WP 2003-37
November 2003

Working Paper

Department of Applied Economics and Management
Cornell University, Ithaca, New York 14853-7801 USA

COMMUNITY AND ANTI-POVERTY TARGETING

Indraneel Dasgupta and Ravi Kanbur

Community and Anti-Poverty Targeting[•]

By

Indraneel Dasgupta
University of Nottingham
indraneel.dasgupta@nottingham.ac.uk

and

Ravi Kanbur
Cornell University
sk145@cornell.edu

This version: 11.5.03

Contents

Abstract

The standard theory of anti-poverty targeting assumes individual incomes cannot be observed, but statistical properties of income distribution in broadly defined groups are known. Targeting rules are then derived for the forms of transfers conditioned on group membership of individuals. In this literature the motivating notion of a "group" is purely statistical, even when it is groups such as localities and ethnicities. We model instead a group as a "community", meaning thereby a collection of individuals who have access to a community-specific public good, from which non-members are excluded. Such differential access constitutes a source of inequality among poor individuals belonging to different communities. We show that this formulation of what constitutes a group changes many of the basic results of the targeting literature. Optimal targeting for poverty alleviation leads to seemingly paradoxical rules, such as targeting transfers to the community that is richer. Total wealth of non-poor members of a community and its distribution both become relevant for specifying optimal targeting rules.

Keywords: Community, Inequality, Anti-poverty Targeting, Local Public Good.

JEL Classification Number: D31, D63, D74, Z13.

[•] We thank the Pew Charitable Trusts for financial support.

1. Introduction

The theory of targeting is now well developed. Starting with the work of Akerlof (1978), the use of income and non-income information to target transfers in anti-poverty programs has led to considerable work along theoretical, empirical and policy lines. At the heart of this literature is the following question. How should one condition transfers to individuals on their non-income characteristics, so as to increase the poverty alleviation efficiency of a given anti-poverty budget, the objective being to minimize a given measure of poverty? The non-income information can be used to supplement income information. Typically, individual level income information is assumed unavailable, statistical information on the joint distribution of income and other observable characteristics being all that is available to target transfers.[1]

Very often in this literature, the non-income information that is available is whether or not an individual belongs to a well defined "group". Obvious examples are spatial units (egg rural-urban, or provinces) and ethnic/religious groupings. Whichever grouping is chosen for focus, the targeting literature has not shown much interest in what follows from the notion of a group in terms of individual behavior. The grouping is simply another partitioning of the population, leading to a statistical income distribution pattern that can be used to better target anti-poverty transfers conditioned on group membership. The question asked in the targeting literature is how precisely to use this information to design targeting rules.

However, in socio-economic reality group membership also affects individual behavior and welfare outcomes. Indeed, groups are groups for a reason—they are not simply arbitrary partitionings of the population. One line of reasoning is that what makes a group a group, the glue that holds individuals together, is access to a group specific local public good, from which members of other groups are excluded. Such a club good perspective on groups, or "communities" is introduced in Dasgupta and Kanbur (2001). But once this line of reasoning is started, we have to ask how the supply of the community specific public good is determined, and how its presence impacts on individual well being. These are important building blocks to designing an anti-poverty program targeted to the wellbeing of the least well off in society, no matter which group they belong to.

If group membership allows poor people access to public goods from which non-members are excluded, then membership status becomes a source of inequality among the poor. Two poor individuals may have the same money income, yet one, by virtue of belonging to the group that is better endowed with the public good, may be better off than the other. Thus, for example, one poor individual may live in

[1] Kanbur (1987), Besley and Kanbur (1993), Kanbur, Keen and Tuomala. (1994), Bourguignon and Fields (1990), and Ravallion (1993) are examples of analyses in this vein.

a community which has access to a village well, or irrigation ditches, but another may not. Or the former may live in a region which organizes its own security and maintains its roads better than others. Yet another example would be that of a poor individual who is a member of an ethnic or religious community whose members take greater precautions against communicable diseases. Clearly, this factor should have a bearing on how optimal anti-poverty policies are targeted.

As we shall see, taking the notion of a group, or community, seriously has major consequences for the results of the targeting literature. Section 2 of this paper sets out the major thrusts of this literature to establish the benchmark. Section 3 develops our model of community. Section 4 then revisits the basic issues in the targeting literature in the new framework. It follows from our framework that richer communities should have lower nominal poverty lines. We show that, somewhat paradoxically, efficient targeting of anti-poverty programs may dictate favoring of poor members of the richer community. This happens simply because monetary transfers are more effective in improving welfare in the richer community. Furthermore, total income of *non-poor* members of a community, and its distribution, are both important for determining optimal anti-poverty targeting rules, since they determine the magnitude of the public goods that community members have access to. Section 5 concludes.

