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Does More for the Poor Mean Less for the Poor?

The Politics of Tagging

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Attempts to achieve "more for the poor" through the use of indicator targeting may in fact mean less for the poor. The efficient use of a fixed budget for poverty reduction may require targeting. However, the use of indicator targeting, using fixed characteristics that are correlated with poverty to determine the distribution of expenditures, will tend to reduce the budget. Ignoring the budget reducing effects can reduce the welfare of the poor as they receive a greater share of a shrinking budget. There are political economy limits to not only the scope but the form of redistribution.



Summary findings

Proposals aimed at improving the welfare of the poor often include indicator targeting, in which non-income characteristics (such as race, gender, or land ownership) that are correlated with income are used to target limited funds to groups likely to include a concentration of the poor.

Previous work shows that efficient use of a fixed budget for poverty reduction requires such targeting, either because agents' income cannot be observed or to reduce distortionary incentives arising from redistributive interventions.

In spite of this, Gelbach and Pritchett question the political viability of targeting. After constructing a model that is basically an extension of Akerlof's 1978 model of "tagging," they derive three main results:

- Akerlof's result continues to hold: that, ignoring political considerations, not only will targeting be desirable but recipients of the targeted transfer will receive a greater total transfer than they would if targeting were not possible.

- A classical social-choice analysis — in which agents vote simultaneously about the level of taxation and the degree of targeting — shows that positive levels of targeted transfers will not exist in equilibrium (an unsurprising finding, given Plott's 1968 theorem). It also shows that a voting equilibrium often will exist with no targeting but with non-zero taxation and redistribution.

- In a game in which the policymaker chooses the degree of targeting while voters choose the level of taxation, the redistributive efficiency gains from tagging may well fail to outweigh the resulting reduction in funds available for redistribution.

These results may be extended readily to account for altruistic agents.

Gelbach and Pritchett stress that even when these results hold, the alternative to targeted transfers — a universally received lump-sum grant financed through a proportional tax — will nonetheless be supported politically and will be quite progressive relative to the pretransfer income distribution.

This paper — a product of the Poverty and Human Resources Division, Policy Research Department — is part of a larger effort in the department to understand the role of targeting in poverty alleviation efforts. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Sheila Fallon, room N8-031, telephone 202-473-8009, fax 202-522-1153, Internet address sfallon@worldbank.org. October 1995. (52 pages)

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Does More for the Poor Mean Less for the Poor? The Politics of Tagging¹

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1 Introduction

Fiscal conditions requiring reductions in government expenditures often produce a dialogue like the following between a policymaker (PM) and a technocrat economist (TE):

TE: We must reduce the deficit. Therefore, spending on category X (e.g. social security, telephone subsidies, education, health, irrigation water) must be cut.

PM: But if we cut the budget for X, the poor will be hurt, since they benefit from government expenditures on X programs.

TE: Don't worry. The current incidence of benefits from X expenditures is uniform, regressive, or at best only modestly progressive. Therefore, if we restrict X spending to the poor, we can *both* cut the X budget *and* reduce poverty.

PM: But the administrative costs of identifying the poor correctly would be prohibitive.

TE: Don't worry. Even if we can't observe actual income, we can find easily observable *indicators*—like region of residence economic sector, occupation, gender, ethnicity, or land-owning status—that are correlated with household income. So long as these indicators are highly enough correlated with income, we can *target* our X-expenditures to people based on these indicators and still do more with less.

PM: But you assume that the budget for X will remain fixed. If I narrow the incidence of X-related benefits by concentrating spending on targeted households, I also narrow the constituency for spending on X. In fact, the ultimate outcome will be further cuts in the budget X sufficient to wipe out any efficiency-related poverty reductions resulting from targeting.

Who is right? The theoretical foundation for the technocrat economist's argument was provided by George Akerlof in his 1978 paper, "The Economics of Tagging As Applied to the Optimal Income Tax". Akerlof develops a strong and coherent argument for the possibility that conditioning income transfers on immutable characteristics of potential recipients allows a more efficient social welfare system. The essential problem solved—or at least mitigated—by the use of tagging (Akerlof's term for indicator targeting) is the tradeoff between the incentive costs of distortionary marginal income taxes and the social welfare gains of income or consumption redistribution. As the technocrat economist notes in the dialogue above, targeting is possible when some indicator set I can be used to condition transfers to recipients, so that when a person scores highly on some criterion $C(I)$, she is "targeted" to receive a transfer (in addition to any other untargeted transfers she may receive). When these indicators are not easily manipulable, a targeted transfer will be essentially a lump-sum transfer for those who receive it, and the advantages of such transfers (as opposed to those conditioned on manipulable characteristics) are well known.² As Akerlof shows in what he calls the "rudimentary Mirrlees-Fair" setting (discussed formally below), when lump-sum targeting is possible, transfers to targeted individuals exceed both

²In industrialized nations, where income is observable (for the most part), these advantages largely derive from the fact that lump-sum transfers reduce or eliminate incentive distortions. As the policymaker in our dialogue points out, in LDCs the issue is just as often the unobservability of income.

transfers to the untargeted and transfers in a world in which no targeting is possible. Akerlof points out that general theorems concerning the relative merits of targeting are not possible in a world in which indicators may be affected by agents' behavior. We follow Akerlof in ignoring this problem: as he notes, its treatment simply makes the issue an empirical, rather than theoretical, in character.

We laud the motives underpinning proposals to use indicator targeting.³ However, the policymaker's objections may have merit: we believe that serious questions exist concerning the political viability of targeting. In the rest of this paper, we develop a model that essentially generalizes Akerlof's. The two primary differences are that we introduce a third, middle-income, class of agents (Akerlof has only high- and low-income people) and allow for "unemployment" of the poor and middle class. Adding a third income class of course is necessary for any consideration of political issues. The introduction of individual income uncertainty via unemployment reflects our belief that insurance motives play a significant role in the determination of the degree of income redistribution in a society. The other possible determinant is altruism. While the model can get along perfectly well when altruism is accounted for, we believe that altruism in fact is *not* a primary determinant of redistributive politics. We offer a full section below treating both theoretical and empirical considerations related to this issue.

We make one critical methodological assumption. While our use of a continuum of agents rules out aggregate uncertainty over the number of people in a given income class receiving targeted transfers, we assume that from the point of view of any given person, the event of receiving a targeted transfer is random. Without this assumption (and in the absence of altruistic motives for redistribution) the politics of targeting is trivial: if the set of agents receiving targeted transfers has more than half the political power in the society, maximal targeting will be observed, while no targeting will be observed otherwise. Of course, this situation is uninteresting from a modeling point of view, but we also believe that it fails to reflect a sizable number of actually proposed targeting systems, particularly in developing countries.⁴

³Hereafter all references to "targeting" refer only to the type of indicator targeting we define formally below.

⁴As for developed countries, e.g. the U.S., our formulation may be less realistic, primarily because we assume independence of the processes generating bad income shocks and receipt of the targeted transfer. In fact, one is eligible for food stamps only if one passes income and asset tests, which quite certainly will be correlated with shocks to current-period income, like unemployment. The important fact is that it is not correct to say that all targeting is deterministic, i.e. that people always know whether or not they will receive targeted transfers. Some people of course will know that they *never* will receive such transfers: men in the U.S. do not receive AFDC. But as Congress moves toward ending the entitlement status of myriad targeted transfers, it will no longer be true that targeted people know that they *will* receive targeted transfers. In any case, we do not believe that taking these considerations into account is worth doing here, both because we focus in this paper on LDCs and because such a modification actually would make our analytical case stronger, since it would reduce the number of states of nature under which targeting benefits the middle class.

1.1 Politics and Indicator Targeting

We take two distinct approaches in modelling political equilibrium. The first uses a classical social choice model, in which binary elections are held between pairs of alternatives, which are ordered pairs specifying a tax rate and the percentage of the budget allocated to targeted transfers. In this model, an equilibrium is defined in the traditional way: a point x is an equilibrium if and only if no other point y is strictly preferred to x by a majority of voters⁵. In section 4 we derive two basic results using this equilibrium concept. First, we show that no equilibrium can exist with positive levels of the targeted transfer.⁶ This result is entirely unsurprising in light of Plott's (1968) well-known and restrictive conditions for majority voting equilibria. However, our second social choice result is quite a bit stronger: under plausible conditions, *no* targeting is an equilibrium of the voting model. We stress that in this equilibrium, a (possibly sizable) universal transfer will exist, enabling redistribution.

The force of this result depends on the subtle but critical distinction between the following two statements: 1) "No point $y \neq x$ is an equilibrium"; 2) "The point x is unbeaten in majority voting by all points $y \neq x$ (i.e. x is an equilibrium)". This distinction is critical because it may well be (indeed it is often) the case that no voting equilibria exist. In such cases, non-equilibrium status hardly is a reasonable criticism of any point, since all other points have the same flaw!⁷ However, when an equilibrium *does* exist, political actors flout it at their peril, so that economic advisers (like TE in the dialogue above) who suggest that policymakers abandon an equilibrium position risk being ignored altogether.⁸

Our second approach is to imagine a game played between the policymaker and the electorate, with simple Nash equilibrium being our solution concept. The policymaker is allowed to choose the proportion of the budget spent on targeted transfers, and then an election is held to determine the level of taxation conditional on the policymaker's choice. We make use of the well-known median voter result, which is appropriate in this context since once the degree of targeting is fixed, only one dimension of policy (the level of the budget) remains to be sorted out through the political process⁹. Within this median voter approach, we distinguish two possible versions of our game. In the first, the policymaker takes the *level* of taxation as given. In the second, she takes account of political constraints by taking a *function* $\tau^*(k)$ as given, where k is the proportion of the budget spent on targeted transfers and τ^* is the function describing the median voter's optimal tax conditional on

⁵As discussed in Section 4, we weaken the definition of equilibrium to require a majority of voting power, rather than of voters, to allow for the likelihood that political power is distributed non-uniformly throughout the population

⁶As stated in the text, this result actually is a special case; the general result, discussed in Appendix 2, is that there is zero probability that a majority voting equilibrium exists with positive levels of the targeted transfer.

⁷This remark is even more appropriate in light of McKelvey's (1978) remarkable demonstration that when the equilibrium set is empty, all points belong to the same cycle set, so that there is likely to be no social choice-theoretic basis for eliminating any points from consideration.

⁸Provided, of course that other political agents may propose the equilibrium point. We should note, moreover, that when no targeting is an equilibrium, small perturbations of preferences do not in general ruin its equilibrium status, despite Plott's result that when interior equilibria exist (in our context, this means equilibrium at positive levels of targeted transfers) they are not robust to small changes in preferences.

⁹The other principal requirement for use of the median voter theorem, single-peaked preferences, will follow trivially from our assumption that agents are risk averse.

k (we show below that this approach is mathematically proper). It is trivial to show that when the policymaker takes account of political constraints, i.e. in the second version, she never does worse—and almost always does better—than when she does not.

Moreover, we show that it is quite possible for the optimal politically-constrained level of targeting to be zero—even though casual observation (e.g. large differences in income across regions, ethnic groups, occupations) may point to significant social welfare improvements from positive levels of targeting using available indicators. This result has perhaps the most “economic” intuition of our findings. When people are unlikely enough to receive targeted transfers, positive levels of targeting may be thought of as a tax on the activity of publicly financed consumption insurance. Since in our model the amount of consumption shifting done is a monotonic transformation of the level of taxation, we can think of taxation as the “good” being “purchased”. Hence for people unlikely enough to receive targeted transfers, targeting may be thought of as a tax on—or price increase of—the “good” of taxation. The question of how the level of taxation changes when the degree of targeting changes thus boils down to the standard tug of war between substitution and income effects: while the higher price of unemployed- relative to employed-state consumption makes employed-state consumption relatively more attractive at the margin, it also makes a given amount of unemployed-state consumption more expensive, requiring higher expenditures on the latter. Since we are operating in the expected utility framework, the crucial “parameter” of interest in resolving the substitution-income effect question will be the elasticity of substitution of marginal utility, which is also the coefficient of relative risk aversion, across states of the world. We often will use CRRA preferences, though this assumption is not critical (by changing the word “parameter” to “function”, we can treat general preferences). When the degree of relative risk aversion is (relatively) small, the substitution effect prevails, with the result that the politico-equilibrium tax rate (and hence the overall budget for transfers) falls as the level of targeting rises. In this situation, it is possible for the optimal policy to be no targeting of transfers: the efficiency gains from targeting may be outweighed by an associated loss in the budget for redistribution.

Both of these results regarding the political viability of targeting stand in stark contrast to Akerlof’s proposition. As he notes, his model is highly stylized, so that one might be tempted to argue that the world described in our model—even in the absence of political constraints—simply does not characterize one in which targeting would be useful anyway. In fact, as we show in Section 3, with only one very weak and natural assumption, Akerlof’s first result—that some targeting always is optimal—generalizes directly to our model. This fact is intuitive, for the basic reason that more instruments gives the policymaker more freedom in designing policy; a small amount of targeting thus almost always brings an efficiency improvement, verifying the generality of Akerlof’s result (in a non-political world).

1.2 LDCs and Indicator Targeting

In LDCs, indicator targeting is proposed not only as a means to reduce incentive problems (the focus of Akerlof’s model), but also because conditioning transfers income simply is infeasible. In one common type of indicator targeting, a limited data set (say, a household survey) is used to establish a relationship between some readily observable household

characteristics (e.g. region of residence) and poverty (or income or consumption). This relationship then can be used to condition transfers to the entire population based on the identified characteristics rather than on actual income.

For instance, in a particularly interesting empirical application of indicator targeting, Glewwe (1990) finds that the poverty minimizing policy in urban Cote d'Ivoire is to give *all* transfers to households in the East Forest region. Of course, seen through an *ex post* lens, this proposal implies that no household not located in the East Forest—no matter what its actual income—would have any chance to receive a transfer, and hence would have no self-interested incentive to support the proposal. As Glewwe stresses, this example paints a particularly stark picture of the obvious and fundamental political economy problem inherent in *deterministic* indicator targeting *ex post* of the decision on the indicators and the criterion function

Our argument is deeper: we show that even *ex ante*, before the criterion function $C(I)$ is known, targeting may have adverse political economy consequences. For example, in an election between two parties, one campaigning on a platform involving more focused (i.e. targeted) delivery of benefits and the other proposing the opposite, $C(I)$ need not be known for the targeting party to be defeated. Alternatively, a party in power for the foreseeable future might be forced to reduce overall redistributive expenditures in order to increase targeting.¹⁰ In either case, political opposition is to the *possible* outcomes of targeting. But if the “wrong” party is elected, or if budget cuts are large enough, targeting proposals may result in lower *realized* welfare for the poor. Moreover, insofar as parties that generally support targeting also support other economic reforms thought to be beneficial, proponents of these other reforms should be sensitive to the practical possibility that political losses resulting from targeting proposals may not be separable from these other reforms. The possibility that *proposing* targeting will have serious political consequences is no less real than are these consequences themselves.

The rest of this paper proceeds as follows. In Section 2, we present a brief summary of Akerlof's model and his result. We then describe the components of our model. In Section 3 we discuss the optimal transfer regime in a world where the policymaker need not worry about political support. Then in Section 4 we embed the model in a social choice framework. In Section 5, we take a Nash equilibrium approach to the political economy of targeting, letting the policymaker choose the degree of targeting while the population votes over the tax rate conditional on the policymaker's choice. In Section 7, we discuss both theoretical and empirical issues related to altruism. In Section 6 we describe existing empirical literature (related to targeting in developing countries) and policy implications, and we argue that our model does a reasonable job of capturing the basic characteristics of proposals made in this literature. In Section 8 we conclude. Three appendixes contain, in order, proofs of several results of the basic model, a generalization of the results of Section 4, and some technical details regarding the introduction of altruism in section 7.

¹⁰We imagine, for example, a system of government in which an executive branch may determine the basic form of transfer distribution, while “the voters” or, more realistically, a legislative branch, determines the overall budget. This framework is developed in detail below.

2 The Model

We begin by summarizing Akerlof's model (using our notation), and then set up our own model.

2.1 Akerlof's Model

There is a continuum of agents having measure one. Half the population is skilled, while the other half is unskilled. There are two kinds of jobs, easy and hard, and they pay μ and r , respectively; unskilled workers can do easy jobs only, while skilled workers can do either job. Utility of income is given by a twice differentiable, increasing and strictly concave function u . Easy jobs carry no disutility of labor, but associated with hard jobs is an effort cost c , which enters the utility of hard-job workers additively. Hence in the absence of government intervention, unskilled workers have utility $u(\mu)$, while skilled workers have utility

$$\begin{aligned} u(r) - c, & \text{ if the hard job is chosen} \\ u(\mu), & \text{ if the easy job is chosen} \end{aligned}$$

So long as $u(r) - u(\mu) \geq c$, skilled workers take hard jobs. We now introduce lump-sum taxation and transfers. Letting T_s and T_u be the tax (transfer) for skilled and unskilled workers respectively, in any equilibrium with positive levels of T_s and T_u , we have the incentive compatibility constraint that $u(r - T_s) - u(\mu + T_u) \geq c$ and the budget constraint that $T_s = T_u$ (since the two types of workers have equal population sizes). It is straightforward to show that when the policymaker's objective is to maximize the sum of utilities, both constraints bind in equilibrium, so that everyone has equal utility at the optimum.

Akerlof then introduces targeting in the following way. Some proportion δ of the population of unskilled workers is assumed to be targeted, so that the government may make separate lump-sum transfers to these people. The policymaker now has the instruments t_s , t_{un} , and t_{ut} , which are (respectively) the tax on skilled workers, the tax on (if negative) or transfer to (if positive) unskilled, non-targeted workers, and the transfer to unskilled, targeted workers. The incentive compatibility constraint is now $u(r - t_s) - u(\mu + t_{un}) \geq c$; we use t_{un} rather than t_{ut} because skilled workers are untargeted. It is in this sense that this form of targeting is lump-sum in nature: no matter what they do, there is no way for untargeted people to obtain the targeted transfer. The budget constraint (when incentive compatibility is satisfied) is now $t_s = \delta t_{ut} + (1 - \delta)t_{un}$. Letting asterisks denote optimal values, Akerlof's achievement is his demonstration that if $u(r) - c > u(\mu)$,

- 1) $t_{ut}^* > t_{un}^*$ and
- 2) $t_{ut}^* > T_u^*$.

In words, 1) says that the optimal transfer to targeted unskilled workers is larger than the transfer to untargeted, unskilled workers, while 2) says that the optimal transfer to targeted workers exceeds the transfer they receive when targeting is not possible. This is precisely the sense in which targeting means "more for the poor".

However, both results suggest the presence of a significant political economy problem: the use of targeting drives a wedge between the two groups of poor agents, both of which

otherwise would support *some* form of redistribution rather than none. This point is made most stark by Akerlof's observation that it is possible for t_{un} to be *negative*, so that untargeted, unskilled agents pay a *tax*; why would people expecting to be taxed under a targeted regime support that regime over an untargeted one in which they would receive benefits? We now describe the model we use to consider this question.

2.2 Our Model: Description

The population in our economy has mass one, and there are three classes of people: rich, middle income, and poor; we use the subscripts r , m , and l , respectively, to refer to them. Each group has a probability distribution over employment status and a corresponding maximum marginal product when employed. For simplicity, we assume that the probability distribution for the poor and middle income groups is the same¹¹: with probability $p > 0$, these agents will receive zero pre-transfer income, and with probability $q = 1 - p$, they will receive income according to the jobs they choose. We assume that the respective maximum marginal products of members of the rich, middle income, and poor groups are r^* , 1 , and μ , with $r^* > 1 > \mu$. An agent first finds out her employment status and then, if employed, chooses a job to work in. We assume that for each maximum marginal product level, there is a corresponding job paying that marginal product as a wage, and there are no other jobs. An agent can choose to work in any job whose wage does not exceed her maximum marginal product. Thus rich people can work in any of the three jobs, middle income agents can work in the two lower paying jobs, and the poor can work only in the lowest paying jobs. There is no disutility of labor, so that the only incentive compatibility issues we will have to consider concern employed workers' choice of jobs.

We classify our three groups along two further dimensions: diversification of income and tax status. All agents working in jobs paying more than μ must pay taxes, but those working in μ jobs need not.¹² The rich (mass σ_r) have guaranteed income (i.e. can diversify), so that if they choose to work in jobs that pay r^* , they will have income of $r = q_r r^*$ with probability one. We can justify the guaranteed income of the rich either by assuming that they really are not subject to income uncertainty ($q_r = 1$), or that they have access to an actuarially fair insurance market, in which case, so long as they exhibit some degree of risk aversion, rich agents will insure fully. For convenience, and without loss of generality, we will put $q_r \equiv 1$, so that $r^* = r$. Middle class (mass σ_m) and poor agents cannot diversify.

We define the tax base as \bar{y} , so that $\bar{y} = \sigma_r r + q\sigma_m$ when everyone works in jobs paying their maximum marginal products. The assumption that $\bar{y} < q$ is needed below to ensure that the tax chosen in a social choice setting is less than unity¹³. If the rich work in

¹¹The social choice results we will state are completely invariant to changes in this assumption, though our results on the optimality of positive levels of targeting are not. Nonetheless, the invalidation of these results would require $p_l < p_m$, which seems counterintuitive.

¹²There is a potential consistency problem here: how is it that we assume people pay an income tax when income is unobservable? Any proportional tax, e.g. a VAT, would do; alternatively, we might think of the tax and transfer sides of government activity as unconnected, so that a revenue agency collects payroll taxes while a benefits agency pays them out, and the two agencies are unable (or unwilling) to match up records. In any event, we believe that this issue is of minor importance.

¹³This assumption might seem objectionable, since it appears to say that pre-transfer mean income is

r^* -marginal product jobs but middle income agents work in μ -marginal product jobs, then we will have $\bar{y} = \sigma_r r$; if everyone works in μ -marginal product jobs, then $\bar{y} = 0$, i.e. no one pays taxes. We will see below that the rich never will choose to work in middle class jobs, so we need not consider \bar{y} for those cases.

Any transfers are financed by a linear tax $\tau \in [0, 1]$, and two kinds of transfers are possible. The first is a universal, or nontargeted transfer N ; everyone in the economy receives this subsidy. The second is a targeted transfer, θ , which is received by only the population proportion $\bar{\delta} \equiv \sum_i \sigma_i \delta_i$, $i = l, m, r$, where δ_i is the proportion of agents of type i who receive θ . Given our assumptions of probabilistic targeting and a continuum of agents, δ_i also is the probability that any given person of type i receives the targeted transfer. Throughout the paper, we will assume that $\delta_r = 0$, so that no rich agents receive θ ; thus $\bar{\delta} = \sigma_l \delta_l + \sigma_m \delta_m$. We stress that the policymaker is permitted to condition targeted transfers neither on realized income level nor on employment. This assumption captures the policymaker's first objection (in our opening dialogue) to targeting, namely that it is not feasible for administrative reasons. However, since $\delta_l, \delta_m \geq 0 \equiv \delta_r$, using targeted transfers allows the policymaker to avoid giving benefits to the rich, who are known not to "need" them, while directing them to the poor and middle class, at least some of whom do need them. This fact makes targeting more efficient in a non-political world.¹⁴

We do not endogenize within the model the particular way in which the the δ 's might be generated under a particular proposal for indicator targeting; whether or not regressions (or simple cross-category income data) based on surveys or other techniques are used is not a central issue. In practice, what is central is that the "indicator" used be (relatively) permanent and not depend on observing current income status. Were temporary characteristics—in our model, employment status—observable and hence "targetable", we would have a targeting technology with four δ s, two for each of the poor and the middle class. In a loose sense, the setup we use captures the permanent-income characteristics aspect of most (developing country) targeting proposals, e.g. using gender, ethnicity, disability, or other "long-term" characteristics to target recipients.

We summarize the model's structure in Table 1. For each of the three groups of agents, the table shows their maximal marginal products, their tax status, their probability of a "bad shock," and their targeting probabilities.

less than pre-transfer median (expected) income. However, when everyone works at her maximum marginal product, pre-transfer mean income actually is greater, since it is defined as $\bar{y} + \sigma_l q \mu$. Moreover, pre-transfer median income will depend on the population proportions (the σ_i) and the probability of unemployment; while it is possible for this median to be less than μ , unless p is very large it will be any number $m \in (\mu, 1)$.

¹⁴Of course, in this context "efficiency" means that the benefits to the winners outweigh the costs to the losers, of whom some will always exist: with δ_l or δ_m less than unity, targeted transfers are not provided to some poor and middle class agents who need them.

Table 1: Structure of the model			
	Type of agent		
	Poor	Middle	Rich
Population share	σ_l	σ_m	σ_r
Income if employed	μ	1	r
Probability of "unemployment"	p	p	0
Can Diversify	No	No	Yes
Tax Rate	0	τ	τ
Universal transfer	N	N	N
Probability of receiving targeted transfer = θ	δ_l	δ_m	0
Utility function	Von Neumann Morgenstern utility function u : $u' > 0, u'' < 0$.		

2.3 Budget Balance and Incentive Constraints

Budget balance requires that $N + \bar{\delta}\theta = \bar{y}\tau$. Defining k as the proportion of the budget spent on targeted transfers, budget balance is expressed by the two identities

$$\begin{aligned}\theta &\equiv \frac{k\bar{y}}{\bar{\delta}}\tau \\ N &\equiv (1 - k)\bar{y}\tau\end{aligned}\tag{1}$$

The efficiency gain from targeting is directly attributable to the $\bar{\delta}$ in the denominator of the first identity: a dollar spent on targeted transfers allows *recipients* to receive $1/\bar{\delta}$ dollars, while a dollar spent on untargeted transfers gives only one dollar in transfers to everyone in the economy.

