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The political economy of targeting*

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Abstract. One of the most widely used method of targeting is to reduce welfare benefits as income rises. Although the need for such targeting is clear enough, it also entails two important difficulties. Firstly, the prospect for the recipients of losing part of their benefits if they were to earn more can be a deterrent to work harder. Secondly, by reducing the number of recipients, targeting reduces the political support for taxation and redistribution. The purpose of this paper is to study the voting equilibrium of the degree of targeting and the level of taxation in an economy where labour supply is variable. The analysis reveals that targeting may be fatal for redistribution even though it rejects strictly less than the richest half of the population, and that it is not possible for a coalition of the extremes to form and reject the middle income group from the welfare system. Moreover, because targeting affects labour supply, we find that Pareto improvements are possible when targeting is either "too low" or 'too high". We also find that voting simultaneously over taxation and targeting is favourable to the poor in the sense that they can converge to their most-preferred policy by successively forming a majority coalition with the rich to increase targeting and with the middle to increase taxation.

1. Introduction

1.1. *Two difficulties of targeting*

The public debate about the reform of the welfare state in many countries features the idea of greater targeting of social security. On the one hand, the necessity of a greater concentration of benefits on those most in need commands wide support. On the other hand, targeted transfers can also affect

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people's economic behaviour. In fact, when targeting is based on labour income, as it is most often the case, reducing the benefit as income increases, imposes a high implicit tax rate on the recipients, which in turn discourages them to work harder.[1] As an illustration, according to a recent report (Field, 1995), nearly half of British households are now on means-tested benefits.[2] These include income support given to those without other means of support; family credit to heads of households on low pay; housing benefit to those who cannot afford their rent; and council tax rebates. Atkinson calculates that in 1993 the effective marginal tax rate reaches 96 per cent where all these benefits are received (1993: 57) (see also Webb, 1995).

Earlier theoretical work on this problem has typically compared a universal benefit with a targeted one on the basis of a social welfare or Pareto criterion (see Kesselman and Garfinkel, 1978; Sadka et al., 1982).[3] The main result is that the targeted benefit is Pareto superior (or social welfare maximising) when the compensated net wage derivative of labor supply is non-decreasing with income.

Recently some authors have provided more general arguments in favour of targeting. Moffitt (1985) shows that abandoning targeting could decrease work incentives of welfare recipients because of the possibility of changes in welfare participation. Assuming a continuum of types, Alesina and Weil (1992) demonstrate that the government can improve upon a linear income tax schedule (i.e., universal benefit) by offering an alternative tax schedule with both a lower tax rate and a lower lump-sum transfer. They show that more productive individuals will select this new tax schedule and will pay more taxes provided that their labour supply functions are sufficiently elastic to the net wage rate. To put differently, the high types would voluntarily accept a reduction in transfer in exchange for a lower marginal tax rate. This result has been confirmed in independent work by Slemrod et al. (1991) who use numerical optimisation to show that the high income taxpayers should be taxed at a lower rate than the low income taxpayers. Clearly these papers improve our previous knowledge by establishing a convincing case for targeting: namely that high incomes should be taxed at a lower rate to induce greater labour supply from the most productive individuals, while the increased tax revenue can be either redistributed in a lump-sum manner or used to reduce the tax burden on the least productive individuals, achieving a Pareto improvement. This is, of course, reminiscent of Seade (1977)'s no-distortion-at-the-top result.

Another problem with targeting is that benefits concentrated on the poor may lack the political support to sustain them and eventually end up being poor benefits. As noted by Amartya Sen, "the political economy of targeting has to be concerned not just with the economic problems of selection,

information and incentives, but also with the political support for, and feasibility of, aiming public policy specifically at removing the deprivation of particular groups" (1995: 14). Recently, Gelbach and Pritchett (1996) have shown that in a political model in which the policy maker chooses the degree of targeting and voters react by choosing the level of taxation, the redistributive gains from targeting can be insufficient to outweigh the resulting lack of political support for taxation and the consequent losses of funds available for redistribution.[4] They conclude that targeting the poor may be detrimental to the poor themselves.

The erosion of political support for sharply targeted benefits is well documented among political scientists (e.g. Skocpol, 1991; Wilson, 1987; and Jencks and Peterson, 1991). There are also some evidence supporting that argument. For instance, the change from universal food subsidies to targeted food stamps in Sri Lanka in the mid-1970s has provoked a significant reduction in funding so that many of the poor ended up absolutely worse off with a larger share of a smaller cake (see Gelbach and Pritchett, 1996). This political constraint to targeting is also recognised in a 1994 World Bank's report on poverty in Colombia: "although the program seemed effective and well targeted in Colombia, it lacked political support and was discontinued".

1.2. *The motivation of this paper*

The objective of this paper is then to bring together the incentive and the political aspects of targeting. As noted by Besley (1996), the existing literature has largely neglected this issue, so that few things have been written on the subject.[5] Thus, what is described in below is an attempt to make a potentially predictive analysis of the level of taxation and the degree of targeting with both political and economic content.

We suppose in the sequel that individuals differ by their productive abilities. Government can observe income which is taxed at a constant rate $t \in [0,1]$. Tax revenues are used to pay welfare benefits which are reduced at a constant targeting rate $\tau \in [0,1]$ as pre-tax income rises.[6] Thus each individual can receive welfare benefits provided that he is poor enough to be eligible. On this basis, we look for values of (t, τ) which are likely to emerge as political equilibrium.

We decompose our analysis in two parts. In the first part, we exogenously fix the level of τ and analyse the one-dimensional vote on t. In that context, we show that increased targeting is not detrimental to the poor up to a critical level above which redistribution lacks political support.[7] At this critical level of targeting a large fraction of the population (nearly three-quarters) receives welfare benefits. This is all the more surprising in view of the fact that the

median income group could push further targeting as a means to reduce transfers to those with income just above them.

In the second part, we study majority voting games where both tax and targeting rates are simultaneously chosen by the electorate. Our primary interest is to describe the types of political equilibria (t^*, τ^*). As is well known, it is virtually inevitable that in multidimensional choice problems majority voting leads to cycles which can cover the entire policy space. To escape this problem, we consider a voting process in which two political parties seek to maximise their vote share. The analysis reveals that it is not possible to find a majority coalition of the extremes that would reject the middle in exchange of lower taxation. More interesting yet, the poor can form alternative coalitions with the rich and the middle so as to raise respectively targeting and taxation to their most preferred levels.

The remainder of the paper is organised as follows. In the next section, we describe the model. Section 3 aims at giving a sound theoretical basis to the idea that pushing targeting too far may erode the political support for taxation. In Section 4, w e look for the tax and targeting rates which are likely to emerge in a democracy. Focusing on the electoral competition between two parties who try to maximise their vote share, we identify the weakly undominated strategies and the Kramer's vote-maximising trajectories. Section 5 concludes the paper.