2. <u>The Standard Theory of Targeting</u>

2.1 Measuring Poverty:

The canonical problem in the targeting literature is that of allocating a given transfer budget to minimize poverty. Let

$$I_1 \leq I_2 \leq \ldots \leq I_q < z < I_{q+1} \leq \ldots \leq I_n \tag{1}$$

be the distribution of income I across n individuals, where z is the exogenously given poverty line which separates the poor from the non-poor. In the above representation, z is shown to cut off q individuals below the poverty line.

In applied work, I is usually some form of total real resources of the household, information about which is collected from household surveys. The poverty line is a normative concept, reflecting social norms on what it means to be "poor". A common starting point is minimum intake of calories, but this is supplemented with requirements for non-food expenditures such as clothing and housing. It should be clear that the latter items, but also to some extent food related minimum requirements, are dependent on social norms and can vary from society to society. Conceptually, we can think of a basic bundle of commodities as the minimum requirement, or as derived from the minimum requirement of more basic but more intangible considerations (e.g. the ability to appear in public without shame), and then this bundle is "priced out" and a minimum level of income is then derived as the poverty line. Once all price variations are taken into account, and if I is also corrected for relevant variations, the poverty line should be the same for all members of a society.

However, as the commodity bundle changes, or as the cost of achieving a given bundle changes, the poverty line may change. If a poverty line moves with the mean of the income distribution, it is usually referred to as a *relative* poverty line. Otherwise, it is called an *absolute* poverty line. Whether the poverty line should be relative or absolute is the subject of much debate (see for example the discussion in Atkinson and Bourguignon (2000), Ravallion and Lokshin (2003)). But there seems to be a general consensus that as societies develop their production structures change, as might their norms. There is also a consensus that for these reasons, richer societies should have higher poverty lines.

Given a poverty line and given a distribution of income, the next question is how to aggregate the information into an index of poverty. There is again a large literature on this topic. But in applied work, and also in much theoretical work, a central role is played by the FGT index, first developed in Foster, Greer and Thorbecke (1984):

$$P_\alpha = \frac{1}{n}\sum_{i\in\Pi}\left(1-\frac{I_i}{z}\right)^\alpha \text{, where } \Pi = \{j \mid j \in \{1,\ldots,n\}, \ \ and \ \ I_j < z\}. \tag{2}$$

In the above, Π is the set of poor individuals and α is an index of poverty aversion which emphasizes concern for the poorest of the poor. Note that when $\alpha = 0$, the index collapses to the fraction of people below the poverty line, the commonly used "head count ratio". When $\alpha = 1$, the index is simply a sum of the gaps of each poor person's income from the poverty line, suitably normalized. This is often referred to simply as the "income gap" measure. As α increases beyond unity, increasing weight is put on the larger gaps. In the literature, a particular benchmark is provided by $\alpha = 2$, in which case the normalized income gaps are squared and then summed. As α increases the focus is increasingly on the poorest of the poor. In the limit, as α tends to infinity, the only thing that matters is the poverty of the very poorest person.

2.2 Income Based Targeting:

Suppose we have a limited budget for income transfers. How can it be allocated to have the biggest impact on reducing poverty? This is the question posed in the targeting literature. The answer depends on the information structure of the problem, and on the behavioral responses to the transfers. Let us start with the most comprehensive information that can be available to those implementing the antipoverty program—every individual's income can be identified costlessly. Let us also assume no behavioral responses to the transfers. Then it is clear that the transfer rule for the marginal dollar depends on the value of α (Bourguignon and Fields, 1990).

When $\alpha = 0$, the focus is on the margin at the poverty line. If the transfer is so small that not even the person closest to the poverty line can be lifted over the poverty line, then it does not matter who it is given to. As the amount available grows to an amount that can shift this person over the poverty line, then the transfer should be given to her, and then to the next person, and so on. Thus the transfers should go first to those closest to the poverty line. When α = 1, it does not matter who the marginal transfer goes to, since the reduction of anyone's poverty gap counts the same in the overall index. However, when α becomes bigger than 1 the rule changes to the following: the transfer should be made to the poorest person; as the resources increase, this transfer should continue until the poorest person has the same income as the next poorest person; as resources increase further, the transfer should continue equally to these two people until they have the same income as the next poorest person; and so on.

2.3 Group Based Targeting:

Suppose now that individual income cannot be observed, but what can be observed is individual membership of a group. More formally, consider a society of *n* individuals, represented by the set *S*, which can be partitioned into two non-empty subsets *a* and *b*. Thus, society consists of two mutually exclusive groups, indexed *A* and *B* (the generalization to more than two groups is straightforward). The set *a* then is the collection of all members of group *A*, and similarly *b*. Let the sets *a*, *b*, and *S* contain, respectively, n_A, n_B and *n* members. The transfer can now be conditioned on group membership. All members of a group have to be treated alike, since there is no basis on which to do otherwise, but members of different groups can be treated differently. Let the resources available at the margin be denoted by *c*. We suppose these are small enough that nobody is pushed over the poverty line. We can begin by posing the following question on policy "stance"—if the transfer was to be given to only one group, which group should it be?

