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Poverty

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The Principles of Targeting

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Administrative and data-collection costs, individual responses to targeted interventions, and considerations of political economy make it difficult to establish workable procedures for fine targeting of spending to alleviate poverty. Self targeting and targeting by indicators offer more advantages than other approaches.

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This paper — a product of the Research Administrator's Office — is part of a larger effort in PRE to understand the design of poverty alleviation policies. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Jane Sweeney, room S3-026, extension 31021 (35 pages).

In response to calls for finer targeting of spending to alleviate poverty in developing countries, Besley and Kanbur discuss the principles of targeting.

The ideal solution — the benchmark for discussion — is that all transfers go to the poor. The ideal solution is unrealizable because of three factors:

- The costs of administration and data collection.
- Individual responses and incentive effects.
- Considerations of political economy.

The best strategy will probably lie somewhere between the two extremes — the ideal solution and universal intervention — mediated by these three considerations.

Two types of targeting, although short of the ideal, may be useful in certain contexts.

With *statistical targeting* (using indicators), programs target key indicators such as a region, occupation, or the crops grown. (It might be easier, for example, to target everyone in a low-income neighborhood, particularly when it is difficult to identify individual incomes.)

Self-targeting uses differences in needs, tastes, or incomes as a device for achieving self-selection by only the poor into poverty alleviation programs.

Real progress in understanding how targeting works best can be made only through country-specific research that quantifies the costs and benefits of targeting using data that has increasingly become available for many developing countries — and research that is sensitive to the political realities of reform.

Produced at the PRE Dissemination Center

The Principles of Targeting[1]

by
Timothy Besley
and
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[1] An earlier version of this paper was presented to the World Bank symposium on Poverty and Adjustment, April 11-13, 1988. We are grateful to Stephen Coate for comments.

1. Introduction

In the realm of poverty alleviation policies, it is often argued that the "best" solution is one which identifies who is poor and then targets benefits towards that group. The debate on targeting is an old one and moreover, it has been as much a topic of controversy in developed countries as in developing countries[2]. Commentators have emphasized the costliness of identifying the poor and the effects on incentives which may attend income tested programs[3]. The counterpoint is to recommend universalistic programs which provide benefits which are paid independently of income. However, it is in the wake of macroeconomic and structural adjustment that targeting seems to have attained a special significance in developing countries, as more and more governments have come under pressure to reduce expenditure. Indeed, targeting has become a panacea in the area of poverty alleviation, whence it is suggested that policy makers can have their cake and eat it too – improved targeting means that more poverty alleviation could be achieved with less expenditure! Alas, the real world is not quite so straightforward. There are good reasons why this best of all possible worlds is not available to policy makers in developing countries and hard decisions will have to be made that weigh up the costs and benefits of targeting.

The object of this paper is to provide a framework for considering the principles of targeting to alleviate poverty. Since the focus is on the *principles*, much of the discussion will be at a general and abstract level. However, these principles are intended to be applicable in particular Less Developed Countries where upon the flesh of institutional knowledge must be added. Section 2 begins by stating the basic problem in a very simple framework and here we present the ideal solution: a case of "perfect targeting". The following sections take up three central problems with this solution – administrative costs, high marginal tax rates and political economy considerations. Each of these militates

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[2]See the contributions in Garfinkel [1982].

[3]Kanbur [1987a] reviews the issues in the light of recent US and UK policy.

against fine targeting and suggest the advantages of more universalistic schemes. Section 6 considers the 'intermediate' option of targeting by indicators. In section 7, we consider self–targeting schemes and section 8 concludes.

2. The Basic Problem and the Ideal Solution

Any discussion on targeting for poverty alleviation presupposes agreement on what is meant by poverty i.e. agreement on (i) a measure of the "standard of living", (ii) a "poverty line" which distinguishes the poor from the non–poor and (iii) a "poverty index" which aggregates together information on the standard of living of the poor. Each of these is an important and controversial topic and would demand a separate paper on its own[4]. For our purposes, we shall assume that these problems have been "solved", in order to focus attention on targeting directly.

Let us suppose, initially, that we have a household income distribution which measures "income" correctly and adjusts for households facing different prices, household size and composition etc. Suppose furthermore, that the poverty line is given by z, so that all those with incomes less than z are in poverty. The object of policy is to reduce poverty to zero. The "ideal solution" would be where income can be observed accurately and costlessly, and where no incentive effects prevent the State from plugging the gap between the poverty line and income. The ideal solution is depicted in Figure 1, which plots final income (i.e. post transfer) against original income. Along the dotted 45^0 line there is no difference between original and final income[5]. A point above this line indicates a subsidy or transfer, while a point below indicates a withdrawal or tax. The ideal solution is given by the solid line. For anybody with original income y less than z, the government transfers exactly the amount z–y so as to bring final income up to z. This completely eliminates

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[4]On these issues see Atkinson [1987], Kanbur [1987b].

[5]It requires the State to have perfect information about individuals' tastes and charactistics so that individuals are prevented from "pretending" to have incomes below the poverty line in order to claim a transfer.

poverty. The financial cost of this strategy is given by the sum of these transfers z–y. If the distribution of income was uniform then this cost would simply be depicted by the triangular areas between the horizontal solid line and the 45^0 line.

The structure of the scheme for those with income above z depends on the nature of the budget constraint. If the transfer/poverty alleviation scheme is to be self–financing, then those with incomes above z have to be taxed. This is shown in Figure 1 by the solid line beyond z lying below the 45^0 line. The larger the tax revenue to be raised, the shallower this line will have to be in order to balance the budget. Figure 2 makes explicit the transfers to and from the government as a function of original income. Below z, the transfers are from the government and are therefore shown as negative, whilst above z they are to the government. The slope of the solid line in Figure 2 is the *marginal* tax rate. Figure 2 shows that the "ideal solution" imposes a higher marginal tax rate on the poor than one the non–poor. We return to this point in Section 4, where disincentive effects of high marginal tax rates are discussed.

