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Direct income transfers and public good provisioning: choosing between two anti-poverty schemes

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Abstract

In this paper, we consider the economics of choosing between two types of anti-poverty programme: targeted direct income transfers and the universal provisioning of a public good. We construct a simple analytical model to examine the issue. As might be expected, our results suggest that the choice between the two poverty-alleviation schemes would depend on the relative strengths of the productivity of public goods investment on the one hand, and the information costs of targeting benefits, on the other.

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1. Introduction

This paper belongs to a category of research on poverty that could be said to be subsumed under the heading of 'optimal budgetary intervention in anti-poverty policy'. An early contribution to this field of enquiry is by Bourguignon and Fields (1990) who analyze how optimal direct income transfers vary with the particular poverty measure that is employed in order to measure poverty. Gangopadhyay and Subramanian (1992) extend the Bourguignon-Fields analysis to wage employment programmes. Optimal wage-setting problems in works programmes are considered by Basu (1981, 1992), while the choice between low-wage-high-coverage policy and high-wage-low-coverage-poverty-line-crossing policy is considered by Ravallion (1992). Besley and Coates (1992) study the analytics of the choice between workfare and welfare as the appropriate anti-poverty policy, while Besley and Kanbur examine the relative merits of marginal and infra-marginal commodity subsidies as poverty-alleviation strategies. The problem addressed in this paper, and briefly described in what follows, belongs to this larger body of analysis.

Suppose we have a budget of size S to allocate among the poor in order to alleviate their poverty. A problem frequently confronting the policy-maker relates to what sort of anti-poverty programme most merits the available budgetary outlay. A case in point, which is the subject of enquiry in this paper, is the choice between direct income transfers on the one hand, and the creation of a poverty-relieving public good on the other. There is an increasing tendency amongst policy analysts in India, for instance, to promote the virtues of unconditional targeted cash transfers – presumably at the expense of other forms of public spending on poverty alleviation, such as on the creation of public goods like schools.

In what follows, we present a particularly stark and simple account of the determinants of such a choice. The emphasis throughout will be on bringing out the essential features of the problem in an intuitively direct way which, in that cause, will avoid all details of distracting complexity. The principal thrust of the paper will be to underline the importance of productivity-enhancing technology as an argument in favour of the public good policy.

2. Setting up the problem

Poverty will be measured by a function P which is given by the following expression:

$$P(\{x_i\},\{t_i\},\{E_i\}) = (1/n)\sum_{i=1}^{q}\left[\frac{z - x_i - t_i}{z + E_i}\right] \qquad (1)$$

where

x_i is person i's income (before taxes and transfers) in a community of n individuals;

z is the poverty line, which is a distinguished level of income such that those with incomes less than this level are certified to be absolutely impoverished;

q is the number of poor persons in the community of n individuals;

$t_i \ (\geq 0)$ is the net direct income transfer to person i; and

$E_i \ (\geq 0)$ is the beneficial externality (measured in monetary units) accruing to person i from the State's provisioning of a public good.

In effect, what we are assuming is that a poor person's deprivation is a declining function of her income, of any transfers that might be made to her, and of any public good externality that might accrue to her: if d_i is person i's deprivation function, then we are postulating that

$$d_i = \frac{z - x_i - t_i}{z + E_i} \text{ if } x_i < z;$$

$$= 0 \text{ otherwise;}$$

and the overall measure of poverty is simply the deprivation levels of the population averaged over its n consituents:

$$P = (1/n)\sum_{i=1}^{q} d_i.$$

It should be noted that our specification of d_i is a very particular one. There are surely other functional forms for d_i which would satisfy the desired properties associated with it; and it is useful to bear in mind the dependence of our eventual results on the particular specification to which we have resorted. Any such specialized assumption, in the end, is a concession to the demands of expository clarity.

In what follows, we shall represent the *aggregate income deficit* $\sum_{i=1}^{q}[z - x_i]$ - which is just the total shortfall of the incomes of the poor from what would be required to raise them all to the poverty line – by the quantity D.

Now let S be the size of the budget available for poverty alleviation. S will be assumed to be non-negative, but, so as to keep the problem of poverty alleviation non-trivial, it will also be assumed to be smaller than the aggregate poverty deficit: $0 \leq S < D$.We shall consider two poverty-alleviation programmes – *Direct Transfers* (*DT*) and *Public Good* provisioning (*PG*) – as described below.

