On the Voluntary and Involuntary Provision of Public Goods

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This paper extends preexisting results concerning voluntary private funding of public goods. The assumption that individuals care about the magnitude of their own contributions only insofar as these contributions affect the aggregate level of expenditures is shown to have untenable implications. The analysis suggests that a reexamination of the factors that motivate individuals to make contributions is in order.

Many public goods, including most charitable causes and various forms of political activity, are funded predominantly through voluntary private contributions. Recently, this topic has attracted a great deal of interest.[1] In a provocative paper, Peter Warr established a simple, yet startling result: "When a single public good is provided at positive levels by private individuals, its provision is unaffected by a redistribution of income. This holds regardless of differences in individual preferences and despite differences in marginal propensities to contribute to the public good" (1983, p. 211). Warr's conclusion depends critically upon two assumptions: individuals care about the magnitude of their own contributions only insofar as these contributions affect the aggregate level of expenditures; and all individuals make strictly positive contributions. Theodore Bergstrom et al. have recently provided a more general and illuminating analysis of this proposition.

In this paper, I suggest that Warr's result as well as Bergstrom et al.'s generalizations, are only the tip of the iceberg. Maintaining Warr's assumptions, I demonstrate the following:

1) Any policy consisting of lump sum transfers, and lump sum public contributions to the privately provided public good, has no effect on resource allocation.

2) Any policy consisting of apparently "distortionary" transfers, and distortionary public finance of the privately provided public good, has no effect on resource allocation.

3) In general, the method used to raise revenue for public transfers and expenditures (including expenditures on public goods for which *no* private contributions are made) is completely irrelevant: all taxes are equivalent to lump sum taxes.

One might be tempted to dismiss these results on the grounds that, while the vast majority of individuals contribute to some cause, no single privately provided public good receives universal support. However, it turns out that this observation is immaterial, as long as there is sufficient overlap between the sets of donors to different causes (for example, *A* contributes to the Republicans, *B* to the Democrats, *C* to the Republicans and the United Way, and *D* to the Democrats and the United Way). Furthermore, Kyle Bagwell and I (1985) have argued that voluntary interpersonal transfers serve to link different individuals in the same manner as voluntary contributions to public good.[2]

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[1]Theodore Bergstrom, Lawrence Blume, and Hal Varian (1984) provide a brief but comprehensive review of this literature.

[2]In my paper with Bagwell, we focus attention on transfers between individuals, and do not explicitly consider the role of public goods. Of course, one can think about a public project as a selfish individual who cares only about his own consumption, and who therefore makes transfers to no one else. To the extent a number of individuals contribute voluntarily to the project, our analysis is applicable (thus, in our textual example, we may think of the Democrats as an individual, to whom both *B* and *D* contribute). However, one

Thus, it seems quite plausible that everyone who either makes or receives a voluntary transfer or contribution is indirectly linked through such transactions to everyone else, in which case the conditions for widespread private neutralization of public policies are satisfied.

What, then, are we to make of these results? Rather than believe that virtually all government policy is neutral, I am inclined to reexamine the critical assumptions. Two alternatives are available. First, one could argue that large segments of the population are isolated, in the sense that they are not linked through chains of voluntary transfers and contributions. While this view may seem inviting, it is troubling in one respect. Suppose, hypothetically, that all individuals were linked through such chains. Do we indeed believe that this would neutralize the effects of all taxes and transfers? If one's answer is negative, then it is necessary to examine other assumptions.

As mentioned earlier, these results also depend critically upon the assumption that individuals care about the magnitude of their own contributions only insofar as these contributions affect the aggregate level of expenditures. This explicitly rules out the possibility that individuals enjoy (or dislike) making transfers, or that benefactors acquire bargaining leverage over recipients. Elsewhere, Andrei Shleifer, Lawrence Summers, and I (1985) have argued that there is strong empirical support for such alternative formulations. In order to avoid the implausible implications of equilibrium behavior in models of contributions and transfers, one is naturally and inevitably led to these alternatives.

I. The Model

Consider an economy consisting of i individuals, indexed $i=1,\dots,N$. Each selects a level of labor supply (l_i), consumes a private good (χ_i), and enjoys the benefits of two public goods (G, H). I write i's utility as a general function of these variables:

$$u_i = u_i(l_i, \chi_i, G, H). \tag{1}$$

The units of l_i, G, and H were chosen so that all prevailing prices are unity.[3]