If the government is perfectly informed, the ideal solution is clearly the least cost method of alleviating poverty. If external resources were at stake, or if internal resources had to be raised to finance the poverty alleviation program, the ideal solution would be preferred. But is it feasible? It relies on being able to transfer exactly the right amount to each individual below the poverty line without affecting their incentives to earn. The administrative costs of this in a developing country context are taken up in the following section. Here we will present the opposite extreme to the ideal solution, by way of contrast. This is a completely universalistic scheme which gives *everybody* a transfer of z (i.e. regardless of income). This is depicted in Figures 3 and 4. This scheme also eliminates poverty but at a far greater budgetary cost. it is easy to see why this is so. Now everybody, even someone with original income exceeding z, receives the transfer of z from the government, (as shown in Figure 4). The budgetary cost of this is simply z times the population size. If this is to be recouped through taxation, then the marginal tax rates

on the non–poor will need to be higher than in the ideal solution, although the marginal tax rates on the poor are now lower. Figures 5 and 6 depict such a scheme, which is discussed further in Section 4.

These two extremes (ideal means testing and universalistic) serve to anchor our discussion of the principles of targeting. As will become clear by the end of this paper, neither extreme is particularly appealing. The benefits of the ideal solution are clear. The next four sections will discuss some of its costs.

3. Administrative Costs

Although the previous section developed its argument using the language of income transfers, it is also relevant to other institutional settings – e.g. the analysis of various food subsidy programs. Prior to the reforms of 1977, ration shops in Sri Lanka provided rice rations to all Sri Lanka below market prices. As Besley and Kanbur [1987] have shown, this is equivalent to an income transfer equal to the ration times the effective subsidy if any unwanted rice can be resold. Hence it is like a universalistic program. After 1977, this system was gradually replaced by a food stamp program which restricted benefits to those households whose incomes were below a critical value (the details are given in Anand and Kanbur, [1987]). This involves a move towards the ideal solution of the last section. However, a recent World Bank [1986] study points out some difficulties with this attempt to effect the "ideal solution".

> "One problem is inflexibility in the way a program determine who is eligible, as exemplified by Sri Lanka's food stamp program. The target group was identified by household size and earnings but, because households were never checked to see if they remained eligible, many stayed on the rolls even after their earnings increased above the eligibility cut off. Households that became eligible after the program started, however, never had a chance to get on the polls."

Lest it be thought that this is an isolated case, the same document provides other examples, e.g. Brazil:

"A coupon program that distributed food every two weeks through government–run supermarkets used income to determine who could participate in Recife, Brazil. The program revealed several problems... It is difficult to target income if income reporting is arbitrary... A coupon program requires extensive book keeping and administrative cost... Building on lessons from the evaluators, the Brazilian program was modified, with apparent success, to reach very low income neighborhoods without coupons or down payments. Common basic foods are now subsidized for all customers of many small neighborhood stores in selected poverty areas. Any leakage of benefits to people not in need is much less expensive than administering the cumbersome coupon program."

One of the main lessons of the above is the difficulty of assessing and verifying low incomes. This is not even easy in developed countries, with their systems of regular employment and with a literate population accustomed to filling in tax returns (see for example Kay and King [1978]). In developing countries, where much employment (especially that of the poor) is irregular, where there is production of agricultural output for home consumption and where the definition of a "household" is problematic, one would suspect a priori that the administrative costs involved in the ideal solution are high. The frequency of testing is also necessary as the Sri Lankan case illustrates, to ensure those genuinely in need are in the scheme and to weed out those who are not. The administrative capacity to do this simply does not exist in many (perhaps most) developing countries. Macedo [1987] identifies cases in Brazil where the authorities relied on local committees to identify the needy, and he points to the difficulties to which this gave rise.

The quantification of administrative costs by program will not be an easy task, particularly if costs are shared by several programs. However, some allocation formulae might be feasible. The revenue required R, of a program can be divided into three categories:

$$R = A + NP + P$$

where A are administrative costs, NP are transfers (leakages) to the non–poor or more generally to those not in the target group, while P is the effective transfer to the poor. A

measure of the fineness of targeting is then given by

$$F = \frac{P}{P + NP}$$

i.e. the fraction of the total non–administrative outlay that reaches the target group. The administrative costs as a proportion of the revenues are:

$$C = \frac{A}{A + P + NP}$$

It is hypothesized that C rises with F and at an increasing rate. This is illustrated in Figure 7. Figure 7 also assumes that there is a minimum level of administration costs needed to get any program going, and that a basic minimum level of targeting can always be achieved. For example, if the total non–administrative budget is divided equally among the population, with no attempt at targeting, the fraction of the outlay that goes to the pretransfer poor is given by the fraction of poor people in the population, i.e. the incidence of poverty. This much targeting is always possible, even with the opposite extreme of the ideal solution. It is the shape of the curve between F and 1 upon which we require more information yet it is the one about which we are most ignorant at present[6].

Quantifying administrative costs of poverty alleviation programs is clearly an important issue for future research since the efficacy of means tested programs depend upon it in an important way.

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[6]For developed countries there has been some collation of evidence. Kesselman [1982] classified several programmes into "universal" or "tested". Of the seven U.K. programmes considered two were unviersal and five tested. Administrative costs as a percentage of benefits were 3.8% and 3.5% for the universal programmes, while they ranged from 5.2% to 15.4% for the tested programmes. In the U.S., the old age, survivors, disability and health insurance programme (a universal programme) had administrative costs of 2.5% of benefits, while for public assistance and unemployment insurance (tested programmes) the figures were 12.1% and 11.8%. The veterans' welfare programme, a tested programme, had an incredible administrative cost to benefits ratio of 95.2%. What seems to be needed is systematic compilation and analysis of such data for developing countries.

4. Individual Responses and Incentive Effects

The incentive effects of the "ideal solution" must also be weighed up in assessing its applicability, Besley [1988] examines one aspect of this – that certain individual might not participate in finely targeted programs because of the costs involved in subjecting oneself to very detailed assessment, filling out of forms, attending interviews etc. Alternatively they might just be the psychic costs of the social stigma that attaches to participation in programs specifically meant for the poor[7].