It will be convenient to define $\bar{\gamma} \equiv (1 - \bar{\delta})/\bar{\delta}$ and γ_i similarly for each group i . We note that $N + \theta \equiv (1 + \bar{\gamma}k)\bar{y}\tau$, and hence $\partial(N + \theta)/\partial k = \bar{\gamma}\bar{y}\tau$ and $\partial(N + \theta)/\partial \tau = (1 + \bar{\gamma}k)\bar{y}$.

All agents have von Neumann-Morgenstern preferences with the twice continuously differentiable state-contingent utility function u , $u' > 0$, $u'' < 0$.¹⁵

Indexing employment status by $h = 1$ if an agent is employed and $h = 0$ if not, and indexing receipt of the targeted transfer by $j = 1$ if θ is received and $j = 0$ if not, we can define consumption for type i individuals in state hj as $y_{h,j}^i$. Poor agents' possible income states appear in Table 2a.

For the middle class and the rich, we need to take account of job choice in determining state contingent post-transfer income. Hence we require that if, given the tax and transfer regime, an employed agent could do better by earning a lower before-tax income, that agent

¹⁵Again, for our social choice results, we need not assume that the function u is the same for all three types of individuals; for our results on the (social) optimality of positive levels of targeting, we would not require identical u functions, but some restrictions would be necessary.

will do so.¹⁶ Since everyone always receives N , its size is irrelevant for incentive compatibility concerns. Moreover, the fact that targeted transfers are conditioned on underlying characteristics rather than on observed income means that even if, say, $\delta_m < \delta_l$, the size of θ is of no concern to middle class agents in their decision over which job to take when employed. It is for this reason, as Akerlof shows, that a targeted transfer may be desirable: unlike transfers conditioned on income level, fully lump-sum targeted transfers do not reward inefficient behavior.¹⁷ As such, for employed members of the middle class, the only factor affecting which job to take is the relative size of their income when employed, $1 - \tau$, and the income they would have if they were to masquerade as poor agents, which is μ . Hence we have our first incentive compatibility constraint:

$$(IC)_m \quad \tau \leq 1 - \mu \quad (2)$$

Middle-income agents' state-contingent incomes are described in Table 2b.

	Unemployed ($h = 0$)	Employed ($h = 1$)
Do not receive θ ($j = 0$)	$y'_{00} = N$	$y'_{10} = N + \mu$
Receive θ	$y'_{01} = N + \theta$	$y'_{11} = N + \theta + \mu$

	Unemployed ($h = 0$)	Employed ($h = 1$)	
		Takes Job Paying μ	Takes Job Paying 1
Do not receive θ ($j = 0$)	$y''_{00} = N$	$y''_{10} = N + \mu$	$y''_{10} = N + 1 - \tau$
Receive θ	$y''_{00} = N + \theta$	$y''_{10} = N + \theta + \mu$	$y''_{10} = N + \theta + 1 - \tau$

The associated consumption state probabilities for type i individuals are $\pi_{h,j}^i$, i.e. $\pi_{01}^l = p\delta_l$, $\pi_{00}^l = p(1 - \delta_l)$, etc. Hence overall utility for an agent of type i , $i = l, m$, is $U_i(k, \tau) = \sum_h \sum_j \pi_{h,j}^i u(y_{h,j}^i)$, $h, j = 0, 1$. To find the incentive compatibility constraint for the rich, we first note that since $\tau > 1$ and people working in middle class jobs pay taxes when employed, rich agents never will take middle income jobs. Hence the constraint that matters for the rich is the one that keeps them from taking low income jobs. Again, neither N nor θ can affect this margin, so the constraint is simply

$$(IC)_r \quad \tau \leq 1 - \frac{\mu}{\tau} \quad (3)$$

It is obvious that in any equilibrium with positive levels of transfers, $(IC)_r$ must be satisfied, since if $(IC)_r$ is not satisfied, neither is $(IC)_m$, and hence the tax base is zero. We will show below that in both the policymaker's optimal solution with no political constraints and the political equilibrium, positive levels of transfers will exist; as such, we require $(IC)_r$

¹⁶It should be noted that this issue arises only because the poor pay no taxes, so that for the middle class and the rich, taking untaxed μ -jobs is advantageous if the tax rate is too high.

¹⁷Hence what we mean by targeting is precisely what Akerlof meant, and not what Nichols and Zeckhauser (1982) mean.

to hold throughout the rest of this paper. Hence, rich agents' post-transfer income is just $y^r = r(1 - \tau) + N$, and their utility in all states is $u(y^r)$.

Before concluding this section, we note that $y_{h,j}^m \geq y_{h,j}^l$ —middle class people always do at least as well as poor people in the same employment-targeting state—and $y_{h0}^m, y_{h0}^l \leq y^r$ —non-rich people who do not receive θ never do better than rich people.

3 The Policymaker's Optimum With No Political Constraints

In this section, we ignore political constraints and explore the characteristics of the optimal tax and transfer regime when the policymaker faces only the budget and incentive constraints. We will generalize Akerlof's first result directly: optimality requires the use of some targeting, i.e. $k > 0$. but also requires that targeted agents receive a greater total transfer than they would in a world where targeting was impossible. This finding is interesting not only because our economy is more general than Akerlof's, but also because we consider a narrow set of feasible policies. Since Akerlof's economy has only two types of agents and no income uncertainty, his tax and transfer system can be derived from either a lump-sum (once job choice is fixed) or linear tax system. In adding another type of agent and unemployment, we force ourselves to choose between the two approaches; as the enumeration in the previous section makes clear, we choose the latter approach. Hence our verification of Akerlof's results is not only an extension, but also a broadening, of the circumstances known to foster the efficiency of targeting when political constraints do not operate.

Since our economy has a continuum of agents at each consumption level, we are able to define social welfare over realized consumption states (with each consumption state occurring in the same frequency as its population-proportion weighted probability). Assuming that the policymaker's goal is to maximize some appropriately weighted, nondecreasing and concave evaluation function G , the policymaker's objective function is

$$S(k, \tau) \equiv \sigma_l \sum_h \sum_j \pi_{h,j}^l G(u(y_{h,j}^l)) + \sigma_m \sum_h \sum_j \pi_{h,j}^m G(u(y_{h,j}^m)) + \sigma_r G(u(y^r)), \quad (4)$$

and her problem when facing no political constraints is to

$$\max_{\{k, \tau\}} S(k, \tau) \text{ subject to budget balance(1) and incentive compatibility(3)}. \quad (5)$$

We may now state our first result in Theorem 1: when enough poor people receive the targeted transfer, the politically unconstrained optimal policy necessarily involves a positive level of targeted transfers.

Theorem 1 (Some targeting is optimal with no political constraints) *Suppose that $\delta_l \geq \bar{\delta}$ and G is differentiable. Then any (k^*, τ^*) solving \mathfrak{P} will have $k^* > 0$.*

Proof: It is sufficient to show that for any tax rate, social welfare is increasing in k when $k = 0$ (i.e. that $\frac{\partial S}{\partial k}(0, \tau) > 0 \forall \tau$). We first show that this condition is satisfied when G is

the identity function, i.e. the policymaker maximizes a utilitarian social welfare function. Note that when $k = 0$ income is independent of targeting status for each income group, $y_{h0}^i = y_{h1}^i$ for all i . Also note that when $k = 0$ the income of the poor and the middle class when unemployed is just the universal transfer, $y_{0j}^l = y_{0j}^m = \bar{y}\tau = N$. Substituting in those equalities and differentiating, we have in the utilitarian case

$$\begin{aligned} \frac{\partial S}{\partial k}(0, \tau) &= p\bar{y}\tau u'(N)[1 - \bar{\delta} - (1 - \sigma_r - \bar{\delta})] \\ &+ q\bar{y}\tau[\sigma_l u'(y_{1j}^l)(\frac{\delta_l}{\bar{\delta}} - 1) + \sigma_m u'(y_{1j}^m)(\frac{\delta_m}{\bar{\delta}} - 1)] - \sigma_r \bar{y}\tau u'(y^r) \end{aligned}$$

Dividing through by $\bar{y}\tau$, this expression can be rewritten as

$$p\sigma_r[u'(N) - u'(y^r)] + q\left\{\frac{\sigma_l}{\bar{\delta}}(\delta_l - \bar{\delta})[u'(y_{1j}^l) - u'(y_{1j}^m)] + \sigma_r[u'(y_{10}^m) - u'(y^r)]\right\} \quad (6)$$

Since $N < y^r$, $y_{1j}^l \leq y_{1j}^m$, $y_{10}^m < y^r$, and $u'' < 0$, all bracketed terms involving differences in $u'(\cdot)$ quantities are positive; hence, $\delta_l \geq \bar{\delta}$ is sufficient for the entire term to be positive in the utilitarian case. If G is not the identity function, then each $u'(\cdot)$ term is multiplied by an associated term $G'(u(\cdot))$. Since G is concave, this operation only increases the relative differences in the $u'(\cdot)$ terms.

Q.E.D.

The condition $\delta_l \geq \bar{\delta}$ is sufficient, but clearly stronger than necessary, since the other terms in (6) are strictly positive. Moreover, this condition is very reasonable, since with $\delta_r \equiv 0$, the condition may be rewritten as

$$\delta_l \geq \frac{\sigma_m}{\sigma_m + \sigma_r} \delta_m, \quad (7)$$

from which it is clear that the condition simply requires that δ_l not be too much *less* than δ_m , whereas typically we would expect poverty-oriented proposals for targeting programs to have $\delta_l > \delta_m$: poor people should be more likely than middle class people to receive targeted transfers.

One obvious result of Theorem 1 is that targeted people of a given income type receive greater post-transfer income than do untargeted people of the same type. For our purposes, this finding is the important half of Akerlof's result.¹⁸ We now turn to the social choice context.

¹⁸In addition, Akerlof demonstrated that so long as higher income agents' (*IC*) constraint is satisfied when the tax level is zero, when targeting is possible, recipients of the targeted transfer have greater post-transfer income than they would under the optimal policy when targeting is not possible (i.e. when k is constrained to be zero). In our terminology, Akerlof proved that $y_{h1}^*|_{k>0} > y_{h1}^*|_{k=0}$, where asterisks denote optimality. While we have been able to derive restrictions on our model's non-preference parameters under which this result holds here as well, they are not particularly intuitive. Moreover, without placing restrictions (beyond concavity and monotonicity) on the form of the utility function, the conditions under which the result holds are not very broad either. Since the result is not our main focus, we forgo a detailed statement of these conditions.

4 Targeting and Social Choice

In this section we take a classical social choice approach and prove two basic results. The first establishes conditions under which there can be no equilibrium with positive levels of targeting, so that the only possible equilibrium entails no targeting. The second result establishes conditions under which an equilibrium with no targeting does exist. We stress again that even with no targeting, there will be redistributive universal transfers. After introducing some useful notation in the first subsection, we prove the theorems in the second.

4.1 Social Choice Framework

In an election between two proposed points, we will say that one beats another if it has voting support of more than half the population. Since the groups are continua, within which all agents are identical (and hence will vote identically), we may think of the model in terms of three representative agents, each having total voting strength v_i , with $\sum_i v_i = 1$. We do not impose any relationship between a group's population size and its voting strength. As such, we may consider societies where, for example, a large majority of people are poor but form a relatively insignificant political force, a situation common to many developing nations. However, we do assume that no group is decisive, i.e. that $v_i < 1/2 \forall i$; this assumption is necessary for there to be a political economy issue at all. Once it is made, however, it is obvious that any combination of two groups forms a majority coalition, so that our social choice analysis may be conducted in a traditional three-person majority voting framework.

For our purposes, the fundamental result in such a setting is Plott's (1968) theorem on the existence of *interior* majority voting equilibrium. In the present context, Plott's two substantive conditions are that at any equilibrium point $(k, \tau) > 0$,

1) Members of one of the three groups must have maximal utility (for a local equilibrium, we require only that utility be maximal locally) and

2) The other two groups' marginal rates of substitution between k and τ must be equal.

We verify in the next subsection that these two conditions are mutually exclusive for interior points. However, a fact that seems to have been overlooked in the social choice literature is that for *non-interior* points, e.g. points of the form $(0, \tau)$, the second condition is considerably weaker. So long as the two non-maximizing groups do not have their indifference curves intersect except at the interior point, existence of equilibrium is consistent with unequal marginal rates of substitution, if the inequality is in the right direction. In subsection 4.3 we offer intuitive conditions under which such an equilibrium will exist.

We now introduce some terminology that will be useful in our consideration of targeting in a social choice context. First, we denote the entire feasible set of tax rates and targeting proportions, $[0, 1] \times [0, 1]$, as \mathcal{F} . At times it will be easier to carry out our analysis if we can confine our attention to the set of values of τ for which both (IC) constraints are satisfied.¹⁹

¹⁹Since when τ just exceeds $1 - \mu$, employed middle income people switch into low-income jobs, so that there is a discrete change in everyone's after-tax, after-transfer income; this complication means that indifference maps, which we describe below, will not be continuous at $1 - \mu$.

Thus we define the set of points for which both (IC) constraints are satisfied as

$$\mathcal{F}(\mu) \equiv \{(k, \tau) : k \in [0, 1] \text{ and } \tau \leq 1 - \mu\}$$

We then define

$$B_i(\hat{k}, \hat{\tau}) \equiv \{(k, \tau) : U_i(k, \tau) > U_i(\hat{k}, \hat{\tau})\}$$

$$L_i(\hat{k}, \hat{\tau}) \equiv \{(k, \tau) : U_i(k, \tau) = U_i(\hat{k}, \hat{\tau})\}$$

Respectively, these sets are group i agents' better-than and level sets.²⁰

Now define the win set of any given point $(\hat{k}, \hat{\tau})$ as the set of all points that is preferred to the point by at least two groups.

$$W(\hat{k}, \hat{\tau}) \equiv \{(k, \tau) : (k, \tau) \in (B_i(\hat{k}, \hat{\tau}) \cap B_j(\hat{k}, \hat{\tau})) \text{ for some } i \neq j\}$$

We define the set of voting equilibria over some set $X \subseteq \mathcal{F}$ as points that cannot be beaten by any other points, that is, with empty winsets

$$E(X) \equiv \{(k, \tau) : W(k, \tau) \cap X = \emptyset\}$$

We will define a local equilibrium in $X \subseteq \mathcal{F}$ as any point $(k, \tau) \in E(O \cap X)$ for some open ball O around (k, τ) . When we want to consider the whole set of feasible (k, τ) , i.e. $[0, 1] \times [0, 1]$, we will simply write E for the associated equilibrium set. With this notation in hand, we begin our consideration of social choice issues by addressing the political viability of positive levels of targeted transfers when all of \mathcal{F} , i.e. the entire set $[0, 1] \times [0, 1]$, is admissible.

4.2 Targeting Cannot Exist in a Voting Equilibrium

²¹Since the poor do not pay taxes and do receive transfers, it must always be the case that $\partial U_i / \partial \tau > 0$, which implies that poor agents always prefer a tax rate of unity to any

²⁰We note that B_i and L_i define partial orderings for each group i , with their union defining a complete transitive ordering. Using the standard terminology, we have

$$\begin{aligned} (k, \tau) \in B_i(\hat{k}, \hat{\tau}) &\Leftrightarrow (k, \tau) P_i(\hat{k}, \hat{\tau}) \\ (k, \tau) \in L_i(\hat{k}, \hat{\tau}) &\Leftrightarrow (k, \tau) I_i(\hat{k}, \hat{\tau}) \\ (k, \tau) \in (B_i \cup L_i)(\hat{k}, \hat{\tau}) &\Leftrightarrow (k, \tau) R_i(\hat{k}, \hat{\tau}), \end{aligned}$$

where P_i , I_i and R_i have their standard choice-theoretic meanings.

²¹In this subsection, we will assume that $\mu = 0$, i.e. that the poor have zero marginal product. While obviously unrealistic, this assumption is made solely for ease of mathematical exposition. Given our assumption that poor agents' marginal product is zero, $\mathcal{F}(\mu) = \mathcal{F}(0) \equiv \mathcal{F}$. Quite obviously, under this assumption both (IC) constraints are satisfied trivially, so we have $\bar{y} \equiv \sigma_r \tau + \varphi \sigma_m$. All qualitative results in this section are extended to the general case $\mu > 0$ in Appendix 2, while non-intuitive or tedious proofs of results derived in this section are relegated to Appendix 1.

other feasible value. Similarly, the rich always pay taxes, and since we have assumed that $\tau > 1 > \bar{y}$, the rich always pay more in taxes than they receive from N . Hence it must always be the case that $\partial U_r / \partial \tau < 0$, which implies that the rich always prefer a tax of zero.

We now offer a fundamental condition on δ_m and $\bar{\delta}$ and use it below to prove Lemma 1, which establishes that when the condition is satisfied, middle class agents always prefer no targeting (and also always prefer any constant-tax reduction in targeting at any level of targeting).

C 1

$$\delta_m \leq \bar{\delta}$$

We note that this condition can be rewritten as $\delta_m \leq \frac{\sigma_l}{\sigma_l + \sigma_r} \delta_l$, so that it requires that a smaller proportion of middle class than of poor people receive θ . We choose to write the condition as in C 1 because in that form it emphasizes the comparison a *given* middle class person, who has measure zero, makes between her own chances of receiving θ and the overall number of people in the population receiving θ . This approach is useful since the basic logic of Lemma 1 below has to do with precisely this comparison, rather than one between the poor and middle class *group* probabilities of receiving θ (it so happens that the individual and group probabilities are identical, but that fact is irrelevant to the individual agent's assessment of various (k, τ) points).

Lemma 1 (The middle class prefers less targeting when $\delta_m \leq \bar{\delta}$) *Suppose that C 1 holds. Then $\partial U_m / \partial k \leq 0$, with equality at $k = 0$ iff C 1 holds with equality.*

Proof: The truth of the Lemma could be demonstrated algebraically by partial differentiation, but a more intuitive proof is possible. First, note that for $\delta_i < 1$, using some of the budget to fund a targeted transfer increases group- i agents' uncertainty about their income (above and beyond the exogenous uncertainty attributable to unemployment). Next, recalling from equation (1) that $\theta \equiv k\bar{y}\tau/\bar{\delta}$, the expected value (over targeting-receipt states of the world) of income for an agent in group i (when employment status is fixed) is

$$\begin{aligned} \delta_i(y^i + N + \theta) + (1 - \delta_i)(y^i + N) &= y^i + N + \delta_i\theta \\ &= y^i + N + \frac{\delta_i}{\bar{\delta}}k\bar{y}\tau \\ &= y^i + \bar{y}\tau(1 - k(1 - \frac{\delta_i}{\bar{\delta}})) \end{aligned} \quad (8)$$

where y^i is after-tax, pre-transfer income of agent i . Noting that $1 - \delta_i/\bar{\delta} > 0$ by hypothesis of strict satisfaction of C 1, the expected value of income over targeting states is decreasing in k . Hence when C 1 holds strictly, targeting adds uncertainty to middle class income and does so at a return that is worse than actuarially fair. Replacement of $>$ with $=$ in the

appropriate places yields the result that targeting is actuarially fair for the middle class group when C 1 holds with equality. It is a well-known result that risk-averse agents will reject gambles that are not better than actuarially fair. Hence we must have $\partial U_i / \partial k \leq 0$, with equality at $k = 0$ if C 1 holds with equality; but this is the statement of the Lemma. *Q.E.D.*

Thus satisfaction of C 1 implies that the unique local—and hence global—maximum of U_m occurs at $(0, \arg \max_{\tau} U_m(0, \tau))$. Moreover, the condition implies that $(k, \hat{\tau}) \in B_m(\hat{k}, \hat{\tau}) \Leftrightarrow k < \hat{k}$. Similarly, since $\delta_r = 0$ trivially implies satisfaction of the analogue of C 1 for the rich, we see that the unique local (and hence global) maximum of $U_r(k, \tau)$ occurs at $(0, 0)$. Combining application of Lemma 1 and our result that $\partial U_r / \partial \tau < 0$, it must be true that $(k, \tau) \in B_r(\bar{k}, \bar{\tau})$ if $k < \bar{k}$, $\tau < \bar{\tau}$, or both.

The level sets $L_i(k, \tau)$ will be of fundamental importance in our analysis. It will be convenient to refer to them in terms of their associated indifference maps $\tau_i(k; U_i)$, which may be defined as that level (or set of levels) of the tax rate that keeps utility constant at U_i when the degree of targeting is k .²²

The only one of these three indifference maps that we may describe explicitly (without strong assumptions on u , δ_m , or δ_l) is τ_r . Since rich voters face no uncertainty over income, their level sets are determined by those variations in k and τ that leave them with constant consumption, so that for any level of consumption c_r , we have

$$\tau_r(k; u(c_r)) \equiv \frac{r - c_r}{r - (1 - k)\bar{y}} \quad (9)$$

Figure 1a depicts a typical map τ_r and the better-than set B_r of any point lying on it. To continue, if we know that $u(\hat{k}, \hat{\tau}) = u(c_r)$, we can write

$$\tau_r(k; u(c_r)) \equiv \frac{r - (1 - \hat{k})\bar{y}}{r - (1 - k)\bar{y}} \hat{\tau} \quad (10)$$

Unless strong simplifying assumptions on the δ s are made, it is not in general possible to give closed-form definitions of τ_l and τ_m . However, as we show below, the primary results

²²Given values U_i^0 of the voters' utility functions, over some domain $K_i(U_i)$ of possible values of k , group i 's level set will have an associated function (for the poor and the rich) or correspondence (for the middle class) mapping a value of k to values of τ that yield the same utility to members of that group as does $(\hat{k}, \hat{\tau})$. The poor and the rich have functions because their utility functions are strictly increasing (the poor) or strictly decreasing (the rich) in τ , so that no value of k can be mapped to more than one value of τ yielding the same level of utility. The middle class have an indifference correspondence because for any value of k , there may be zero, one, or two values of τ yielding a given level of utility. (The possibility of zero is trivial, and by strict concavity of U_m in τ , we know that there cannot be more than two values. There will be one value if either that value is a maximum (conditional on k) or a non-feasible tax (i.e. greater than 1 or less than zero) were necessary to achieve the given level of utility.) That said, we have $\tau_l : K_l(U_l^0) \rightarrow [0, 1]$, $\tau_r : K_r(U_r^0) \rightarrow [0, 1]$, and $\tau_m : K_m(U_m^0) \Rightarrow [0, 1]$, where

$$K_i(U_i^0) \equiv \{k : \exists \tau \text{ s.t. } U_i(k, \tau) = U_i^0\}$$

we will need for τ_l may be gotten with the aid of the implicit function theorem. Moreover, the only qualitative result we will need regarding middle class agents' preferences is the previous lemma's, namely that when C 1 holds, middle class people will vote for constant-tax reductions in k at all points. All necessary intuition regarding τ_m may be gotten from Figures 1b, an example when C 1 is satisfied, and 1c, in which it is not.

It will be useful to define a function $\tau^*(k)$ which satisfies

$$\tau^*(k) = \arg \max_{\tau \in [0, 1] \text{ given } \mu = 0} U_m(k, \tau) \quad (11)$$

This function tells us the optimal tax rate, from the point of view of middle class agents, when the degree of targeting is k .²³ The function is given implicitly by the equation

$$\frac{\partial U_m}{\partial \tau} = 0 \quad (12)$$

By the implicit function theorem, for $\tau^*(k) \in (0, 1)$ we have

$$\frac{d\tau^*}{dk} = -\frac{\partial^2 U_m / \partial k \partial \tau}{\partial^2 U_m / \partial \tau^2} \quad (13)$$

Similarly, we can define a function $k^*(\tau)$, which tells us middle class voters' optimal level of k when the tax rate is τ :

$$k^*(\tau) = \arg \max_{k \in [0, 1] \text{ given } \mu = 0} U_m(k, \tau) \quad (14)$$

given by²⁴

$$\frac{\partial U_m}{\partial k} = 0 \quad (15)$$

and whose first derivative, when the assumptions of the IFT are satisfied, is given by²⁵

$$\frac{dk^*}{d\tau} = -\frac{\partial^2 U_m / \partial k \partial \tau}{\partial^2 U_m / \partial k^2} \quad (16)$$

We can now prove another lemma.

Lemma 2 (Conditions for the middle class to prefer $\tau < 1$) *Suppose $\mu = 0$. Then $\bar{y} < q$, i.e. $\sigma_r \tau < q(1 - \sigma_m)$, if and only if*

- (i) $\tau^*(0) < 1$ and
- (ii) *At any point $(k, 1)$, either $\partial U_m / \partial \tau < 0$, $\partial U_m / \partial k < 0$, or both.*

²³The opportunity set $[0, 1]$ is compact and our assumptions on u imply that U_i is continuous and concave in τ over this set. Thus by the theorem of the maximum, τ^* exists and is continuous.

²⁴Of course, when C 1 is satisfied, we have $\partial U_m / \partial k \leq 0$, so that $k^*(\tau) = 0$ and $dk^* / d\tau = 0$.

²⁵We note that by our assumption that $u'' < 0$, the denominator terms in both first derivatives are negative. Hence each first derivative has the sign of the cross partial derivative in its numerator.