2. The model

The model is adapted from Hindriks (1995) to address the political aspects of targeting. We consider a constant returns to scale economy with a finite (odd) number of agents $I = 1, ..., i, ..., n$. Agents differ according to their unobservable preference defined over consumption x and pre-tax income y.[8] The latter good can be thought of as efficient-labour so that the privately owned production sector transforms one unit of efficient-labour into one unit of consumption good. It is assumed that for each agent $i \in I$ the ranking of bundles (x, y) can be represented by a continuous, strictly monotone and strictly quasi-concave utility function $U_i : \Re^2_+ \to \Re$. We consider that pre-tax income is monitorable with sufficient accuracy. Hereby, we cast the targeting problem in a context where tax evasion is a minor preoccupation. (We relax this assumption in Section 5.)

The government collects income taxes from all agents $i \in I$ at a constant rate $0 < t \leq 1$ and pays welfare transfers according to

$$T(y) = b - \tau y \text{ for } y \leq b/\tau$$
$$= 0 \text{ otherwise},$$

where the targeting rate $\tau \geq 0$ represents the transfer-reduction rate. Since transfers are reduced at a rate τ as pre-tax income rises, it follows that the recipients (i.e. every agent i poor enough to be eligible) face an effective marginal tax rate equal to $t + \tau$ while the non-recipients (i.e. every agent i rich enough not to be eligible) face a lower marginal tax rate, t.

Taking as given (b, t, τ), each agent i chooses his pre-tax income to maximise $U_i(x, y)$ subject to the budget constraint $x = T(y) + (1 - t)y$ where the transfer function $T(y)$ is such as given above. Let $y_i(b, t, \tau)$ denote the pre-tax income that agent i chooses to earn given the fiscal parameters b, t and τ. Clearly his pre-tax income choice determines his welfare participation : agent i is recipient if $y_i(b, t, \tau) \leq b/\tau$ and non-recipient otherwise.[9] Hence the set of agents who weakly prefer being recipient is $R(b, t, \tau) = \{i \in I : y_i(b, t, \tau) \leq b/\tau\}$ and the set of agents who strictly prefer being non-recipient is $NR(b, t, \tau) = I - R(b, t, \tau)$. In general, holding b constant, we expect that welfare participation decreases with τ by the selection effect and increases with t by the disincentive-to-work effect.

Assuming a purely redistributive taxation, the fiscal parameters b, t and τ must satisfy the following government budget constraint:

$$\sum_{i \in R(b,t,\tau)} b = \sum_{i \in R(b,t,\tau)} (t + \tau) y_i(b, t, \tau) + \sum_{i \in NR(b,t,\tau)} t y_i(b, t, \tau) \qquad (1)$$

This budget-balanced condition establishes a functional relationship $b(t, \tau)$ which is complex and possibly discontinuous due to the shifting in welfare participation. In fact there is no compelling reason to believe that b would be a "well-defined" function either of the tax rate or the degree of targeting. Hence, agent i's indirect preferences over fiscal parameters need not be "well-defined" either. To circumvent that difficulty we shall throughout the paper make the following restrictions on individual preferences and resort exclusively to numerical simulations to derive the voting equilibria.[10]

We assume that individuals differ only by their ability level a and that it is common knowledge that the ability levels in the population $(a_1, \ldots, a_n)$ are uniformly distributed over the interval $[0, 1]$.[11] Without any loss of generality we label individuals so that $0 \leq a_1 < \ldots < a_n \leq 1$ and we represent individual preferences over (x, y) bundles by utility functions $U(x, y; a)$ parametrised by the ability level. Lastly, we restrict these utility functions to the following quasi-linear form:

$$U(x, y; a) = x - \frac{(y/a)^2}{2} \qquad (2)$$

where y/a is the effort level required from an agent with ability a to produce a pre-tax income y. Assuming quasi-linear preferences enables us to

avoid the circularity problem between the determination of the transfer level b and the pre-tax income levels y_i since, as we shall see shortly, it implies that there is no income effect on labour supply up to a change in welfare participation.

Given b, t and τ and the preferences represented in (2), agent i's optimal pre-tax income is given by

$$y_i(b, t, \tau) = \arg\max_y(x - \frac{(y/a_i)^2}{2}) \tag{3}$$

subject to

$$x = b + (1 - t - \tau)y \text{ if } y \leq b/\tau$$
$$x = (1 - t)y \text{ otherwise}$$

where the first and second constraints represent the agent's budget constraint respectively in case of welfare participation and non-participation. We can solve this optimal labour supply decision of agent i as follows. Agent i can freely choose his welfare participation. On the one hand, if he chooses to participate, his pre-tax income is the solution of

$$\max_y(x - \frac{(y/a_i)^2}{2}) \text{ such that } x = b + (1 - t - \tau)y \tag{4}$$

which yields $y_i^R = (1 - t - \tau)a_i^2$ and a corresponding utility level of $V_i^R = b + (1 - t - \tau)^2 a_i^2/2$.

On the other hand, if he chooses to opt out, his pre-tax income is the solution of

$$\max_y(x - \frac{(y/a_i)^2}{2}) \text{ such that } x = (1 - t)y \tag{5}$$

which yields $y_i^{NR} = (1 - t)a_i^2$ and a corresponding utility level of $V_i^{NR} = (1 - t)^2 a_i^2/2$. Agent i chooses to opt out and thus to earn a pre-tax income y_i^{NR} if and only if V_i^{NR} is greater than V_i^R. Hence agent i's indirect utility is

$$V_i(t, \tau, b) = \max\{V_i^R, V_i^{NR}\} \tag{6}$$

Fixing b, t and τ, high ability agents are thus less likely to participate than low-ability agents. Figure 1 section illustrates the optimal pre-tax income of agents of various ability levels. Notice that the change in welfare participation of agent i entails a discontinuous change in pre-tax income.

Incorporating the optimal pre-tax income function of every agent i into the government budget constraint (1), we derive by means of numerical simulations the functional relationship $b(t, \tau)$. This is illustrated in Figure 2.

Substituting again this functional relationship and the optimal pre-tax income function in the utility functions yields agent i's reduced indirect preference over t and τ, $v_i(t, \tau) = V_i(t, \tau, b(t, \tau))$.