We need to make some assumption about how direct transfers are rationed. We shall assume a transfer mechanism that is progressive and leaves the numbers of the poor unchanged. (This is another instace of a very specific assumption made in the interests of explicitness and ease of exposition.) In particular, under a Direct Transfers scheme, each poor person will be assumed to receive an income transfer in proportion to her poverty gap, with nothing available for a rich person:

$$t_i = \left[\frac{z - x_i}{D}\right] S \text{ if } x_i < z;$$

$$= 0 \text{ otherwise.} \qquad (2)$$

It is quite clear, from the progressive nature of the transfers, that perfect targeting of the transfers has been presumed, namely, that not only can the poor be distinguished from the non-poor, but that who has what income is a matter of public knowledge. Naturally, the achievement of such knowledge must be assumed to come at a cost; and we shall assume that if any positive budgetary allocation is made toward Direct Income transfers, then the cost of targeting, *C*, will be a fixed cost of $\overline{C}$:

$$C = 0 \text{ if } S = 0;$$

$$= \overline{C} \text{ otherwise.} \qquad (3)$$

Where the public good is concerned, its scope will be assumed to be universal, which follows from the non-excludability feature of such a good. In particular, we shall make the simple assumption that the beneficial externality accruing from the public good to each person is directly proportional to the size of the budgetary outlay on the public good:

$$E_i = \lambda S \ \forall i, \lambda > 0. \qquad (4)$$

λ, clearly, is in the nature of an 'efficiency' parameter: the 'productivity' of the public good is an increasing function of λ.

The problem confronting the policy maker is: under what circumstances, if any, will either of the two anti-poverty schemes just discussed be preferred to the other?

3. The solution to the problem

It is useful to note, first, that the value of the poverty measure prior to any form of budgetary intervention, is given by

$$P^0 = (1/n)\sum_{i=1}^{q}(z - x_i)/z \equiv D/nz\,. \qquad (5)$$

Suppose now that the entire budget *S* is allocated to Direct Transfers. Let P^{DT} stand for the value of the poverty index after the direct income transfers have been introduced. How would poverty decline with the size of the budgetary intervention? Note that at $S = 0$, the value of the poverty measure is just P^0, as specified in equation (5). As soon as *S* becomes even infinitesimally positive, however, the value of the poverty measure jumps up abruptly to $P^0 + C_0$ where $C_0 \equiv \overline{C}/nz$ is derived from the fixed cost of targeting for any positive level of budgetary allocation. There is thus a discontinuity in the value of the poverty measure P^{DT} as a function of *S*. It is straightforward that for $S > 0$,

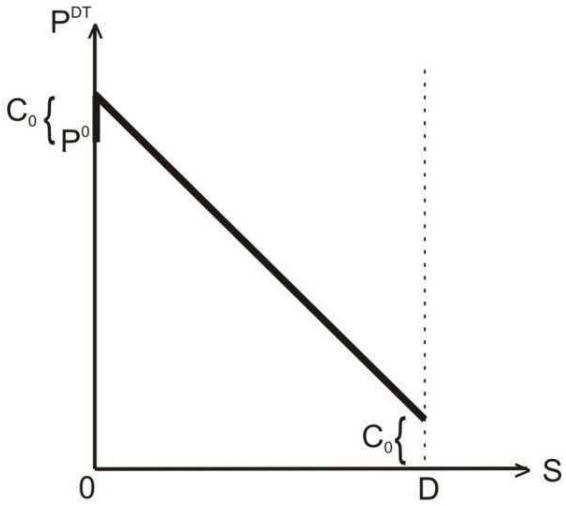
$$P^{DT}(S) = (1/n)\sum_{i=1}^{q}\left[\frac{z - x_i - \left(\frac{z - x_i}{D}\right)S}{z}\right] + C_0$$

which simplifies to

$$P^{DT}(S) = (D - S)/nz + C_0. \qquad (6)$$

So we have: $P^{DT}(0) = P^0$, $P^{DT}(D) = C_0$, $\frac{dP^{DT}}{dS} = -(1/nz) < 0$, and $\frac{d^2P^{DT}}{dS^2} = 0$; thus, over the range $[0,D]$, P^{DT} is a declining, strictly linear function of *S*, with a discontinuity at $S = 0$, and with left and right boundary values of P^0 and C_0 respectively. The function $P^{DT}(S)$ has a visual representation in Figure 1.