The overall poverty index can be written as:

$$P_\alpha = \frac{1}{n}\left[\sum_{i\in\Pi_A}\left(1-\frac{I_i}{z}\right)^\alpha + \sum_{i\in\Pi_B}\left(1-\frac{I_i}{z}\right)^\alpha\right], \tag{3}$$

where Π_A and Π_B are the sets of poor individuals in the two groups. For each of the cases where the transfer is made to group *A* or group *B* individuals, the poverty index is given respectively by the following expressions:

$$P_\alpha = \frac{1}{n}\left[\sum_{i\in\Pi_A}\left(1-\frac{I_i+\frac{c}{n_A}}{z}\right)^\alpha + \sum_{i\in\Pi_B}\left(1-\frac{I_i}{z}\right)^\alpha\right], \tag{4}$$

$$P_\alpha = \frac{1}{n}\left[\sum_{i\in\Pi_A}\left(1-\frac{I_i}{z}\right)^\alpha + \sum_{i\in\Pi_B}\left(1-\frac{I_i+\dfrac{c}{n_B}}{z}\right)^\alpha\right]. \tag{5}$$

The impact on poverty of a marginal transfer to either group is thus given by the derivatives of (4) and (5), evaluated at $c = 0$. The respective expressions are:

$$\frac{dP_\alpha}{dc}\Big|_{c=0} = \frac{-\alpha}{nz}\left\{\frac{1}{n_A}\sum_{i\in\Pi_A}\left(1-\frac{I_i}{z}\right)^{\alpha-1}\right\} = \frac{-\alpha}{nz}P_{(\alpha-1),A}\,, \tag{6}$$

$$\frac{dP_\alpha}{dc}\Big|_{c=0} = \frac{-\alpha}{nz}\left\{\frac{1}{n_B}\sum_{i\in\Pi_B}\left(1-\frac{I_i}{z}\right)^{\alpha-1}\right\} = \frac{-\alpha}{nz}P_{(\alpha-1),B}\,. \tag{7}$$

The expressions in (6) and (7) capture a result first derived in Kanbur (1987), that if the objective is to minimize P_α, then the group with the higher $P_{\alpha-1}$ (which need not be the one with the higher value of P_α) should be targeted at the margin. Thus if the normatively chosen value of α is 1, the group with the higher head count ratio should be targeted. If α is 2, then the group with the higher value of the income gap should be targeted, and so on. The basic intuition that the poorer group should be targeted is borne out, but with a subtle modification. If the objective is P_α, the targeting indicator is $P_{\alpha-1}$. The expressions can also be used to develop rules for the optimal allocation of a transfer budget—the first order condition is obviously that the $P_{\alpha-1}$ should be equalized across the two groups. They can also be used for targeting in a wide variety of contexts, for example, food subsidies (Besley and Kanbur, 1988), land holding based targeting (Ravallion and Chao, 1989) or geographical targeting (Ravallion, 1993).

3. Group as Community

We develop now the idea that a group is more than simply an index that distinguishes one set of individuals from another. We wish to develop the idea of a group as a community defined by access to a community specific public good, from which members of other communities are excluded.

Individuals derive utility from private consumption and from a community specific public good. For any individual $i \in S$, belonging to community $k \in \{A, B\}$, amounts of the private and the public good consumed are, respectively, x_i and y^k. Preferences are given by a strictly quasi-concave and twice continuously differentiable utility function $u(x_i, y^k)$. We thus assume that all individuals in society have identical preferences; however, members of, say, community A, do not have access to community B's public good, and vice versa. Agent *i* has own money (or nominal) income I_i.

We model the supply of the public good in a standard way, using the literature on the voluntary provision of public goods (Bergstrom, Blume and Varian, 1986). It is argued in Dasgupta and Kanbur (2001) that it is precisely voluntary provision that distinguishes community from state, whereas non-rival consumption distinguishes community from market. The total supply of the public good is assumed to be simply the sum of the individual contributions to the public good in that community. Thus in any community *k* each individual solves the problem:

$$\underset{x_i, y}{Max} \quad u\left(x_i, y^k\right) \text{ s.t.} \tag{8}$$

$$x_i + y^k = I_i + y_{-i}^k,$$

$$y^k \geq y_{-i}^k;$$

where y_{-i}^k is the sum of contributions of individuals other than i in the community, and all relative prices have been fixed at unity, following standard practice. The solution to the maximization problem, subject to the budget constraint alone, yields, in the standard way, the unrestricted demand functions: $\left[y = g\left(I_i + y_{-i}^k\right)\right]$, and $\left[x_i = h\left(I_i + y_{-i}^k\right)\right]$. We assume that all goods are normal:

A1. $g', h' > 0$.