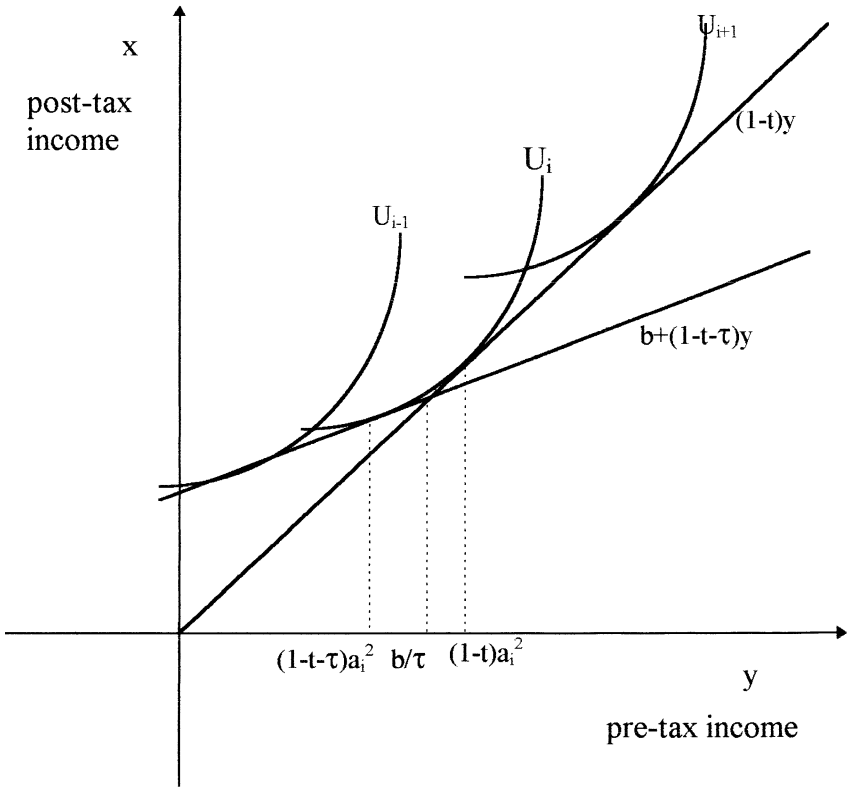

Figure 1. Optimal labour supply decisions where agent i is indifferent between welfare participation or not. Lower ability agents strictly prefer participating and higher ability agents strictly prefer opting out

The rest of the paper looks at values of (t, τ) which are likely to emerge as political equilibrium in our specific environment, and more importantly, aims at finding some qualitative properties which would extend to more general environments.

We decompose our analysis in two parts. In the first part, we assume that the targeting rate is given from the outside and we let the agents vote on the tax rate only. This allows us to see how a targeting change is likely to influence the level of taxation chosen by the electorate. In the second part, we let the agents vote simultaneously on both dimensions.

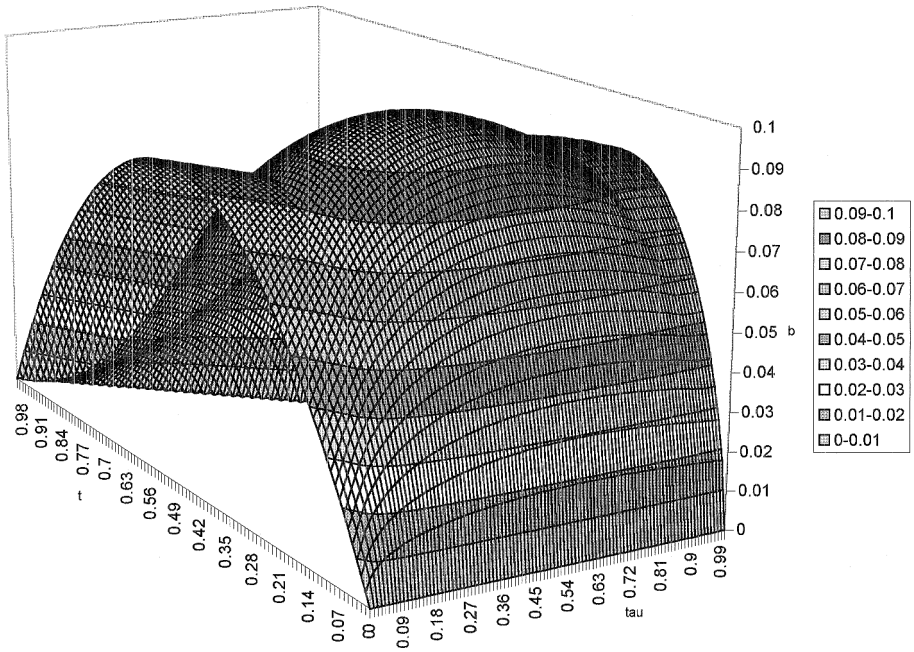

Figure 2. Dupuit-Laffer surface.

3. Why targeting may be fatal for redistribution

In this section we are not concerned about how the degree of targeting is determined. Rather, we are interested in investigating how its level influences the choice of t in a majority voting game. In doing so we aim at illustrating the idea mentioned in the introduction that sharply concentrated benefits may lack political support and eventually end up being poor benefits. In fact, we show that pushing targeting beyond a certain threshold destroys the political support for redistribution. Interestingly enough, this critical degree of targeting leaves a large fraction of the population on welfare; namely, three-quarters of the population.

Formally, our purpose is to derive the majority winning tax rate for various degrees of targeting, $t^*(\tau)$, and then to show that there exists a critical degree of targeting t° such that $t^*(\tau) = 0$ for all $\tau \geq \tau^\circ$.

In our majority voting game, agents take τ as given and vote over tax rates correctly anticipating the resulting effect on the aggregate pre-tax income level and participation rate. This is subsumed in their indirect preferences over tax rates.

Before starting the analysis, it remains to specify our voting equilibrium solution concept. A natural concept of political equilibrium is the Con-

dorcet winner.

Definition 1. An option x belonging to the set of feasible outcomes is the Condorcet winner if for any alternative feasible option y, the number of voters who strictly prefer x to y exceeds the number of voters who strictly prefer y to x.

The concept of Condorcet (or majority) winner is particularly appealing from a normative viewpoint. It is also very interesting from a purely positive viewpoint. As Ordeshook (1986) states, "(the) Condorcet winner (is) an outcome whose prominence reflects a particular configuration of individual preferences and that we anticipate being chosen under a wide variety of institutional arrangements (although not necessarily all arrangements)"(p. 298).

When options can be ranked on a single dimension on which voters have single-peaked preferences, Black (1958) has shown that the Condorcet winner is the option preferred by the median voter. Furthermore, the median voter blisspoint is also the option chosen at equilibrium in the benchmark Hotelling (1929)–Downs (1957) bipartisan electoral competition game (this result is usually referred to as the *median voter theorem*). We will describe this model more precisely below.

Going back to our specific environment and fixing $\tau = 0.30$, we can compute the optimal pre-tax income of each agent $i \in I$ for various tax rates and so derive their indirect preferences over tax rates as illustrated in Figure 3.

Figure 3 suggests that indirect preferences over tax rates may fail to be single peaked. The reason why single-peakedness over tax rates does not hold in the presence of targeting is simple. Starting from a small tax rate, an individual may dislike a marginal increase in taxation because he prefers not participating in the welfare program. However further increases in taxation may induce him to switch to welfare participation and so to favour these further increases in tax rate.