Besley [1988] hypothesizes that if an individual's costs of participating in a finely targeted poverty alleviation program are c, then those with income greater than z–c will not take part in them. This means that those with incomes between z and z–c will remain below the poverty line. The alternative is to have a universal scheme which gives everybody an amount m, such that the total budgetary outlay is equal to that of the targeted program. These two alternatives are illustrated in Figure 8. As can be seen, the finely targeted program tends to exclude those just below the poverty line, while the universalistic program with the same budget does not do as much for the poorest of the poor. Besley [1988] provides some quantification of these tradeoffs for assumed income distributions. His numerical simulations indicate that the introduction of take–up costs does not turn the tables against income testing.

Incentive problems are in significant measure related to problems of imperfect information. If the government found individuals transparent i.e. knew their tastes and abilities then taxes and benefits could be made to depend directly upon immutable characteristics. In fact only income is observable (perhaps not even this) and by altering their behavior to alter their income agents can alter the amount of tax/benefit which they

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[7]The latter has been much discussed in the developed country literature (see, for example, Moffitt, 1983) but very little, if anything, has been written on it in the developing country context.

pay/receive. This is the root of the incentive problem[8].

The "ideal" solution is also faced with the problem that it imposes a 100% marginal tax rate on all those below the poverty line. This can be seen from the fact that the slope of the solid line in Figure 2 is below z. The advantage claimed for this is that, since this is the way of alleviating poverty at least cost (the shaded triangle in Figure 1), in a self–financing scheme the high marginal tax rates upon the poor will be offset by the lower marginal tax rates on the non poor. There is however, an important caveat to be added : marginal tax rates affect the incentive to work and hence to earn income – i.e. income is endogenous and hence depends on the tax schedule implicit in the program. To see this, notice that with a 100% marginal tax rate there is no incentive for anybody with original income below z to work. All these people would be better off by not working, while receiving z from the government. But if original income for these individuals falls to zero then the financial cost of the program is no longer depicted by the triangle in Figure 1 – it is now the rectangle of size z[9]. Thus the marginal tax rates on the rich will have to be higher than that indicated by the ideal solution. But this will in turn mean that the rich work less hard and even less revenue is generated. The alternative of having a universalistic scheme, will have medium level marginal tax rates on everybody. The choice is between having a distribution of high marginal tax rates skewed in the direction of the poor, or a more even spread of marginal tax rates.

Clearly, the final decision rests with the specifics of the case[10]. Kanbur and Keen

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[8]This is the motivation for the analyses of optimal income tax problems, first analysed by Mirrlees [1971].

[9]Besley [1988] provides simulations which suggest that mean tesing is still very often widely preferable to a universalistic programme in spite of these effects.

[10]Much work has been done in the developed country context. In a recent exercise based on U.S. data, Sadka, Garfinkel and Moreland [1982] conclude that:

> ".. the results presented in this paper are sufficient to call into question the consensus among economic experts that transfer programmes which provide benefits only to those with low incomes are more efficient than those which provide benefits to all regardless of income".

[1987] provide a general theoretical analysis of the issues. However, what is needed is detailed country–specific analyses for developing countries. In the past such analysis may have been thought to be problematic given the lack of adequate micro data. But recent advances in micro level data collection makes this excuse less plausible. Policy analyses and research programs utilizing this data, and addressing the issue of targeted versus universalistic schemes are now pressing.

5. The Political Economy of Targeting

A purely "technocratic" approach to the problem of poverty alleviation asks only how the informational, administrative and other costs can be taken into account. Whilst useful, it neglects issues of distributional and political conflict which lie at the heart of the problem. It is interesting to consider the political support that various types of poverty alleviation programs might enjoy. The "ideal solution" of Figure 1 will only rationally be supported by those with incomes below the poverty line. But this group is unlikely to have sufficient political power to predominate against those above the poverty line who have to pay. The universalistic scheme of Figure 5 has the advantage that it brings into the net of beneficiaries some people with incomes above the poverty line. It pits the "middle classes" between z and y in Figure 5 against those with the highest incomes. This contrasts with the "ideal solution".

Tullock [1982] espouses the view that universalistic schemes are a way of minimizing net transfers to the poor:

> "When we consider the political forces which may lead to the expansion [universalization] of a program it is, in general, clear that if people who are interested in expanding the program are trying merely to help the poor, they have chosen an inept way of doing it. Only if they feel that they can trick members of the middle and upper class into voting for a program to help the poor by that indirect method which is more generous than they are willing to give a direct and open way, is it sensible."

Tullock's views are however controversial (see Downs [1982]). Nevertheless the

considerations that he raises are relevant to the recent debate in developing countries on moving away from universalistic schemes (such as general food subsidies) towards targeted schemes such as food stamps based on income criteria. If a constant budget is maintained this entails a net loss to the middle and upper income classes[11]. The tolerance of the political system then becomes an issue. Bienen and Gersovitz [1985] have analyzed recent attempts to remove food subsidies (in the context of a larger stabilization and adjustment program). Their work demonstrates the importance of particular countries' circumstances, i.e. the existing configurations of power and the possibilities for power realignment:

> "IMF programs may also incorporate cutbacks in subsidies for goods, especially those disproportionately purchased basic needs programs, it should be noted, benefit urban middle classes. Mexico's middle classes, for example, frequently shop in subsidized retail outlets ... But elites are reluctant to make precipitous policy changes that threaten their support... Exceptions include regimes in Sri Lanka (1977), Turkey (1984) and Zimbabwe (1984) that did successfully cut consumer good subsidies."