Figure 1
Poverty as a Function of Budgetary Size
Under Direct Income Transfers



Next, we consider what happens when the entire budgetary outlay is devoted to the Public Goods (*PG*) scheme. The value of the poverty measure after budgetary intervention – call it $P^{PG}(S)$ - is given, in view of Equations (1) and (4), by

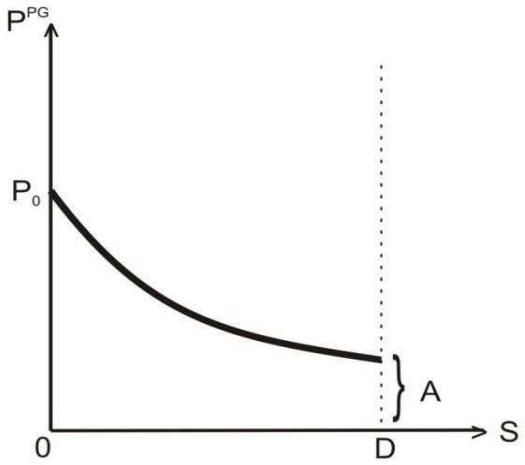
$$P^{PG}(S) = (1/n)\sum_{i=1}^{q}\left[\frac{z - x_i}{z + \lambda S}\right],$$

which simplifies to

$$P^{PG}(S) = (1/n)\left[\frac{D}{z + \lambda S}\right]. \qquad (7)$$

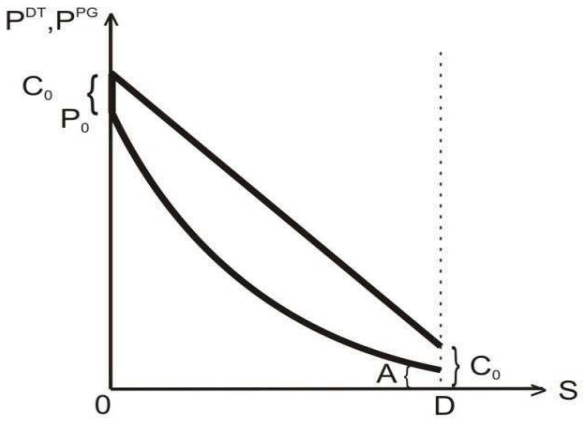
It is a simple matter to verify that $P^{PG}(0) = \left[\frac{D}{nz}\right] \equiv P^0$; $P^{PG}(D) = \left[\frac{D}{n(z + \lambda D)}\right] (\equiv A, say) > 0$; $\frac{dP^{PG}}{dS} = -(\lambda D / n(z + \lambda S)^2) < 0 \forall S > 0$; and $\frac{d^2 P^{PG}}{dS^2} = 2\lambda^2 Dz / n(z + \lambda S)^3 > 0 \forall S > 0$. That is to say, poverty is a declining and strictly convex function of the size of the budgetary allocation over its range [0,*D*], and it takes the boundary values of P^0 and A for $S = 0$ and $S = D$ respectively. Figure 2 provides a diagrammatic representation of P^{PG} as a function of *S*.

Figure 2
Poverty as a Function of Budgetary Size
Under Public Good Provisioning



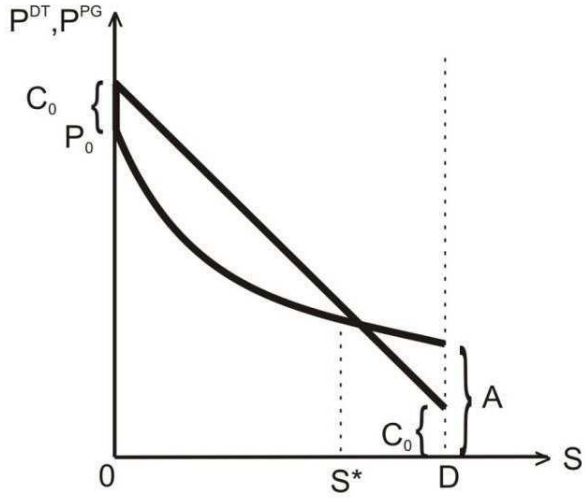
The issue of optimal budgetary intervention becomes immediately clear when we superimpose Figure 2 on Figure 1. There are two cases to consider here: the first relates to a relatively 'large' targeting cost C_0, and the second to a relatively 'small' targeting cost, separated one from the other by the quantity A defined earlier. The two cases are represented in Figure 3(a) and Figure 3(b) respectively.