It is easily seen in our setting that individuals can be ordered by their pre-tax income independently of the fiscal policy: individuals of higher ability always earn higher incomes.[12] Roberts (1977) called this property the Hierarchical Adherence and demonstrated that it is a sufficient condition for the median voter theorem to apply in a voting game over tax rates. The reason is that Hierarchical Adherence ensures that if the median ability agent favours a move towards lower tax rates, half the population with lower ability levels will also favour this move. So, although indirect preferences over tax rates are not single-peaked, we know that if for any given degree of targeting the median voter has a unique most preferred tax rate, it corresponds to

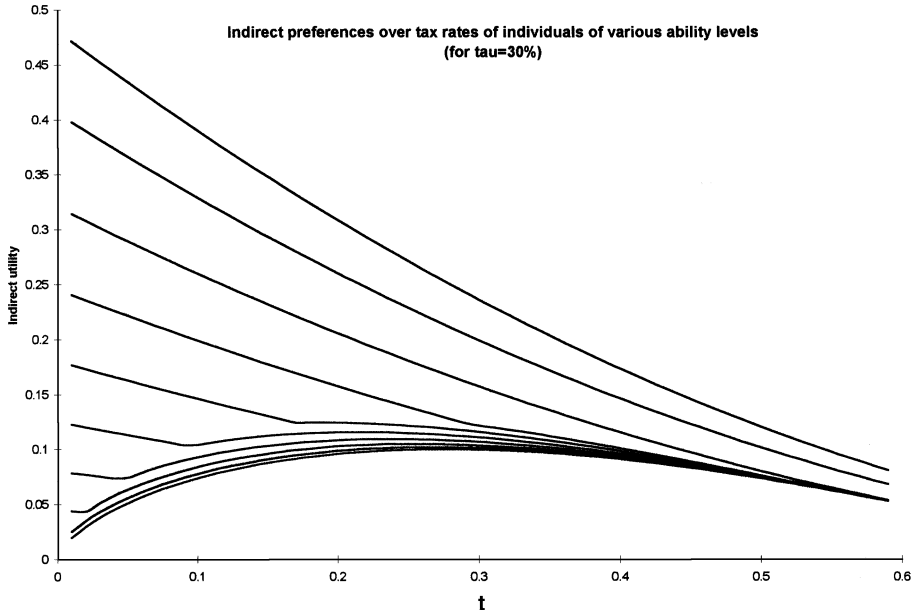

Figure 3. Indirect preferences over tax rates of individuals of various ability levels (for tau = 30%).

the unique majority voting equilibrium (and Condorcet winner) of the game. As illustrated in Figure 4, the median voter's most preferred tax rate is a U-shaped function of τ.

This U-shaped function has the following interpretation. If τ is sufficiently low, everybody is on welfare which implies as shown in Figure ■ that everybody faces an effective marginal tax rate equal to $t + \tau$. Being on welfare, the median voter chooses the level of t which maximises $v_{med}(t, \tau) = b(t, \tau) + (1 - t - \tau)y_{med}(b, t, \tau)$ where the level of b depends on the aggregate pre-tax income and participation rate. Clearly, any change of t and τ that keeps both the effective marginal tax rate $t + \tau$ and the participation rate constant does not affect individual welfares since the pre-tax incomes and the level of transfer $b(t, \tau)$ are unchanged. Hence, tax rate and targeting rates are perfectly substitutable instruments of taxation ; and it is no wonder that the median voter responds to any increase in τ by a one-to-one reduction in $t^*(\tau)$ so as to keep the effective marginal tax rate at his most-preferred level $t^*(\delta) + \delta = 0.20$. However as τ increases and $t^*(\tau)$ falls accordingly to a certain point, the high-income agents opt out the welfare program. At this moment, t and τ are no longer perfect substitutes since raising t increases the contribution of the non-recipient (i.e., those agents rich enough not to be

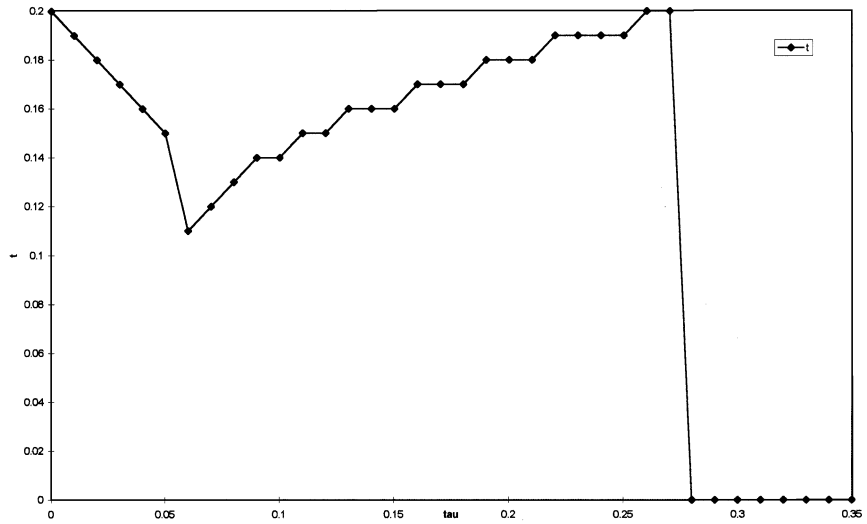

Figure 4. Marginal tax rates selected by majority voting for various degrees of targeting.

eligible) while an increase of τ does not. This implies that the median voter is less willing to reduce t as τ increases. In fact, for a uniform distribution of ability, the number of agents opting out is so high that the median voter starts favouring further taxation as a means to extract more income from them. Hence, increasing the degree of targeting rises the majority winning tax rate and so does $\mathrm{b}(\mathrm{t}^*(\tau), \mathrm{t})$[13] while $\mathrm{R}(\mathrm{t}^*(\tau), \tau)$ decreases monotonically.

As τ increases, the median voter progressively raises $\mathrm{t}^*(\tau) + \tau$ up to the point, such as illustrated in Figure 4, where he starts favouring the laissez-faire situation. Pushing targeting beyond that point (labelled τ°) would destroy the majority support for taxation and drive the majority winning tax rate to zero. This is the theoretical underpinning of the idea that sharply targeted benefits may erode their political support and end up being small benefits. Clearly this result cautions against policies that would push targeting too far.[14]

Interestingly enough, in our example, more than three-quarters of the population is still on welfare at τ° which means that we do not need to reject the richest half of the population from the welfare benefits to erode their political support. Figure 5 below shows heuristically that this result is not specific to the environment adopted.

Clearly, the median voter will always favour zero taxation instead of opting out the welfare system and being a net fiscal contributor. As long as the slope of the indifference curve in the (t, τ) space is monotonically decreasing with the ability level and the distribution of ability is smooth enough, we have that