However, if a universal program is in fact removed and a targeted program is substituted, this means that the poor are isolated in terms of political alliances. The history of Sri Lanka since 1977 in relation to food subsidies (see Anand and Kanbur [1987]) is particularly instructive. After the introduction of targeting with food stamps, the real value of food stamps was allowed to fall during an ensuing period of inflation, with severe consequences for poverty and undernutrition. With the new institutional arrangements, the interests of the middle classes lay elsewhere (the maintenance of public sector wages, for example) and the poor were to some extent abandoned to their own political devices. With generalized subsidies the middle classes would have been linked to the poor in a significant way.

In his fascinating account of the targeting of social programs in Brazil, Macedo

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[11]A theoretical analysis of the impact of political economy constraints on the analysis of price reform is provided in Braverman and Kanbur [1987].

[1987] has also highlighted political aspects of poverty alleviation strategies. He concludes that "if policy changes were introduced at the highest levels of decision–making in Brazil, then many changes would follow at the level of programs, both in their design and management".

The political equilibrium is a significant determinant of what types of poverty alleviation programs may be sustained. Proper consideration of it might lead one away from programs which give benefits only to those with income below z towards those which are more universal and a source of political cohesion.

6. Targeting Using Indicators

In view of the informational and administrative difficulties encountered in implementing the ideal solution, it may be worthwhile enacting poverty alleviation programs through targeting key indicators (e.g. a household's region or the age distribution of its members). In LDCs where income is very difficult to measure this solution may be particularly pertinent. However, such targeting may be relevant more widely (see Deaton and Stern [1986] and Akerlof [1978]). World Bank [1986] discusses the use of geographical area for targeting. Under such a scheme, all individuals *within* an area are treated identically – (as with the universalistic scheme depicted in Figures 3 and 4) – but only certain areas are chosen to receive benefit. These are the low income neighborhoods which are easier to identify than individual incomes. The aim, in general is to find an indicator which is less costly to identify but is sufficiently correlated with income to be useful for poverty alleviation. Whilst there is bound to be some leakage, no indicator being perfectly correlated with income, it is hoped that any leakage of benefits to those who are not in poverty is much less expensive than administering the cumbersome ideal solution.

Continuing the regional metaphor, household income and expenditure surveys[12] can

[12]Such as those being conducted, with World Bank support in Cote d'Ivoire. Peru, Ghana and Marutania.

be used to evaluate the poverty characteristics of individual regions as finely as sample size will allow. How can this information be used to develop a priority ranking of regions? This problem has been analyzed in Kanbur [1986]. The answer depends upon the precise objectives of the government, and how the expenditure devoted to each group translates itself into individual incomes[13]. If the government's objective is to have as big an impact as possible on the national poverty gap[14] then the relevant regional ranking is one by incidence of poverty in each region (*not* by the regional poverty gap). An intuitive account of this result follows from considering the "poverty alleviation efficiency" of a uniform transfer to a region. If every income in a region is increased by $1, the cost is $1 times the total number of people, while the increase in poor incomes is $1 times the number of *poor* people in that region. The poverty alleviation efficiency is simply the ratio of the latter to the former, which is just the incidence of poverty in that region.

This argument from Kanbur [1986] can apply to any method of classifying the population (i.e. it need not be regional). Household size and composition could be used to condition payments if this was felt to be easy to monitor. For example the number of children might be chosen as an indicator. In fact, combinations of region, of residence and household characteristics could be used, as was done in Colombia:

> "In Colombia areas of poverty were identified as part of the national development plan. Targets of food subsidies were then narrowed to households with children under five years old or a pregnant or lactating woman. This reduced the number of possible beneficiaries and thus lowered administrative and fiscal costs. Little leakage or fraudulent coupon use was apparent" (World Bank, 1986).

If the number of indicators is pushed to the limit, we would be back to a case where every unit was being identified separately. The beauty of using just a few indicators is that administrative costs are kept low while leakage is less that it would be under a

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[13]Those interetsed in the details should consult Kanbur [1986, 1987b].

[14]i.e. the aggregate of individual short falls of income from the poverty line for poor people.

universalistic scheme, so that more poverty alleviation could be achieved with the same resources. This suggests a focus for future research on LDCs in which there is quantification of the impact of targeting according to different characteristics. In fact there are three important decision variables to which data should speak:

(i) Given a set of partitions of characteristics (e.g. regional boundaries) what levels of benefit are appropriate?

(ii) Where should the divisions be made between different groups, i.e. where should boundaries be drawn, e.g. if targeting is according to age?

(iii) How many partitions should there be e.g. how many age bands or regional areas?

These questions provide exciting possibilities for both theoretical and empirical work[15]. As more and more categories are introduced, then the targeting achieved by indicators becomes finer and poverty is reduced. On the other hand, more categories raises administrative costs (a further justification for the position depicted in Figure 7). The optimal policy equates the marginal reduction in poverty from a further indicator being used with its marginal administrative cost. This is illustrated in Figure 9 where n to denotes the number of indicators, C(n) is the marginal cost of more indicators and P(n) is the marginal gain on poverty as a function of the number of indicators. The optimal number of indicators is n^*.

Interesting empirical work has already begun in this area. Ravallion and Chao [1987] illustrate how the benefits of region–based targeting can be quantified. They first of all calculate, for a given budget, the poverty level that could be achieved with optimal use of regional poverty information, following the analysis of Kanbur [1986, 1987b]. The gain from targeting is then defined as the amount by which an untargeted budget would have to be larger in order to achieve the poverty level attained through targeting. They call this the "equivalent gain from targeting". They present evidence for Bangladesh, Philippines

[15]For an overview of how the available published evidence for Latin America might be used, see Kanbur [1987d].

and Sri Lanka. For the first two countries they distinguish between the urban and rural sectors, for the last they consider urban, rural and estate sectors. Their illustrative exercises show that the gains from indicator based targeting very greatly from country to country, ranging from almost 40% in the Philippines to around 2% in Bangladesh. Another interesting conclusion is that the percentage gains from targeting are greater the smaller is the budget.