The allocation of resources is determined in three stages. In stage 1, the government picks a policy,

$$P = (y, \tau, \gamma_0, \eta_0). \tag{2}$$

The policy consists of four distinct components. First, the government selects a vector of exogenous (nonlabor) incomes for the consumers,

$$y \equiv (y_1, \dots, y_N). \tag{3}$$

Implicitly, in choosing y, the government determines lump sum taxes and transfers. I denote the total amount of nonlabor income available in this economy as Y. Second, the government selects a vector of income tax functions,

$$\tau = (\tau_1, \dots, \tau_N). \tag{4}$$

I allow τ_i to depend on the entire vector of labor supply decisions, $l \equiv (l_1, \dots, l_N)$: $\tau_i(l)$ indicates i's income tax payment when individuals have chosen to supply l. Among other things, this formulation permits the government to condition its transfer policies upon available revenues. Third, the government selects a function, γ_0, which describes its contributions to the first public good as a function of the labor supply vector (national income). Similarly, η_0 is a function which describes contingent contributions to the second public good.

The government must, of course, respect its budget constraint under all contingencies.

requires a more fully articulated model, such as that considered here, to analyze the effects of financing public goods which are supported exclusively by the government.

[3] In this respect, my analysis does not treat a general equilibrium. However, the extension to general equilibrium is straightforward: to the extent policies are allocatively neutral, any prices which prevailed prior to the policy may also prevail after.

Specifically, for all l,

$$(5)\quad \eta_0(l)+\gamma_0(l)=\left(Y-\sum_{i=1}^{N} y_i\right)+\sum_{i=1}^{N}\tau_i(l).$$

In stage 2, each consumer selects his labor supply, and realizes his total net income:

$$(6)\qquad y_i+l_i-\tau_i(l).$$

At the same time, government collects its revenue.

In stage 3, the government funds the public goods as prescribed by its policy P. Consumers divide their resources between the private good, χ_i, and contributions to the public good. In order to illustrate basic principles within as simple a context as possible, I assume that all individuals contribute to the first public good (G), and that none contribute to the second (H). This configuration of contributions may arise due to the structure of preferences for G and H, or may be the consequence of government policy (for example, government crowds out private contributions to H, but provides no funding for G). For concreteness, we may think of G as funding of religious organizations, while H represents provision for the national defense.

I will use g_i to denote i's contributions to the first public good. Ordinarily, one would introduce nonnegativity constraints, $g_i \geq 0$, as in Bergstrom et al. However, I wish to assume that these constraints are nonbinding both before and after the imposition of some particular policy. In such cases, nonnegativity constraints do not affect the local opportunities of any individual. While they do affect global opportunities, it is permissible to ignore them as long as either 1) the economy has sufficient convexity properties, or 2) the economy has sufficient continuity properties, and the policy represents a small change from the prevailing system. I will assume that one of these two conditions is satisfied, and henceforth consider a world in which contributions may be negative.

The allocation procedure described above induces a game between consumers. Given the policy P^*, consumer i's strategy consists of announcing a level of labor supply, l_i, and a function, γ_i, which prescribes a level of contributions for i in stage 3 for every potential labor supply vector, l, chosen in stage 2. Let $\gamma \equiv (\gamma_1,\dots,\gamma_N)$. Let us say that (l^*,γ^*) is an *equilibrium*[4] if, for all l, $\gamma_i^*(l)$ solves

$$(7)\quad \max_{g_i} u_i\left(l_i,\, y_i^*+l_i-\tau_i^*(l)-g_i,\, \sum_{j\neq i}\gamma_j^*(l)+g_i,\, \eta_0^*(l)\right),$$

where "$j\neq i$" is understood to include the case of $j=0$, and if l_i^* solves

$$(8)\quad \max_{l_i} u_i\left(l_i,\, y_i^*+l_i-\tau_i^*(l_i,l_{-i}^*) - \gamma_i^*(l_i,l_{-i}^*),\, \sum_{j=0}^{N}\gamma_j^*(l_i,l_{-i}^*),\, \eta_0^*(l_i,l_{-i}^*)\right).$$

A final word concerning the model. To obtain the general result described below, it is essential that contributions to the public good be chosen *subsequent* to the choice of labor supply. While this may appear restrictive, it is actually relatively innocuous. In a more general context, my result would require only that individuals are linked through *some* network of transfers and contributions subsequent to each potentially distorted choice.

II. The Result

I am now prepared to prove the central result.

THEOREM 1: *Consider any two policies,* $P=(y,\tau,\gamma_0,\eta_0)$, *and* $P'=(y',\tau',\gamma_0',\eta_0')$. *Suppose* $\eta_0=\eta_0'$. *Then any final allocation sustained as an equilibrium under P can also be sustained as an equilibrium under P'.*

This result indicates that, as long as the government adheres to its policy for allocat-

[4] Since we require that $\gamma_i(l)$ solves (7) for all l, this definition corresponds to Reinhard Selten's (1965, 1975) notion of subgame perfect Nash equilibrium (each l defines a distinct subgame).

ing the second (publically provided) public good (η_0), altering lump sum taxes and transfers (y), distortionary taxes (τ), and/or contributions to the first (privately provided) public good (γ_0) will have no effect on the private consumption of any individual, nor on chosen labor supplies, nor on the total levels of public goods provided.