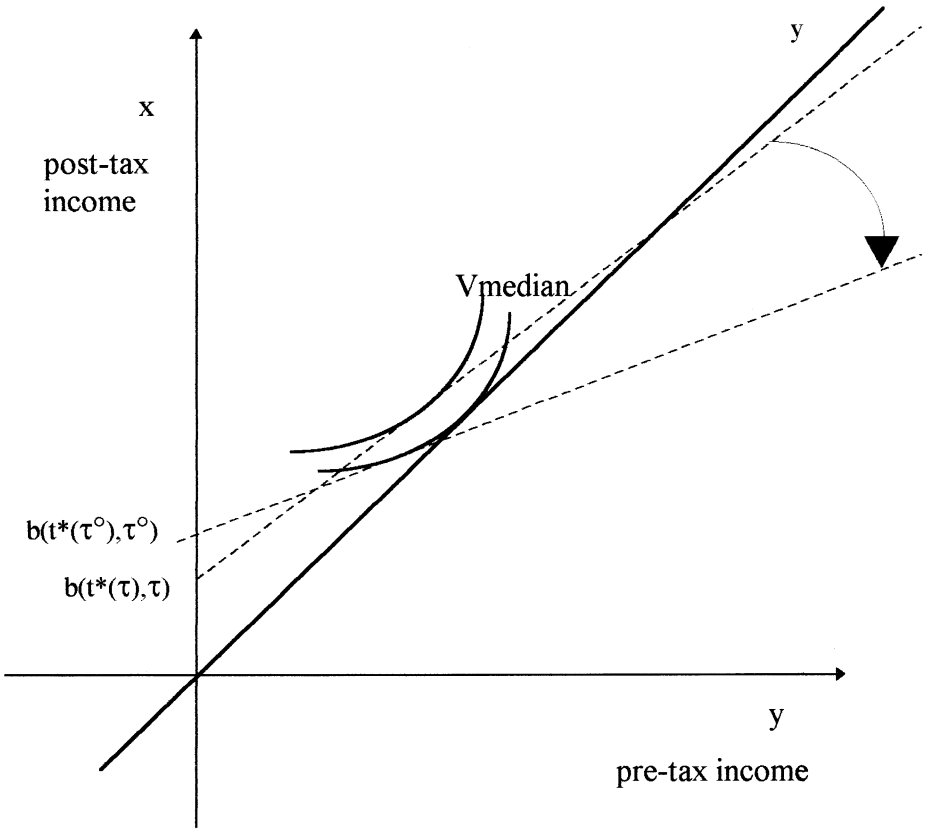

Figure 5. When targeting may be fatal for redistribution. Increasing τ rises $t^*(\tau)$ and $b(t^*(\tau), \tau)$, which provokes a clockwise rotation of the median voter budget line up to the point $\tau = \tau^\circ$ where he starts favouring zero taxes.

at τ° some individuals with higher abilities than the median voter necessarily prefer being on welfare than opting out. This implies that strictly more than half the population is on welfare at τ°.

4. Voting over targeting and taxation

We now allow individuals to vote simultaneously on the tax and targeting rates. Unfortunately, Plott (1967) has shown that multidimensional majority games usually do not have a Condorcet winner. The consequence of this absence is rather severe, since the social preference generated by pairwise majority comparisons may be cyclic over the entire set of feasible options.[15]

In such circumstances, one could resort to issue-by-issue voting, where individuals vote on one dimension at a time (see Shepsle and Weingast, 1981). However, issue-by-issue voting raises more problems in our setting than it solves.

First, for any given level of taxation, our model does not guarantee the existence of a Condorcet winner on the τ dimension. This is due to fact that the decisive voter is endogenous. To understand this, fix $t > 0$ and consider the preference profile over τ. Let τ_1 denote the targeting rate which is most-preferred by the median income voter *in the population* and let τ_2 $(\tau_2 > \tau_1)$ denote the targeting rate such that the median voter weakly prefers zero targeting. Fixing $t > 0$, τ acts as a linear tax rate among the recipients. If the median income is less than the mean income in the population, the voter with median income prefers the positive τ_1 over zero and the poorest half of the population has the same preference ordering. Hence, τ_1 defeats zero in pairwise majority comparison. Comparing τ_1 to τ_2, the non-recipients are indifferent (since t is the same) and we assume that they cast their vote for τ_2 which is preferred by the poorest individual.[16] If the median *among the recipients* prefers τ_2 over τ_1, then the poorest half among the recipients have the same ordering and τ_2 defeats τ_1. But by definition the median in the population strictly prefers zero targeting over τ_2 and so the richest half of the population have the same preference ordering. It follows that zero targeting defeats τ_2 and the voting cycle arises where τ_1 beats zero, τ_2 beats τ_1, and zero beats τ_2.[17]

The second problem with issue-by-issue voting is that even if we modify our model to obtain a Condorcet winner on the τ dimension, the fact that individuals' preferences on (t, τ) are not separable (i.e. that a person's preferences on one dimension depend on what occurs on the other dimension) implies that the selected outcome is very sensitive to the type of voting procedures we choose. For example, supposing that agents vote independently on the two dimensions gives results different from those obtained when individuals vote sequentially in a predefined order. The result is also very dependent on whether or not issues can be reconsidered and voters are sincere/sophisticated.

The third problem raised by the issue-by-issue voting, as noticed by Gevers and Jacquemin (1987), is that it can select a Pareto dominated option. We can show that this is actually the case in a slightly modified version of our model (available on request).

Thus, in the sequel, we study the simultaneous voting on (t, τ). In doing so, we use the standard Hotelling-Downs electoral competition game between two parties. We select this bipartisan model for two reasons. First, this model selects as unique Nash equilibrium the Condorcet winner whenever it exists.

Second, it reflects a real-world tendency toward two-party systems. The theoretical argument behind this so-called Duverger's law is that if voters think that all parties are not equally likely to win the elections, they can fear to lose their vote if they do not vote for a party which has serious chances of being elected.[18]

4.1. *Bipartisan electoral competition*

We now describe more precisely this bipartisan electoral competition game. Two political parties simultaneously choose an option (t, τ) in the set of feasible options $\blacksquare = \{t, \tau : 0 \leq t, \tau \leq 1, 0 \leq t+\tau \leq 1\}$.[19] Each voter then votes for the party whose option maximises his indirect utility function (since there are only two political parties, there is no room for strategic voting). The party which receives the greatest number of votes is then elected, and implements its option as the social choice of the economy.

To complete the description of this game, we need further specification of the parties' objectives. We suppose that the parties are only interested by the results of the election and that they derive no intrinsic utility from the particular option they choose. Furthermore, we suppose that the parties are not only interested in winning the elections, but also in the size of their majority, as represented by the number of votes their option attracts. This hypothesis seems more meaningful than supposing that parties are only interested in winning the election and thus have a zero marginal utility for votes once a bare majority is achieved. Several justifications can be given to this hypothesis. Following Kramer, "uncertainty about the election outcome itself, or in a parliamentary system, about future defections or deaths among the majority party, provides a strong incentive for parties to strive for larger-than-minimal majorities, as risk insurance. Moreover, a large winning margin is generally valued in itself as a "mandate" for the victor, and in many systems brings tangible benefits such as increased patronage, and the election of legislators from marginal districts whose indebtedness to the party leadership ensures a more cooperative legislature" (1977, page 317).

We now describe formally the voting game. There are n individuals, each endowed with an indirect utility function $v_i(t, \tau)$. If $v_i(t_1, \tau_1) > v_i(t_2, \tau_2)$, we say that individual i votes for option (t_1, τ_1) when given the choice between (t_1, τ_1) and (t_2, τ_2). Similarly, if $v_i(t_1, \tau_1) = v_i(t_2, \tau_2)$, we impose that individual i votes for that option which is preferred by the poorest individual.

Let $n_{xy} = \#\{i \in I : v_i(x) > v_i(y)\} + \#\{i \in I : v_i(x) = v_i(y) \text{ and } v_1(x) > v_1(y)\}$ denote the number of votes received by option x when confronted to option y in pairwise comparison $(x, y \in \blacksquare)$. Since political parties want to maximise the number of votes their option receives, n_{xy} is party 1's payoff when it chooses option x while party 2 opts for y.