A much more detailed analysis of targeting using indicators is provided in Ravallion [1988], which focuses on land–contingent transfers, i.e. transfers of income are given contingent on land ownership. This is attractive since land ownership is often observable where income is not. Such transfers are almost always a feature of policy discussion, particularly in Asia and Latin America. For the specific case of Bangladesh he concludes that "the equivalent gain from targeting with unrestricted land–contingent tax powers is only slightly more than 10 per cent of mean income for rural Bangladesh or 20 per cent of mean poverty deficit of the poor". These gains have to be set against the administrative costs of land contingent polities. this suggests a further case for studying administrative costs of poverty alleviation programs as we outlined above.

Another type of targeting via indicators occurs when certain foods are subsidized because it is though that they are primarily consumed by the poor. Besley and Kanbur [1988] distinguish between two types of food subsidy program: (i) where a fixed quantity of food is provided at below market prices and (ii) where the market price is subsidized for every unit that is purchased. If resale of rations cannot be prevented, then the first type of program is equivalent to an income transfer to all those eligible for the program. The size of the transfer is equal to the ration quantity times the unit subsidy. The central question then becomes the criterion according to which ration shops are located in particular areas, or according to which ration cards are issued within an area. The second type of food subsidy program is one which benefits consumers in proportion to their consumption of commodity in question. Thus, in absolute terms, the rich gain more than the poor if the

commodity is not an inferior good. Besley and Kanbur [1988] show that if the objective is to minimize the aggregate poverty gap at the national level, the appropriate indicator to use is the ratio:

$$\frac{\text{Quantity Consumed by Poor}}{\text{Total Quantity Consumed}}$$

Commodities should be ranked according to this ratio and those highest on the list should be prime candidates for protection during the period of retrenchment on the food subsidy[16].

Notice that the above ratio can be calculated using household income and expenditure surveys. Indeed, this is done in Kanbur [1988] to argue that rice in Cote d'Ivoire is not a prime candidate for subsidy. The importance of this ratio has indeed been grasped in the policy literature. World Bank [1986] notes:

> "The main determinant of food's suitability for subsidy is the share of it that goes to the target population. If a food is consumed exclusively by the target group, the subsidy will be very efficient; a dollar's worth of subsidy will provide almost a dollar of added income to the target group. But if the target population consumes only 30 per cent of a subsidized food, the subsidy is much less efficient".

However, it can be shown (see Besley and Kanbur [1988]) that the use of the "consumption by poor" ratio is strictly valid only when the objective is minimization of the aggregate poverty gap. Different rules come into operation if the poverty alleviation objective pays special attention, for example, to the poorest of the poor and when Engel curves for food show significant nonlinearity.

Finally, we take up the case where individual responses are such as to allow the possibility of changing between the categories being used for targeting. An obvious example is the relocation of families to areas where ration shops are present, or increasing family size if that is being used as an indicator. Roberts [1983] provides a general

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[16]Besley and Kanbur [1988] also presents generalizations of this rule.

theoretical analysis of such problems. Clearly, if individuals can respond to the use of non–income indicators by manipulating their indicator to advantage, the policy maker should take this into account. The central question is whether the incentives of poorer families to do so are greater than those of the richer families. For example, if migration costs are smaller as a percentage of richer household income the "wrong" households may move in response to the setting up of a ration shop in a distant area. Once again, detailed research is needed to quantify the tradeoffs involved. If these responses are sufficiently adverse, even the use of non–income indicators for targeting comes under question – creating a further argument in favor of more universalistic schemes.

7. Self Targeting

An alternative approach to targeting involves designing schemes which are based upon broad, self–acting tests which only the truly poor would pass. We shall refer to such schemes as "self targeting". In general, programs of this kind involve an agent either making a non–monetary payment to receive an income transfer or receiving a payment in–kind rather than in cash. We shall first discuss two paradigmatic examples of such schemes before drawing some general conclusions about their design.

7.1 Workfare:

A workfare scheme operates by making a claimant of poor relief give up labour time in exchange for an income transfer. There are two reasons for doing so[17]. First, those who are poor may have a lower opportunity cost of labour time relative to others and hence, for a given income transfer, are prepared to give up more labour time. Hence, a work requirement may serve to screen the truly deserving from the rest. Such a test of eligibility has figured centrally in Indian famine relief policy (see Dreze [1986]). Its efficacy depends

[17]For further discussion, see Besley and Coate (1988).

crucially upon whether the hypothesis that the opportunity cost of time is lower for target groups. Holding other things equal, it seems likely that this would be so. If however, poorer families have greater household commitments, for example to child rearing activities, then work requirements would be a poor targeting device. Alderman [1987] presents evidence suggesting that having to wait in line for food is a discouragement for many consumers. His evidence also questions the view that the poor gain disproportionately from using such allocation mechanisims.

A second reason for wishing to impose a work requirement is that it encourages certain kinds of behavior. Hence, it may encourage agents to invest in skill formation which makes it less likely that they will require poor relief in future. Whether this argument works depends upon whether there is a link between key investment decisions and the availability of poor relief. In the context of the United States, this has proved to be a controversial issue (see, for example, Murray [1984]). There seems however to be very little research on this issue in the context of LDC's.

7.2 Transfers In–Kind

Targeting of certain groups in the population can also be achieved by making transfers in kind, a point first clearly explained by Nicholls and Zeckhauser [1982]. Consider, for example, a good which is demanded discretely such as an educational qualification or a course of medical treatment (see Besley and Coate [1989] for a detailed analysis of this problem). Such goods are typically available at different quality levels. If the State provides a certain quality level free of charge, then a consumer must choose between public and private provision weighing up the cost of buying the good in the private market. If the government can find a quality level such that the demand for the publicly provided good is only from the poor, then quality choice provides a self acting test on the basis of which the poor can be targeted. Moreover, such targeting is consistent with the government having limited information about the poor population.