By A1, there must exist a unique Cournot-Nash equilibrium in the voluntary contributions game.[2] Agent *i* belonging to community *k* is *non-contributory* in a Nash equilibrium if and only if, in that Nash equilibrium, $\left[y_{-i} > g\left(I_i + y_{-i}^k\right)\right]$, and *contributory* otherwise. Let:

$$\underline{I}\left(y_{-i}^k\right) \equiv g^{-1}\left(y_{-i}^k\right) - y_{-i}^k.$$

A1 implies that *i* is non-contributory if, and only if, $I_i < \underline{I}\left(y_{-i}^k\right)$.

Let C^k, N^k be the sets of all contributors and non-contributors, respectively, in community k, with cardinality n_{Ck}, n_{Nk}. We assume that both sets are non-empty. Evidently, given A1, all contributors must be richer than any non-contributor. In a Nash equilibrium, the utility of each individual will depend critically on whether or not that individual is a contributor to the public good.

Starting from an initial income distribution in community *k*, with its attendant Nash equilibrium level of the public good, consider an income redistribution only among contributors such that their incomes are

[2] See Bergstrom, Blume and Varian (1986).

equalized, every such agent receiving $\bar{I}_{Ck} = \frac{\sum_{i \in C^k} I_i}{n_{Ck}}$. Let the corresponding Nash equilibrium amount of the public good be given by $\bar{y}(\bar{I}_{Ck}, n_{Ck})$. Evidently, every contributor must provide $\frac{\bar{y}(\bar{I}_{Ck}, n_{Ck})}{n_{Ck}}$ in this equilibrium. It follows from the neutrality property of Cournot games with public goods (Bergstrom *et al.* (1986)) that the original Nash equilibrium amount of the public good must also be $\bar{y}(\bar{I}_{Ck}, n_{Ck})$; furthermore, private consumption among contributors must be identical in the two Nash equilibria as well.

Let the *real income* of agent *i* in a Nash equilibrium, where she consumes (x_i, y), be defined as: $\left[r(x_i, y) \equiv V^{-1}(u(x_i, y))\right]$; where V is the indirect utility function. Thus, the real income in a Nash equilibrium is the minimum expenditure required to generate the same utility, as that provided by the consumption bundle the agent actually consumes, in that Nash equilibrium. The utility of contributors and non-contributors is given respectively by:

$$u = V\left(\bar{I}_{Ck} + \bar{y}(\bar{I}_{Ck}, n_{Ck})\left(\frac{n_{Ck} - 1}{n_{Ck}}\right)\right), \tag{9}$$

$$u = u\left(I_i, \bar{y}(\bar{I}_{Ck}, n_{Ck})\right). \tag{10}$$

We can specify the "real income" of a non-contributory agent in community k as:

$$r_i = r(I_i, \bar{y}) \equiv I_i + \left[y^k - f(I_i, \bar{y})\right], \tag{11}$$

such that: $f(.) \in (0, \bar{y})$.

Real incomes of all contributors in a community are identical. It follows from (9) that, for a contributor,

$$r_i = r^*(\bar{I}_{Ck}, n_{Ck}) \equiv \bar{I}_{Ck} + \bar{y}(\bar{I}_{Ck}, n_{Ck})\left(\frac{n_{Ck} - 1}{n_{Ck}}\right). \tag{12}$$

Real incomes of non-contributors vary with their nominal incomes, but also depend on the level of the community specific public good, $\bar{y}$, and thereby, on the nominal incomes of the contributory (richer) members of their community. Note that, since preferences are identical, one agent is better off than another if, and only if, she has a higher real income.

We now introduce two more restrictions on preferences.

A2. There exists a positive monotonic transformation of $u(x_i, y)$, $W(x_i, y)$, such that: (a) $W_{x_i y} \geq 0$, and (b) the indirect utility function corresponding to *W* is strictly concave in income.

A3. There exists a positive monotonic transformation of $u(x_i, y)$, $Z(x_i, y)$, such that: (a) $Z_{x_i x_i}, Z_{yy} < 0$, and (b) the indirect utility function corresponding to Z is convex in income.

Standard functional forms used in theoretical and applied work such as the Cobb-Douglas, Stone-Geary and CES all satisfy A1-A3.