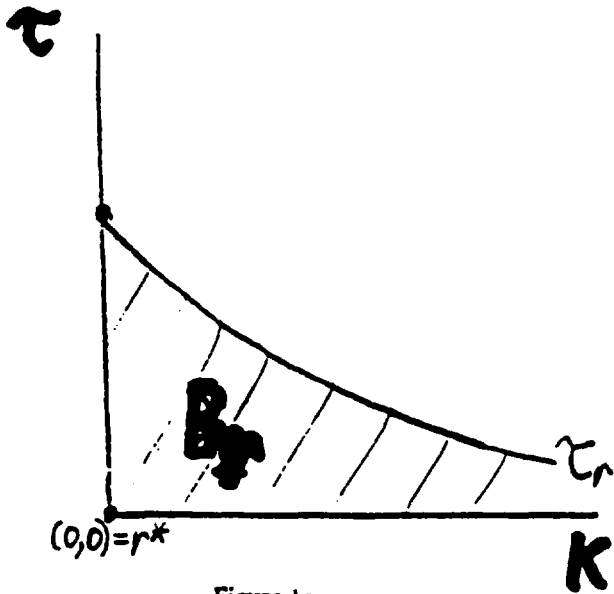


Figure 1a:
 Rich voters' indifference curve τ_r and their better-than set B_r .
 Rich voters have an optimum at $r^*=(0,0)$.

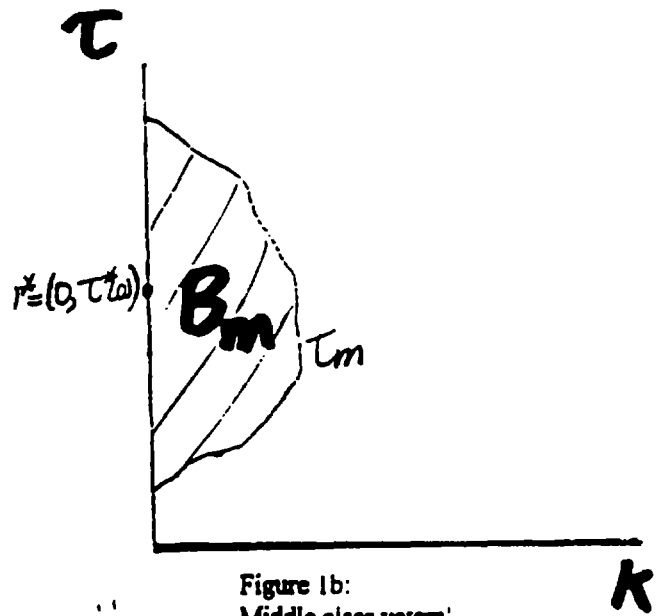


Figure 1b:
 Middle class voters' typical indifference curve and better-than set when $\delta_m \leq \bar{\delta}$. Their optimum must be at $(0, \tau^*(0))$ in this case.

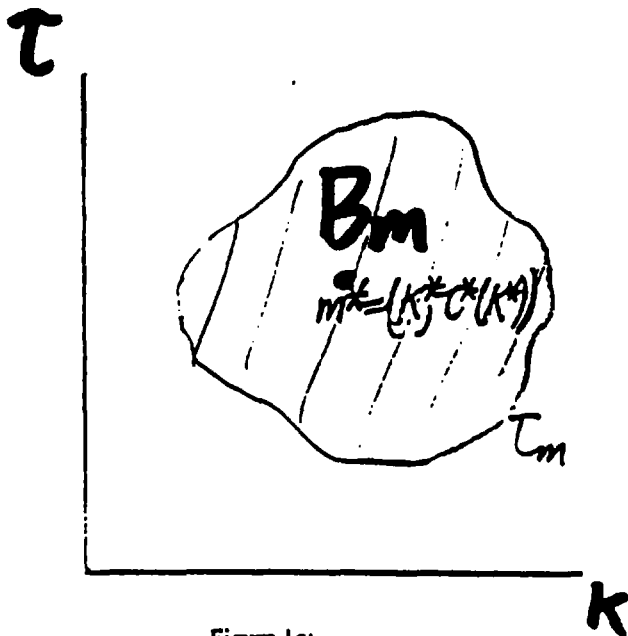


Figure 1c:
 Middle class voters' typical indifference curve and better-than set when $\bar{\delta} < \delta_m < 1$. Their optimum must lie at an interior point like m^* .

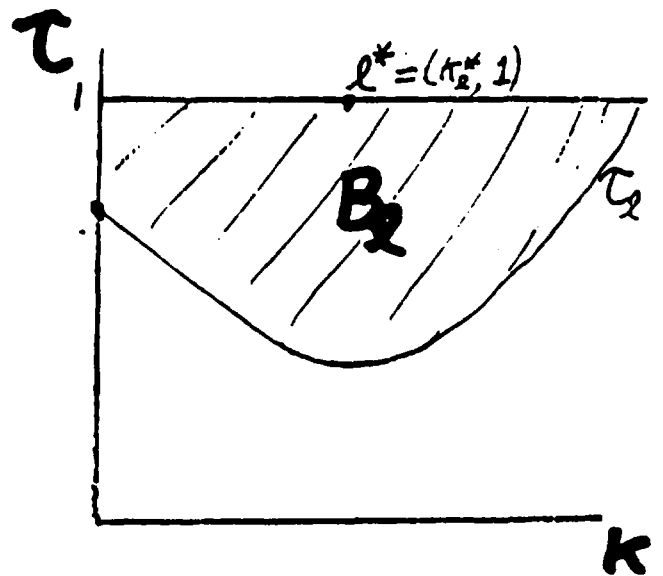


Figure 1d:
 Poor voters' indifference maps look like τ_p with better-than sets like B_p . Their optimum lies at some point $(K, 1)$.

Proof: See Appendix 1.

Conclusion (i) of Lemma 2 evidently implies that when $\mu = 0$, the point $(0, 1)$ is never a voting equilibrium, since the optimal tax rate for both rich and middle class voters when $k = 0$ is less than unity. For technical reasons, conclusion (ii) is useful below in ruling out the possibility of positive levels of θ in equilibrium (when $\mu = 0$).

Next, we use Condition C 2 to establish in Lemma 3 an instrumental single-crossing property between τ_l and τ_r . This property will rule points $(k, \tau) \in (0, 1) \times (0, 1)$, i.e. points in the interior of \mathcal{F} , out of the equilibrium set.

C 2

$$\frac{\delta_m}{\delta_l} \geq 1 - \frac{q}{r}$$

Lemma 3 (Single Crossing for τ_r & τ_l) *If C 2 is satisfied, then*

(i) *Any two indifference curves $\tau_l(k; U_l)$ and $\tau_r(k; c_r)$ intersect at most once.*

(ii) *If $\tau_l(\hat{k}) = \tau_r(\hat{k})$, then $\tau_l(k) < (>) \tau_r(k) \forall k < (>) \hat{k}$.*

For $k = 0$, (i) and (ii) hold only if C 2 is satisfied.

Proof: See Appendix 1.

Figure 1d depicts a typical example a poor agent's indifference map τ_l . The single crossing result established in the previous lemma is depicted in Figure 2a. When the result holds, any possible rich-poor coalitions to defeat a point are limited to points having lower values of k than the point in question. Hence b is beatable, but a is not, since it lies on the vertical axis, and negative values of k are not permitted. Figure 2b shows what happens when C 2 is violated: any point on the vertical axis is locally beatable by a rich-poor coalition in favor of points like those in $B_l \cap B_r$.

As for coalitions involving the middle class, Figure 2c shows an example in which the middle class and the rich may form a successful coalition. In fact, Lemma 1 tells us that so long as $\delta_m \leq \bar{\delta}$, such coalitions always are possible at interior points (such as a). Figure 2d depicts two possible situations regarding poor-middle class coalitions. The point a is beatable by any point in the region I (which includes that part of the vertical axis adjacent to it), while the point b cannot be beaten by a poor-middle class coalition.

With these graphs and Plott's conditions in mind, any interior majority voting equilibrium must resemble the situation shown in Figure 3. The point m^* is optimal for middle class voters (we include the locus of points τ_m only to remind readers what middle class voters indifference curves must look like in this case; for any point on this locus, the arrows indicate the direction of improvement for middle class voters). At the same time, the better-than sets for rich and poor agents have to be disjoint, which implies that their indifference curves are tangent, i.e. that rich and poor voters have equal marginal rates of substitution at m^* . Hence interior equilibrium requires the simultaneous violation of

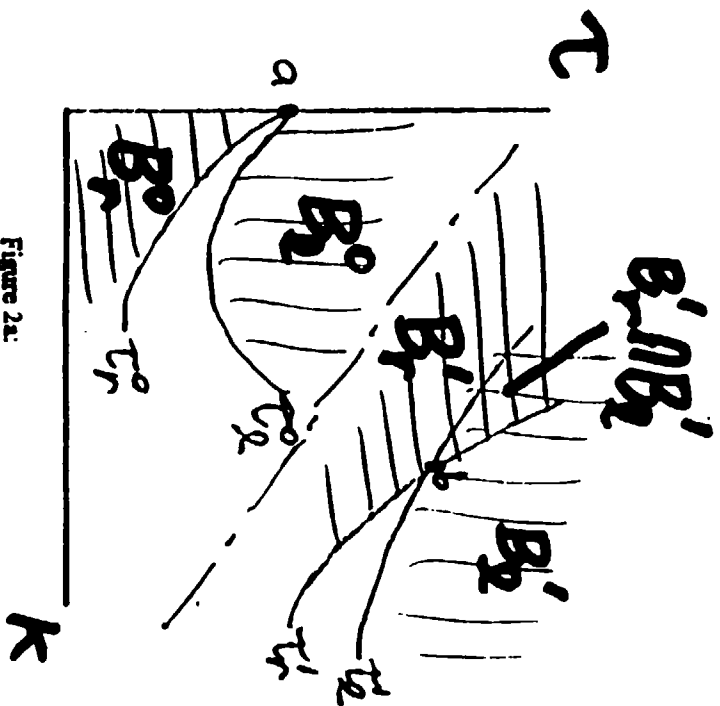


Figure 2a:
Single-crossing for rich
and $B_r \cap B_r^1$ poor
agents. Any point in
finds a rich-poor coalition
to defeat a , since
 $B_r \cap B_r^1$ is empty.

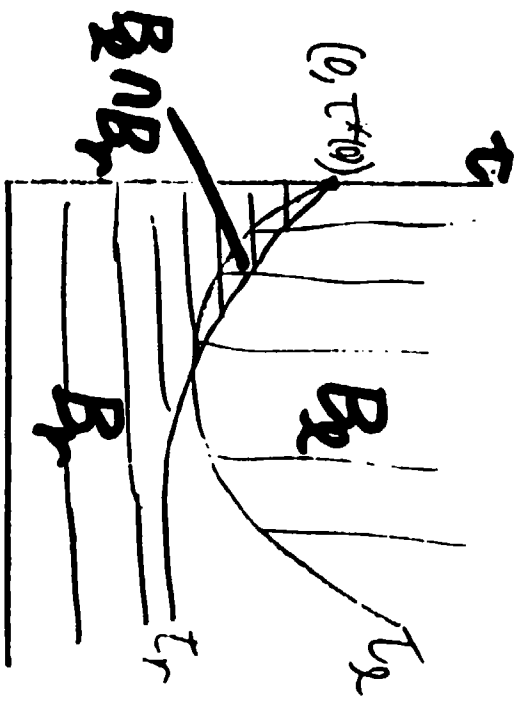


Figure 2b:
Non-single crossing and
a resulting coalition
between rich and poor
agents to favor points
in $B_r \cap B_r^1$,
over $(0, T+0)$.

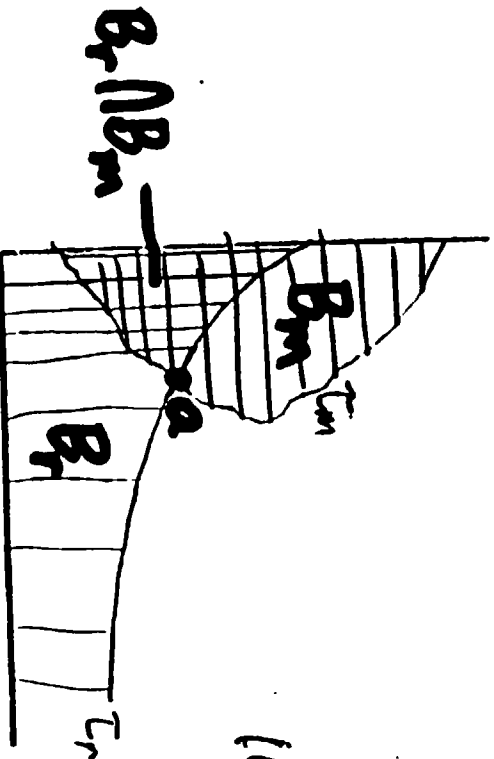


Figure 2c:
Points in the region
 $B_r \cap B_r^1$ find a rich-
middle class coalition
defeating the point a .

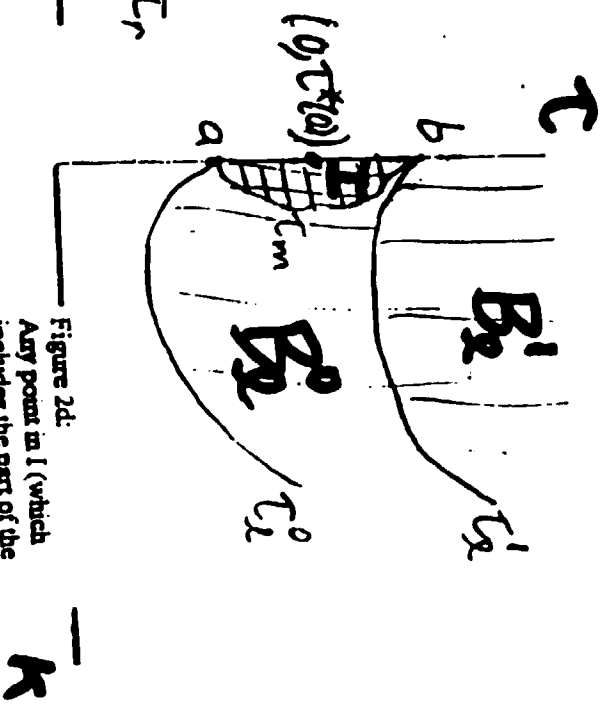


Figure 2d:
Any point in I (which
includes the part of the
vertical axis adjacent to it)
finds a coalition, between
poor and middle class
agents, to defeat the point
 a . No points can find a
poor-middle class

conditions C 1 and C 2. Lemma 4 shows that this situation cannot happen. In the theorem that follows, we bring together this lemma and the ones preceding it to show that the set of interior equilibria is empty.

Lemma 4 *At least one of C 1 or C 2 is satisfied.*

Proof: Appendix 1.

Theorem 2 (Targeting cannot exist in equilibrium (Plott, 1968)) *Suppose $\mu = 0$. For any set $X \subseteq \mathcal{F}$ satisfying $\text{int}(X) \neq \emptyset$ and any point $(k, \tau) \in \text{int}(X)$, $W(k, \tau)$ is locally nonempty. (Equivalently, $E(O \cap X) = \emptyset$ for all open balls O of (k, τ) and $(k, \tau) \in \text{int}(X)$.)*

Proof: We begin by demonstrating the result for \mathcal{F} . By Lemma 4, no point (k, τ) , $k > 0$, can satisfy both of Plott's conditions, since either the middle class and rich can form a coalition in favor of a constant-tax local reduction of k or the rich and poor can form a coalition to reduce k locally while increasing τ locally. This establishes the result for $X \equiv \mathcal{F}$. But since the coalitions just described favor points that are arbitrarily close to (k, τ) , the result must carry over to any arbitrary $X \subset \mathcal{F}$.

Q.E.D.

This result is obviously negative from the point of view of supporting targeting, but by itself it is hardly sufficient to ruin the case for targeting. An enormous and well-known literature has established that social choice models do not in general have voting equilibria, so it might be the case that an equally negative result holds for any non-targeting ($k = 0$) regime. That is, it might be the case that while positive levels of targeting always are beatable, there always exists a positive level of targeting that can beat any non-targeting regime. This possibility is exactly what we rule out in the next subsection.

4.3 Equilibrium Exists With No Targeting

We now prove Theorem 3, which gives necessary and sufficient conditions for the existence of majority voting equilibrium with no targeting (we stress again that positive *transfers* will occur in such an equilibrium).

Theorem 3 (Equilibria exist with no targeting.) *Suppose $\delta_l \geq \delta_m$. Then both C 1 and C 2 are satisfied if and only if $E(\mathcal{F}) = \{(0, \tau^*(0))\}$*

Proof: See Appendix 1.

We point out that the results given so far imply that, while an equilibrium need not exist, if one does it can occur *only* in a non-targeting regime. Hence even if one wishes to dispute the assumptions used in Theorem 3, one still must face the fact that no other point in the space may be supported as an equilibrium.

Aside from noting that we have put $\mu = 0$ (an assumption we deal with in Appendix 2), two basic attacks on this theorem's assumptions are possible. First, one might argue that

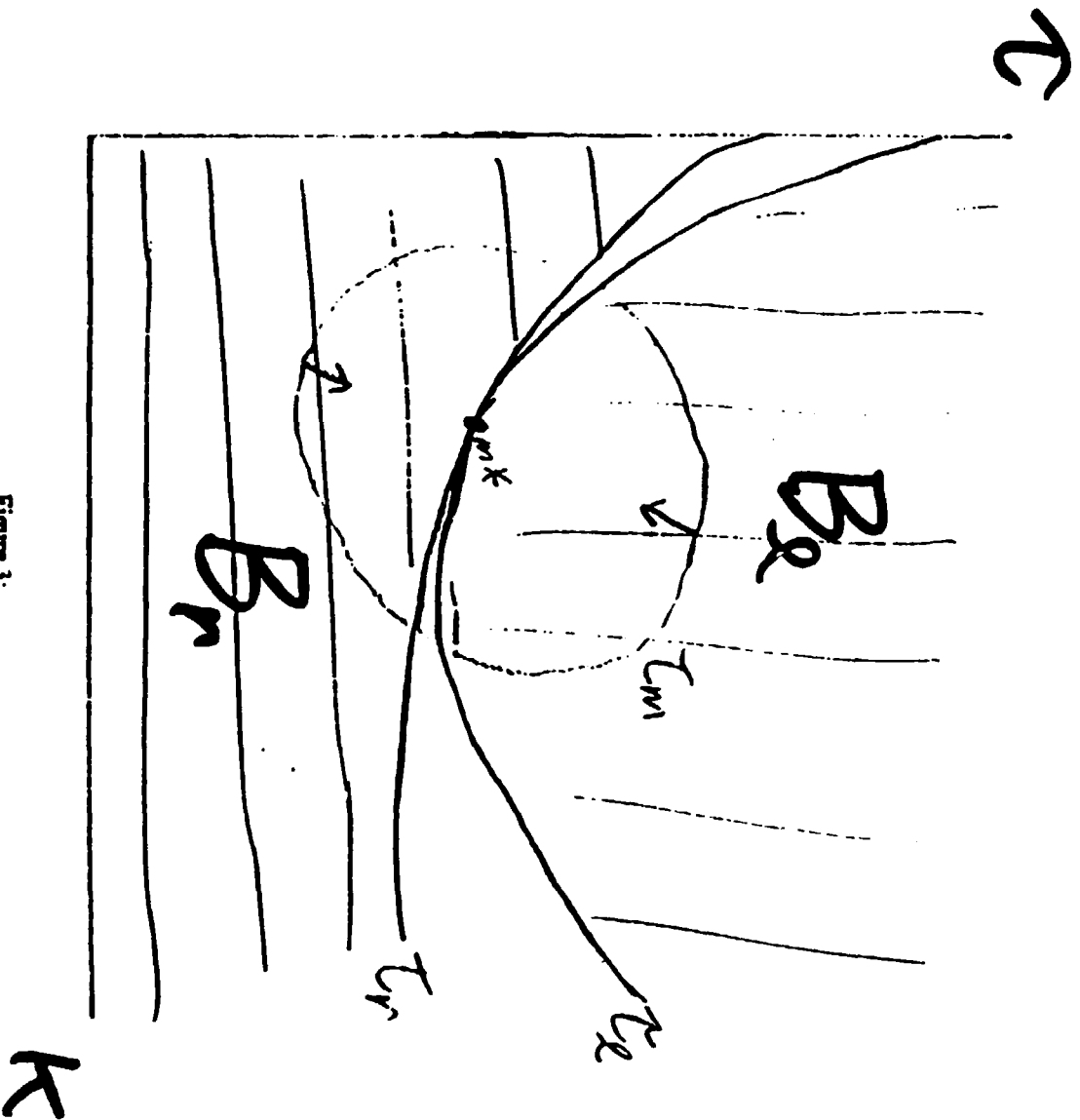


Figure 3:
 A hypothetical - but non-
 existent - interior
 equilibrium

we should not assume $\delta_l \geq \delta_m$. We are perfectly willing to entertain the idea that when this assumption is violated—which implies that $\delta_m \geq \bar{\delta}$ —targeting might be a good idea from a political point of view: our aim in this paper is to argue that targeting is politically viable *only* when the benefits of targeting are dispersed over a large enough group of people. But a targeting regime in which the middle class are more likely than the poor to receive a transfer is not what most people have in mind when they propose to target transfers.

Second, one might argue that the requirement in condition C 2 that δ_l and δ_m be sufficiently close is overly restrictive. In response, we note first that while the condition is always sufficient, it is necessary only at $k = 0$. Moreover, while we admit being less than satisfied with the condition, it does have an intuitive explanation. When δ_l is large by comparison to δ_m , it also must be large relative to $\bar{\delta}$, so that the poor gain a large amount from targeting relative to taxation; that is, they are more willing to agree to tax reductions in return for increased targeting. The rich, on the other hand, will be more willing to agree to such deals when their taxable income is large relative to the transfers they receive, i.e. N . Recalling that the income of the rich always is $r(1 - \tau) + N$, it makes sense that as τ increases, so that the rich care relatively more about the taxes they pay than about the transfers they receive, they will be more willing to accept more targeting in exchange for lower taxes. Hence this attack on Theorem 3 relies on the claim that the rich and the poor are likely to agree on proposals to cut taxes in return for more targeting. Whether or not this phenomenon generally occurs in the real world is an empirical question worth answering, but rarely (if ever) considered in existing empirical work. As a practical matter, however, the requirement that δ_l be sufficiently larger than δ_m requires relatively high performance from the indicators used to develop the criterion function that is to identify the poor, and most existing empirical work does not suggest such performance is possible.

5 A Nash Equilibrium Approach

5.1 Introduction

Our second approach to modelling the politics of tagging is to assume that elections are held to determine the level of taxation, given the policymaker's choice of the level of targeting. This approach allows us to assess the applicability of the targeting assessment literature, where authors typically assume what we will call the "naive policymaker". That is, these authors ask the question, "For a *fixed budget*, what kind of targeting regime, based on observable indicators, minimizes the level of a poverty index?"²⁶

The Glewwe (1990) example cited in our introduction is an excellent example of this approach. He calculates that with a fixed budget of 10 million CFA francs, a uniform *per capita* transfer in Cote d'Ivoire could reduce poverty by six percent. By contrast, using estimates of the relationship between income and household characteristics to implement indicator targeting, that same 10 million francs could reduce poverty by more than three times as much—19 percent. Yet, *all* transfers go to East Forest residents. Numerous other examples of roughly the same approach may be found, with a variety of indicators used.

²⁶Typically, a Foster, Greer, Thorbecke (1984) index is used, with poverty lines determined using one of the methods proposed by Ravallion (1994).

Baker and Grosh (1994) examine the implications of geographic targeting in Jamaica and find that allocating a poverty budget of 10 percent of the poverty line to five (of 14) parishes would reduce poverty nearly twice as much as a nationwide transfer. Ravallion and Chao (1989) use data on differences in household income across six regions of Java, Indonesia, to show that the optimally targeted budget of 114 million rupiahs would direct the entire poverty alleviation budget to rural residents of East Java. More strikingly, if one allows taxation of residents in one region to finance transfers to those in another, residents of East Java should receive 1,963 Rupiahs per household, while urban residents of West Java should pay a head tax of 2,585 Rp. ²⁷

Use of this general approach is not confined to journal articles. In the present international development climate, which features both enhanced efforts to reduce poverty and (at least perceived) tighter fiscal constraints, targeting is very much on economic advisers' agenda. A recent treatment of public spending and the poor states that "the most commonly heard proposal for achieving a more pro-poor benefit distribution is 'improved targeting'." (van de Walle [1995]). A primary aim of household income surveys in LDCs is to construct poverty profiles which are to be used to target resources more effectively. One recent World Bank report states that "probably the most important use of the poverty profile is to support efforts to target development expenditures towards poorer areas, aiming to reduce aggregate poverty." Policy discussions and most of the articles cited above alike mention political issues in passing, but these are not taken into account explicitly.

5.2 Solving the wrong problem is not right

We consider two versions of the elections approach, in each case using the median voter theorem to pin down the level of taxation at $\tau^*(k)$. In the first version, which reflects the methodology of the targeting assessment literature discussed above, the policymaker takes the level of taxation as given, while in the second version the policymaker takes the function $\tau^*(k)$ as given. That is, in the second version the policymaker recognizes that her choice of k will affect the level of taxation in political equilibrium.