There are three main principles behind this argument. First, quality must be a normal good. Note that when taste variation is brought into the picture, then matters are somewhat complicated. For example, religious affiliations may be an important determinant of a consumer's propensity to use certain kinds of medical services. The correlation between tastes for quality and incomes then becomes important and the present story overlaps with the statistical targeting story of the last section. Second, there must be a private market for the publicly provided good at the higher quality level. This certainly inhibits the applicability of this sort of targeting in the context of LDC's since often the only private sector alternatives are of a kind that only those with very high incomes can afford. Third is the related point that one must be able to find a quality level at which only some fraction of the population make use of the publicly provided good. This is required since otherwise, in–kind transfers are dominated by transfers of cash of the same value. This is because transfers in kind carry a dead weight loss due to the fact that cash can be spent upon what ever a consumer wishes. In general, this deadweight loss can be tolerated only if there is a gain from targeting particular groups.

Both kinds of self–targeting schemes that we have discussed, require the effective prohibition of a secondary market in the publicly provided good. For example, it must be impossible for a rich consumer to get a poor consumer to undertake his work requirement in order for him to get his benefit. Similarly, those who do not wish to consume public education should be unable to sell their right to a school place to another. In practice, there are many commodities for which this restriction can be enforced. However, this requirement does suggest that, in general, food will *not* be an acceptable commodity for a self–targeting scheme. Typically, it would be impossible to prevent unwanted food allocations from being claimed by consumers who were not poor and then sold. Hence, the gains from the program would cease to be targeted.

The two theories of targeting under limited information which we have identified here are best viewed as complementary with each other. For example, a workfare scheme

located in a particular region draws motivation from both statistical and self targeting considerations. We believe that many thoughtfully designed targeting schemes will have this property.

8. Conclusion

In the wake of recent calls for finer targeting of poverty alleviation expenditure in developing countries, we have investigated some of the principles of targeting. We posited an "ideal solution", where transfers went to the poor and only to the poor, as the benchmark for discussion and as the rationale for current trends in the policy debate. But the ideal solution fails to take into account three crucial aspects of the real world: (i) administrative and informational costs of implementation, (ii) individual responses and incentive effects and (iii) the political economy of the problem. It has been argued that each of these militates against the ideal solution. The optimal strategy will probably lie somewhere between the two extremes of the ideal solution and complete universalism, mediated by each of the three considerations above.

All of the above suugests the need for more country specific research which quantifies the costs and benefits of targeting using the variety of micro level data that has increasingly become available for many developing countries; research which is sensitive to the political feasibilities of reform.

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Appendix

Principles of Targeting for a Class of Poverty Measures.

1. Consider the poverty index suggested by Foster, Grear and Thorbecke [1984] given by,

$$P_\alpha(z) = \int_0^z \left[\frac{z - y}{z}\right]^\alpha dF(y) \qquad \alpha \geq 0 \tag{1.1}$$

where y - income z - poverty line

α - a poverty alleviation parameter

F(y) - distribution function of income

This poverty measure encompasses some commonly used poverty measures as special cases.

$$P_0(z) = F(z) \equiv H \tag{1.2}$$

the "head-count" measure of poverty which tells one how many poor people there are in the population. This can be questioned for failing to give us any information about the "depth" of poverty, i.e. how poor the poor are. Hence the indicator

$$P_1(z) = \frac{(z - \mu^p)}{z} F(z) \equiv IH \tag{1.3}$$

where $\mu^p \equiv \int_0^z y \frac{dF(y)}{F(z)}$: the mean income of the poor. This gives the average shortfall from the poverty line times the proportion of the population is poor. However, such an indicator gives us no information about the distribution of income amongst

the poor which is often thought desirable. This corresponds to this index when $\alpha = 2$.

$$P_2(z) = H\{I^2 + (1-I)^2\sigma_p^2\}^{1/2} \tag{1.4}$$

where $\sigma_p^2 \equiv \int_0^z \frac{(y - \mu_p)^2}{\mu_p^2} \frac{dF(y)}{F(z)}$ the coefficient of variation of income amongst the poor. It should be clear that if income is equally distributed amongst the poor then (1.4) reduces to (1.3)

This form of poverty indicator provides a convenient way of modeling the impact of policies oriented towards the alleviation of poverty. For our purposes it also has the useful property of decomposibility. Specifically

$$P_\alpha(z) = \Sigma_i \gamma_i P_\alpha^i(z) \tag{1.5}$$

where γ_i is the population share and $P_\alpha^i(z)$ the poverty index of the ith group in poverty.

2. The "Ideal" Solution

If y is observable before intervention or equivalently the government has enough information to calculate what an individual's y would have been without intervention, then the ideal solution gives every agent a transfer of z - y so that after intervention, each has an income equal to at least z and no matter what α is chosen, $P_\alpha(z)$ is zero, i.e. there is no poverty. The revenue required to effect such a policy is

$$(z - \mu^p)F(z) = P_1(z) \qquad (2.1)$$

and all of this revenue goes to the poor.

3. A Universal Transfer Scheme.

Under a universal transfer scheme a benefit which we denote by 'b' is given to rich and poor alike. In this case poverty is given by

$$P_\alpha(z,b) \equiv \int_0^{z-b} \left[\frac{z - y - b}{z}\right]^\alpha dF(y) \qquad (3.1)$$

Note that the limit of integration is altered since all those with incomes greater than z - b will have left poverty completely. All those remaining in poverty receive post transfer incomes of y + b. If the universal benefit were set at z then all agents will have left poverty under this scheme also. However, the revenue costs of poverty alleviation in this case would be z (normalising population size at one). Hence the reduction in revenue requirements from having a perfectly targeted scheme is

$$z - (z - \mu^p)F(z) = (1 - H)a + H\mu^p \qquad (4.1)$$

an amount which is increasing in z, μ^p decreasing in H. This required revenue difference is a weighted sum of the poverty line and the mean income of the poor.

