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Social Norms, the Welfare State, and Voting

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Social Norms, the Welfare State, and Voting^α

Assar Lindbeck^γ, Sten Nyberg^z and J rgen W. Weibull^x

April 9, 1996

Abstract

This paper analyzes the interplay between economic incentives and social norms in a public finance context. We assume that to live off one's own work is a social norm, and that the larger the population fraction adhering to this norm, the more intensely it is felt by the individual. It is shown that this may give rise to multiple equilibria and to non-linearities that do not arise from economic incentives alone. In the model, individuals also vote on taxes and transfers. Hence, the social norm influences both their economic and political behavior. We show that monotone and continuous changes in external factors may result in non-monotone, and even discontinuous, changes in the political equilibrium.

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1 Introduction

Both economic incentives and social norms influence individual behavior. While sociologists have emphasized social norms, economists have dealt mainly with economic incentives. It is therefore of considerable interest to analyze human behavior taking both factors into account. This paper is an attempt along those lines.

We have chosen to study this issue in a specific context, namely the political economy of welfare-state benefits. The economic relevance of this topic is evident from the fact that such benefits have increased dramatically in recent decades, and now constitute a large fraction of the national income in most OECD countries. Examples of such benefit systems are social assistance ("welfare" in US terminology), early retirement, and unemployment benefits. About a quarter of the Swedish population in working age is, at a given point in time, basically financed in this way. Similar, though somewhat lower, numbers are found in some other west-European countries such as Belgium and Denmark.

In our analysis of the interplay between economic incentives and social norms in this context we focus on two types of choices in connection with benefit systems - economic and political. On one hand, the individual maximizes her utility subject to given taxes, transfers, and the behavior of others. On the other hand, the individual expresses her preferences concerning taxes and transfers as a voter.

We assume that there is a social norm against living on social benefits, i.e., on other people's work. This assumption conforms to the views of at least some sociologists: "The work place is a hotbed of norm-guided action. ... There is a social norm against living off other people and a corresponding normative pressure to earn one's income from work." (Elster [6], p. 121). While the existence of such a social norm is taken as given here, the intensity of the norm, as perceived by the individual, is endogenous in our model and depends on the number of people adhering to it. We assume that living on transfers becomes relatively more attractive when more individuals do likewise ("preferential herding"). Thus, when the population fraction of transfer recipients is large (small), the individual's discomfort from such a life style is relatively weak (strong).

We assume that every individual can choose between two (and only two) alternatives: either to work full time or to live solely on public transfers. In reality, individuals often do not have such a choice, and those who do need not have only two alternatives. Within limits, however, many individuals have some discretion to choose whether to utilize existing benefits or not, and they are more or less constrained to work full time or not at all. Moreover, many benefits require that the individual does not work. The subsequent analysis can be extended to cases where only some individuals are entitled to benefits, and where part-time jobs are available and compatible with some benefits etc. However, our concern is here to understand the logic of the interplay between economic incentives and social norms in the simplest possible setting.

Whether the individual chooses to work or not depends on the after-tax wage, level of public transfers, and the population fraction of transfer recipients. The tax rate and the per capita transfer are, in turn, determined in a political process. We assume that every individual correctly foresees the share of transfer recipients resulting from any tax/transfer combination on the political agenda, and votes according to her preferences. We define political equilibrium in terms of what we call an unbeatable policy, i.e., a transfer/tax combination that balances the government budget and obtains a majority of votes against any alternative balanced tax/transfer combination. It follows from our set-up that an unbeatable policy is either the zero-transfer zero-tax policy or a policy that results in a majority of transfer recipients. Political equilibria with a minority of transfer recipients may, however, arise if one extends the model to encompass altruism (see section 6). By way of computer calculations we show that monotone changes in preferences and endowments can result in non-monotonic and even discontinuous changes in political equilibrium. In this sense, monotone changes in exogenous factors may result in the "rise and fall" of the welfare state.