We establish a series of results. First, we show that choosing the degree of targeting to maximize a SWF²⁸ subject to a fixed budget constraint is an ill-posed problem, in the sense that it almost never produces a "true" optimum. That is, the budget is *not* in fact fixed, so that treating it as such involves misspecifying the opportunity set. Second, we offer conditions under which the median voter's optimal tax function $\tau^*(k)$ is monotonically decreasing in the degree of targeting. Third, we show in the second version that under broader conditions, τ^* is decreasing at $k = 0$, so that depending on the SWF of choice, it often will be possible that zero targeting is a (local²⁹) Nash equilibrium.

Recalling the social welfare function S and its associated evaluation function G introduced in Section 3, we can write the policymaker's problem in Versions I and II, respectively, as:

²⁷Recall Akerlof's result that having some low-skill workers pay taxes to fund transfers to other similar workers cannot in general be ruled out of the set of optimal policies.

²⁸Recall that minimizing a poverty index of the FGT form is a special case of this procedure.

²⁹We define our concept of local Nash equilibrium below

$$\max_{k \in [0,1]} S(k, \tau) \text{ given } \tau \quad (17)$$

$$\max_{k \in [0,1]} S(k, \tau) \text{ such that } \tau = \tau^*(k) \Rightarrow \max_{k \in [0,1]} S(k, \tau^*(k)) \quad (18)$$

Thus in Version I, Nash equilibrium requires both that $\tau = \tau^*(k)$ and that k solve (17), while in Version II, it is taken as given (by the policymaker) that $\tau = \tau^*(k)$, so Nash equilibrium is achieved by any k solving (18). Our first result, given in Theorem 4, demonstrates that Nash equilibria exist in both versions of the Nash approach.

Theorem 4 (Existence of Nash Equilibrium) *In both Version I and Version II, at least one Nash equilibrium exists.*

Proof: In both of Problems 17 and 18, S is continuous by our assumption that G is, τ^* is continuous by the theorem of the maximum, and the set $[0, 1]$ is compact. Hence an optimal value of k for the policymaker exists, establishing proof for Version II. In Version I, since S also is concave in k , the optimal value is unique; in this case, we have a functional relationship $k = \phi(\tau)$ if k solves (17), where ϕ is continuous by the theorem of the maximum. As we describe in the text, the equilibrium set consists of all points $(k, \tau) = (\phi(\tau), \tau^*(k))$, suggesting we define a function $n : \mathcal{F} \rightarrow \mathcal{F}$ such that $n(k, \tau) = (\phi(\tau), \tau^*(k))$; note that n is continuous and \mathcal{F} is convex. By Brouwer's Fixed Point Theorem, n has at least one fixed point, proving that a Nash equilibrium exists in Version I.

Q.E.D.

Assuming that G —and hence S —is differentiable³⁰, we can use the usual first order conditions to establish necessary conditions for Nash equilibrium. In Version I, each objective function is strictly concave in its choice variable, so (interior) Nash equilibria are fully described by³¹

$$\tau = \tau^*(k), \quad S_k = 0. \quad (19)$$

As the discussion in the introductory part of this section details, this situation conforms to what proponents of indicator targeting have in mind. However, our approach in Version II suggests that more careful analysis is in order. So long as $\tau^*(k) \in (0, 1)$, i.e. the middle class's problem always has an interior solution, our assumptions on u imply, via the

³⁰Some evaluation functions are only piecewise differentiable; one example is the Foster-Greer-Thorbecke poverty index mentioned earlier. These functions are more tedious to work with, since one must take into account the possibility (perhaps even the likelihood) that optima occur at kink points. However, the usual approach, i.e. checking all kink points for optimality conditions, solves the problem; as there is no gain in intuition from treating such functions explicitly, we leave the reader to make the necessary modifications to the argument in the text.

³¹For boundary solutions, we would replace $=$ with \leq (for $k = 0$) or \geq (for $k = 1$). Of course, Theorem 1 demonstrates that at $k = 0$ we have $S_k > 0$.

implicit function theorem, that τ^* is everywhere differentiable. Hence we can take a first-order approach to (18), so that the necessary condition for (an interior) Nash equilibrium of Version II is³²

$$S_k + S_\tau \frac{d\tau^*}{dk} = 0 \quad (20)$$

Except for points where either S_τ or $d\tau^*/dk$ equals zero, optima will not be characterized by $S_k = 0$. This fact of course begs the question, Will S_τ or $d\tau^*/dk$ equal zero? Before answering, we demonstrate in the following theorem that from the policymaker's point of view, any Version II equilibrium weakly dominates all Version I equilibria. The logic of the theorem is nearly trivial: if one misspecifies one's constraint set and then solves the associated misspecified optimization problem, but the constraint must bind in equilibrium, one can hardly expect to outperform an optimal choice made over the correctly specified constraint set. The "weak" part of the theorem is necessary because it is of course possible that the misspecified constraint set contains the optimal choice from the correctly specified one. However, after stating the theorem, we shall argue for the unlikelihood of this particular outcome in the present context.

Theorem 5 (Assuming a fixed budget is (almost) never optimal) *Suppose G is differentiable. Let Φ be the parameter space with vector elements ϕ satisfying the basic restrictions of the model. Let*

$$VI(\phi) = \{k : k \text{ solves (17) when the parameters of the model are specified as } \phi\}$$

and define $VII(\phi)$ analogously. Then for any $\kappa \in VII(\phi)$ and $\kappa' \in VI(\phi)$, $S(\kappa, \tau^(\kappa)) \geq S(\kappa', \tau^*(\kappa'))$.*

Proof: Suppose that κ' solves (17); then by definition $S_k(\kappa', \tau^*(\kappa')) = 0$; note that by Theorem 1, $\kappa' > 0$. Hence from (18) we have

$$\frac{dS}{dk} = S_\tau(\kappa', \tau^*(\kappa')) \frac{d\tau^*}{dk}(\kappa', \tau^*(\kappa')) \quad (21)$$

So long as neither term on the RHS of Equation 21 is zero, it is obvious that κ' does not solve (18), which is to say that there is some other value κ in a neighborhood of κ' such that $S(\kappa, \tau^*(\kappa)) > S(\kappa', \tau^*(\kappa'))$. If either RHS term is zero at κ' , this inequality need not hold (it need not be violated either, since it is possible that κ' is a global maximum of S over the Version I constraint set but only a local maximum over the Version II), but κ' itself is always feasible in (18), so the policymaker never does worse by solving the Version II problem.

Q.E.D.

³²As above, we note that boundary solutions would involve the replacement of = with \leq (for $k = 0$) or \geq (for $k = 1$).

Figure 4a should provide the necessary intuition. The curves labeled SW are iso-social welfare loci, whose slopes are $-S_k/S_\tau$. At point A , or (k_0, τ_0) the curve SW_0 has a minimum, so $S_k = 0$; also, $\tau^*(k_0) = \tau_0$. Hence A is a Nash equilibrium of Version I. However, $d\tau^*/dk > 0$ at A , so that an improvement of social welfare is feasible by moving, for example, to point B : Version I leads to an *undertargeted* equilibrium in this case. This outcome occurs because when the policymaker takes τ_0 as given, she ignores the entire region R , all of which is feasible and some of which allows welfare improvement over A .

Figure 4b shows an example where the equilibria of our two games are equivalent from the policymaker's perspective. It should be obvious that the possibility of this event is quite remote ³³.

5.3 Is the "naive" amount of targeting too high or too low?

Although Figure 4a showed an undertargeting example, we believe that the more likely scenario is depicted in Figure 5. The difference here is that at A' , $d\tau^*/dk < 0$. In this case, the policymaker fails to regard as feasible the region R' , all of which allows improvement. In this case, the Nash equilibrium of Version II occurs at $(0, \tau^*(0))$, where the policymaker is on her highest *politically* feasible iso-welfare curve. At this point, the "naive" policymaker of Version I believes the entire rectangle $\tau^*(0) - O - 1 - \tau^*(0)$ is feasible, so she turns down the opportunity to select $(0, \tau^*(0))$, preferring instead the point C , with the associated level of targeting k_1 . But at k_1 , $\tau^*(0)$ is not selected by voters; rather, they choose τ_1 , and so on, until we reach the point A' , where both $S_k = 0$ and $\tau = \tau^*(k)$.

Figure 5 suggests heuristically that when the Version I equilibrium is worse than the Version II equilibrium, it can be a *lot* worse. This fact suggests that we should examine in detail the conditions under which our economy looks like the one depicted in Figure 2. In particular, we would like to characterize $d\tau^*/dk$ and the sign of S_τ , especially at $k = 0$. We will find it convenient to restrict consideration to the case of constant relative risk aversion utilities ³⁴.

Unless we indicate otherwise, we assume throughout the remainder of this section that C 1 is satisfied with strict inequality. We proceed by offering sufficient conditions under which τ^* decreases monotonically. We then show that at $k = 0$ this sufficient condition is far stronger than necessary.

Proposition 1 *Suppose that we have CRRA utilities with parameter ρ , C 1 is satisfied strictly and $\rho \leq 1$. Then τ^* is monotonically decreasing.*

Proof: To begin, we recall from equation (13) that $d\tau^*/dk = -(\partial^2 U_m / \partial k \partial \tau) / (\partial^2 U_m / \partial \tau^2)$. Since $\partial^2 U_m / \partial \tau^2$ always is negative (by concavity of u), $d\tau^*/dk$ has the same sign as $\partial^2 U_m / \partial k \partial \tau$. Dropping the m subscript of U_m , partial differentiation with respect to k yields

³³Algebraically, this event requires that there is a point (k, τ) where simultaneously $\partial U_m / \partial \tau = \partial^2 U_m / \partial k \partial \tau = S_k = 0$. There is no reason why all three of these conditions—which generally imply very different qualitative restrictions on the model's parameters—should hold at once.

³⁴When we say that this restriction is for convenience, we really mean it. The main result we report in the text below carries through without the CRRA assumption; we will use footnotes in the text below to describe the necessary revisions when a general utility function is used.

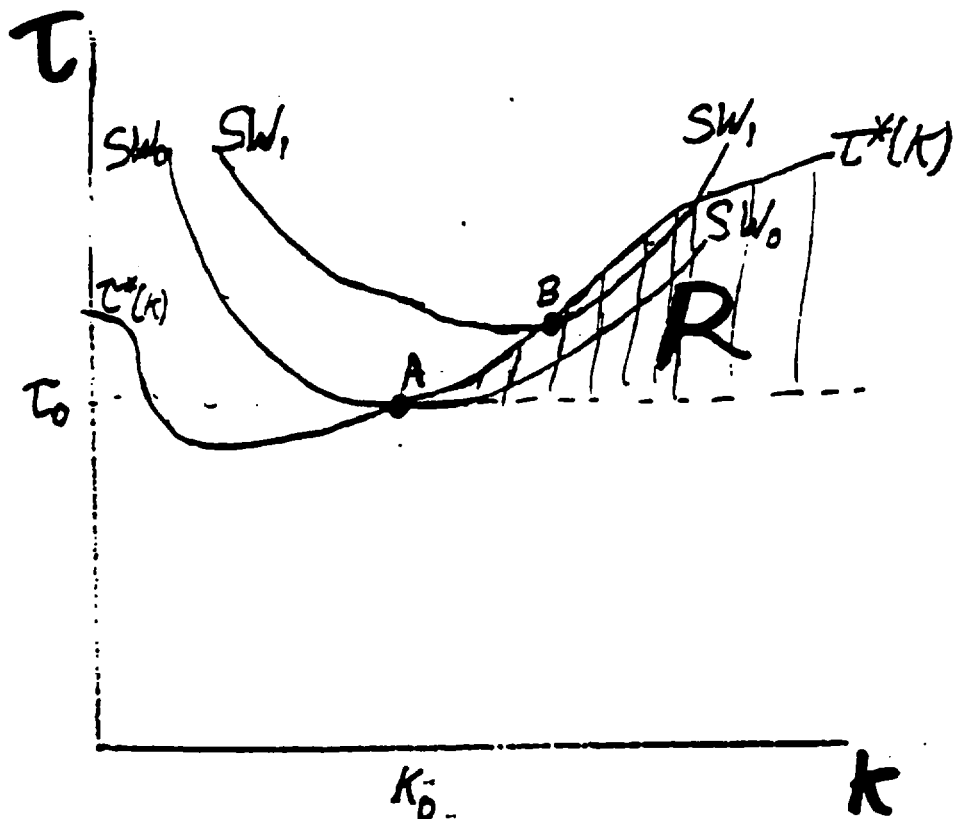


Figure 4a:
An example in which
naive a policymaker
chooses too little targeting.

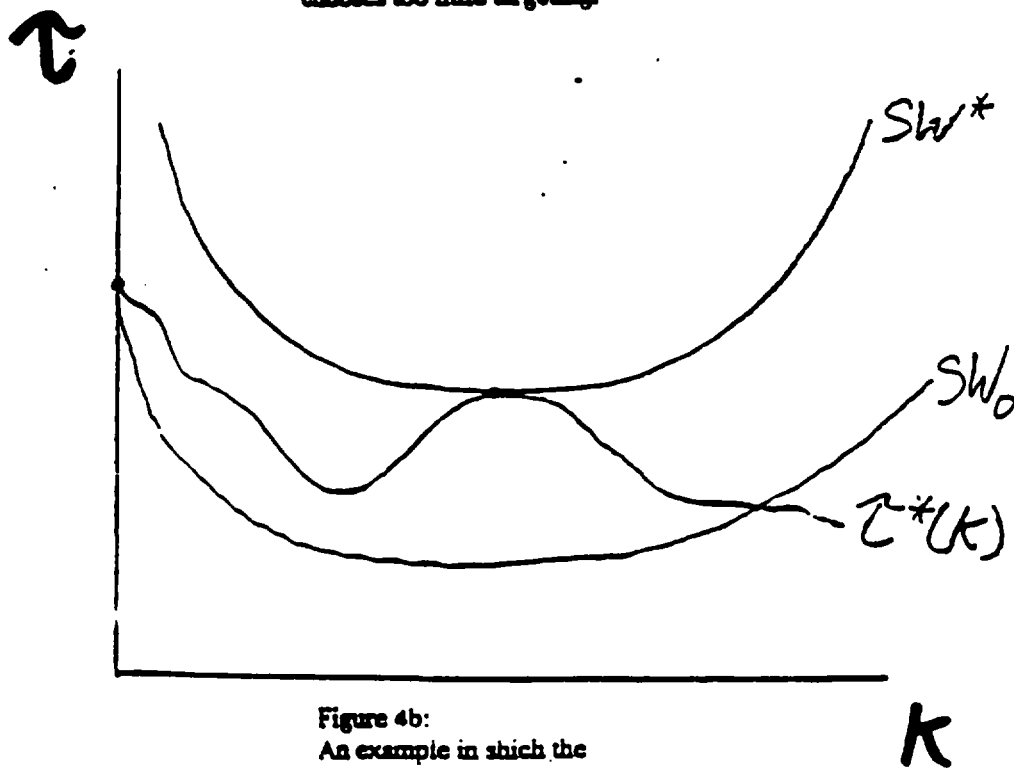


Figure 4b:
An example in which the
naive policymaker
happens to choose the
actually optimal level of
targeting.

$$\delta_m \bar{y} \tau \{ \bar{\gamma} [p u'(N + \theta) + q u'(N + \theta + 1 - \tau)] - \gamma_m [p u'(N) + q u'(N + 1 - \tau)] \} \quad (22)$$

Differentiating this expression partially with respect to τ , we have

$$\begin{aligned} U_{k\tau} = & \frac{U_k}{\tau} + \delta_m \bar{y} \{ \bar{\gamma} [p(N + \theta) u''(N + \theta) + q(N + \theta - \tau) u''(N + \theta + 1 - \tau)] \\ & - \gamma_m [p N u''(N) + q(N + 1 - \tau) u''(N + 1 - \tau)] \}, \end{aligned} \quad (23)$$

which can be rewritten as

$$\begin{aligned} U_{k\tau} = & \delta_m \bar{y} (1 - \rho) \{ \bar{\gamma} [p u'(N + \theta) + q u'(N + \theta + 1 - \tau)] - \gamma_m [p u'(N) + q u'(N + 1 - \tau)] \} \\ & - q \delta_m \bar{y} [\bar{\gamma} u''(N + \theta + 1 - \tau) - \gamma_m u''(N + 1 - \tau)] \end{aligned} \quad (24)$$

Since $u'' < 0$ and $\bar{\gamma} < \gamma_m$ (by C 1), the term multiplied by $(1 - \rho)$ is negative. The rest of the RHS must be negative, since $u''' > 0$. Hence $\rho \leq 1$ is a sufficient condition for τ^* to be monotonically decreasing.

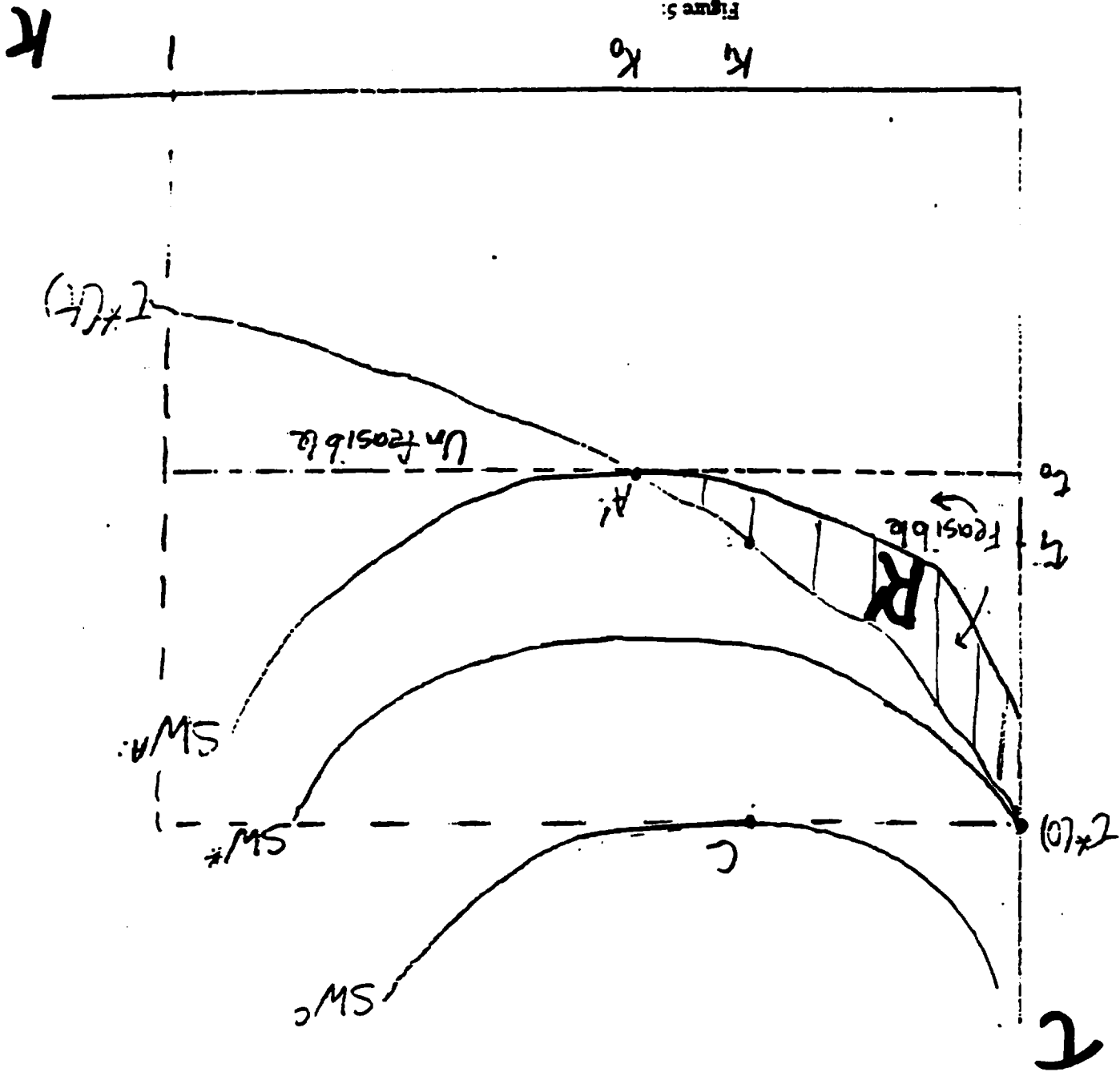
Q.E.D.

That τ^* should be monotonically decreasing whenever the degree of risk aversion does not exceed that exhibited by log utilities has an entirely intuitive explanation.³⁵ From the point of view of middle class voters, the role served by taxation is the redistribution of income from the unemployed state of the world to the employed one. When C 1 is satisfied, we know from Lemma 1 that this redistribution becomes less efficient.³⁶ Stated in slightly different form, as k rises, the price of shifting consumption from the employed state to the unemployed state rises. We therefore know there will be a substitution effect: when a good's price rises, people have an incentive to shift some consumption to other goods. In the present case, "other goods" are employed-state consumption, so that the substitution

³⁵We can weaken Proposition 1's hypothesis by dropping the CRRA assumption and instead substituting the assumptions that $u''' > 0$, ρ be nondecreasing, and $\rho(1) \leq 1$. The assumption on u''' ensures negativity of the second part of the RHS of equation (24). As for the first term, it must be altered by multiplying each u' term by one minus its associated coefficient of relative risk aversion (e.g. we multiply $u'(N)$ by $[1 - \rho(N)]$). We require $\rho(1) \leq 1$ because $\bar{y} < q < 1$ guarantees $N < \tau$, so that $N \leq N + 1 - \tau \leq 1$. Together with the assumption that ρ is nondecreasing, this ensures that neither term multiplied by γ_m exceeds its associated $\bar{\gamma}$ term. It is worth noting that while the degree of risk aversion is uniquely determined (unlike the representation of preferences over consumption levels, the representation of preferences over risk is not altered by affine transformations), our requirement on $\rho(1)$ might seem to imply that when u does not satisfy the CRRA form, it matters which units we use to measure income. Of course, this is backwards: if we multiply all income variables by any positive constant, middle class voters' first order condition $U_\tau = 0$ is unaffected, and we end up with the condition that $\rho(m) \leq 1$, where m is middle class voters' maximum marginal product. Hence the restrictions in this footnote are qualitative in nature.

³⁶This point is made precise by observing that $\partial^2 U_m / \partial k \partial \tau = \partial(\partial U_m / \partial \tau) / \partial k$, so that the condition $\partial^2 U_m / \partial k \partial \tau < 0$ implies that the change in utility achieved for a small increase in the tax rate $-\partial U_m / \partial \tau$ is decreasing as k increases. It is therefore natural to think of increases in k as reducing the efficiency of taxation in redistributing income across states of the world.

Figure 5:
 An example in which the
 naive policy maker over
 targets and zero targeting
 is actually optimal.



effect makes middle-class agents want to *reduce* the tax rate. Of course, there will also be an income effect: since any *given* level of consumption of a good becomes more expensive as that good's price rises, more income must be spent on that good to maintain the present level of consumption. Thus the income effect makes middle-class agents want to *increase* the tax rate.

Hence the signing of $d\tau^*/dk$ can be thought of as the resolution of the standard tension between the substitution and income effects. When ρ is unity, we have the Cobb-Douglas (log utilities) case, when we know that the income and substitution effects exactly offset; thus we could hardly expect τ^* to be *increasing* in this case. While it might seem puzzling that $\rho = 1$ is a sufficient condition for τ^* to be *decreasing*, since we have just noted the offsetting influences of the substitution and income effects in the Cobb-Douglas case, the puzzle is solved when we recognize that *all* prices change when k changes. That is, changes in k change the relative rate of redistribution of income across states in a non-proportional way, so that more than one set of income and substitution effects must be taken into account.

It is reasonable to believe that people's risk aversion exceeds that described by log utilities, and we admit both our desire and our inability to derive general analytical conditions that allow the signing of $d\tau^*/dk$ in all cases. However, it turns out that the log utilities condition is much stronger than is often needed. We demonstrate this fact by considering the case when $k = 0$ and showing that under broad circumstances, τ^* may be decreasing there even as ρ approaches infinity. At $k = 0$, we have $\theta = 0$ and $N = \bar{y}\tau$, so that the first order condition is

$$p\bar{y}N^{-\rho} = q(1 - \bar{y})(N + 1 - \tau)^{-\rho} \quad (25)$$

We can solve this equation for the explicit value of $\tau^*(0)$:

$$\begin{aligned} \tau^*(0) &= \frac{\lambda^{\frac{1}{\rho}}}{\bar{y} + (1 - \bar{y})\lambda^{\frac{1}{\rho}}} \quad \text{where} \\ \lambda &\equiv \frac{p\bar{y}}{q(1 - \bar{y})} \end{aligned} \quad (26)$$

It is easy to see that so long as $\bar{y} < q$ and $\rho > 0$, we have $\lambda, \tau^*(0) \in (0, 1)$. It is also clear that $\lim_{\rho \rightarrow \infty} \tau^*(0) = 1$ and $\lim_{\rho \rightarrow 0} \tau^*(0) = 0$. These facts confirm what our basic intuition should be: with no targeting, the tax rate (and hence redistribution across employment states) should approach zero as people approach risk neutrality and unity as the marginal rate of substitution of income between states becomes infinitely inelastic (Leontief preferences). In the special case when $\rho = 1$, i.e. log utilities, we have $\tau^*(0) = p/(1 - \bar{y})$. In general, $\tau^*(0)$ is increasing in σ_r, σ_m , and τ (since the transfer "technology" is more efficient from the perspective of any *given* middle class voter the greater is the rich-income part of the tax base and, in general, the more other people—including other middle class people—there are to tax). The general effect of p is indeterminate, i.e. it depends on ρ , since a higher probability of unemployment for all middle class people both increases their need

for transfers and decreases the tax base, making inter-employment state transfers more expensive for the middle class³⁷.