5. The Effects of Costly Take-up[1].

This class of poverty indicators can be used to model the effects of costly take up. Imagine that although all other conditions of the ideal solution are met, individuals face a cost 'c' of claiming which is not recouped from the transfer programme. In this instance all of those with incomes less than z - c will claim whilst those with incomes above will not. Residual poverty is then amongst the non-claiming group

$$P_\alpha^r(z,c) \equiv \int_z^{z-c} \left[\frac{z - y}{z}\right]^\alpha dF(y) \qquad (5.1)$$

and the cost of the scheme is reduced to

$$(z - \mu^m)F(z - c) \qquad (5.2)$$

where $\mu^m \equiv \int_0^{z-c} y \frac{dF(y)}{F(z-c)}$ is the mean income of those who continue to claim the benefit on offer. The amount in (5.2) could alternatively be given in the form of a universal benefit b. We might ask how high c must then be before so few people claim that a universal benefit leads to less poverty than with the "ideal solution" with take-up costs. Besley [1988] shows that when α=1, this value of costs is given by

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[1]This section is based on Besley [1988].

$$c = \frac{H^u}{H^m}\left[(1-H^m)(z-\mu^m) - (\mu^u-\mu^m)\right] - \frac{H^r}{H^m}(z-\mu^r) \qquad (5.3)$$

where $H^u \equiv \int_0^{z-b} dF(y)$ $\qquad$ $\mu^u \equiv \int_0^{z-b} y+b \frac{dF(y)}{F(z-b)}$

$H^r \equiv \int_{z-c}^{z} dF(y)$ $\qquad$ $\mu^r \equiv \int_{z-c}^{z} y \frac{dF(y)}{F(z)F(z-c)}$

$H^m \equiv \int_0^{z-c} dF(y)$

This "critical" cost has three components

(i) $(1 - H^m)(z - \mu^m)$ (5.4)

which gives the proportion of the previously finely targeted benefit which now goes to other individuals. This measures the "leakage" from a previously targeted benefit to those who did not claim and those who are not poor. The critical cost rises with this, as one might have anticipated.

(ii) $(\mu^u - \mu^m)$ (5.5)

the difference in mean incomes between the universalistic and scheme and "ideal solution" with take-up costs. The larger the difference in mean incomes between a means tested and universalistic scheme, the smaller the critical cost.

(iii) $(z - \mu^r)$ (5.6)

the extent of poverty in the group who do not claim any benefit since it is too costly for it to be worthwhile. If $\alpha = 2$ were chosen then the cutical cost would also depend upon idicators of the distribution of income amonst the poor. The greater is

poverty in the group who do not claim in the means tested programme, the smaller is the critical cost above which universal provision is preferred. Further resuts for the case in which $\alpha=2$ and some simulations assuming a lognormal income distribution are given in Besley [1988].

6. Budgetary Rules for Targeted Groups.[2]

Consider splitting the population into mutually exclusive groups according to some observable characteristic (e.g. age or region of residence). We shall label these groups 1 and 2. Aggregate poverty is

$$P_\alpha(z) = x_1 P_{1,\alpha}(z) + x_2 P_{2,\alpha}(z) \tag{6.1}$$

where x_i is the population share of the ith group. Suppose now that the state has a budget B to dispense amongst the two groups and that it can give different additive transfers of income to those in groups 1 and 2 respectively. What rule should it pursue in doing this? The government's budget constraint is given by

$$x_1 b_1 + x_2 b_2 = B \tag{6.2}$$

Minimizing (6.1) subject to (6.2) yields,

$$P_{i,\alpha-1} = \lambda \quad \text{(a constant)} \quad i = 1,2 \tag{6.3}$$

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[2]This section is based on Kanbur [1986].

that is, the optimal budgetary rule equates the $P_{\alpha-1}$ indices of the two groups. Hence if the income gap measure of poverty is used ($P_1(z)$), then the optimal budgetary rule equates the headcount over the two groups. To get some grasp on the difference between the transfer given on a targeted and untargeted basis we expand the equality

$$P_{1,\alpha-1} = P_{2,\alpha-2} \tag{6.4}$$

to the first order around the untargeted benefit outcome to obtain

$$\gamma_1 = \left[\frac{P_{1,\alpha-1} - P_{2,\alpha-1}}{(a_1 + a_2)} \right] \tag{6.5}$$

where $\gamma_i \equiv b_i - x_i B$ i.e. the difference in the government expenditure share that goes to the ith group under targeting versus the non targeting situtation and $a_i \equiv P_{i,\alpha-2}/x_i$. Since $\gamma_1 + \gamma_2 = 0$ if the budget is the same in both cases, the expression for γ_2 is easily obtained. Note that the highest benefit will go to that group with the highest $P_{\alpha-1}$ in the untargeted state.

Equation (6.6) can be used to give an expression for gain in terms of poverty alleviation from targeting. Using a linear

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[3]See Besley and Kanbur [1988] for details and the generalisation of this argument.

expansion around the untargeted point yields[4]

$$P_a^T - P_a^{NT} = - (a/z) \frac{(P_{1,a-1} - P_{2,a-1})^2}{(a_1 + a_2)} \tag{6.6}$$

which is proportional to the squared difference between the P_{a-1} index of the two goups which are now being targeted. This gives us a measure of the gain that can be obtained by targeting using the type of budgetary rule discribed in (6.3).

Measures of the fineess of targeting can be obtained by examining what proportion of the benefits go to the poor. For the untargeted case

$$F^u = H \tag{6.7}$$

and for the targeted case

$$F^T = \frac{H_1 b_1 + H_2 b_2}{b}$$

$$= H + \frac{H_1 \gamma_1 + H_2 \gamma_2}{b} \tag{6.8}$$

Using (6.5)

$$H_1 \gamma_1 + H_2 \gamma_2 = \frac{(H_1 - H_2)(P_{1,a-1} - P_{2,a-1})}{(a_1 + a_2)} \tag{6.9}$$

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[4]See Besley and Kanbur [1988].

If $\alpha=2$ this always positive since the term in the numerator of (6.9) is $(H_1-H_2)^2$.