Figure 3a
The Choice Between Direct Transfers and
Public Good Provisioning. Case 1: $C_0 \geq A$



Only Public Provisioning for all S

Figure 3b
The Choice Between Direct Transfers and
Public Good Provisioning. Case 2: $C_0 < A$



Only Public Provisioning for all S not greater than S*;
Only Direct Transfers for all S greater than S*

Figure 3(a) makes clear that when $C_0 \geq A$, the $P^{PG}(S)$ curve lies everywhere below the $P^{DT}(S)$ curve, that is, poverty is always lower under the Public Goods scheme than under the Direct Transfer scheme: optimal policy would dictate that the entire budget, in such a case, should be allocated to the Public Goods scheme. This makes intuitive sense, for it is simply a reflection of the prohitively high cost of targeting which the Direct Transfer scheme demands. In the second case, when $C_0 < A$, figure 3(b) makes it clear that the $P^{PG}(S)$ curve intersects the $P^{DT}(S)$ curve once from above, at some level of budgetary allocation S^*: for $S \leq S^*$, the poverty level under the Public Good programme is always lower than under the Direct Transfer programme; while for $S > S^*$, poverty under the Public Good programme is always higher than under the Direct Transfers programme. Optimal policy would therefore require complete specialization in the Public Good scheme for 'low' levels of budgetary allocation, and complete specialization in the Direct Transfers scheme for 'high' levels of budgetary allocation – high and low being separated by the critical value S^*. It is quite easy to determine S^* (of course when $C_0 < A$), as that value of S which equalizes the expressions for poverty under the two schemes, given by Equations (6) and (7) respectively:

$$(D - S^*)/nz + C_0 = (1/n)\left[\frac{D}{z + \lambda S^*}\right] . \qquad (8)$$

It turns out that the solution to Equation (8) is the solution to a quadratic equation, whose (positive) root is given by

$$S^* = [D + C_0 - z/\lambda + \{(C_0 + z/\lambda)^2 + D(D + C_0)\}]^{1/2} / 2 . \quad (9)$$

Inspection of Equation (9) assures us that *S** is an increasing function of C_0; further, some routine calculation will reveal that

$$\frac{\partial S^*}{\partial \lambda} = (z/\lambda^2)(1 - R), \text{ where } R \equiv \frac{C_0 + \lambda/z}{[(C_0 + \lambda/z)^2 + D(D + C_0)]^{1/2}} . \quad (10)$$

Clearly, since $C_0 + \lambda/z < [(C_0 + \lambda/z)^2 + D(D + C_0)]^{1/2}$, we can deduce from (10) that $R < 1$, whence $\frac{\partial S^*}{\partial \lambda} > 0$.

That is to say, *S** is an increasing function of both C_0 and λ, which makes sense, as is pointed out in the following final section.

4. Concluding remarks

In this paper, we have considered the problem of optimal budgetary division between two forms of anti-poverty policy – direct income transfers and the provisioning of public goods. The issue under review belongs to an entire class of problems relating to optimal budgetary intervention in poverty alleviation schemes. The specific problem dealt with here has implications for the more general issues of 'cash versus non-cash' and 'targeted versus universal' interventions which are typical subjects of debate in anti-poverty policy. Our findings conform with the intuitive judgement that budgetary decisions would depend on the relative efficiency of public goods provisioning and the information costs of targeting income benefits. In particular, and as may be expected, our results suggest that the public good option would stand a higher chance of being favoured the larger – other things being equal – is the 'productivity', in terms of beneficial externality conferred, of the public good, and the larger – again other things being equal – is the cost of targetted income transfers. Arguably, the costs of targeting are less amenable to State control and choice than is the productivity of investment in public good investment. This is of particular salience in a country like India where, as noted in our intoductory remarks, some policy analysts have been displaying increasing enthusiasm for targeted cash transfers. This appears to suggest a misplaced priority, when the more urgent requirement, arguably, is to correct the prevalent tendency toward investing in roads which get washed away in the next rains (Basu, 1981), or in schools distinguished largely for their teacher-absenteeism, or in public

health centres poorly endowed with both personnel and equipment. These elementary considerations have been sought to be conveyed in this paper through the mechanism of a simple analytical construct involving a programming problem, and it is hoped that the outcome may be of some pedagogic use in classroom teaching on anti-poverty policy in a course on development economics.

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