Next, recalling that $d\tau^*/dk$ has the same sign as $\partial^2 U_m / \partial k \partial \tau$, we take this cross-partial derivative and divide it by $\delta_m \bar{y}$, yielding

$$(\bar{\gamma} - \gamma_m)[pu'(N)(1 - \rho) + qu'(N + 1 - \tau)(1 - \rho) - qu''(N + 1 - \tau)]$$

The term in parentheses has the same sign as $\delta_m - \bar{\delta}$, which we have assumed to be negative. Noting that $u''(c) = -\rho u'(c)/c$ and that our first order condition for $\tau^*(0)$ was $p\bar{y}u'(N) = q(1 - \bar{y})u'(N + 1 - \tau)$, the term in brackets will be positive if and only if

$$\rho < 1 + \frac{\bar{y}}{1 - \bar{y}} \left[1 + \rho \frac{\tau - N}{1 - (\tau - N)} \right] \quad (27)$$

Using Equation (26) it can be shown that $(\tau - N)/(1 - (\tau - N)) = \lambda^{1/\rho}(1 - \bar{y})/\bar{y}$, so we can rearrange (27) to read

$$\rho < \frac{1}{1 - \bar{y}} + \rho \lambda^{\frac{1}{\rho}}$$

or

$$\rho(1 - \lambda^{\frac{1}{\rho}}) < \frac{1}{1 - \bar{y}} \quad (28)$$

The right hand side of (28) is strictly greater than unity, and the left hand side is strictly less than ρ , leaving a good deal of slack (as theory goes) for satisfaction of (28); in particular, if $\rho \leq 1$ -i.e. the degree of risk aversion is no greater than that present with log utilities-then (28) must be satisfied. To consider $\rho > 1$, we note that the left hand side of (28) approaches zero when ρ approaches zero and is strictly concave in ρ . By L'Hopital's rule, $\lim_{\rho \rightarrow \infty} LHS = -\ln \lambda > 0$, so the left hand side must also be strictly increasing; hence $-\ln \lambda$ is the least upper bound of the LHS. Therefore, a sufficient condition for the bracketed term in equation (27) to be positive, no matter what value ρ takes, is

$$-\ln \lambda \leq \frac{1}{1 - \bar{y}}$$

or

$$\lambda \geq \exp\left[-\frac{1}{1 - \bar{y}}\right] \quad (29)$$

Evaluating at $\bar{y} = q$, the upper bound on \bar{y} the left hand side of (29) is unity and the right hand side is $\exp[-1/(1 - q)]$; if $q = 0.9$, then this term is $\exp[-10]$, which is 4.5×10^{-5} . Quite obviously, \bar{y} may be very small and still satisfy the inequality. To be more concrete still, suppose that $q = 0.9$ (there is a ten percent chance of unemployment), $\sigma, r = 0.6$, and

³⁷Of course, if we carry out the thought experiment of raising a *given* middle class person's probability of unemployment while holding everyone else's (and hence the tax base) fixed, it is of course the case that that person will want a greater tax rate.

$\sigma_m = 0.3$. Then $\bar{y} = .87$, the right hand side of (29) equals 0.00046, and $\lambda = 0.088$; we satisfy our extreme sufficient condition with two orders of magnitude and almost a factor of two to spare. If one enjoys plugging parameters into models, one could hardly seek a stronger confirmation of a claim than is provided for our argument that $d\tau^*/dk < 0$ at $k = 0$ when $\delta_m < \bar{\delta}$.

Continuing with our analytical treatment of the Version II model, we note that in general, one would expect that if the policymaker is interested in poverty reduction, we will almost always have $S_\tau > 0$ (unless τ is very large), i.e. from the policymaker's point of view a slightly greater value of τ would be an improvement. This assertion is buttressed by the fact that in any Nash equilibrium, $\tau = \tau^*(k)$, so that (if $\tau \in (0, 1)$) $\partial U_m / \partial \tau = 0$. If we define S^i as that part of S that corresponds to group i 's utility, i.e. $S^i(k, \tau) = \sum_h \sum_j \pi_{hj}^i u(y_i)$, then in any Nash equilibrium we will have $S_\tau^m \geq 0$, with equality only if S is utilitarian (i.e. G is the identity function). Hence we will always have $S_\tau > 0$ unless $\sigma_l S_\tau^l < -\sigma_r S_\tau^r$, i.e. unless the policymaker views further taxes as detracting more (according to the metric implicit in G) from the rich than adding to the poor. When there is no targeting, it is straightforward to show that this event is impossible. We show the result when S is utilitarian; adding more curvature (i.e. making G a strictly concave function) only strengthens the result. Since we are evaluating at $k = 0$,

$$S_\tau^l = \bar{y}[pu'(N) + qu'(N + \mu)]$$

and

$$S_\tau^r = -(r - \bar{y})u'(N + r[1 - \tau])$$

Since rich agents' incentive compatibility constraint must be satisfied, we have $r[1 - \tau] < \mu$. Hence the u' terms are greater for poor than for rich agents. As such, a sufficient condition for $S_\tau(0, \tau)$ to be positive is $\sigma_l \bar{y} \geq \sigma_r(r - \bar{y})$, which can be shown to be equivalent to the requirement that $\bar{y} \leq q$, which has already been assumed. Hence $S_\tau(0, \tau) > 0$ for all τ satisfying $(IC)_r$.

If S_τ is positive and $d\tau^*/dk$ is negative, then Equation (20), which can be rewritten as $S_k = -S_\tau d\tau^*/dk$, implies that at any optimum, S_k must be positive! Under these conditions, when empirical work (like that discussed in the introduction to this section) shows that, fixing the budget, an increase in targeting will improve social welfare, we are *not* entitled to conclude that transfers are being delivered inefficiently—at least not without prior knowledge that the conditions for $S_\tau > 0 > d\tau^*/dk$ are violated.

This result really is the heart of our criticism of policy recommendations based on empirical findings that $S_k > 0$, i.e. that the implementation of indicator targeting would reduce poverty given a fixed rate of taxation. The approach is incapable of distinguishing whether the explanation of the apparent gain from increased targeting is inefficient policy design or a combination of real concern for efficiency in targeting the poor tempered by an awareness of the endogeneity of the budget with respect to increased targeting.

5.4 When is zero targeting a Nash equilibrium?

We need not stop there. We now offer an example in which no targeting is a (local) optimum, and hence a (local) Nash equilibrium.³⁸

With CRRA utilities, it can be shown that at $k = 0$ we have

$$-\frac{\bar{y}}{1-\bar{y}}\left(1-\frac{\delta_m}{\bar{\delta}}\right)\tau^*(0)z, \quad (30)$$

where

$$z \equiv 1 + \frac{1-\rho}{\rho}(\bar{y} + (1-\bar{y})\lambda^{\frac{1}{\rho}})^{-1}$$

We note that $z \geq 1$ if and only if $\rho \leq 1$.

Now suppose that the policymaker is as pro-poor as possible, and chooses as her social welfare function the utility of a representative poor person. Then $-S_k/S_\tau = d\tau_l/dk$. From the proof of Lemma 3 it can be shown that at the point $(0, \tau^*(0))$, we have

$$\frac{d\tau_l}{dk}(0, \tau^*(0)) = -\left(\frac{\delta_l}{\bar{\delta}} - 1\right)\tau^*(0) \quad (31)$$

Hence zero targeted transfers is (locally) optimal under Version II if and only if the RHS of (31) exceeds the expression in (30), i.e. if and only if the politically-induced reduction in the tax rate that occurs when a small amount of targeting is introduced exceeds the reduction in the tax rate that would leave the poor just indifferent given that amount of targeting. To think of the situation graphically, simply replace the *SW* curves of Figure 5 with the indifference curves τ_l : zero targeted transfers is locally optimal if and only if $\tau^*(k)$ lies outside poor agents' better-than set for all k sufficiently close to zero. Algebraically, we have optimality if and only if

$$\delta_l - \bar{\delta} \leq z(\bar{\delta} - \delta_m)\frac{\bar{y}}{1-\bar{y}} \quad (32)$$

This condition may be rewritten as follows:

$$\frac{\delta_m}{\delta_l} \leq 1 - \sigma_r \frac{\bar{y} + 1 - \bar{y}}{(1 - \sigma_m)\bar{y}z - \sigma_m(1 - \bar{y})} \quad (33)$$

³⁸The concept of a "local" Nash equilibrium is not standard; what we mean is that there exists some open neighborhood of the point $(0, \tau^*(0))$ such that if the game were restricted to that neighborhood, $(0, \tau^*(0))$ would be a Nash equilibrium of the restricted game. As we discussed above, since in Version II the policymaker takes $\tau^*(k)$ —which is the politico-equilibrium value of τ conditional on k —as given, Nash equilibrium is fully described by any choice of k solving (18), a necessary condition for which is that k solve equation (20). Unfortunately, no primitive conditions exist under which the function $V(k) \equiv S(k, \tau^*(k))$ is globally concave in k , so there is no guarantee that any particular solution of equation (20) is unique. Moreover, there remains the question of the second order sufficiency condition. Fortunately, since we are dealing with a boundary point, our argument will seek to establish conditions under which $S_k + S_\tau d\tau^*/dk$ is strictly less than zero when all terms are evaluated at $(0, \tau^*(0))$. If this inequality holds, then we must have a local maximum by definition, since: 1) a local maximum is any point k where $V(k') \leq V(k)$ for all feasible k' in some neighborhood of k , 2) $V'(0) < 0$ implies there is some ϵ such that for all $k' \in (0, \epsilon)$, $V(0) > V(k')$ and 3) $k' < 0$ is not feasible.

This condition requires a given middle class person to be sufficiently less likely than a given poor person to receive the targeted transfer. Recall that in condition C 2 of subsection 4.2, however, we required the opposite to hold: poor and middle class agents had to have sufficiently *close* probabilities of receiving targeted transfers (the condition was that $\delta_m/\delta_l \geq 1 - q/r$). Thus it is interesting to know when the two conditions may be satisfied jointly and when they are mutually exclusive; they may be satisfied jointly if and only if

$$\frac{q}{r} \geq \sigma_r \frac{\bar{y} + 1 - \bar{y}}{(1 - \sigma_m)\bar{y}z - \sigma_m(1 - \bar{y})}$$

This inequality holds if and only if $z > z^* \equiv (1 - \bar{y})/(q - \bar{y})$. It is clear that z^* is strictly greater than unity, so that ρ must be less than unity if our results are to be nonexclusive. While we are disappointed with this finding, ρ need not be too much less than unity; it can be shown that a sufficient condition for $z > z^*$ is for ρ to be less than

$$\rho^* \equiv \frac{q - \bar{y}}{1 - \bar{y}} [p\lambda + q]^{-1}$$

As an example, with $p = 0.1$ and $\bar{y} = 0.6$, we would need $\rho \leq 0.82$, not so different from log utilities. It is important to recall that when $\rho = \rho^*$, there is but a single value of the ratio δ_m/δ_l for which both our results may hold. While this fact implies much lower levels of risk aversion for which one might feel comfortable saying that a broad class of parameter values are likely to satisfy our conditions, it is still the case that *at least* one of our two approaches will suggest that targeting fails the political test. Put another way, the level of risk aversion will have to be fairly high before one might comfortably assert that *neither* of our critiques might be valid for a broad class of parameter values.

Moreover, we stress that the low level of ρ required for both results to hold is an artefact of our choice of social welfare function (the utility of a representative poor agent). Instead, we might have chosen, say, a convex combination of all three agents' utilities.³⁹ In fact, weightings always exist for which a choice of zero targeting is optimal for the policymaker, *no matter what level risk aversion takes*.⁴⁰ These facts go a long way in cementing our belief that both the social choice and Nash equilibrium approaches are useful in assessing the viability of indicator targeting.

It might be objected that the whole project of assuming a social welfare maximizing policymaker is a sham, anyway. But this argument is a nonstarter within the contexts of current debate over targeting, since the claim being advanced by proponents of targeting is precisely that social welfare would be improved with more targeting. Moreover, it seems reasonable to believe that policymakers typically are at least as concerned by political viability as they are about first-best (or $n - 1$ best) program design. Also, policymakers are likely to hold a comparative advantage over economists in assessing the political viability of various policies.

³⁹Such a choice unambiguously would restrict the social better-than set. Put another way, the slope $-S_k/S_r$ is increasing in the amount of weight put on middle class or rich agents' utility.

⁴⁰That is, there will always be some weighting under which our condition for local (politically constrained) optimality of zero targeting requires only that δ_m/δ_l not exceed a number greater than unity; but $\delta_m < \delta_l$ by assumption.

To conclude this section, we do not claim that whenever non-targeted programs are observed, it *must* be the case that the status quo is optimal, even taking political factors into account. However, we think that the argument advanced in this section goes a long way in shifting the burden of proof toward proponents of targeting: it is not enough simply to declare that in a world of fixed budgets, program efficiency can be enhanced by more targeting. Rather, the political costs of more focused transfer delivery must be researched, evaluated, and weighed against the economic benefits.

6 Empirical Facts Consistent with our Model

In this section, we argue that our model has direct practical relevance, particularly to policies actively being considered in LDCs. We first consider policy prescriptions flowing from recent empirical work and then turn to some empirical evidence that both is at odds with those prescriptions and supports our model. While we are not silly enough to think that a model as schematic and stylized as ours can be “tested” in any rigorous sense, we do think our model is broadly consistent with three strands of evidence about government spending and targeting.

First, nearly every incidence study of benefits of government expenditures—even those aimed at social-welfare, e.g. health and education—finds that benefits are at best no more progressive than would be a uniform transfer to all citizens. While social expenditures at times are progressive relative to pre-transfer income distribution, typically they are much less progressively distributed than would be a uniform transfer. Table 3 summarizes the results of a number of such studies, whose subjects include social insurance, health, and education. These programs typically constitute the bulk of social spending in developing countries. We report the ratio of benefits received by the third (“middle class”) and fifth (“richest”) quintile to those received by the poorest quintile. In nearly every instance, the per capita benefits received by the middle class and the rich exceed those received by the poor.⁴¹ Even in programs justified exclusively on the grounds that they aid the poor, the incidence of benefits is less progressive than would be a uniform transfer (see, for instance, Alderman and von Braun (1984) on Egypt’s food subsidy). As Birdsall and James (1993) point out, a normative model of how an egalitarian social welfare maximizer would distribute benefits makes a poor positive model of the *actual* distribution of government-funded benefits.

The second fact supporting our conclusions is that episodes of increased targeting have been followed by reductions in overall benefits, as we would predict. In the mid 1970s Sri Lanka had universal food subsidies that provided every citizen with a rice ration at subsidized prices. At around 5 percent of GDP, the program’s fiscal cost was felt to be unaffordable. In 1978 the government restricted the ration to the poorest half of the

⁴¹Of course the distribution of benefits within the social spending categories is very different (e.g. university versus primary schooling, public health versus hospitals). For instance, Jimenez (1994) finds that the median ratio of the fraction of benefits received by the lower 40 percent of households to the middle 40 percent for all education spending is 1.23 (for eight countries) and of public health (not public spending on health) is 1.27. Moreover, since poorer households tend to be larger than other ones, this fraction will be greater than the analogous one using per capita benefits.

Table 3: The ratio of benefits per person from various types of social expenditures accruing to individuals in the third (middle) or fifth (richest) group¹ relative to the poorest.

Country	Type of social expenditure	Ratio of benefits by income group:	
		Third to poorest	Richest to poorest
Brazil	Education	1.18	1.55
	Health	1.73	1.01
	Social Insurance	6.31	12.34
	Total Social Spending (including other categories not shown)	1.81	2.31
Vietnam	Education	1.48	3.38
	Health	1.80	2.49
	Social Transfers	2.62	5.15
Uruguay	Education	0.51	0.44
	Health	0.47	0.29
	Social Security	1.65	2.48
	Total Social Spending (including other categories not shown)	0.91	1.16
Tanzania	Education (Primary and Secondary)	1.14	2.64
	Health	.94	1.70
	Total (including water)	1.14	2.42
Ecuador	Education	1.32	1.43
	Health	0.98	1.14
Kenya	Education (Primary and Secondary)	1.18	0.97
	Health	1.57	2.33
Peru	Education	1.67	1.67
Colombia	Health	1.06	0.79
	Rural Programs	0.81	0.51
Indonesia	Health	1.56	2.42

1) The classifying groups are quintiles of either per capita consumption or per capita income except in Brazil, where the five classes are defined by household income relative to the minimum wage (e.g. < 1/4 of minimum wage, 1/4 to 1/2, 1/2 to 1, 1 to 2, > 2).

Sources: For Indonesia, van de Walle, 1994, for Peru, Selden and Wasylenko, 1995, for the rest various World Bank reports.

population and in 1979 replaced the rice ration with a food stamp program, again targeted to the bottom half of the population. Since the introduction of targeting the real value of benefits per household has fallen to 40 percent of its previous level, from Rs 425 to Rs 170. It is intriguing to note that even with targeting there was substantial leakage. Calculations from a household survey indicate that (in our notation) $\delta_m = .38 < \bar{\delta} = 0.43 < \delta_l = .7$. These parameters fit our story, and it is also the case that targeting was far from “perfect”, so that the non-poor had ample chance in *absolute* terms to receive the targeted subsidy. While it is impossible to say what would have happened to the program’s budget had benefits remained universal (since 5 percent of GDP simply may have been unsustainable), the fiscal cost of the program is now just 0.7 percent of GDP. More of the savings came from reductions in the magnitude of the transfer than from better targeting.

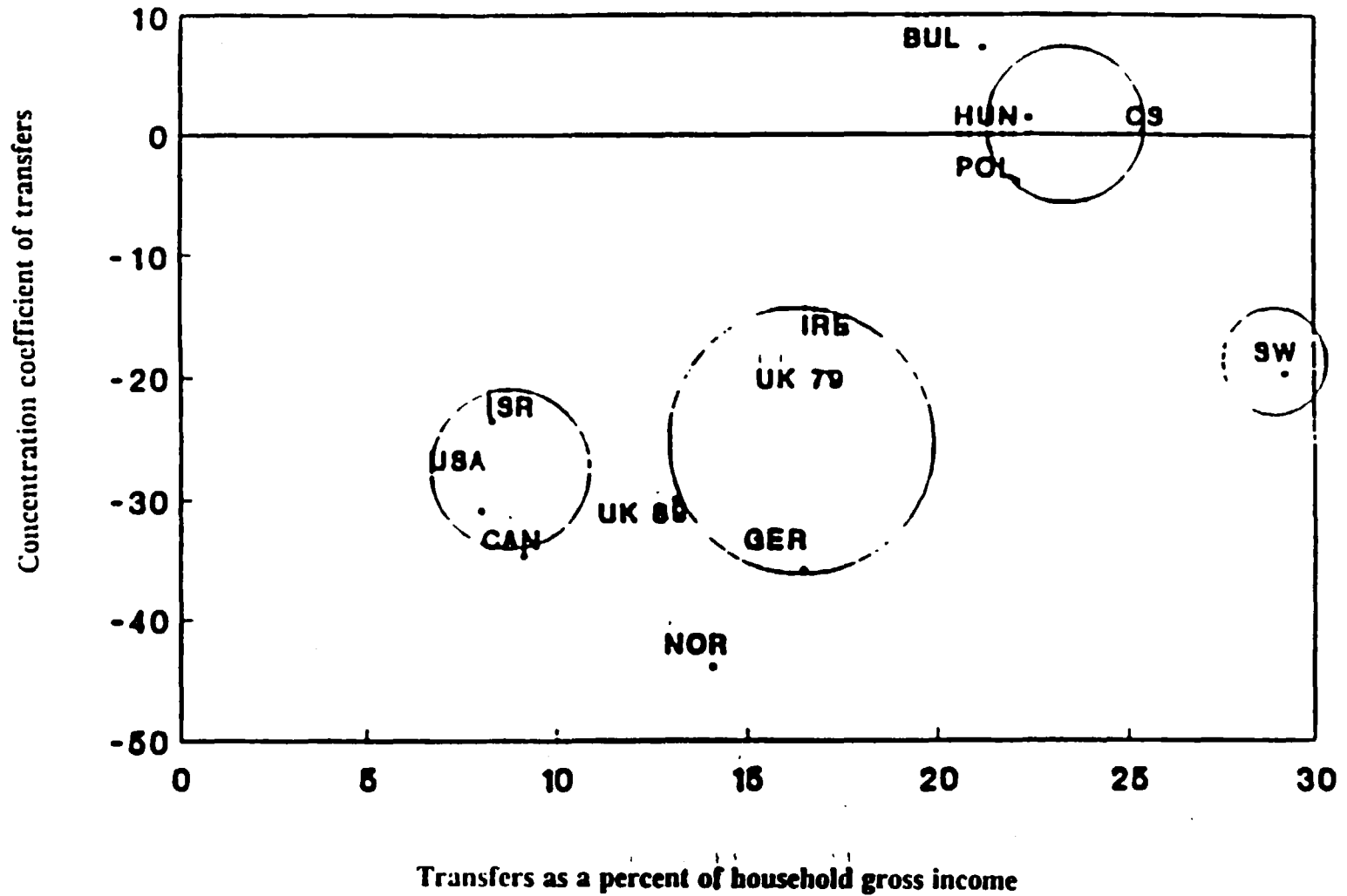
A similar episode occurred in Colombia, where a targeted food stamp program was eliminated. In terms of the differences between the technocratic and political approaches, a recent assessment of poverty in Colombia (World Bank, [1994]) seems instructive: “although the program seemed effective and well targeted in Colombia, it lacked political support and was discontinued.” Our results suggest that the word “although” should be changed to “*because*”.

Notwithstanding our earlier disclaimer regarding our model’s lack of direct applicability to developed countries, trends in U.S. social welfare spending constitute another potential example. Only in the most radically of anti-government climates has Medicare become a politically viable target, and Social Security remains totally off-limits to budget cutters. Both of these programs, while benefiting only the elderly at any given moment, are received universally (at least if the labor force is considered universal) by people reaching retirement age. By contrast, every imaginable “welfare” program—AFDC, food stamps, Medicaid—targeted to the poor has rested squarely on the anti-government chopping block.⁴² Interestingly, unemployment benefits, which clearly do benefit the working and middle classes, have been maintained in real terms. In fact, during recessions, when the proportion of potential and actual middle class UI recipients is comparatively large, benefit duration often is extended. Moreover, we are not the only analysts to suggest a positive link between the degree of targeting for such programs and the erosion of political support for their financing (see, for example, Skocpol [1991]).

Our third strand of supportive evidence is the cross-country relationship between the magnitude of social welfare spending and the degree to which it is targeted. Figure 6 (taken from Milanovic [1994]) shows the association between the degree to which cash transfers are targeted and their overall magnitude (as a fraction of GDP). The U.S. finds itself at one pole, with highly targeted but small overall transfers, while pre-market-transition Eastern European countries inhabit the other extreme—large transfers with hardly any targeting.

⁴²It will be interesting to see what happens to Medicaid funding given the exploding share of program spending now directed at nursing home costs for those elderly people who qualify for Medicaid only after exhausting (often-substantial) savings on such care.

Figure 6: Relationship between the magnitude of cash transfers and their progressivity



Source: Milanovic, 1994

7 Altruism

In this section, we generalize the model to include a treatment of altruism and then consider empirical findings concerning the extent of altruism. We believe these findings are inconsistent with the hypothesis that altruism can be an important factor in generating publicly financed income redistribution. Nonetheless, we use evidence from Sri Lanka to construct a back-of-the-envelope calculation of the degree of altruism necessary to invalidate our claim that the general, altruism-included model can be invoked to explain experiences (like Sri Lanka's) with targeting.

7.1 Incorporating Altruism Into The Model

We assume that the "overall" utility of the middle class and the rich may be written as a convex combination of own utility and the expected utility of a representative poor person.⁴³ This approach has the virtue of being easy to think about intuitively: if α is the weight a person places on her own consumption, then we might think of the given person as admitting a probability distribution over her type, with the probability that she is to be of her actual type equaling α and the probability that she is to be poor equaling $1 - \alpha$. Hence the approach has a certain Rawlsian flavor: people can be thought of as considering the possibility that they might have been in someone else's shoes before making decisions about social policy.⁴⁴

We define the functions

$$V_m(k, \tau) \equiv \alpha U_m(k, \tau) + (1 - \alpha) U_l(k, \tau)$$

and

$$V_r(k, \tau) \equiv \beta U_r(k, \tau) + (1 - \beta) U_l(k, \tau)$$

so that α and β are the respective weights placed on own utility by middle class and rich agents (we assume that the poor care only about their own consumption and that the rich do not care about middle class consumption). It will be useful to define the

⁴³The convex combination part of this assumption has no substance, as it follows directly from the assumption of additive separability: suppose $V_m \equiv \alpha U_m + \beta U_r$ for arbitrary non-negative constants α, β ; then all choices regarding targeting and taxation are the same as if $V_m/(\alpha + \beta)$ is used, since this second function is a monotonic transformation of the first, and the new weights sum to unity.