7. Food Subsidies and Poverty Alleviation[5]

To represent the impact of food subsidies we shall use the consumer's equivalent income function which is defined implicitly from,

$$u(p, y^E) = u(q, y) \tag{7.1}$$

where $u(\cdot, \cdot)$ is the consumer's indirect utility function, p is a set of reference prices, q actual prices, y actual income and y^E equivalent income. When utility is monotonically increasing in income[6] we use (7.1) to give the function

$$y^E = g(p, q, y) \tag{7.2}$$

We can then specify the poverty line in equivalent income space and denote it by z^E, which then implies a cut-off in income space defined by the z which satisfies

$$g(p, q, z) = z^E. \tag{7.3}$$

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[5]This section is based upon Besley and Kanbur [1987].

[6]Which requires that the direct utility function be increasing in its arguments.

In this instance our poverty indicators is given by

$$P_{\alpha}^{e}(z) = \int_0^z \left[\frac{z^E - y^E}{z^E}\right]^{\alpha} dF(y), \tag{7.4}$$

where it should be noted that z is a function of p, q and z^E. The poverty indicator is now directly a function of the prices faced by the consumer, and we can consider changes in such prices and their impact upon poverty. Differentiating with respect to q_i and evaluating the outcome at q = p, whence y^E and y and z^E and z are the same, we have[7]

$$\left.\frac{\partial P_{\alpha}^{e}(z)}{\partial q_i}\right|_{q=p} = \frac{\alpha}{z}\int_0^z \left[\frac{z - y}{z}\right]^{\alpha-1} x_i(q, y)dF(y) \tag{7.5}$$

This is a weighted sum of the demands where weights are derived from the P_{α} class of poverty measures. Consider now the choice between increasing the subsidy to two goods. Let s_1 and s_2 denote their respective subsidies and

$$s_1\int x_1(q, y)dF(y) + s_2\int x_2(q, y)dF(y) = B \tag{7.6}$$

denote the government's budget constraint. Differentiating (7.6) to impose a budget balance condition we find that impact a subsidy to good 1 financed by a tax on good 2 to reduce poverty is given

[7]The derivate of the equivalent income function is obtained from (7.1) using Roy's identity.

by

$$\frac{d\,P_{\alpha}^{e}(z)}{dq_1}\bigg|_{q=p} = \frac{\alpha}{z}\,\bar{x}_1 \int_0^z \left[\frac{z-y}{z}\right]^{\alpha-1} \left[\frac{x_1}{\bar{x}_1} - \frac{x_2}{\bar{x}_2}\right] dF(y) \qquad (7.7)$$

where $\bar{x}_i = \int x_i(q, y)dF(y)$ is the mean demand for good i on an economy wide basis. The ratio $x_i/\bar{x}_i$ is the demand for good i by a particular poor person in relation to the average demand. The rule in (7.7) says that subsidizing good 1 and taxing good 2 reduces poverty if the weighted sum of $x_1/\bar{x}_1$ exceeds that of $x_2/\bar{x}_2$. In the case in which $\alpha = 1$ the (7.7) becomes

$$\frac{dP_{\alpha}^{e}(z)}{dq_1} > 0 \longleftrightarrow \left[\frac{\bar{x}_1^p}{\bar{x}_1} - \frac{\bar{x}_2^p}{\bar{x}_2}\right] > 0 \qquad (7.8)$$

where $\bar{x}_i^p \equiv \int_0^z x_i(q, y)dF(y)/F(y)$ is the mean consumption of good i by the poor. This confrms the World Bank view that one should target the subsidy towards the good which has the highest ratio of demand by the poor to mean demand. Other simple rules can be obtained from (7.7) if preferences are restricted.

If $$x_i(q, y) = \gamma_i(q) + \beta_i(q)y \qquad (7.9)$$

i.e. Engel curves are affine in income[8] then

[8]Preferences are quasi-homothetic.

$$\left.\frac{dP_a^e(z)}{dq_1}\right|_{q=p} = \frac{a}{z}\bar{x}_1\left[\left(\frac{\gamma_1}{\bar{x}_1} - \frac{\gamma_2}{\bar{x}_2}\right)P_{a-1} + \left(\frac{\beta_1}{\bar{x}_1} - \frac{\beta_2}{\bar{x}_2}\right)z(P_{a-1} - P_a)\right] \qquad (7.10)$$

Now, whether a subsidy on good 1 financed by a tax on good 2 reduces poverty depends upon wighted differences in demand coefficients where weights are P_a indices. Further generalisations are given in Besley and Kanbur [1987]. For practical purposes rules of the kind given in (7.7) may be implementable. Most estimated demand functions can be written in their P_a form since almost all lie in the class

$$x_i(q, y) = \gamma_i(q) + \beta_i(q)y + \theta_i(q)f(y) \qquad (7.11)$$

for some function f(y). Which foods should be "targeted" in this framework depends upon the shapes of Engel curves and various of the P_a indices.

Other food subsidy schemes are of the "ration shop variety" in which a fixed amount of subsidy is given below the market price. If resale of any unwanted food is permissable then we are effectively back to the type of scheme discussed in section 6 without targeting subgroups (unless different subsidies are given to different groups, e.g. by strategic location shops with only residents of these areas able to qualify). An intermediate scheme is one in which resale is not permitted. If the good being sold through a ration shop is normal then there will be some income level $\bar{y}$, say, at which take-up is complete and the food subsidy is just like an income transfer. For incomes below $\bar{y}$, it

will be just like the marginal food subsidy discussed above. Under such a scheme poverty is given by

$$\int_0^{\bar{y}} \left[\frac{z^E - y^E(q,p,y)}{z^E}\right]^{\alpha} dF(y) + \int_{\bar{y}}^{z-m_i} \left[\frac{z^E - y^E(q,p,y+m_i)}{z^E}\right] dF(y) \qquad (7.12)$$

where $m_i \equiv (q_i - p_i)x_i^R$ where x_i^R is the quantity available from a ration shop. The effect on poverty of a change in the subsidy now has two components which are like the food subsidy rule in (7.5) for these with incomes less than $\bar{y}$ and an additive transfer to those with incomes above. This suggests the importance of modeling behaviour vis à vis take-up of unwanted food in a ration shop scheme.

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