PROOF:

Suppose that, under P, we have some equilibrium (l^*, γ). Now consider P'. Define the vector of new strategies

$$(9) \quad \gamma_i'(l) = \gamma_i(l) + (y_i' - y_i) - (\tau_i'(l) - \tau_i(l)).$$

I will show that (l^*, γ') is an equilibrium under P'. It is easy to verify that it induces the same final allocation (private goods and public goods) as does (l^*, γ) under P.

Take some l. Suppose $j \neq i$ uses γ_j'. Then i's problem is to

$$(10) \quad \max_{g_i'} u_i\left(l_i, y_i' + l_i - \tau_i'(l) - g_i', \sum_{j \neq i} \gamma_j'(l) + g_i', \eta_0(l)\right).$$

Now do the following change of variables:

$$(11) \quad z = g_i' - (y_i' - y_i) + (\tau_i'(l) - \tau_i(l)).$$

Individual i's problem is then to

$$(12) \quad \max_z u_i\left(l_i, y_i + l_i - \tau_i(l) - z, \quad \gamma_0'(l) + \sum_{j \neq 0, i} \gamma_j(l) + \sum_{j=1}^{N} [(y_j' - y_j) - (\tau_j'(l) - \tau_j(l))] + z, \eta_0(l)\right)$$

Using (5) for both P and P', we see that

$$(13) \quad \sum_{j=1}^{N} [(y_j' - y_j) - (\tau_j'(l) - \tau_j(l))] = \gamma_0(l) - \gamma_0'(l).$$

Substituting this into (12), we see that i's problem is to

$$(14) \quad \max_z u_i\left(l_i, y_i + l_i - \tau_i(l) - z, \sum_{j \neq i} \gamma_j(l) + z, \eta_0(l)\right).$$

But since (l^*, γ) is an equilibrium under P, we know that $z = \gamma_i(l)$ is a solution to (14). Thus, returning to the original variables, it can be seen that $g_i' = \gamma_i'(l)$ solves (10). Thus, condition (7) is satisfied for all l.

Now consider condition (8). I wish to show that l^* solves

$$(15) \quad \max_{l_i} u_i\left(l_i, y_i' + l_i - \tau_i'(l_i, l_{-i}^*) - \gamma_i'(l_i, l_{-i}^*), \sum_{j=0}^{N} \gamma_j'(l_i, l_{-i}^*), \eta_0(l_i, l_i^*)\right).$$

Using (9) and (13), it is easy to see that

$$(16) \quad \sum_{j=0}^{N} \gamma_j'(l_i, l_{-i}^*) = \sum_{j=0}^{N} \gamma_j(l_i, l_{-i}^*).$$

Substituting (16) and (9) into (15), it can be seen that the consumers' problem is to

$$(17) \quad \max_{l_i} u_i\left(l_i, y_i + l_i - \tau_i(l_i, l_{-i}^*) - \gamma_i(l_i, l_{-i}^*), \sum_{i=0}^{N} \gamma_j(l_i, l_{-i}^*), \eta_0(l_i, l_{-i}^*)\right).$$

But, since (l^*, γ) is an equilibrium under P, l_i^* solves (17). Consequently, conditions (7) and (8) are both satisfied—(l^*, γ') is an equilibrium under P'.

Intuitively, Theorem 1 holds for a remarkably simple reason: if all but one individual acts to offset the policy change for each labor supply profile, then the opportunity set of the remaining individuals (achievable combinations of l_i, χ_i, G, and H) are unchanged. It is therefore optimal for him, as well, to neutralize any effects.

It is natural to wonder whether this result is sensitive to the introduction of several privately provided public goods. In particular, while each individual might contribute to some good, it is easily conceivable that no single good would receive universal support. Through a completely analogous argument, one can show that the central result continues to hold as long as it is impossible to partition the set of consumers into two subsets, I_1 and I_2, and the sets of goods into two subsets, G_1 and G_2, such that members of I_i contribute *only* to goods in G_i ($i = 1,2$). This condition implies that one can find a chain of contributions linking any two members of the population.

To reiterate, the result depends essentially upon only two assumptions. First, individuals care about the magnitude of their contributions only insofar as these contributions affect the aggregate level of expenditures. Second, chains of operative voluntary transfers and contributions link all individuals (my paper with Bagwell extends the argument provided here to situations in which linkages are indirect). For reasons described earlier, the first of these assumptions deserves much closer scrutiny.

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