Lemma 2.1. (Dasgupta and Kanbur (2001)) *Given A1-A3, if* $I_i < \underline{I}(y_{-i})$, *then:* $r_{\overline{y}I_i} > 0$, *and* $r_{I_i I_i}, r_{\overline{yy}} < 0$.[3]

One particular functional form for the utility function that will be useful in the detailed analysis is:

$$u = \ln x_i + \ln y. \tag{13}$$

Then $\underline{I}(y_{-i}) = y_{-i}$. Suppose $I_i < y_{-i}$, which implies *i* is non-contributory. It is easy to check that:

$$r_i = 2\sqrt{I_i y_{-i}} = 2\sqrt{I_i \bar{I}_{Ck}\left(\frac{n_{Ck}}{n_{Ck}+1}\right)}. \tag{14}$$

The real income of contributors is given by:

$$r_i = \bar{I}_{Ck}\left(\frac{2n_{Ck}}{n_{Ck}+1}\right). \tag{15}$$

4. Targeting With Community

4.1 Real Incomes Within Communities and Measuring Poverty:

In the model developed above, nominal income is no longer an appropriate measure of wellbeing, at least not by itself. Since there is now a community specific public good which provides utility, this has to be taken into account in the measurement of wellbeing and indeed of poverty. Real income is an obvious basis for such measurement. In principle, given the distribution of r, we can compute poverty in exactly the same as was done for I in Section 2.1, but with a poverty line define on r, z_r.

Once again, let the two communities in our society be indexed by A and B. Let the income levels in each community be I_j, j = 1, 2,…, J. Let the number of individuals at each income level in community A be $n_{A,j}$ and that in community B be $n_{B,j}$. Let the critical level on income that demarcates contributors from non-contributors in the Nash equilibrium in the two communities be $\hat{I}_A, \hat{I}_B$, and let the level of the public good in the two communities be y_A and y_B. For all $k \in \{A, B\}$, let the set of contributory income classes

[3] A3 is slightly different from the corresponding assumption in Dasgupta and Kanbur (2001), generating negativity for r_{II}, $r_{\overline{yy}}$, rather than non-positivity as in their formulation. The proof is identical.

be defined as $M_k = \{j \in \{1,...,J\} \mid I_j \geq \hat{I}_k\}$, and let the set of contributory individuals in community k be defined, as before, as $C_k = \{i \in k \mid I_i \geq \hat{I}_k\}$. Then $\bar{I}_{Ck} = \sum_{j \in M_k} n_{kj} I_j$, and $n_{Ck} = \sum_{j \in M_k} n_{kj}$. The real income at each level of nominal income in the two communities is given (using (11) and (12)) by:

$$r^A = \begin{cases} r^*\left(\bar{I}_{CA}, n_{CA}\right) \text{ if } I_j \geq \hat{I}_A \\ r\left(I_j, \bar{y}\left(\bar{I}_{CA}, n_{CA}\right)\right) \text{ otherwise} \end{cases}; \tag{16}$$

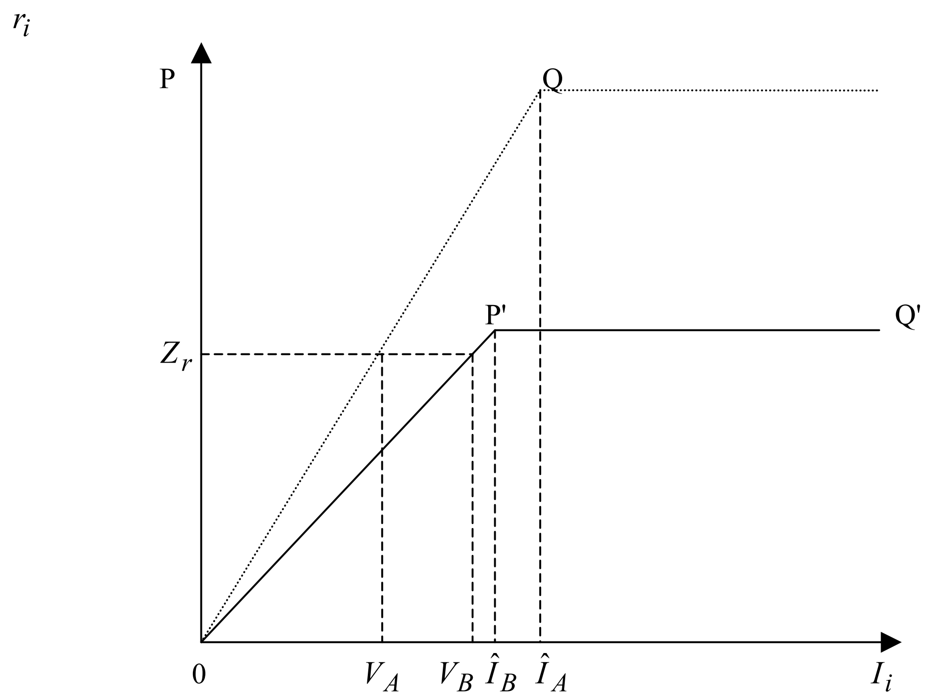
$$r^B = \begin{cases} r^*\left(\bar{I}_{CB}, n_{CB}\right) \text{ if } I_j \geq \hat{I}_B \\ r\left(I_j, \bar{y}\left(\bar{I}_{CB}, n_{CB}\right)\right) \text{ otherwise} \end{cases}. \tag{17}$$

To fix ideas, we think of A as being the richer community, in the sense that its *contributors* have higher total income and, as a result, its public good level is higher. Thus the contributors in A are better off than contributors in B. But non-contributors in A are also better off than non-contributors in B with the same level of nominal income, because those in A have access to a higher level of public good supply by virtue of belonging to the community, even though they are not contributing at all to the supply of public good. It is the good fortune of those in A that they live in a community where the contributors to the public good have greater total wealth than the corresponding contributors in community B.

