply of the head subsidy could be easily implemented by the government, but the imposition of the head tax may be difficult since some people may be too poor to pay the head tax.

In the context of public good provision with distortionary taxes as well, Fuest and Huber (2001, hereafter, F-H) compared tax competition with tax coordination in a median voter model. For the purpose of exposition, let us extend the preferences of individuals to incorporating the public good provision so that $u^i = u(c^i, l^i) + h(G)$, where $h(G)$ is the utility from the consumption of the public good G with $h' > 0$ and $h'' < 0$. The political equilibrium under tax competition in F-H's model is characterized by (their Equation (18) in terms of our notation):

$$(19) \qquad nh' = (y^m/y)[1/(1-\varepsilon)].$$

This is the Samuelson rule for the public good provision; however, the rule has been modified to take account of both distortionary financing and redistributive concern.[15]

Note that both terms ε and y^m/y appear in Equation (17) (M-R's political equilibrium characterization) and Equation (19) (F-H's political equilibrium characterization). This coincidence is not surprising. We remark at the end of our paper that the trade-off between the marginal distortionary cost of taxation (related to ε) and the marginal redistributive benefit from taxation (related to y^m/y in a median voter model) is highlighted in many tax models of political economy. Since a decisive median voter will balance this trade-off at the margin, it is natural to find both terms, ε and y^m/y, appearing in a political equilibrium characterization.

F-H utilized their derived political equilibrium characterized by Equation (19) to study a normative question: whether or not a departure from the tax competition equilibrium with tax coordination will be welfare improving. An interesting feature of their finding is that the welfare effect of tax coordination will

15. If $y^i = y$ so that there were no redistributive concern, Equation (19) would be reduced to: $nh' = 1/(1 - \varepsilon)$, which is the optimal rule for the provision of public goods with distortionary taxation in a homogenous consumer economy; see, for example, Usher (2002, Equation 7). If the provision of public goods were financed by lump-sum rather than distortionary taxation, Equation (19) would be further reduced to: $nh' = 1$, which is the standard Samuelson rule.

be negative if and only if $\varepsilon < 1 - (y^m/y)$ (F-H's Proposition 1). By contrast, we utilize the political equilibrium characterized by M-R to study a different normative question: the SMCF on the basis of the plausible assumption that the existing tax system itself represents a political equilibrium. An interesting feature of our finding is that y/y^m can act as a proxy for the MCF of taxation (our Proposition 2). It is important to recognize that *both* y^m/y and ε are required in F-H's welfare criterion, whereas *only* y^m/y is required in our MCF criterion. F-H calculated the deadweight loss or excess burden of taxation on the basis of ε rather than y^m/y as is typical in the MCF literature (see their Corollary 1). They do not relate the MCF estimate to the ratio of average to median income as Usher or we did.

IV. DISCUSSION

When the tax system is assumed to be arbitrary, a common feature of previous SMCF studies with heterogenous consumers is that the SMCF formulas they derive are closely akin to our Equation (16).[16] This implies that the elasticities of labor supply will play an important role in their MCF estimation. However, the magnitudes of the estimates of the labor supply response vary widely in the extant empirical literature.[17] This variation explains to some extent why previous MCF estimates vary considerably. By comparing Equation (15) with Equation (16), we see a possible advantage of our approach: the labor supply response is replaced by the readily estimated variable y/y^m.

Of course, one cannot deny that the tax rates we actually observe may not represent the outcome of a median voter equilibrium as in the M-R model. In reality, voters typically choose representatives who campaign on a wide variety of issues. Moreover, unlike the strictly static M-R model, voters may be interested in the evolution of their incomes over time. This involves a dynamic issue. For instance, a young voter who currently has a low income may be unwilling to vote for a high level of taxation because of the belief that he or she will one day have an income that is much higher in the distribution.[18] Let us face it: the politics in the real world has many, many complications that are not captured by any simple model. However, this does not mean that we should abandon simple models. Simple models certainly can enhance our understanding. Indeed, the bottom line is perhaps the thesis proposed by Holcombe (1989, 115): "the median voter model in the public sector has served in much the same role as the model of pure competition in the private sector." The model of pure competition has proved to be an enduring research device in understanding private sector behavior. Analogously, we would believe that our political economy approach to the SMCF is a useful research device; at least, it can complement the usual apolitical approach.

Finally, we would like to emphasize one point. The basic reason why we can transform the SMCF formula from Equation (16) into Equation (15) is due to our exploitation of the trade-off at the margin between the distortionary cost of taxation and the redistributive benefit from taxation in political equilibrium. This trade-off between distortion and redistribution is highlighted in many tax models and seems to be the most important feature of the political economy of taxation. It is thus not unreasonable to speculate that the exploitation of this balanced trade-off at the margin in the measurement of the SMCF may be more general and need not be confined to the M-R model.

16. See, for example, Sandmo (1998) and Dahlby (1998).

17. For a summary of more recent estimations, see Blundell and Macurdy (1999). For the overall elasticities of taxable income, see Gruber and Saez (2002).