In this so-called "bipartisan plurality game",[20] it is straightforward that a unique Nash equilibrium in pure strategies exists if and only if a Condorcet winner exists, in which case both parties select this option. If there is no Nash equilibrium in pure strategies, one can think of applying weaker solution concepts, such as the deletion of weakly dominated strategies, the saddle or the Nash equilibrium in mixed strategies. These solution concepts have been widely studied in the context of bipartisan plurality games for a finite set of options.[21]

Our purpose is thus to distinguish several solution concepts and to consider their implications for the choice of a fiscal policy. We shall pay particular attention to the deletion of weakly dominated strategies and Kramer's vote-maximising trajectories.

4.2. *Deletion of weakly dominated alternatives*

Definition 2. *We say that option* x weakly dominates option y ($x, y \in \blacksquare$) if and only if $n_{xz} \geq n_{yz}$ for all $z \in \blacksquare$, with at least one strict inequality.

This criterion is an incomplete selection mechanism. On the one hand, when an alternative is weakly dominated, it is reasonable to think that it is unlikely to be selected. On the other hand, the set of weakly undominated alternatives cannot be seen as the set of "best" alternatives since it does not reduce to the Condorcet winner whenever it exists (although this set always contains the Condorcet winner).

Figure 6 illustrates this set on a finite policy space where t and τ vary in $[0, 1]$ by increments of 0.02 subject to the constraint that $t + \tau \leq 1$. It turns out that 85 percent of the possible alternatives are weakly dominated and that the set of weakly undominated alternatives is connected. One can show that weakly undominated strategies cannot be Pareto-dominated (see De Donder (1996)), but Figure 6 further indicates that the Pareto set coincides with the set of weakly undominated alternatives.

Figure 6 also shows that options with sufficiently high tax rates or targeting rates are Pareto dominated. The reason is simply that all theses options are on the downward sloping side of the Laffer surface (see Figure 2) and thus that it is possible to reduce either the level of taxation or the degree of targeting without reducing b, achieving a Pareto improvement. Moreover, Figure 6 shows that sufficiently small targeting rates are Pareto dominated. To understand this, consider Figure 7 and observe that when the targeting rate is sufficiently small with respect to the tax rate, everybody is on welfare. Hence, by the strict quasi-concavity of preferences, there exists another scheme with a lower tax rate $t' < t$ and a higher targeting rate $\tau' = \tau + t - t'$

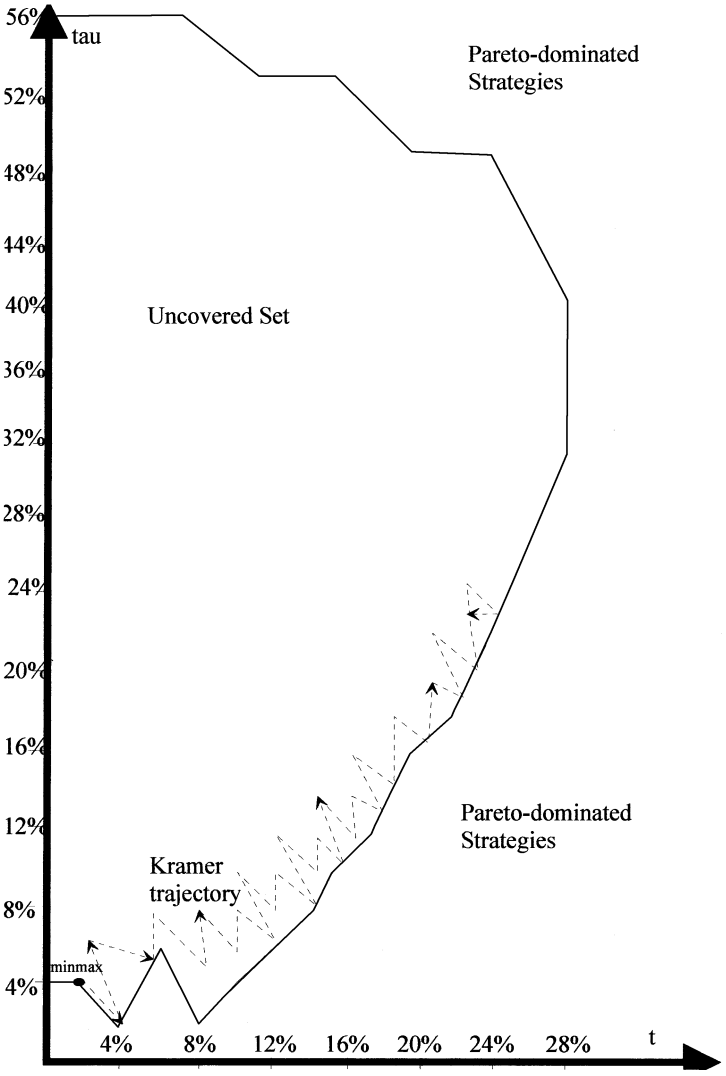

Figure 6. Uncovered set, Pareto-dominated strategies and the Kramer's trajectory.

which makes individual n (with the largest pre-tax income) weakly better off by voluntarily opting out the welfare program and such that the government budget constraint is relaxed. This in turn enables the government to increase b, achieving a Pareto improvement.

In short the richest agent n voluntarily abandons welfare benefits in exchange for a reduction in tax rate which induces him to work more and to pay more taxes. This in turn enables the government to pay higher transfers. Note also

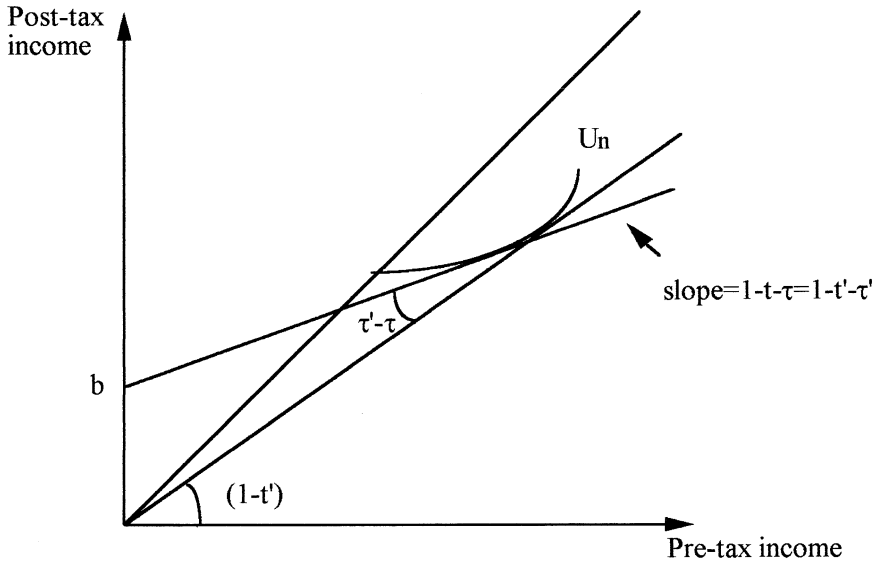

Figure 7. Why having everybody on welfare is Pareto-dominated.

that this argument does not depend on the particular distribution of abilities chosen.