Figure 1 plots the relationship between nominal and real income for the two communities. The schedule OP'Q' shows the relationship for individuals belonging to community B. The schedule OPQ shows the relationship for members of community A. As can be seen, the schedule for A lies everywhere above that for B.

Remark 4.1. If we were to choose a poverty line in nominal income space, say $0V_A$, we would arrive at the following paradoxical situation. Individuals in community B whose nominal earnings fell in the region $V_A V_B$ would be considered non-poor. However, there might exist individuals in community A, classified as poor, who are actually *better off* than some of those in B, with incomes in this region, who are classified as non-poor. Therefore, for consistent and non-discriminatory identification of the poor, we need to move to the space of real incomes and define a poverty line in this space, say z_r,, represented by the distance $0Z_r$. But this poverty line in real income space corresponds to two different poverty lines in nominal income space for the two communities, OV_A and OV_B. In particular, the richer community A, has the *lower* poverty line, OV_A.

Figure 1



The reason this happens in our setting is clear. All individuals have more than just their nominal income. They have the public good, and individuals in community A have more of it. Thus they need less nominal income to reach a given level of real income, and thus a given level of welfare. While this logic is clear, notice that it is very different to the usual logic by which poverty lines in nominal income space are *higher* for societies that are richer. The argument there is that in richer societies the technology for achieving a given level of real well being may well be more expensive in terms of nominal income. The community model of voluntary provision of public goods provides a different perspective—achieving the same level of real income may be less expensive in terms of nominal income because of the wellbeing provided by the public good by virtue of community, even to those who do not contribute to its provision.

Given a real income poverty line z_r, we can specify the FGT class of poverty indices analogously to (2) and (3):

$$P_\alpha = \frac{1}{n}\left\{\sum_{i\in\Pi}\left(1-\frac{r_i}{z_r}\right)^\alpha\right\}, \tag{18}$$

$$P_\alpha = \frac{1}{n}\left\{\sum_{i\in\Pi_A}\left(1-\frac{r(I_i, y_A)}{z_r}\right)^\alpha + \sum_{i\in\Pi_B}\left(1-\frac{r(I_i, y_B)}{z_r}\right)^\alpha\right\}, \tag{19}$$

where the index i ranges over individuals and Π_A and Π_B are the sets of poor individuals in communities A and B, defined as those whose real incomes are below z_r. We will make the assumption, shown in Figure 1, that the nominal poverty lines corresponding to z_r, OV_A and OV_B, are strictly less than $\hat{I}_A$ and $\hat{I}_B$, respectively. Thus, none of the contributors in either community are among the set of the poor.

4.2 Income Based Targeting:

The objective of anti-poverty policy is now to minimize poverty defined on real incomes, but of course using nominal income transfers as the policy instrument. We begin with the assumption that the policy maker can costlessly identify each individual's nominal income, and also knows the real income functions (11) and (12), so that the real income of individuals can also be identified.

When α = 0, so that the objective is to minimize the head count ratio defined in real income space, if all the poor are strictly below the poverty line then a marginal transfer makes no difference to poverty at all. But when α ≥1, a transfer to any one of the poor will reduce poverty. But for which individual, in which community, will the transfer have the biggest impact? To answer this question, consider expression (20), and differentiate it with respect to the nominal income of a typical poor individual i:

$$\frac{\partial P_\alpha}{\partial I_i} = -\left(\frac{\alpha}{nz_r}\right)\left(1-\frac{r_i}{z_r}\right)^{\alpha-1}\left(\frac{\partial r_i}{\partial I_i}\right). \tag{20}$$

The marginal transfer should go to the individual with the highest value of (20).

The first term on the right hand side is a constant. When α = 1, the second term is simply unity. Thus the magnitude of (21) is determined by the third term. But from Lemma 2.1, this term is higher for lower nominal income, and rises with total public good supply. Consider therefore I_1, the lowest level of income in either community. In the world described in Section 2.1, we could transfer nominal income to any poor individual. But in this world of community specific public goods, the greatest increase in real income comes from making the transfer to those with nominal income I_1 in the *richer* community, A. But, as is seen from Figure 1, these are also better off than the corresponding people in community A. Seemingly paradoxically, efficient targeting in this world requires favoring those who are better off to begin with, in direct contrast to the standard targeting literature.