18. Krusell and Rios-Rull (1999) considered a dynamic extension of the M-R model, in which individuals differ not only in labor productivity but also in initial asset holdings. They calibrated their model to U.S. data, showing that the political equilibrium transfer level predicted by their model is quite close to the transfer level in the data. Europeans tend to view their economies as stratified, and hence, they are more willing to embrace redistributive taxation. Americans, on the other hand, tend to perceive that their economy has greater mobility, and hence, they are less willing to engage in redistributive taxation. This difference in perceptions persists despite the fact that the actual degrees of mobility are not very different in Europe and the United States. We refer those interested in the issue to Alesina and Glaeser (2004).

REFERENCES

Alesina, A., and E. L. Glaeser. *Fighting Poverty in the U.S. and Europe: A World of Difference*. Oxford, UK: Oxford University Press, 2004.

Atkinson, A. B., and J. E. Stiglitz. *Lectures on Public Economics*. London: McGraw-Hill, 1980.

Ballard, C. L. "The Marginal Efficiency Cost of Redistribution." *American Economic Review*, 78, 1988, 1019–33.

———. "Marginal Efficiency Cost Calculations for Government Exhaustive Expenditure and for Redistribution." *Public Finance*, 46, 1991, 177–85.

Blue, E. N., and L. Tweeten. "The Estimation of Marginal Utility of Income for Application to Agricultural Analysis." *Agricultural Economics*, 16, 1997, 155–69.

Blundell, R., and T. Macurdy. "Labor Supply: A Review of Alternative Approaches," in *Handbook of Labor Economics*, Vol. 3A, edited by O. Ashenfelter and D. Card. Amsterdam: North-Holland, 1999, 1559–1695.

Browning, E. K., and W. R. Johnson. "The Trade-off between Equality and Efficiency." *Journal of Political Economy*, 92, 1984, 175–203.

Buchanan, J. M., and G. Tullock. *The Calculus of Consent*. Ann Arbor: University of Michigan Press, 1962.

Dahlby, B. "Progressive Taxation and the Social Marginal Cost of Public Funds." *Journal of Public Economics*, 67, 1998, 105–22.

Dahlby, B., and G. Ruggeri. "The Marginal Cost of Redistribution: Comment." *Public Finance Quarterly*, 24, 1996, 44–62.

Fuest, C., and B. Huber. "Tax Competition and Tax Coordination in a Median Voter Model." *Public Choice*, 107, 2001, 97–113.

Gruber, J., and E. Saez. "The Elasticities of Taxable Income: Evidence and Implications." *Journal of Public Economics*, 84, 2002, 1–32.

Harsanyi, J. "Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparisons of Utility." *Journal of Political Economy*, 63, 1955, 309–21.

Hettich, W., and S. L. Winer. *Democratic Choice and Taxation: A Theoretical and Empirical Analysis*. Cambridge: Cambridge University Press, 1999.

Holcombe, R. G. "The Median Voter Model in Public Choice Theory." *Public Choice*, 61, 1989, 115–25.

Krusell, P., and J.-V. Rios-Rull. "On the Size of U.S. Government: Political Economy in the Neoclassical Growth Model." *American Economic Review*, 89, 1999, 1156–81.

Levy, F., and R. J. Murnane. "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations." *Journal of Economic Literature*, 30, 1992, 1333–81.

Meltzer, A., and S. F. Richard. "A Rational Theory of the Size of Government." *Journal of Political Economy*, 89, 1981, 914–27.

Moffitt, R. A. "Welfare Programs and Labor Supply," in *Handbook of Public Economics*, Vol. 4, edited by A. J. Auerbach and M. Feldstein. Amsterdam: North-Holland, 2002, 2392–2430.

Persson, T., and G. Tabellini. *Political Economics: Explaining Economic Policy*. Cambridge, MA: MIT Press, 2000.

Rae, D. W. "Decision-Rules and Individual Values in Constitutional Choice." *American Political Science Review*, 63, 1969, 40–56.

Rawls, J. *A Theory of Justice*. Cambridge, MA: Harvard University Press, 1971.

Sandmo, A. "Redistribution and the Marginal Cost of Public Funds." *Journal of Public Economics*, 70, 1998, 365–82.

Tanzi, V., and L. Schuknecht. *Public Spending in the 20th Century*. Cambridge: Cambridge University Press, 2000.

U.S. Census Bureau. *Current Population Survey, Annual Social and Economic Supplements*. Washington, DC: U.S. Census Bureau, 2004.

Usher, D. *The Marginal Cost of Public Funds Is the Ratio of Mean Income to Median Income*. Kingston, ON: Queen's University, 2002.

———. *Variations on the Marginal Cost of Public Funds*. Kingston, ON: Queen's University, 2005.

Zeckhauser, R. J. "Optimal Mechanisms for Income Transfer." *American Economic Review*, 61, 1971, 324–34.