⁴⁴It is worth flagging a basic conceptual problem with this approach: if there are positive levels of targeted transfers, some people who are poor by type, i.e. have maximum marginal product μ , will have realized post-transfer income exceeding that of some middle class type agents. This event occurs because some poor people receive the targeted transfer θ , while some middle class people are both unemployed and do not receive θ . Moreover, if taxes and targeted transfers are large relative to universal transfers and the marginal products of middle class or rich agents, poor people receiving targeted transfers may receive post-transfer income exceeding that of even employed middle class or rich agents. Hence the convex combination approach carries with it an explicitly *ex ante* character: it is best interpreted as altruism defined over possibilities, not outcomes. One might try to remedy this problem by placing a ceiling on income levels subject to altruistic feelings, but we reject this approach, since it would only strengthen our claims while playing havoc with the model's tractability.

function $\tau^{**}(k) \equiv \arg \max_t V_m(k, t)$. As with τ^* , elementary mathematical results ensure the existence, continuity, and, when $\partial V_m(k, 1)/\partial \tau < 0$, differentiability of τ^{**} .

To review the basic steps taken in deriving our primary results above, we used the following facts, true under assumptions C 1 and C 2:⁴⁵

(I) $\partial U_m/\partial k \leq 0$, with equality possible only at $k = 0$

(II) $\partial U_r/\partial k < 0$

(III) Single-crossing between any two intersecting τ_l and τ_r curves, with the former crossing the latter from below

(IV) $\partial^2 U_m/\partial k \partial \tau < 0$ for CRRA utilities with $\rho \leq 1$

To show (I), we offered a descriptive proof, using the fact that when $\delta_m \leq \bar{\delta}$, i.e. when C 1 holds, targeted transfers are inferior in expected value to an actuarially fair gamble; the result followed directly from this fact. For the general case, i.e. without making assumptions on u or the particular proportion $\bar{\delta}$ of people receiving targeted transfers, this approach is the only way to obtain the result. A similar condition can be derived when we admit the possibility of altruism, but it is less general.

At first glance, the logic of our proof of Lemma 1 suggests that we need only continue with our Rawlsian interpretation of altruism, and derive a condition under which the *total* “probability” that our non-poor agent will receive a targeted transfer, taking into account the “probability” that she will “be poor”, is less than the proportion of the population receiving the transfer. However, it turns out that if we want our result to hold for general preferences, this condition, which may be written as $\alpha \delta_m + (1 - \alpha) \delta_l \leq \bar{\delta}$ for the middle class,⁴⁶ cannot always be shown to be sufficient. The basic logic is as follows. If $\theta + \mu < 1 - \tau$, employed middle class people—even those not receiving θ —always have higher consumption than do employed poor people. Hence with probability $1 - \alpha$, employed middle class people who “become” employed poor people will “need” θ more than will employed middle class people who “remain” middle class.⁴⁷ As such, these middle class people will place a premium on targeted transfers, reflecting the chance that poor people whose need for them is greater will receive them. Hence without saying more about the shape of u , we are entitled to use the above condition only when $\theta + \mu \geq 1 - \tau$, in which case the opposite calculation is made: employed middle class people not receiving θ have a higher marginal utility of consumption than do employed poor people who do receive θ . For the rich, however, the requirement on θ is stronger still: we must have $\theta + \mu \geq \tau(1 - \tau)$; all other details of the preceding discussion apply directly.

⁴⁵We wish to note that in this section we do not deal with a number of technical issues handled in the no-altruism case (e.g. accounting for the incentive compatibility constraint when $\mu \neq 0$). While a full treatment would require some such issues to be resolved, others of them no longer are important, largely because the introduction of altruism requires that all attention in the social choice approach be focused on local rather than global equilibria. We have chosen to ignore those details that remain, on the grounds that there is nothing intuitive or challenging in handling them.

⁴⁶For the rich, since $\delta_r \equiv 0$, the condition would be $(1 - \beta) \delta_l \leq \bar{\delta}$, but this condition will turn out to hold in all cases we consider below.

⁴⁷Our focus is on the employed of both classes because in the event of unemployment, members of both classes receive zero pre-transfer income. Hence differences in *post*-transfer income for unemployed agents derive solely from differences in δ_l and δ_m . Hence the “naive” condition in the text is sufficient for that part of expected utility related to the unemployed state, i.e. that part multiplied by p .

We now offer two very similar conditions that allow us to generate in Lemma 5 results analogous to (I) and (IV).

C 3

$$\alpha\delta_m + (1 - \alpha)\delta_l + q(1 - \alpha)(\delta_l - \bar{\delta})(u'(\mu) - 1) \leq \bar{\delta}$$

C 4

$$\alpha\delta_m + (1 - \alpha)\delta_l + (1 - \alpha)(\delta_l - \bar{\delta})(u'(\mu) - 1) \leq \bar{\delta}$$

Lemma 5 (When Altruistic Middle Class Agents Oppose Targeting) (i) Suppose C 3 is satisfied. Then $\partial V_m / \partial k < 0$ for $k = 0$.

(ii) Suppose that C 4 is satisfied and that utilities are of the CRRA form, with $\rho \leq 1$. Then $\partial^2 V_m / \partial k \partial \tau < 0$ for $k = 0$.

Proof: See Appendix 3.

The intuitive explanation of why C 3 gives the lemma's first result is simple enough. The term $\alpha\delta_m + (1 - \alpha)\delta_l$ plays the role explained above, while the remaining term on the LHS is a correction factor for the greater marginal utility of income experienced by employed poor than employed middle class people. This correction term has four components. The q occurs because the correction need be made only for differences in middle class and poor marginal utilities occurring in the employed state. The $(1 - \alpha)$ part reflects the fact that the problem arises only when middle class agents place some weight on the utility of the poor. The $(\delta_l - \bar{\delta})$ term is a measure of the gain (relative to an actuarially fair gamble) from targeting received by a poor person (at $k = 0$). The last term, $(u'(\mu) - 1)$, reflects the difference in marginal utilities of consumption between employed poor and middle-class agents (as we detail in the lemma's proof, we choose 1 as a normalization for $u'(1)$).

As for the second condition and the lemma's second result, the only difference in the two conditions is the absence of the q in the third LHS term in C 4. Explaining why this difference is necessary is less easy than explaining the roles of the other components of the condition. Because the poor are not taxed while middle class are, an increase in targeting has a different (i.e. non-proportional) impact on the redistributive efficiency of taxation for the two types of agents. Beyond that, all that can be said is that the algebra plays out in such a way that an analytical sufficient condition may be obtained only via the strengthening of C 3 into C 4.

It should be easy to see that the deviation of C 3 from its naive counterpart is increasing in the degree of altruism (i.e. in $1 - \alpha$, the weight middle class people put on the utility of the poor). Second, this deviation is increasing in the excess of δ_l over $\bar{\delta}$, since the poor benefit from targeting more as they become *relatively* more likely to receive targeted transfers. Third, the deviation of C 3 from its naive counterpart is increasing in the excess

of the marginal utility of consumption of the employed poor over that of the middle class, since the greater is this difference, the greater is the relative need of the employed poor (by comparison to the employed middle class), and hence the greater is the “premium” middle class agents place on the value of targeting. It is important to note that except for the income of the rich and the probability of unemployment, all of the model’s parameters now affect our (strong) sufficient condition for middle class agents’ utility to be strictly decreasing in the degree of targeting. Hence more risk aversion or lower (relative) income of the poor each makes violation of the condition more likely, just as altruism does. Moreover, these effects *interact*, so that small amounts of altruism in very poor, very well targeted (i.e. $\delta_l \gg \bar{\delta}$) economies may lead to the violation of the condition; the converse is of course also true: large degrees of altruism will make little difference (relative to the basic Rawlsian condition) in economies with fairly equal left-tail income distributions and poor targeting technology.

The second result of the previous lemma is as far as we will go in extending the Nash equilibrium results. The lemma makes it clear that the condition under which $d\tau^{**}/dk < 0$ —namely that $\partial U_m/\partial k \partial \tau < 0$ —is not knife edge in character. Moreover, we can always choose an α close enough to unity to be in a close enough neighborhood of the no-altruism case. However, to actually calculate a threshold level α^* (as a function of the model’s other parameters) such that the Nash equilibrium results of Section 5 hold for $\alpha \geq \alpha^*$ would be time consuming, and, we think, not terribly intuitive. The point is that such a level must exist and, for fixed parameters, be bounded away from unity. By contrast, our social choice results may be generalized analytically without much trouble.

For reasons that will become apparent, our results in this section do not require us to offer conditions under which $\partial V_r/\partial k < 0$; this result will be shown to follow directly from other conditions developed here. As for extending result (III), this task might seem foreboding: it now requires that

$$\begin{aligned} \frac{d\tau_l}{dk} &\equiv -\frac{\partial U_l/\partial k}{\partial U_l/\partial \tau} \\ \frac{d\hat{\tau}_r}{dk} &\equiv -\frac{\beta \partial U_r/\partial k + (1-\beta)\partial U_l/\partial k}{b \partial U_r/\partial \tau + (1-\beta)\partial U_l/\partial \tau} \end{aligned} \quad (34)$$

and at first blush, there seems no particular reason to believe that C 2 should generalize directly. Nonetheless, this concern will be shown to be without foundation.

We begin by defining the following relation (which may be either a function or correspondence) analogous to τ_r :

$$\hat{\tau}_r(\hat{k}; \bar{V}) \equiv \{\tau : V_r(\hat{k}, \tau) = \bar{V}\}$$

Hence the family of $\hat{\tau}_r$ maps describes the level sets of now-altruistic rich agents. Before proving two useful lemmas, we note that the equilibrium status of $(0, \tau^{**}(0))$ to be shown below in general is neither global nor local: we show in Theorem 6 that, under certain conditions, there is a definite, non-local part of the feasible set over which this point can be shown to have equilibrium status, even though that part need not be the whole set. While

the result to be proved is a single-crossing result, there may be multiple segments to the level set $\hat{\tau}_r$, so that even when single-crossing holds for that part of $\hat{\tau}_r$ “near” $(0, \tau^{**}(0))$, the point $(0, \tau^{**}(0))$ is not a global equilibrium. Such a situation is depicted in Figure 7a: a point like a always allows a coalition between poor and altruistic rich agents. Figure 7b shows the one-segment, global equilibrium case.⁴⁸ As Figure 7a should make clear, allowing the rich to be altruistic implies that, at least at some points, they may prefer increases in targeting. Thus no intuitive restrictions are available under which we may offer a global characterization of rich agents’ better-than sets, nor, therefore, of the intersection of these better-than sets with those of poor agents. Nonetheless, the following two lemmas allow us to characterize altruistic rich agents’ better-than sets locally and to be sure that certain points—namely those not in poor or non-altruistic rich agents’ level or better-than sets—are not in altruistic rich agents’ level or better-than sets. The lemma rules out situations like that depicted in Figure 8.

Lemma 6 $\hat{B}_r(k, \tau) \subset B_r(k, \tau) \cup B_l(k, \tau)$.

Proof: Because V_r is a convex combination of U_r and U_l , it must lie between them. Hence any point $(k, \tau)' \in B_r^c \cap B_l^c$ (where A^c denotes the complement of A) must yield utility levels $U_r' < U_r$ and $U_l' < U_l$. Similarly, points in agent i ’s level set yield $U_i' = U_i$ and $U_j' < U_j$. Therefore, $V_r > V_r'$, so there exist ϵ_k and ϵ_τ such that for a point $(k', \tau') \in L_i(k, \tau)$, $V_r(k' + \epsilon_k, \tau' + \epsilon_\tau) < V_r(k, \tau)$.
Q.E.D.

The next lemma shows that our single crossing result locally withstands the introduction of altruism, so long as altruistic rich agents prefer reductions in τ at the point in question.

Lemma 7 (A Local Version of the Single-Crossing Result With Altruism) *Both $d\tau_l/dk > d\tau_r/dk$ and $\partial V_r/\partial\tau < 0$ if and only if both $d\tau_l/dk > d\hat{\tau}_r/dk$ and $\partial V_r/\partial k < 0$.*

Proof: See Appendix 3.

To understand Lemma 7, consider a point where, given no altruism on the part of the rich, no rich-poor coalition can agree on a local increase in the degree of targeting. Then if it is also true that the rich—given non-zero altruism—prefer a local reduction in the tax rate, two things must be true: 1) no rich-poor coalition can agree on a local increase in the degree of targeting, *even given non-zero altruism*; and 2) the altruistic rich must prefer a local reduction in the degree of targeting. Thus, at least at such points, the introduction of altruism does not alter the critical characteristics of rich agents’ utility functions, namely that they be decreasing in both k and τ and that they induce level curves that single-cross with those of poor agents.

With the aid of an additional lemma, this result will become quite forceful. We now show that with when there is no targeting ($k = 0$), risk aversion is sufficiently small, and

⁴⁸In technical terms, we know of no general (and not terribly restrictive) conditions under which rich agents’ level- and better-than sets are guaranteed to be connected. Standard mathematical results guarantee the existence, continuity, and differentiability of one part of the level set $\hat{\tau}_r$ “near” any given point, but they do not rule out other such parts. We can say that non-connected level and better-than sets would require a discrete amount of altruism, since the sets are connected with no altruism.

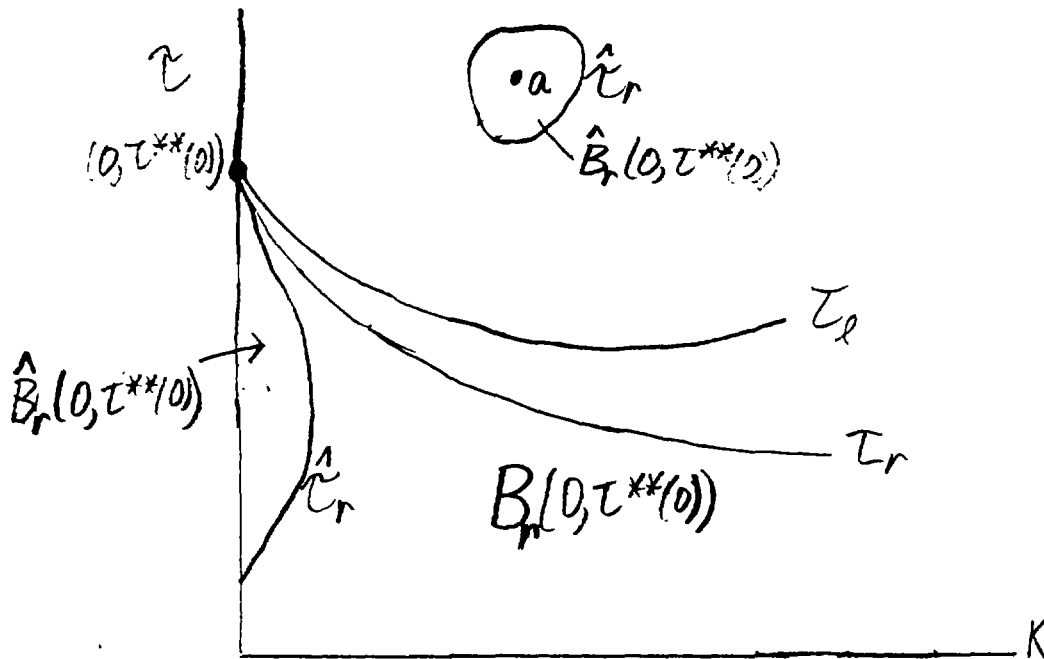


Figure 7a: The point $(0, \tau^{**}(0))$ is a local, but not global, equilibrium. It can be beaten by a coalition of poor and altruistic rich agents, each of whom prefer the point a . This event happens only because, as drawn, the level and better-than sets for altruistic agents are not connected.

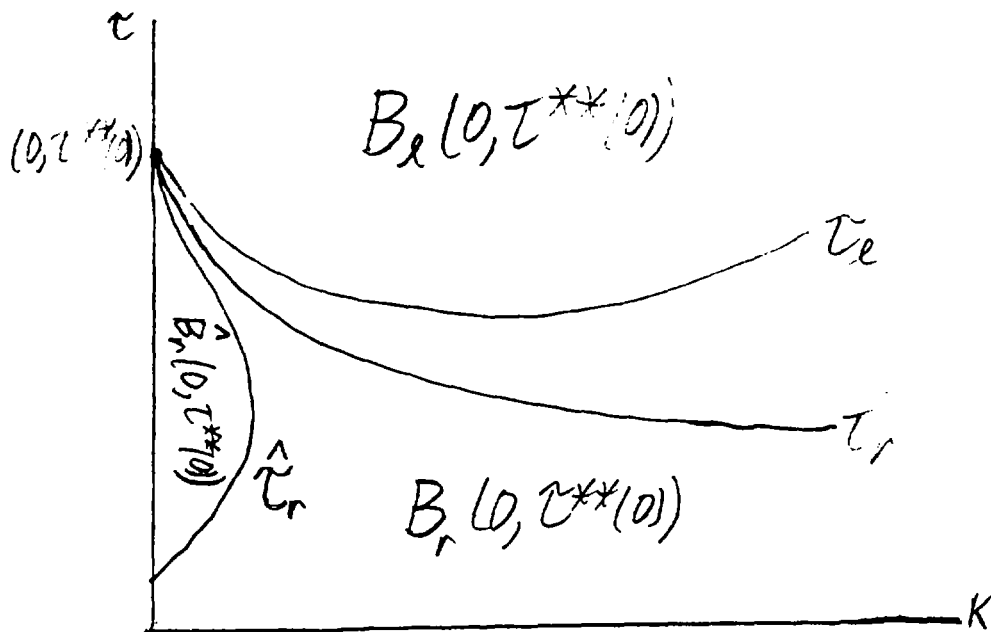


Figure 7b: The point $(0, \tau^{**}(0))$ is a global equilibrium.

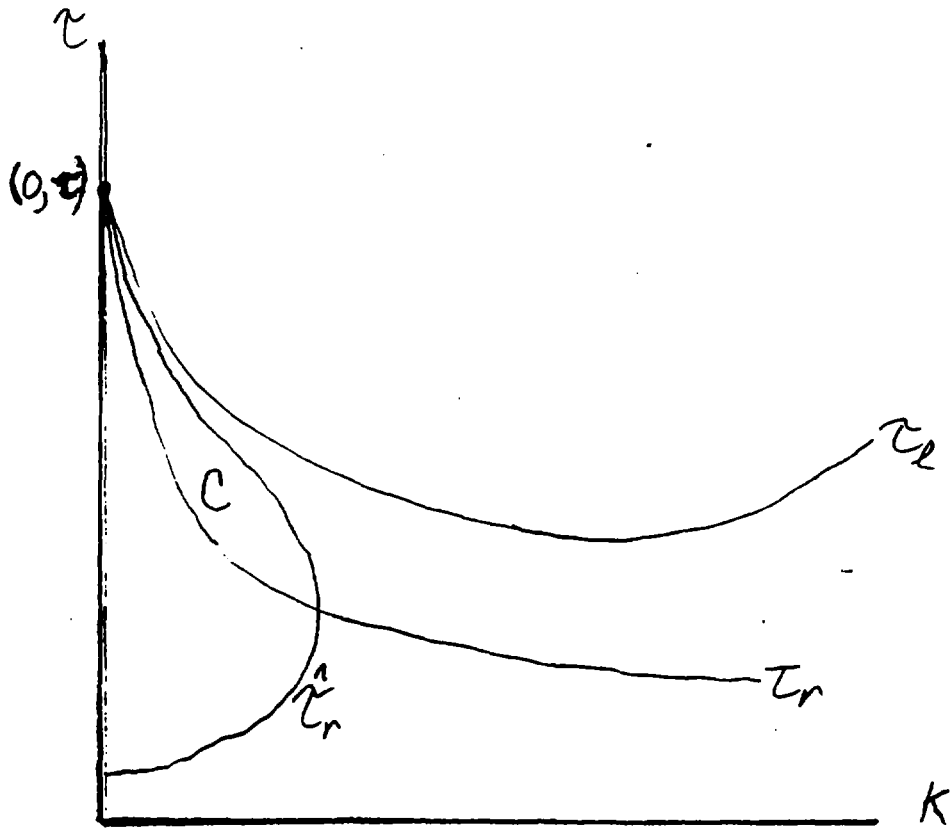


Figure 8: Altruistic rich agents' level sets cannot look like the one drawn in this picture. Any point in region C is worse than the point $(0, r)$ for both poor and non-altruistic rich agents; since altruistic rich agents' utility is a convex combination of these two groups' utilities, points in C must also be worse than $(0, r)$ for altruistic rich agents.

middle class voters are at least as altruistic as rich ones, the rich always will prefer a tax lower than that which is optimal for the middle class.

Lemma 8 (When Altruistic Rich Agents Favor Lower Taxes at $(0, \tau^{}(0))$)** *Suppose that utilities are CRRA with $\rho \leq 1$, and that $\beta > (\geq) \alpha$, i.e. rich agents weight “own” utility at least as heavily as do middle class ones. Then $\frac{\partial V_m}{\partial \tau}|_{k=0} = 0$ implies that $\frac{\partial V_r}{\partial \tau}|_{k=0} < 0$*

Proof: See Appendix 3.

The condition $\rho \leq 1$ has reared its head again; we emphasize that this condition is sufficient only, and a review of the lemma’s proof should convince the reader that it is far from necessary in general. We now can state the following proposition and theorem. Proposition 2 establishes the range of values of k and τ over which no coalition between poor and altruistic rich agents can defeat $(0, \tau^{**}(0))$; Figure 9 depicts an example of this range. Theorem 6 combines this result with Lemma 8 to establish that $(0, \tau^{**}(0))$ has equilibrium status over the full range of (k, τ) values described in Proposition 2. The following definitions will be useful for the results that follow.

$$A(k, \tau) \equiv \{(k, \tau) : (k, \tau) \in B_l(k, \tau) \cap \hat{B}_r(0, \tau)\} \quad (35)$$

$$C_r(\hat{\tau}) \equiv \{(k, \tau) : (k, \tau) \in \hat{L}_r(0, \hat{\tau}) \cap B_r(0, \hat{\tau}) \cup L_r(0, \hat{\tau})\} \quad (36)$$

Hence $A(k, \tau)$ is the set of all points preferred to (k, τ) by both poor and altruistic rich agents; it is a subset (not necessarily proper) of $\hat{W}(k, \tau)$, the win-set of (k, τ) when there is altruism.⁴⁹ For $k = 0$ and tax rate $\hat{\tau}$, $C_r(\hat{\tau})$ is the set of all points that are exactly as good as $(0, \hat{\tau})$ from the point of view of altruistic rich agents and no worse than $(0, \hat{\tau})$ from the point of view of non-altruistic rich agents.

Proposition 2 *Suppose the conditions of Lemmas 6 are satisfied. Then $(\bar{k}, \bar{\tau}) \in C_r(\hat{\tau})$ implies that neither $(k, \bar{\tau})$ nor (\bar{k}, τ) is in $A(k, \tau)$.*

Proof: See Appendix 3.

Theorem 6 (Existence of Equilibrium at $(0, \tau^{}(0))$)** *Suppose that middle class and rich agents are altruistic and that the conditions of Lemmas 6 hold. Then $(0, \tau^{**}(0))$ is a local equilibrium if C 3 holds.*

Proof: When the results of Lemmas 6 hold, there will always be an open ball O such that $(k, \tau) \in C_r(\tau^{**}(0)) \Rightarrow (k, \tau) \in O \cap F$. Hence the set of points over which $\hat{W}(0, \tau^{**}(0))$ was shown in the Proposition to be empty always contains some neighborhood of $(0, \tau^{**}(0))$, which, by Lemma 5, is itself the global optimum for altruistic middle class agents.

Q.E.D.

⁴⁹Of course, at any point where $B_m(k, \tau) = \emptyset$, i.e. at middle class agents’ optimum, it must be true that $A(k, \tau) = \hat{W}(k, \tau)$

We note that while the conditions of Lemmas 5- 8 are sufficient for the proposition and theorem, they are by no means necessary. The proposition and theorem require only the *results* of the lemmas, for which the lemmas' conditions are sufficient, not necessary. Thus there will exist parameter values violating the lemmas' conditions but still yielding the proposition and theorem.

For those readers who believe that altruism is an important issue in assessing transfer programs' political viability, the importance of this theorem should not be understated. It says that our model generalizes directly to the non-zero altruism case, with only minor modifications in the values other parameters must take. The single-crossing result is essentially unchanged, requiring only that middle class voters prefer higher taxes (when there is no targeting) than do rich voters. As we argued above, some analysts might debate such a requirement, but we think it is a natural one to make, and any argument about the issue really seems subordinate to our primary concern, which is political support for targeting in an otherwise standard model. As for the condition under which altruistic middle class voters will continue to favor no targeting, we do not assert that it need always be satisfied in practice (our argument in the following subsection aside). However, we stress yet again that the issue has been reduced to an empirical one: the objection that our model is structurally unable to handle altruism simply is false, leaving only arguments over the degree of altruism actually observed in the world.

Before turning to this question, we revisit Sri Lanka's experience, using it to calculate the critical level of altruism above which the results of this section will not hold. Recall C 4:

$$\alpha\delta_m + (1 - \alpha)\delta_l + (1 - \alpha)(\delta_l - \bar{\delta})(u'(\mu) - 1) \leq \bar{\delta}$$

This inequality may be restated as

$$\alpha \geq \frac{(\delta_l - \bar{\delta})(u'(\mu) - 1)}{(\delta_l - \bar{\delta})u'(\mu) + \bar{\delta} - \delta_m}$$

To calculate the value of μ for Sri Lanka, we take the ratio of the average income for the bottom two income quintiles to median income, which yields the value of 0.42. Assuming log utilities, we have $u'(\mu) = 1/\mu$. Recalling from the previous section that $\delta_l = 0.7$, $\delta_m = 0.38$, and $\bar{\delta} = 0.43$, we may calculate from the expression above that the threshold level of α is 0.54, so that middle class agents would have to place a weight of 0.46 on the utility of the poor to invalidate our conditions. Is this plausible? We think not, as we describe in the next subsection.