The transfers to those with I_1 in community A should continue until $\frac{\partial r}{\partial I}$ for this group falls to the next level observed in the society. This could be the next income level up in community A, or the lowest level in community B, depending on further detailed specification of the model. In either case, this enlarged group should now receive transfers in such a fashion as to lower their common value of $\frac{\partial r}{\partial I}$ to the next level observed in the society, and so on. But notice that in order to do this, different individuals in the group receiving transfers may have to be given *different magnitude of transfers,* when that group consists of members of both communities. For example, it follows from (14) that $\frac{\partial^2 r}{\partial I^2} = -\frac{1}{2I}\frac{\partial r}{\partial I}$. Thus, in this case, individuals in the group receiving transfers who belong to the richer community A will have to be given higher transfers. This is again a very different conclusion from the standard targeting story of Section 2.1.

When α is strictly greater than 1, the second term in (20) falls with r. Comparing I_1 across the two communities, the third term is higher but the second term is lower. The net affect is thus ambiguous.

Remark 4.2. There exists a critical value of α such that, for all values lower than this, the targeting rule is such as to favor transfers to the poor in the rich community. For values of α above this threshold, the poverty aversion effect dominates and the transfer is to the poor of the poor community.

4.3 Community Based Targeting:

We now assume that individual incomes cannot be identified and distinguished. However, we suppose that those above and below the poverty line can be distinguished in each community. Let there be available a total budget c. All poor in each community must be treated identically, irrespectively of how poor they are. Let the numbers of poor individuals in communities A and B be given, respectively, by n_{PA}, n_{PB}. We suppose that the budget is so small that no poor people are pushed over the poverty line. Then the post transfer poverty when all of the transfer is to group A or group B is given, respectively, by

$$P_\alpha = \frac{1}{n}\left\{ \sum_{i\in\Pi_A}\left(1-\frac{r\left(I_i+\frac{c}{n_{PA}}, y_A\right)}{z_r}\right)^\alpha + \sum_{i\in\Pi_B}\left(1-\frac{r(I_i, y_B)}{z_r}\right)^\alpha \right\}, \tag{21}$$

$$P_\alpha = \frac{1}{n}\left\{ \sum_{i\in\Pi_A}\left(1-\frac{r(I_i, y_A)}{z_r}\right)^\alpha + \sum_{i\in\Pi_B}\left(1-\frac{r\left(I_i+\frac{c}{n_{PB}}, y_B\right)}{z_r}\right)^\alpha \right\}. \tag{22}$$

The impact on poverty of a marginal transfer to either group is thus given by the derivatives of (21) and (22), evaluated at c = 0:

$$\frac{dP_\alpha}{dc}\Big|_{c=0} = \frac{-\alpha}{nz_r}\left\{\frac{1}{n_{PA}}\sum_{i\in\Pi_A}\left(1-\frac{r_i}{z_r}\right)^{\alpha-1}\left(\frac{\partial r_i^A}{\partial I_i}\right)\right\}, \tag{23}$$

$$\frac{dP_{\alpha}}{dc}\Big|_{c=0} = \frac{-\alpha}{nz_r}\left\{\frac{1}{n_{PB}}\sum_{i\in\Pi_B}\left(1-\frac{r_i}{z_r}\right)^{\alpha-1}\left(\frac{\partial r_i^B}{\partial I_i}\right)\right\}. \tag{24}$$

Expressions (23) and (24) will be recognized as the community analogs of the individual level expression (20). When α = 1 the targeting thus depends on the comparison:

$$\left\{\frac{1}{n_{PA}}\sum_{i\in\Pi_A}\left(\frac{\partial r_i^A}{\partial I_i}\right)\gtreqless\frac{1}{n_{PB}}\sum_{i\in\Pi_B}\left(\frac{\partial r_i^B}{\partial I_i}\right)\right\}. \tag{25}$$

Suppose that the nominal income distributions below the poverty line were identical in the two communities. The standard theory of targeting would then be indifferent between transfers to either group. However, since the derivative $\frac{\partial r}{\partial I}$ is higher at each income level for the richer community (Lemma 2.1), the targeting rule in this world is to favor the *richer* community. This illustrates a tendency already noted in Section 4.2. Note that, since, by Lemma 2.1, $\frac{\partial^2 r}{\partial I^2} < 0$, the same conclusion will hold if the two communities have identical numbers of poor individuals, but the distribution of nominal income among the poor in the poorer community B stochastically dominates that in the richer community A (in the first degree). When α exceeds one, then there are two forces pulling in opposite directions. For α high enough, the poverty aversion effect dominates, and the transfer should be to the poorer community.

Remark 4.3. If α is close enough to unity, then, in this world, the richer community should get the transfer. This is because the impact of monetary transfers on the real incomes of the poor in the richer community is greater, and this is in turn because the richer community has a higher level of public goods. Thus, even though every poor person in A is better off than every corresponding poor person in B with the same nominal income, the policy stance should nevertheless be to transfer to community A.