This Pareto argument in favour of greater targeting holds true as long as the number of non-recipients is small enough (that is, the targeting rate is sufficiently small with respect to the tax rate). Indeed, let us continue the fiscal reform that increases τ and lowers t such that $t + \tau$ remains unchanged and further individuals opt out. Clearly opting out makes all these individuals better off and increases their net tax payment. All those individuals who were already non-recipients are made better off by the reduction of their tax liability. Hence provided that the size of the latter group is small enough the budget constraint is relaxed and the government can achieve a Pareto improvement by increasing b.

It is worth mentioning that the many Pareto dominated options challenges the widespread view that targeting cannot achieve Pareto improvements (see e.g. Besley, 1996). Indeed, it is quite possible that the cost of sharper targeting borne by the rich be offset by the corresponding tax reduction. And, conversely, it is possible that a reduction in targeting makes everybody better off by a Laffer-type effect.

4.3. *Dynamic competition à la Kramer*

We now seek to narrow down the set of weakly undominated options by considering the dynamic version of the bipartisan plurality game due to Kramer (1977). In that voting game, the incumbent is committed to defend its current policy for the next election[22] and voters as well as political parties act in a myopic way, ignoring the effects of their choice on the subsequent elections.[23] We continue to assume lexical altruism; that is, indifferent voters cast their vote for the option preferred by the poorest individual. We represent the results of this dynamic process by a sequence of pairs in the voting space (t, τ), which we call a "vote-maximising trajectory". This trajectory is a sequence of options such that each point along the sequence beats with a maximal number of votes its predecessor or, to put it differently, each point along the trajectory represents the maximal opposition to its predecessor. Formally, considering two adjacent points x_t, x_{t+1} along the sequence, $x_{t+1} \in \arg\max_{y \in \blacksquare} n_{yx_t}$. In that context, Kramer's paper underlines the fascinating property of the minmax set. By definition, this set contains all options whose maximal opposition in pairwise comparisons is minimum:

Definition 3 $\text{minmax}(\blacksquare) = \arg\min_x(\max_{y \neq x} n_{yx})$

Kramer demonstrates that for Euclidean preferences the minmax set behaves like a basin of attraction in the sense that any vote-maximising trajectory converges to the minmax set. He also shows that the minmax set is not a stable equilibrium "in the sense that there is no guarantee that a trajectory which enters the minmax set will necessarily remain inside thereafter. (...) A trajectory which jumps outside must immediately return toward the minmax set, but re-entries and subsequent departures may recur repeatedly" (Kramer, 1977: 324). He further conjectures that, with a sufficient number of voters, vote-maximising trajectories which enter the minmax set remain "close" to it (though not necessarily inside).[24]

Turning to our stylised model, Figure 5 represents the (unique) vote-maximising trajectory starting from the minmax. The minmax set is the singleton $(t = 0.02, \tau = 0.04)$ whose maximal opposition is 55 percent and the vote-maximising trajectory diverges irreversibly from it. The shape of this trajectory and the cycle to which it converges deserve some explanation. At the minmax, both the level of taxation and the degree of targeting are deemed too small by the low-income group. This group would like to raise both t and τ up to their maximal levels (in the Pareto set) compatible with the preservation of the political support for taxation (see Section 3). These values are in fact those in the cycle where t and τ vary between $[0.22 - 0.24]$. To raise pro-

gressively the tax and targeting rates the low-income group will form a coalition in turn with the middle class by "offering" them to reduce τ in exchange for a proportionate increase of t, and then with the high-income group (i.e., non-recipients) by "offering" them to reduce slightly t in exchange for a sufficient increase of τ. Hence by alternating in power successively with the middle class and the rich, the low-income group pushes progressively t and τ towards their most-preferred levels. This result departs sharply from the median voter argument.

Further simulations reveal some more technical features of the vote-maximising trajectories such as : (i) Any trajectory starting from t $\leq$ 0.04 enters the minmax set and then definitively leaves it, while any other strategy does not even enter the minmax set ; (ii) For no trajectory (whichever the starting point) does the distance to the minmax set monotonically decrease ; (iii) All trajectories (whichever the starting point) end to the same cycle in which t and τ vary between $[0.22 - 0.24]$, and three-quarters of the population is on welfare.

To conclude this section, we ask whether our political equilibrium possesses any desirable properties in terms of poverty alleviation. Fixing the poverty level at 75 percent of the median income, we find that the elimination of poverty is incentive compatible but politically unfeasible. In fact for values of t and τ varying between 0.22–0.24, one third of the population falls under the poverty line with an average income shortfall equal to one fifth of the poverty line.

5. Concluding remarks

The widespread acceptance of targeting among economists relies on the idea that any policy which aims at a specific objective necessarily requires some forms of selection. If the aim is to alleviate poverty, the policies must somehow concentrate on the really poor and there is no way of dispensing with such selection.

If the need for targeting is clear enough, it nevertheless raises the question: where to stop? This paper has studied the choice of the degree of targeting and the level of taxation in relation to political and economic factors. Without any claim of generality, our model attempts to capture as simply as possible the most salient aspects of targeting; notably that targeting affects both the economic choice of labour supply and the political choice of the level of taxation.

On (Pareto) efficiency grounds, we have discredited the view that targeting is in substance equivalent to a transfer scheme which takes money from the very rich to help the poor and thus cannot achieve Pareto improvements (see

Besley, 1996). We have in effect demonstrated that sharper targeting is Pareto improving when everyone is on welfare. The reason is that further targeting induces the more productive agents to abandon voluntarily their welfare benefits in exchange for a reduction in their marginal income tax, making everyone better off. Conversely, we have shown that lowering targeting from high levels can make everyone better off by a Laffer-type effect. Between these upper and lower limits targeting raises conflicts of interest that can be solved by a voting procedure.

Supposing first that agents can vote on tax rates only, we have shown that the electorate may rise taxation in response to a targeting increase but that pushing targeting beyond a certain level is fatal for redistribution even though this level of targeting rejects only a small fraction of the population from the welfare benefits. In this voting game the median voter is decisive. Supposing next that agents simultaneously vote on the level of taxation and the degree of targeting, we have illustrated how the low-income group can form alternative coalitions with the middle and the rich so as to raise respectively taxation and targeting. In this case the decisive voter is rather the poor.

Most fundamentally, this paper suggests that one should be wary of oversimplifying the political economy of targeting. First, one need not reject half the population from the welfare benefits to destroy the political support for taxation. Second, when income is variable it may be difficult for a coalition of rich and poor individuals to reject the middle-income agents from the welfare benefits in exchange for a tax rate reduction. Third, voting over taxation and targeting need not be so detrimental to the poor since they can form coalitions that correspond to their best interest.