7.2 Empirical Facts About Altruism and About Poverty

We begin in this subsection by arguing that the kind of altruism that is relevant for the current discussion is what we call "general social, consumption-related" (GC) altruism. Since there are many types of behavior that may be construed broadly as altruistic, we emphasize that altruism need be neither consumption-related nor motivated by a desire to boost the welfare of people the altruistic actor does not know. For example, many charitable organizations promote consumption of particular goods, irrespective of the income level or

preferences of the intended recipients (religious proselytizing constitutes one such example). Second, transfers may not be reciprocated immediately, even if they are part of long-term implicit insurance contracts (for example, transfers made to one's children to guarantee care in old age). Since neither of these kinds of transfers reasonably may be interpreted as concern for unknown beneficiaries' consumption-based standard of living, neither qualifies as GC altruism.

We believe two facts about the world are grossly inconsistent with the hypothesis that people exhibit large degrees of altruistic concern for the consumption of other citizens. First, even *within* families, income transfers are relatively small and do not appear to be motivated primarily by altruism. Any given person *i*'s concern for *j*'s well-being reasonably can be expected to decline with the social distance between the two people. Hence, estimates of altruism-based transfers within nuclear families (i.e. between parents and children or between siblings) should constitute a high upper-bound on the degree of GC altruism. But intrafamilial altruism seems to be quite small. Although interhousehold transfers are greater in some developing countries than in the U.S. (see Cox [1987] for the U.S. and Cox and Jimenez [1992] for Peru), Scheoni (1993) found that across U.S. households in 1988, the average transfer from parents to children was just \$328. Given the small observed amount of transfers across households and the enormous differences in incomes across generations,⁵⁰ it is no surprise that Altonji, Hayashi, and Kotlikoff (1992) easily reject the hypothesis that the extended family is linked altruistically. And despite large differences in consumption across siblings, transfers received from siblings or other relatives averaged just \$44—one tenth of one percent of household income—for the U.S. in 1988⁵¹. The weight of this evidence suggests a very low degree of intrafamilial altruism.

In the face of this evidence on voluntary redistribution, we find it not credible that "general social" altruism can explain the comparatively large amount of income actually redistributed through the public sector. Paradoxically, we also believe that the amount of actual income redistribution is too *small* to admit both large degrees of GC altruism and observed levels of poverty and deprivation; there is simply too much poverty for there to also be much altruism.⁵² Sen's (1995) remark suggests the degree to which self-interest seems to drive observed transfers to the poor:

The political feasibility of such differential use of public services [i.e. of targeting] depends to a considerable extent on what the more powerful groups in a poor country see as imperative. For example, easily infectious diseases receive much greater attention than other types of maladies do, and they tend to get eliminated with remarkable efficiency. It has happened to small pox, nearly happened to malaria, and is on the way to happening to cholera. Even the poor would tend to get a lot of attention partly for good humanitarian reasons, but also because a poor person with infectious disease is a source of infection for others. Ailments that are not so infectious, including regular undernourishment, do not get quite that comprehensive attention.

⁵⁰ Moreover, both Solon (1992) and Zimmerman (1992) show that the correlation of fathers' and sons' incomes in the U.S. is only about 0.4.

⁵¹ There are models suggesting that large degrees of altruism are consistent with no inter-sibling transfers, but we find such models less compelling than the simpler hypothesis of small degrees of altruism.

⁵² And it appears that the level of contributions by US residents to international charities supports this view: according to Wolpert (1993), this figure was just 2.6 billion in 1991. Moreover, data in Ribar and Wilhelm (1994) suggest that this number probably may well be a high upper bound.

I sometimes wonder whether there is any way of making poverty terribly infectious. If that were to happen, its general elimination would be, I am certain, remarkably rapid.

Of course, Sen's sentiment brings up an important dimension of non-altruistic concern for the welfare of the poor. We have treated the motivation for including the welfare of the poor in non-poor agents' utilities as altruistically based, but there are at least three other reasons for doing so. First, lower welfare for the poor may be associated with direct welfare costs borne by the non-poor (e.g. Sen's infectious externalities). Second, the threat of disruptive political action is likely to be related to the economic welfare of the poor⁵³. Third, raising the welfare of the poor might cause beneficial spillovers to the non-poor. Some new growth models posit a positive link between threshold levels of education and economic growth, so that higher welfare for the poor actually will raise growth rates, benefitting the non-poor as well. In light of these possible motivations, perhaps the reasons for direct concern by the non-poor about the welfare of the poor have nothing to do with altruism. But proper treatment of such considerations would warrant separate models, and in any event these issues are beyond the scope of the current work.

8 Conclusion

In this paper, we have reviewed briefly some recent literature whose central theme is that the use of permanent income characteristic indicator targeting would allow policymakers to reduce poverty. We then developed a simple and general model, which we used to show two main conclusions. First, while social choice theory suggests that it is unsurprising that positive levels of targeted transfers almost never (in the measure-theoretic sense) can exist in equilibrium, we develop simple conditions—that targeted transfers are no better for the middle class than an actuarially fair gamble and that rich and poor agents not be able to agree on more targeting and less taxation—under which *no* targeting is an equilibrium. Second, we argue that the empirical finding that introduction of targeting with a fixed budget could greatly improve social welfare in fact *has no power*: this finding is perfectly consistent with Nash equilibrium in a game played by voters and a social-welfare maximizing (e.g. poverty minimizing) policymaker. Moreover, we give an example in which a no-targeting transfer regime satisfies the median voter's optimization problem and also locally satisfies the policy-maker's optimization problem; a no-targeting regime can thus exist in what we refer to as local Nash equilibrium.

We have three further remarks. First, like all models, ours is stylized and not immune to attack. Nonetheless, we think the ball now is squarely in the other court. We have presented a positive political economy model in which simple conditions imply that introduction of indicator targeting will have budget-reducing effects, and in which ignoring these effects can reduce the welfare of the poor. Even if our model is not to be accepted, proponents of indicator targeting should be able to produce at least some plausible positive model in which the fixed-budget approach *does* lead to an optimal outcome. And of course, simply assuming the budget is fixed counts neither as plausible nor as a model. A positive recommendation

⁵³Glewwe writes that "Use of dummy variables for ethnic groups helps in targeting transfers but . . . this practice could lead, quite literally, to riots in the streets."

to a policymaker that she “should” target ought to be a recommendation that takes account of constraints actually faced by that policymaker.

Second, since both types of transfers we discuss in this model are financed with a proportional tax, each is enormously redistributive. Therefore, to suggest that targeting is likely to be politically infeasible or budget-reducing is not to say that redistribution relative to pre-transfer income distribution is infeasible. Our point is that there are practical limits to not only the scope, but also the form of redistribution.⁵⁴ One need not believe that current patterns of government expenditures reflect the *scope* limits to argue that the *form* constraints bind. Just as our model’s negative conclusions regarding targeting hold only under certain conditions, whether a greater total reduction in poverty is feasible via more targeting at lower budgets or no targeting at existing budgets is fundamentally an empirical question. To pretend otherwise is to rely more on rhetoric than on rigor.

Third, it would be somewhat awkward to discuss a positive political economy *model* without also discussing the positive *politics* of partisans on both sides of the targeting debate. In fact, attitudes towards targeting span the political spectrum: while political positions taken by partisans appear to depend on empirical beliefs about political reality, they do not seem to be related systematically to general ideological fault lines. People who care about the poor may favor or oppose targeting, depending on their beliefs concerning the political reaction function, τ^* , derived above. For those who believe that budgets are exogenous and cannot be influenced, improved targeting seems to be the right strategy to protect the poor. To others, opposition to targeting is *de rigeur*: near-term implementation of targeting is expected to cause long-term erosion of political support for all redistribution.

By contrast, strongly anti-statist people (who we certainly do not mean to imply are indifferent to the plight of the poor) might easily be in favor of targeting rather than universalism. Consider, for example, Deepak Lal (1994), who writes that “An implicit objective of those who argue against targeting and in *favor* of universal welfare states is distributivist. This is not surprising as they are by and large *socialists* who subscribe to the common end of egalitarianism” (our italics).

In final summary, this paper has sought to show that the policy maker in the opening dialogue might really be right. It is theoretically and empirically reasonable to believe that attempts to achieve “more for the poor” through the use of indicator targeting may in fact mean less for the poor.

⁵⁴Non-lump sum—i.e. non-indicator—targeting might fare considerably better. For example, self-selection targeting programs make benefits universally available to anyone willing to accept certain conditions. Thus the Nichols and Zeckhauser [1982] approach to targeting not only handles incentive compatibility issues, but may also solve political economy problems. Public works jobs form one example of such programs: since middle class agents can anticipate the availability of their benefits in times of need, they are much more likely to support such programs. This logic might explain the apparently solid political backing enjoyed by the Employment Guarantee Scheme in Maharashtra.

Appendix 1: Proofs of Results in Section 4

Lemma 2 Suppose $\mu = 0$. Then $\bar{y} < q$, i.e. $\sigma_{rr} < q(1 - \sigma_m)$, if and only if

(i) $\tau^*(0) < 1$ and

(ii) At least one of $\partial U_m / \partial \tau$, $\partial U_m / \partial k < 0$ at any point $(k, 1)$

Proof: To show (i), differentiate U_m partially with respect to τ . When we evaluate at $k = 0$, there will be no difference across targeting states in after-transfer income. Hence we have

$$\frac{\partial U_m}{\partial \tau} = p\bar{y}u'(N) - q(1 - \bar{y})(N + 1 - \tau) \quad (37)$$

At $\tau = 1$, the u' terms drop out, so we have

$$\frac{\partial U_m}{\partial \tau} \geq 0 \quad \Leftrightarrow \quad p\bar{y} \geq q(1 - \bar{y})$$

which is just another way of writing $\bar{y} < q$. Hence utility is decreasing in τ at $(0, 1)$.

As for (ii), it can be shown that

$$\begin{aligned} \frac{\partial U_m}{\partial \tau} &= \frac{\delta_m k}{\tau} \frac{\partial U_m}{\partial k} + p\bar{y}[\delta_m u'(N + \theta) + (1 - \delta_m)u'(N)] \\ &\quad - q(1 - \bar{y})[\delta_m u'(N + \theta + 1 - \tau) + (1 - \delta_m)u'(N + 1 - \tau)] \end{aligned} \quad (38)$$

Substituting $\tau = 1$, we see that the terms multiplied by $p\bar{y}$ and $q(1 - \bar{y})$ are equal, so that this part of $\partial U_m / \partial \tau$ can be non-negative only if $p\bar{y} \geq q(1 - \bar{y})$, which again implies $\bar{y} < q$. Hence under the lemma's hypothesis, $\partial U_m / \partial \tau$ can be non-negative only if either $\partial U_m / \partial k$ is not.

Q.E.D.

Lemma 3 (Single Crossing for τ_r & τ_l) If *C 2* is satisfied, then

(i) Any two indifference curves $\tau_l(k; U_l)$ and $\tau_r(k; c_r)$ intersect at most once

(ii) If $\tau_l(\hat{k}) = \tau_r(\hat{k})$, then $\tau_l(k) < (>) \tau_r(k) \forall k < (>) \hat{k}$

For $k = 0$, (i) and (ii) hold only if *C 2* is satisfied.

Proof: We first dispense with the case when $\delta_l \leq \bar{\delta}$, i.e. when *C 1* is satisfied (note that *C 2* is satisfied trivially in this case, since its left hand side is negative). We know that $\partial U_l / \partial \tau > 0$, and from Lemma 1, we also have $\partial U_l / \partial k < 0$. By the Implicit Function Theorem,

$$\frac{d\tau_l}{dk} \equiv - \frac{\partial U_l / \partial k}{\partial U_l / \partial \tau}, \quad (39)$$

so that in this case, $d\tau_l / dk > 0$. We also know that the utility of the rich is decreasing in both k and τ , which implies that $d\tau_r / dk < 0$ (we could derive this result algebraically by differentiation of 10 with respect to k). Hence we have one strictly increasing function and one strictly decreasing function, and the conclusions of the Lemma are obvious in this circumstance. We now turn to the case in which $\delta_l > \bar{\delta}$.

First, writing out the right hand side of (39) after dividing by $\delta_l \bar{y}$, we have

$$\frac{d\tau_l}{dk} = \frac{-\tau_l(k) \frac{[\bar{\gamma}\{pu'(N + \theta) + qu'(N + \theta + \mu)\} - \gamma_l\{pu'(N) + qu'(N + \mu)\}]}{(1 + \bar{\gamma}k)[pu'(N + \theta) + qu'(N + \theta + \mu)] + \gamma_l(1 - k)[pu'(N) + qu'(N + \mu)]}}{\delta_l \bar{y}}$$

We will want to derive a lower bound for $d\tau_1/dk > 0$, so we are free to do anything to (40) that makes the right hand side smaller. Thus we replace $pu'(N) + qu'(N + \mu)$ with $pu'(N + \theta) + qu'(N + \theta + \mu)$ in both the numerator and the denominator. We can do this with the numerator since this part of the numerator is positive and $pu'(N + \theta) + qu'(N + \theta + \mu) < pu'(N) + qu'(N + \mu)$ (by concavity of u). The numerator thus becomes

$$-\tau_1(k)(pu'(N + \theta) + qu'(N + \theta + \mu))[\bar{\gamma} - \gamma_1],$$

and $\bar{\gamma} - \gamma_1 > 0$ since $\bar{\delta} < \delta_1$ by hypothesis. Since the denominator is strictly positive, the whole (modified) term must be negative. We are therefore free to reduce the value of the denominator, since reductions in the denominator of a negative term make the term more negative, i.e. smaller. Thus we may replace $pu'(N) + qu'(N + \mu)$ with $pu'(N + \theta) + qu'(N + \theta + \mu)$ in the denominator as well; but this step allows us to cancel out all terms in (40) involving u , leaving us with the simple result that

$$\frac{d\tau_1}{dk} \geq -\tau_1(k) \frac{\bar{\gamma} - \gamma_1}{1 + (1 - k)\gamma_1 + k\bar{\gamma}} \quad (40)$$

This inequality holds strictly for all $k > 0$ and with equality at $k = 0$. Next, differentiating τ_r with respect to k , we have

$$\frac{d\tau_r}{dk} = -\frac{\bar{y}r}{r - (1 - k)\bar{y}} \quad (41)$$

Combining (40) and (41), we have $d\tau_1/dk \geq d\tau_r/dk$ (with equality only at $k = 0$, and then only if (42) holds with equality) if

$$-\tau_1(k) \frac{\bar{\gamma} - \gamma_1}{1 + (1 - k)\gamma_1 + k\bar{\gamma}} \geq -\frac{\bar{y}r}{r - (1 - k)\bar{y}} \quad (42)$$

By hypothesis, we want to consider points $(\hat{k}, \hat{\tau})$ such that $\tau_1(\hat{k}) = \tau_r(\hat{k}) = \hat{\tau}$. We may thus cancel τ_1 and τ_r from the above expression; simplifying further, all \hat{k} terms drop out, and we are left with the simple condition that $\delta_m/\delta_1 \geq 1 - q/r$, which is just condition C 2. Hence when C 2 is satisfied, τ_1 is at least as steeply sloped as is τ_r at any point of intersection (and strictly more steeply sloped for all $k > 0$). This fact implies that τ_1 must cross τ_r from below at any point of intersection with $k > 0$. Hence by continuity of both τ_1 and τ_r , if τ_1 intersects τ_r at some value \hat{k} of k , it must lie above τ_r for all $k > \hat{k}$ and vice-versa for all $k < \hat{k}$. Hence the second conclusion of the lemma holds; but this conclusion actually implies the first. *Q.E.D.*

Lemma 4 At least one of C 1 or C 2 is satisfied.

Proof: Rewrite C 1 as $\delta_m = \sigma_1\delta_1\lambda/(\sigma_1 + \sigma_r)$, where the condition is satisfied iff $\lambda \leq 1$. Then we can rewrite C 2 as follows:

$$r \leq \frac{q}{\sigma_r + \sigma_1(1 - \lambda)}$$

or

$$r(\sigma_r + \sigma_1(1 - \lambda)) \leq q \quad (43)$$

Violation of both conditions requires the inequality to be reversed in the above expression, as well as $\lambda > 1$. But we assumed earlier that $\bar{y} = \sigma_r r + q\sigma_m < q$, and if $\lambda > 1$, then the left hand side of (43) is less than $\sigma_r r < \sigma_r r + q\sigma_m$. Hence violating both conditions induces a contradiction.

Q.E.D.

Theorem 3 *Suppose that $\delta_l \geq \delta_m$. Then both C 1 and C 2 are satisfied if and only if $E(\mathcal{F}) = \{(0, \tau^*(0))\}$*

Proof: We know from Theorem 2 that no interior point of \mathcal{F} can be an equilibrium; thus we consider only boundary points in this proof. Also, since middle class agents are risk averse, both they and the poor support a positive level of the tax at any k . Hence we can rule out any points of the form $(k, 0)$. We now tackle the rest of the proof.

(Sufficiency) First, suppose that C 2 is violated. Then by Lemma 3, no point $(0, \tau)$ can be a local equilibrium, since there exist points $(k, \tau') \in W(0, \tau)$ for some k arbitrary close to zero; hence $E(O)$ is empty for any open ball $O \cap \mathcal{F}$ around $(0, \tau)$. Next, suppose that C 1 is violated. Then at $k = 0$, $\partial U_m / \partial k > 0$; this fact is easily seen by differentiating U_m partially with respect to k and evaluating at $k = 0$. By hypothesis, $\delta_l > \delta_m > \bar{\delta}$, so that at $k = 0$ we also have $\partial U_l / \partial k > 0$. Hence there is majority support for a local increase in k .

We now need establish sufficiency only for points $(k, 1)$. To rule out these points, we note first that the median voter theorem implies that no point (k, τ) with $\tau \neq \tau^*(k)$ can be an equilibrium. Next, by Lemma 2, if $\partial U_m(k, 1) / \partial \tau = 0$, then $\partial U_m(k, 1) / \partial k > 0$. Hence if $\partial U_l(k, 1) / \partial k > 0$, $(k, 1)$ can be beaten by a poor-middle class coalition to raise k . Then we can have equilibrium at $(k, 1)$ only if $\partial U_l(k, 1) / \partial k \leq 0$. Differentiating U_l and U_m partially with respect to k , we have

$$\begin{aligned} \partial U_l(k, 1) / \partial k \leq 0 &\Leftrightarrow \bar{\gamma} \leq \gamma_l \\ &\text{and} \\ \partial U_m(k, 1) / \partial k > 0 &\Leftrightarrow \bar{\gamma} > \gamma_m \end{aligned} \tag{44}$$

Both of these conditions hold simultaneously if and only if $\delta_l < \delta_m$, which violates our hypothesis. Hence when C 1 is violated, the equilibrium set must be empty. Lastly, if C 1 is satisfied, then the rich and the middle class both favor reductions in k whenever $k > 0$, so only $(0, 1)$ remains as a possible equilibrium. But Lemma 2 established that $\tau^*(0) < 1$.

Thus we have established sufficiency.

(Necessity) Suppose both conditions hold. Then by Lemma 3, no point $(0, \tau)$ can be beaten by any point with $k > 0$. Moreover, by the Median Voter Theorem, all points $(0, \tau)$, $\tau \neq \tau^*(0)$, are beaten by $(0, \tau^*(0))$. Hence $(0, \tau^*(0))$ is the unique unbeaten point, establishing its solitary membership in $E(\mathcal{F})$.

Q.E.D.

Appendix 2: Allowing positive earned income for the poor

Our first step is to recall that $(IC)_r$ always will bind. As we noted above, positive levels of transfers are not possible when this constraint is violated, while both the poor and the middle class will want some level of transfers. Hence we have two regimes to consider: $\tau \in (0, 1 - \mu]$ and $\tau \in (1 - \mu, 1 - \mu/\tau]$. While the functions k^* and τ^* were defined for $\mu = 0$, nothing about them is changed for $\tau < 1 - \mu$. That is, we may retain the same analysis as before for the range $[0, 1 - \mu]$ of τ^* and the domain $[0, 1 - \mu]$ of k^* .

Next, since we build moral hazard into the model, whenever $\tau > 1 - \mu$ employed middle class workers will take μ -marginal product jobs, so that they receive untaxable earned income of μ in any “high-tax regime”. Hence middle class agents’ utility must be strictly increasing in τ for all $\tau \in (1 - \mu, 1 - \mu/\tau]$, so that both the middle class and the poor support a tax of $1 - \mu/\tau$ when the high-tax regime is given. Though the rich will support the lowest tax possible, just as before, the poor and middle class form a majority coalition, so that any high-tax regime equilibrium must occur at $\tau = 1 - \mu/\tau$.

Our method of eliminating points in the high-tax regime as possible equilibria is simple. If we can ensure that the tax base always is sufficiently small in the high-tax regime, then both N and θ will be lower under this regime than in the low-tax regime. In this case, both the poor and the middle class—whether employed or not—will vote for a tax of $1 - \mu$ instead of $1 - \mu/\tau$, no matter what value k takes. Thus for any k , there will be unanimous support against any point in the high-tax regime.

The condition we seek is simply

$$(\sigma_r r + q\sigma_m)(1 - \mu) > \sigma_r r(1 - \mu/\tau),$$

which can be rewritten as

C 5

$$\mu < \frac{q\sigma_m}{q\sigma_m + \sigma_r(r - 1)} \equiv \mu^* < 1$$

Hence if C 5 is satisfied, no point in the high-tax regime can be in $E(\mathcal{F}(\mu))$. We note that Theorem 2 holds without modification for all $X \subseteq \mathcal{F}(\mu) \setminus [0, 1] \times (1 - \mu)$, since the analysis for such subsets is unchanged by $\mu > 0$. With these facts in hand, we can state a modified version of Theorem 3 in Corollary 1.

Corollary 1 *Suppose that $\delta_l \geq \delta_m$ and $\mu < \mu^*$. Then C 1 and C 2 are satisfied if and only if $(0, \min[1 - \mu, \tau^*(0)]) \in E$*

Proof: As before, we are entitled by Theorem 2 to ignore interior points; we now consider the boundaries of \mathcal{F} .

(Sufficiency) We want to show that if $(0, \min[1 - \mu, \tau^*(0)]) \in E$ then we must satisfy both C 1 and C 2. First, if $(0, \min[1 - \mu, \tau^*(0)]) \in E$, then we must have single-crossing, since otherwise there would exist some point (k, τ) for which a rich-poor coalition would vote instead of $(0, \min[1 - \mu, \tau^*(0)])$; since C 2 is necessary for single-crossing at $k = 0$, it must be satisfied. Third, C 1 also must hold, since otherwise we have $\delta_l, \delta_m \geq \bar{\delta}$, and thus a poor-middle class majority coalition exists for a local increase in k . Hence we have established sufficiency.

(Necessity) We want to show that if C 1 and C 2 are satisfied, then $(0, \min[1 - \mu, \tau^*(0)]) \in E$. The argument in the text above implies that any point in $E(\mathcal{F})|_{\mu=0}$ will beat any point in the high-tax regime, since any such point beats all other points in \mathcal{F} , which includes points $(k, 1 - \mu)$, and any of these points unanimously

beats all points (k, τ) , $\tau > 1 - \mu$. Thus we need consider only points in the low-tax regime. If $\tau^*(0) \leq 1 - \mu$, the proof of Theorem 3 establishes the result. Hence we need only consider the case when $\tau^*(0) > 1 - \mu$. By the same median voter line of argument used above, $(0, 1 - \mu)$ beats all points $(0, \tau)$, $\tau < 1 - \mu$. By single crossing, $W(0, 1 - \mu) \cap (0, 1] \times [0, 1 - \mu] = \emptyset$, and $\delta_m \leq \bar{\delta}$ implies the existence of a rich-middle class coalition to defeat all $(k, 1 - \mu)$, $k > 0$. Hence $W(0, 1 - \mu) \cap \mathcal{F}(\mu) = \emptyset$, so $(0, 1 - \mu) \in E$.

Q.E.D.

The observant reader will have noticed that in the corollary we use “ $\in E$ ”, whereas in conclusion (ii) of Theorem 3, we had “ $(0, \tau^*(0)) \in E$ ”. This difference is not an accident. The “lowering” of the upper bound of the low-tax regime from unity to $1 - \mu$ may make a difference—though it need not. The intuitive explanation for this fact is that, whereas Lemma 2 establishes that at a tax of unity $\nabla U_m \neq 0$, no such fact need hold at a lower tax. When the point $(k, 1 - \mu)$ on the upper boundary of $\mathcal{F}(\mu)$ is a local maximum, i.e. $\nabla U_m(k, 1 - \mu) = 0$, we may be able to support that point as an equilibrium in $\mathcal{F}(\mu)$ (i.e. when the space of alternatives is restricted to the low-tax regime) and possibly in \mathcal{F} as well. The following lemma lays the groundwork for the possible existence of equilibria with positive levels of targeting on the boundary of the low-tax regime when $\mu > 0$ ⁵⁵

Lemma 9 Suppose $\mu = 0$. Then C 1 is violated if and only if

- (i) U_m has a global maximum at some point (k, τ) , $k \in (0, 1]$, $\tau \in (0, 1)$
- (ii) There exists at least one local maximum $(\hat{k}, \hat{\tau}) \in (0, 1] \times (0, 1)$ such that either $\nabla U_m(\hat{k}, \hat{\tau}) = 0$ or $\hat{k} = 1$ and $\partial U_m / \partial k > 0$ at $(1, \hat{\tau})$

Proof: (Sufficiency) If C 1 is satisfied, then by Lemma 1, U_m is strictly decreasing in k , violating (ii). Moreover, $\partial U_m / \partial k < 0 \forall k > 0$ implies that any local (and hence global) maximum occurs at $k = 0$, violating (i). Hence sufficiency is established.