A similar analysis can be conducted for the case where the policy makers can distinguish contributors from non-contributors, but cannot distinguish different incomes among the non-contributory group. Expressions similar to (23), (24) and (25) can be derived, with the numbers of poor replaced by the numbers of non-contributors. If, on the other hand, policy makers cannot make even this distinction, so that there is some leakage to the contributors and this in turn affects the level of public good in each community, the analysis is complicated considerably—to the extent that no fresh general insights can be generated, since the outcome then depends on specificities of preferences, income distribution, and the extent of leakage to contributors.

Remark 4.4. In our analysis, we have termed 'richer' the community with the larger amount of the public good. As pointed out earlier, what determines the Nash equilibrium level of the public good in a community is the total income of its contributors. In general, one would expect community A to have a larger amount of the public good if the non-poor section of its population is significantly wealthier than the corresponding section of community B. However, it can be shown that if income distribution is significantly more unequal within the non-poor segment of community B, then that community can have a larger amount of the public good even if the total wealth of the non-poor segment is B is less. Thus, total income of the non-poor segment of a community and its distribution are both relevant for determining whether that community will be better endowed with public goods than others. It follows from our analysis that both aspects are also relevant for determining optimal anti-poverty targeting rules. Yet neither aspect is relevant in the traditional framework.

Remark 4.5. If the anti-poverty program takes the form of direct provision of public goods rather than income supplements, then Lemma 2.1 generates the unsurprising conclusion that the poorer community should receive such public goods (assuming, as before, identical distribution of nominal incomes below the poverty line in the two communities).

5. Conclusion

In this paper, we have explored the joint consequences, of (a) identifying communities with community-specific public goods, and (b) identifying poor individuals with different communities, for the results of the targeting literature. We have shown that a number of standard results of the literature on targeting of anti-poverty programs change when these two aspects are taken into consideration. In particular, efficient targeting of anti-poverty programs may require favoring of poor members of the richer community. Furthermore, total income of *non-poor* members of a community, and its distribution, both turn out to be important for determining optimal anti-poverty targeting rules.

Our purpose in this paper has been to provide a conceptual framework which enables one to integrate issues surrounding community identity with those related to anti-poverty targeting. Application of this framework to specific policy contexts will require further assumptions regarding the functional forms used to represent preferences and the distribution of nominal income. Such applications may be the subject of future research.

References

Akerlof, George. (1978): "The economics of "tagging," as applied to the optimal income tax, welfare programs and manpower planning," *American Economic Review* 68: 8-19.

Atkinson, A B and F. Bourguignon (2000): “Poverty and inclusion from a world perspective,” in H de la Largentaye, P-A Muet, J-F Rischard and J E Stiglitz (eds.), *Governance, Equity and Global Markets*, La Documentation Française, Paris.

Bergstrom, T.C., Larry Blume and Hal Varian (1986): “On the private provision of public goods,” *Journal of Public Economics* 29: 25-49.

Besley, Timothy and Ravi Kanbur (1988): “Food subsidies and poverty alleviation,” *Economic Journal* 98: 701-719.

Besley, Timothy and Ravi Kanbur (1993): “Principles of targeting”, in M. Lipton and J. van der Gaag (eds.), *Including the Poor*, The World Bank, Washington, DC, pp 67-90.

Bourguignon, Francois, and Gary Fields (1990): "Poverty measures and anti-poverty policy,” Recherches Economique de Louvain.

Dasgupta, Indraneel and Ravi Kanbur (2001): “Class, community, inequality,” Cornell University, Department of Applied Economics, Working Paper no. 24/01.

Foster, James, Joel Greer and Erik Thorbecke (1984): “A class of decomposable poverty measures,” *Econometrica* 52: 761-766.

Kanbur, Ravi (1987): “Measurement and alleviation of poverty,” *IMF Staff Papers* 36: 60-85.

Kanbur, Ravi, Michael Keen and Matti Tuomala (1994): “Labor supply and targeting in poverty alleviation programs,” *World Bank Economic Review* 8: 191-211.

Ravallion, Martin (1993): “Poverty alleviation through regional targeting: a case study for Indonesia,” in K. Hoff, A. Braverman and J. Stigltiz , eds., *The economics of rural organization; theory, practice and policy*, Oxford University Press, Oxford, pp 453-467.

Ravallion, Martin and K. Chao (1989): “Targeted policies for poverty alleviation under imperfect information: algorithms and applications,” *Journal of Policy Modeling* 11: 213-224.

Ravallion, Martin and Michael Lokshin (2003): “On the utility consistency of poverty lines,” processed, The World Bank.

Figure 1

r_i

P Q

P' Q'

Z_r

0 V_A V_B $\hat{I}_B$ $\hat{I}_A$ I_i