The electoral models presented here should be considered as benchmark cases. Since the main conclusion of modern political economy is that institutions and procedures do matter, further work should be devoted to the study of alternative models of election and to the robustness of the results derived above with respect to these modifications. More precisely, the first part of our analysis relies on the equilibrium concept of Condorcet winner. This concept, apart from his appealing normative properties, is used because it is chosen under a wide variety of institutional arrangements (including voting in committees with binary agendas procedures and sophisticated voting or with logrolling). In absence of Condorcet winner, the second part of our analysis re lies on a particular bipartisan electoral competition game and on various solution concepts such as the uncovered set and the minmax set. These concepts represent different ways to generalise the Condorcet intuition.

The uncovered set is an often studied concept which is sufficiently large to include nearly all the other solution sets defined in the social choice literature. Many institutional frameworks (such as amendment agenda procedures)

select an outcome belonging to that set. Also, the interest devoted to the minmax set is not restricted to Kramer's dynamic bipartisan electoral game. It is also studied in relation with "super-majority rules", i.e. when strictly more than half the number of votes is required to defeat the status quo. The minimum super-majority for which a super-majority winner exists is in fact the minmax number and the set of such winners is the minmax set. Going back to Kramer's dynamic model, weakening re-election constraints by requiring a super-majority to replace the incumbent policy would thus reinforce the attraction properties of the minmax.

To make the foregoing analysis reasonably tractable, we have had to make strong assumptions about the structure of the problem, especially about the form of individual preferences and the distribution of ability. However, we have also explained in the paper why changing preferences or the distribution of ability is unlikely to change our results.

Our analysis also rests on the assumptions that agents can freely choose their labour supply, that there is no stigma of being on welfare, and that income is costlessly observable. The latter assumption is certainly crucial, as sharper targeting would increase the incentive to conceal income in order to be eligible for greater benefits. We have thus investigated the impact of this possibility on our results. We find that allowing individuals to conceal a fraction of their income at a quadratic cost provokes a downward adjustment of the voting equilibrium level of taxation and degree of targeting without affecting any of the qualitative properties of our results.

The link between the political economy of targeting and the value that people place on self-reliance and responsibility also deserves further investigation. If most contributors to the welfare state regard the causes of poverty as sharply influencing their willingness to offer aid, tying welfare benefits to work requirements could enhance the political feasibility of targeting. This scheme rejects in effect all those whose deprivation is caused by an unwillingness to work.

6. Glossary

I set of agents, indexed by $i = 1, \ldots n$
$V_i(t, \tau, b)$ indirect utility function of agent i
$v_i(t, \tau)$ reduced indirect utility function of agent i
$T(y) = b - \tau y$ transfer level
y pre-tax income
τ targeting rate
t tax rate
R set of recipients

NR set of non-recipients
$a_i \in [0, 1]$ ability level of agent i
U utility function
$t^*(\tau)$ median voter's preferred tax rate as a function of the targeting rate
■ set of feasible options (t, τ)
n_{xy} number of votes received by option x against option y

Notes

1. For a nice survey on the targeting of social security, see Atkinson, 1993.
2. The document shows that there were nearly 16 million claims for means-tested help in 1993. When those claiming more than once are removed, the net figure was just equivalent to half of all households in Britain.
3. These papers claim to provide an analysis of the efficiency of "income testing". But in fact, any tax and transfer program that intends to effect redistribution from the high income to the low income is by nature income tested. This is the reason why we choose to adopt the expression "targeting" instead of "income testing".
4. In their model there are no income and substitution effects on effort induced by taxation up to the point where workers switch to the untaxed sector.
5. Since this paper was written we have learned of the related work of Moene and Wallerstein (1996). Their work differs from our paper mainly to the extent that taxes have no distorting effect on the labour supply of agents that stay in the labour market, and that targeting imposes necessarily a 100 percent tax rate on the welfare recipients.
6. The very fact that the social policy debate is framed mainly in terms of income based targeting is a good justification for taking this view. This contrasts with Gelbach and Pritchett (1996) who base targeting (as well as taxation) on occupational choice.
7. This is in sharp contrast with Gelbach and Pritchett (1996) who find that any targeting increase will reduce the majority winning tax rate so much that the poor will be made worse off.
8. It should be noted that difference of productive ability can be viewed as difference of taste since high ability agents find it easier to do additional work of the same productive value.
9. We are supposing here that there is no cost to claim welfare benefits and we are ignoring the stigma-related disutility of participation. In fact, it can be shown that positive participation costs would not affect substantially our analysis provided that the decision of being on welfare is positively related to the amount of benefit.
10. We always accompany our numerical results with a discussion which aims at showing how the results are likely to extend to a more general environment.
11. This is clearly a simplifying assumption. However, the main results of the analysis do not change if we adopt a different distribution of ability such as the lognormal distribution.
12. This property in fact holds true for all tax functions that are incentive-compatible (see Guesnerie and Seade, 1982). It is worth noting that the median pre-tax income level is less than the mean income so that the pre-tax income distribution is positively skewed although abilities are uniformly distributed.
13. This might of course fail to hold for a skewed distribution of ability if the number of agents at the top of the distribution is sufficiently small. However, our central point remains valid, that is, the median voter need not reduce the tax rate in response to an increase in the degree of targeting. Notice that this result contrasts with the widespread opinion, as stated in the introduction and formalised in Gelbach and Pritchett (1996), according to which increasing targeting will reduce monotonically the tax rate.

14. Notice that this result is not specific to the uniform distribution of ability since it requires only that $t^*(\tau) + \tau$ increases with τ, which as we have check ed is true for a large class of distributions of ability (including the lognormal distribution).
15. More precisely, McKelvey (1975) shows that if preferences are convex in the multidimensional policy space and if there is no Condorcet winner, then for any two options A and B there exists a finite sequence of pairwise comparisons which starts with the option A and ends with the other option B such that each point along the sequence is preferred by a majority of voters to its predecessor.
16. This assumption of lexical altruism is made for tie breaking purpose only. It is worth noting that most of our results would remain unaffected if we assume rather that indifferent voters distribute their vote evenly on the different options.
17. The probability of a voting cycle is even increased by the possible non-concavity of $b(t, \tau)$ with respect to τ (when $t > 0$ is fixed) which implies that indirect preferences over τ need not be single-peaked.
18. See Myerson (1995) for more on this.
19. Note that we rule out the possibility that the recipients face an effective marginal tax rate greater than one which would imply that net income decreases when gross income rises.
20. The "plurality" term refers here to the objectives of the two parties and not to the way a winning party is elected when allowing for more than two competing parties, as in the "plurality voting" expression used by Myerson (1995).
21. See De Donder (1996) for a survey on the links between these game theoretical solution concepts and the solution concepts developed in the social choice literature on tournaments. See also De Donder, Le Breton and Truchon (1996) for a detailed study of the inclusions/disjunctions between these solution sets.
22. This assumption combined with the absence of Condorcet winner, insures that both parties will alternate in power.
23. This assumption greatly simplifies the analysis (otherwise, we would have to specify explicitly the objective of each kind of player, such as for example maximising a discounted sum of utilities over a given time horizon) and seems supported by real world evidence (at least for large electorates and not too frequent elections).
24. Gevers and Jacquemin (1987) provide a nice application of the minmax set theory in a two-factor economy where individuals vote over labour and capital tax rates. Interestingly, their simulation results reveal that the stability property of the minmax set extends beyond Euclidean preferences.

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