(Necessity) The first several steps in proving both conclusions are identical. First, since $\delta_m > \bar{\delta}$, $\partial U_m(0, \tau) / \partial k > 0$. Second, since $\bar{y} < q$, from Lemma 2 we know that at least one of $\partial U_m / \partial k$, $\partial U_m / \partial \tau = 0$ at any point $(k, 1)$. Third, by risk aversion, $\partial U_m(k, 0) / \partial \tau > 0$. Therefore, we have ruled out all points having $k = 0$ and $\tau \in \{0, 1\}$ as candidates for $\nabla U_m(\hat{k}, \hat{\tau}) = 0$ and hence for satisfying the first order conditions for a global maximum (in each case, the conditions are violated in the direction that implies improvement is feasible). We note that \mathcal{F} is compact and U_m is continuous; thus U_m must take a maximum on \mathcal{F} , proving (i). To prove (ii), note that $\nabla U_m(\hat{k}, \hat{\tau}) = 0$ must be satisfied for any interior maximum. Then we are left only with points of the form $(1, \tau)$. If $\partial U_m / \partial k < 0$ at such points, it is feasible to improve at these points by reducing k . Hence either $\nabla U_m(\hat{k}, \hat{\tau}) = 0$ or $\hat{k} = 1$ and $\partial U_m / \partial k > 0$ at $(1, \hat{\tau})$.

Q.E.D.

Using this lemma, we are able to prove Proposition 3, which establishes conditions for equilibria to exist on the upper boundary of $\mathcal{F}(\mu)$.

Proposition 3 $\delta_l \geq \delta_m > \bar{\delta}$ (and thus C 1 is violated) if and only if any local maximum $(\hat{k}, \hat{\tau})$ of $U_m|_{\mu=0}$ with $\hat{k} > 0$ is a local equilibrium for $\mu = 1 - \hat{\tau}$. Moreover, for all local equilibria $(\hat{k}, \hat{\tau})$, $\mu \leq \mu^*$ if and only if the set over which $(\hat{k}, \hat{\tau})$ has equilibrium status can be expanded to the union of the high-tax regime and some open ball around $(\hat{k}, \hat{\tau})$.

Proof: (Sufficiency) We want to show that if any local maximum $(\hat{k}, \hat{\tau})$ of $U_m|_{\mu=0}$ with $\hat{k} > 0$ is a local equilibrium for $\hat{\mu} = 1 - \hat{\tau}$, then $\delta_l \geq \delta_m > \bar{\delta}$ for some $\hat{k} \in (0, 1]$. If the hypothesis holds, then either

⁵⁵Despite the fact that we assume $\mu = 0$ in the lemma's hypothesis.

$\hat{k} = 1$ or $\hat{\tau} = 0$ or we must have single-crossing (since if all of these are violated, it is possible to find a rich-poor coalition in favor of local changes). We know that $\tau = 0$ is never optimal, and $k = 1$ can be optimal only if $C 1$ is violated. Hence we consider points with $\hat{k} < 1$. If $C 1$ holds, then a middle class-rich coalition favors local reductions in k . Hence $C 1$ must be violated; we have only to show that $\delta_l \geq \delta_m$. We know from Theorem 2 that no interior point of the low-tax regime can be a local equilibrium, so we may look only at points on the boundary of the low-tax regime, i.e. points $(k, 1 - \mu)$ with $k \in (0, 1)$.

Because these points are in the interior of \mathcal{F} , the hypothesis that they are local maxima implies $\nabla U_m|_{\mu=0} = 0$. Since we have assumed that $\mu = 1 - \hat{\tau}$, our local maximum of $U_m|_{\mu=0}$ occurs on the boundary of the two regimes, so that $(IC)_m$ binds. Hence the poor and the middle class have equal consumption in all states (though the differential δ values mean the probability of each state's occurrence varies). Under these circumstances, an argument similar to that in the proof of Theorem 3 implies that $\partial U_l / \partial k < 0$ if and only if $\delta_l < \delta_m$ (see (44)). But if $\partial U_l / \partial k < 0$, then there exists a rich-poor coalition in favor of local reductions in k . Hence $\delta_l \geq \delta_m$ if any local maximum is a local equilibrium, establishing sufficiency.

(Necessity) We want to show that if $\delta_l \geq \delta_m > \bar{\delta}$, there exists some $\hat{\mu}, \hat{k} \in (0, 1)$ such that any local maximum $(\hat{k}, \hat{\tau})$ of $U_m|_{\mu=0}$ with $\hat{k} > 0$ is a local equilibrium for $\hat{\mu} = 1 - \hat{\tau}$. First, by Lemma 9, we know that our hypothesis implies the existence either of an interior point with $\nabla U_m = 0$ or a point $(1, \hat{\tau})$ where $\nabla U_m \geq 0$. In the first case, we have a maximum on the interior of $U_m|_{\mu=0}$, implying that $\nabla U_m|_{\mu=0} = 0$. Since the poor and the middle class again have equal consumption in all states. Then $\delta_l > \delta_m$ implies that $\partial U_l / \partial k > \partial U_m / \partial k = 0$. Hence no local reduction in k has a majority; no reduction in τ does either, since our position at a relative maximum of $U_m|_{\mu=0}$ means that we are on $\tau^*(k)$. Nor is any local increase in either variable possible, since the middle class are (locally) maximizing over both and the desire of the rich to decrease either is not shared by the poor. As for an increase in τ , this will move us into the high-tax regime, which implies a discrete reduction in both N and θ . Since our definition of local equilibrium requires only that there be some open ball for which the point is an equilibrium, we can always find a small enough $\epsilon > 0$ such that no agreement between the rich and poor to increase τ to $\tau + \epsilon$ while reducing k will be possible. In the second case, where $k^*(\hat{\tau}) = 1$, the exact same argument on all fronts (except that we now have $\partial U_m / \partial k \geq 0$) establishes the result *a fortiori*.

As for the last comment, regarding $\hat{\mu} \leq \mu^*$, if this does not hold, any point $(\hat{k}, 1 - \hat{\mu})$ is beaten by $(\hat{k}, 1 - \hat{\mu}/\tau)$ via a poor-middle-class coalition. If the condition does hold, then $(\hat{k}, 1 - \hat{\mu})$ is unbeaten by any point in the high-tax regime (the argument here is familiar).

Q.E.D.

Corollary 2 The assumptions of Proposition 3 hold if and only if $(\hat{k}, 1 - \hat{\mu}) \in E(\mathcal{F}(\hat{\mu}))$ for some \hat{k} and $\hat{\mu}$, i.e. there exists some $\hat{\mu}$ such that the equilibrium set is non-empty when the alternative space is restricted to the low-tax regime. Moreover, $\hat{\mu} \leq \mu^*$ if and only if $(\hat{k}, 1 - \hat{\mu}) \in E$, i.e. iff $(\hat{k}, 1 - \hat{\mu})$ is an equilibrium over all of \mathcal{F} .

Proof: We begin with the first claim of the corollary.

(Sufficiency) Suppose that $(\hat{k}, \hat{\tau}) \in E(\mathcal{F}(\hat{\mu}))$. By the argument in the proof of the proposition, this point must also be a local equilibrium, and hence the appropriate conditions must hold.

(Necessity) Suppose that the assumptions of the theorem hold. Then by Lemma 9, there is some $\hat{\mu}$ such that $(\hat{k}, 1 - \hat{\mu})$ is a global (and hence local) maximum of $U_m|_{\mu=0}$. By Lemma 4, violation of $C 1$ implies that we must have single-crossing, so that no rich-poor coalition can defeat $(\hat{k}, 1 - \hat{\mu})$. Since this point is a global maximum in \mathcal{F} when $\mu = 0$, no majority coalition involving the middle class can arise to put a low-tax regime point in $W(\hat{k}, 1 - \hat{\mu})$. Familiar arguments imply that $\partial U_l / \partial k > 0 > \partial U_r / \partial k$, which means

that no coalition can stay on the low-tax regime boundary and impose a new k . Hence $(\hat{k}, 1 - \hat{\mu})$ must be an equilibrium over the entire low-tax regime.

To show the second claim of the corollary, if $\hat{\mu} \leq \mu^*$, then the point $(\hat{k}, 1 - \hat{\mu}) \in W(k, \tau)$ for any (k, τ) in the high tax regime (the unanimity argument gives the result); since $(\hat{k}, 1 - \hat{\mu})$ was constructed above to be in $E(\mathcal{F}(\hat{\mu}))$, it must therefore also be in E . On the other hand, if $\hat{\mu} > \mu^*$, $(\hat{k}, 1 - \hat{\mu})$ is beaten by $(\hat{k}, 1 - \hat{\mu}/\tau)$. Hence $\hat{\mu} \leq \mu^*$ is necessary and sufficient for the global maximum to be in E .

We note that a point $(\hat{k}, 1 - \hat{\mu})$ satisfying Corollary 2's conclusions need not be a global maximum. To see this, take the smallest $\hat{\tau}$ for which $(\hat{k}, \hat{\tau})$ is a local maximum of $U_m|_{\mu=0}$. Then when $\mu = 1 - \hat{\tau}$, no other maximum of $U_m|_{\mu=0}$ is in the low-tax regime, so that Corollary 2 applies.

The results of this section notwithstanding, one shouldn't get too excited about the possibility of supporting boundary points with $k > 0$. These results may be invoked only in the zero-probability event that at such a point μ just happens to be equal to $1 - \tau^*(k)$ at a point $(k, \tau^*(k))$ that is a local maximum of U_m .⁵⁶ There is therefore no reason to believe that the equilibrium set should ever contain a point with $k > 0$, at least when the set of admissible values of k is all of $[0, 1]$. That said, we stress that these positive results concerning the viability of positive levels of targeting have as necessary conditions both the violation of $C 1$ and on the condition that $\delta_i \geq \delta_m$: even in the extremely unlikely event that μ does satisfy the above maximizing condition, it must be the case that targeted benefits are widely enough received if they are to be seen in any equilibrium.

⁵⁶ The sense in which this event is zero-probability is quite precise: for any continuous distribution of μ having nondegenerate support over the set $[0, 1]$, the probability that any given value of μ is "drawn" is zero by definition; since U_m will always have a countable number of maxima, the set of μ values for which $1 - \mu$ is a maximum has measure zero.

Appendix 3: Theoretical Generalization With Altruism

Lemma 5 (When Altruistic Middle Class Agents Oppose Targeting)

(i) Suppose C 3 is satisfied. Then $\partial V_m / \partial k < 0$ for $k = 0$.

(ii) Suppose that C 4 is satisfied and that utilities are of the CRRA form, with $\rho \leq 1$. Then $\partial^2 V_m / \partial k \partial \tau < 0$ for $k = 0$.

Proof:

(i) At $k = 0$ we have

$$(\bar{y}\tau)^{-1} \frac{\partial V_m}{\partial k} = \alpha [p u'(N) + q u'(N+1-\tau)] \left(\frac{\delta_m}{\bar{\delta}} - 1 \right) + (1-\alpha) [p u'(N) + q u'(N+\mu)] \left(\frac{\delta_l}{\bar{\delta}} - 1 \right)$$

Since we want to make this expression negative, and since the terms multiplied by $u'(N)$ and $u'(N+1-\tau)$ are negative if C 3 holds, we may replace them by something smaller; 1 will be a convenient choice.⁵⁷ Reorganizing thus yields

$$\bar{\delta}^{-1} [\alpha \delta_m + (1-\alpha) \delta_l - \bar{\delta}] p + \bar{\delta}^{-1} [\alpha (\delta_m - \bar{\delta}) + (1-\alpha) (\delta_l - \bar{\delta} u'(\mu + N))] q$$

If we then multiply through by $\bar{\delta}$, recognize that $u'(\mu + N) \leq u'(\mu)$ and also add and subtract the term $q(1-\alpha)(\delta_l - \bar{\delta})$, simple algebra may be used to show that C 3 is indeed a sufficient condition for negativity.

(ii) We write the cross-partial derivative as the sum $A + B - C$, where, using the CRRA assumption, these three terms are defined as follows:

$$\begin{aligned} A &\equiv p \bar{y} (1-\rho) u'(N) \left[\frac{\alpha \delta_m + (1-\alpha) \delta_l}{\bar{\delta}} - 1 \right] \\ B &\equiv q (1-\rho) \left[\alpha \left(\frac{\delta_m}{\bar{\delta}} - 1 \right) u'(N+1-\tau) + (1-\alpha) \left(\frac{\delta_l}{\bar{\delta}} - 1 \right) u'(\mu + N) \right] \\ C &\equiv q \left[\alpha \left(\frac{\delta_m}{\bar{\delta}} - 1 \right) u''(N+1-\tau) + (1-\alpha) \left(\frac{\delta_l}{\bar{\delta}} - 1 \right) u''(\mu + N) \right] \end{aligned}$$

With $\rho \leq 1$, A is clearly nonpositive. To see that B is as well, again multiply through by $\bar{\delta}$, replace $u'(N+1-\tau)$ with unity, and add and subtract $q(1-\alpha)(\delta_l - \bar{\delta})$. This procedure yields C 4, establishing nonpositivity of B . C will be negative if and only if

$$[\alpha \delta_m + (1-\alpha) \delta_l] u''(N+1-\tau) + (1-\alpha) (\delta_l - \bar{\delta}) [\mu u''(N+\mu) - u''(N+1-\tau)] > \bar{\delta} u''(N+1-\tau),$$

which will hold if and only if

$$\alpha \delta_m + (1-\alpha) \delta_l + (1-\alpha) (\delta_l - \bar{\delta}) \left[\mu \frac{u''(N+\mu)}{u''(N+1-\tau)} - 1 \right] < \bar{\delta}$$

This condition differs from C 4 only by the fact that the first term in the brackets on the LHS is not $u'(\mu)$. Therefore we would have our result if it could be shown that

$$\mu \frac{u''(N+\mu)}{u''(N+1-\tau)} < u'(\mu)$$

Using the CRRA assumption (actually, all we really need is non-decreasing relative risk aversion and the normalization $u'(1) = 1$), this condition may be written as $\rho \leq -u''(N+1-\tau)$, which reduces even further to $(N+1-\tau)^{-(1+\rho)} > 1$, which is true since $N+1-\tau < 1$. Hence C must be strictly negative. *Q.E.D.*

⁵⁷ As risk aversion and the degree of altruism jointly approach zero, so does $r^{**}(0)$, so that $u'(N+1-\tau)$ will be arbitrarily close to $u'(1)$, which we normalize to unity. Given this fact, any condition held to be sufficient over all parameter values (with k fixed at zero) must be able to handle replacement of $u'(N+1-\tau)$ with unity. Replacing $u'(N)$ with unity is for mathematical convenience, and clearly adds slack to the condition, since this term is bounded below by $u'(N) > u'(\bar{y}) > 1$. Nonetheless, the precision gained by so doing does not seem worth the loss in expository convenience.

Lemma 7 (Adaptation of the Single-Crossing Result to the Introduction of Altruism) Both $d\tau_1/dk > d\tau_r/dk$ and $\partial V_r/\partial\tau < 0$ if and only if both $d\tau_1/dk > d\tau_r/dk$ and $\partial V_r/\partial k < 0$.

Proof: Define $a \equiv \beta\partial U_r/\partial k$, $b \equiv (1-\beta)\partial U_1/\partial k$, $c \equiv \beta\partial U_r/\partial\tau$, and $d \equiv (1-\beta)\partial U_1/\partial\tau$. Then we can write $d\tau_r/dk \equiv -(a+b)/(c+d)$, $d\tau_r/dk \equiv -a/c$, and $d\tau_1/dk \equiv -b/d$.

(Sufficiency) Hence we have $d\tau_1/dk > d\tau_r/dk$ if and only if

$$-\frac{b}{d} > -\frac{a+b}{c+d} \quad (45)$$

Since $b, d > 0$, $a+b \equiv \partial V_r/\partial k < 0$ implies that (45) can hold only if $c+d \equiv \partial V_r/\partial\tau < 0$. Simple algebra may be used to show that if $c+d \equiv \partial V_r/\partial\tau < 0$, (45) may be reduced to $-b/d > -a/c$, which is another way of writing $d\tau_1/dk > d\tau_r/dk$. Hence sufficiency is established.

(Necessity) Start with the following two assertions: $c+d < 0$ and $-b/d > -a/c$, which form the Lemma's joint hypothesis. Simple algebra again yields truth of (45); together with and $b, d > 0 > c+d$, this fact now requires that $a+b \equiv \partial V_r/\partial k < 0$, establishing necessity.

Q.E.D.

Lemma 8 Suppose that utilities are CRRA with $\rho \leq 1$, and that $\beta > (\geq)\alpha$, i.e. rich agents weight "own" utility at least as heavily as do middle class ones. Then $\frac{\partial V_m}{\partial\tau}|_{k=0} = 0$ implies that $\frac{\partial V_r}{\partial\tau}|_{k=0} < 0$.

Proof: Note first that $\partial V_m/\partial\tau > \partial V_r/\partial\tau$ reduces to

$$\alpha U_r^m - \beta U_r^r > (\alpha - \beta)U_r^l, \quad (46)$$

where the RHS is non-negative. A lower bound for U_r^m is $-u'(N+1-\tau)(q-\bar{y})$. Hence the LHS of (46) will be positive if

$$\beta(r-\bar{y})u'(r-\tau(r-\bar{y})) > \alpha u'(N+1-\tau)(q-\bar{y}), \quad (47)$$

which can be expressed as

$$\frac{\beta(r-\bar{y})}{\alpha(q-\bar{y})} > \left(\frac{r-\tau(r-\bar{y})}{1-\tau(1-\bar{y})}\right)^\rho \quad (48)$$

The LHS of this inequality lies in the interval $[\beta r/\alpha q, \infty]$, while the RHS lies in the interval $[1, r^\rho]$, so that $\rho \leq 1$ implies that the RHS is bounded below r . Since $\beta \geq \alpha$ and $r > q$, the LHS is bounded above r , proving the lemma.

Q.E.D.

Proposition 2 Suppose the conditions of Lemmas 6-8 are satisfied. Then $(\bar{k}, \bar{\tau}) \in C_r(\hat{\tau})$ implies that neither $(k, \bar{\tau})$ nor (\bar{k}, τ) is in $A(k, \tau)$.

Proof: Let $\bar{L}_r(k, \tau) \subseteq L_r(k, \tau)$ and let $\bar{L}_r(k, \tau)$ be connected. Then for $V_r(0, \tau) = \bar{V}$, the following two functions will exist and be continuous and differentiable over their respective domains:

$$\bar{\tau}_r^+ : K^+(\bar{V}) \rightarrow [0, 1] \quad (49)$$

and

$$\bar{\tau}_r^- : K^-(\bar{V}) \rightarrow [0, 1] \quad (50)$$

where

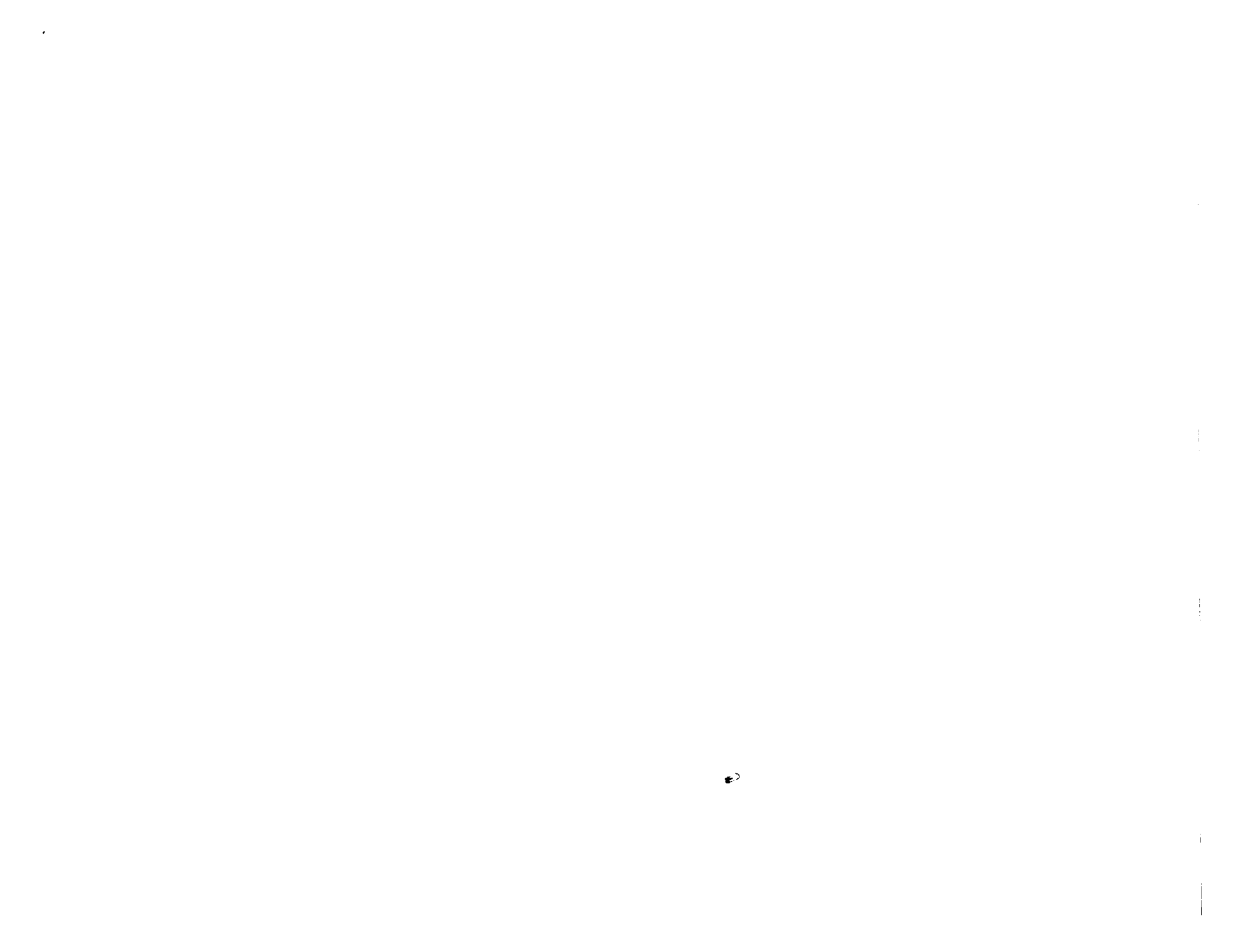
$$K^+(\bar{V}) \equiv \{k : \exists \tau \in [0, 1] \text{ s.t. } V_r(k, \tau) = \bar{V} \text{ and } \frac{\partial V_r(k, \tau)}{\partial\tau} > 0\} \quad (51)$$

and K^- is defined analogously, but with $\frac{\partial V_r(k, \tau)}{\partial\tau} < 0$. (Note that $\bar{\tau}_r^+(k; \bar{V}) = \bar{\tau}_r^-(k; \bar{V})$ at any point where $\partial V_r/\partial\tau = 0$.)

Next, Lemmas 6 and 7 guarantees that $\bar{\tau}_r^i$, $i \in \{+, -\}$, are wholly contained in the set $B_r(0, \hat{\tau})$. Suppose that $(\bar{k}, \tau_0) \in C_r(\hat{\tau})$. Then $\bar{\tau}_r^i(\bar{k}; \bar{V}) = \tau_0$ for $V_r(0, \hat{\tau}) = \bar{V}$ and $i \in \{+, -\}$. Suppose now that $\partial V_r(\bar{k}, \tau_0)/\partial\tau > 0$, which is to say that $i = +$. Then by Lemma 6, there exists a $\tau_1 < \tau_r(\bar{k}; U_r(0, \hat{\tau}))$ for which $\partial V_r(\bar{k}, \tau_1)/\partial\tau < 0$ and $V_r(0, \tau_1) = \bar{V}$, which is to say that $\bar{\tau}_r^-(\bar{k}; \bar{V}) = \tau_1$. By concavity of V_r in its second argument, altruistic rich agents' utility must be decreasing in τ for all $\tau > \tau_1$ when k is held at \bar{k} .

Since $V_r(\bar{k}, \tau_1) = \bar{V}$, it therefore must be true that $V_r(\bar{k}, \tau) < \bar{V} \forall \tau > \tau_1$. But $U_i(\bar{k}, \tau) < \bar{U} \equiv U_i(0, \hat{\tau})$ for all $\tau < \tau_1(\bar{k}; \bar{U})$, while this latter value exceeds $\tau_r(\bar{k}; U_r(0, \hat{\tau}))$ (by single crossing between poor and non-altruistic rich agents), which itself exceeds τ_1 , proving that $A(0, \hat{\tau})$ must be empty for all points (\bar{k}, τ) such that there exists some τ_o for which $(\bar{k}, \tau_o) \in C_r(\hat{\tau})$.

As for points $(k_o, \bar{\tau})$, the Proposition's result follows directly by defining functions \bar{k}_r^i and domains T^i with $i \in \{+, -\}$, noting the concavity of V_r in its first argument, and proceeding as with the $\bar{\tau}_r^i$ functions.
Q.E.D.



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