Theoretical and empirical research by economists on the effects of welfare-state benefit programs have relied on economic incentives. In an influential paper by Meltzer and Richard [8] this approach was extended by letting the size of government transfers be endogenously determined by voting. Our modeling of political equilibrium is similar to theirs. However, while they emphasize the disincentive effects of marginal tax wedges we focus on the disincentive effects of the benefit system. Moreover, the transfer in their model is granted to everyone regardless of their hours of work, while in our model the transfer is an alternative to work. A more fundamental difference is that while social norms constitute an important part of the present analysis, these are not part of Meltzer's and Richard's model.

To consider social norms is commonplace in sociology. For surveys, see, for instance, Coleman [5] and Elster [6]. An early attempt to incorporate social norms in economic analysis is a study by Akerlof [1] on the role of social customs in a model of fair wages and unemployment. Our model of norms is similar to that of Akerlof. However, Akerlof does not deal with issues of public finance, nor are political decisions analyzed in his model.

We model social norms in the same vein as in the literature on interdependent preferences, in particular in models where average behavior (such as average consumption or average hours of work) enter the individual's utility function; see for instance, Blomquist [4] and the literature references there. Social norms have also been analyzed in a recent paper by Bernheim [3] where adherence to social norms is obtained as an equilibrium outcome driven by individuals' wish to obtain social esteem. The interplay between economic incentives and social norms, in connection to welfare state policies, is informally discussed in Lindbeck [7].

The paper is organized as follows. In section 2 we describe the individual's

economic decision problem: whether to work or to apply for the transfer. In section 3 the government's budget constraint is introduced, and section 4 examines which budget-balanced policies qualify as political equilibria under majority rule. In section 5 we illustrate some equilibrium properties of the model by way of computer calculations. Section 6 extends the model to encompass altruism, and section 7 offers some concluding comments. All proofs are relegated to an appendix at the end of the paper.

2 The model

2.1 Micro behavior

Each individual i has a binary choice: she either works full time or does not work at all. In the first case, she consumes her after-tax wage earnings $(1 - t)w_i$ and enjoys some leisure. We normalize this level of leisure to zero. Here t is the tax rate on wage earnings and w_i is her wage. In the second case, the individual receives a government transfer T . This transfer is exempted from taxation and is granted to anyone lacking other income.¹ An individual who receives this transfer thus consumes T and enjoys full-time leisure. Individuals may also experience disutility from accepting the transfer, however. This may be some degree of embarrassment or social stigma associated with living on public transfers rather than on one own's work. Such embarrassment is likely to be weaker the more individuals in society live on the transfer. Thus, if the population share living on the transfer is x , and the disutility from accepting the transfer is $v(x)$, then v may be taken to be a decreasing function. Phrased in terms of social norms: if the social norm is that the source of one's subsistence should be one's own work, then the intensity of discomfort when deviating from this norm is a decreasing function, v , of the population share of deviators.

Each individual i chooses to work if that choice results in higher utility than living on the transfer. That is, she works if²

$$u[(1 - t)w_i] > u(T) + \theta_i v(x): \quad (1)$$

Here $\theta_i > 0$ is the utility gain from the increased leisure that results when one switches from full time work to living on the transfer.³

¹A taxed transfer T^* would be equivalent to a tax-free transfer $T = (1 - t)T^*$.

²Only continuous income distributions will be considered so indifferent individuals can be ignored.

³Of course the utility of leisure may depend on aggregate leisure in society - leisure may have a positive or negative social externality. However, for the sake of analytical clarity we neglect this and assume that the utility of leisure is independent of x . (In the present model aggregate leisure is monotonically related to x , the share of transfer recipients.) Note, however, that the sum of the two terms θ_i and $v(x)$ may together represent the compound effect of social norm adherence and such an externality - if their joint effect is not negative.

We assume that the utility from consumption is an increasing and concave function running from minus infinity at zero consumption to plus infinity at infinite consumption, and that the disutility of deviating from the norm is non-increasing in the fraction of deviators:

$$(A1) \ u : \mathbb{R}_{++} \rightarrow \mathbb{R} \text{ is twice continuously differentiable, with } u' > 0, \\ u'' < 0, \lim_{c \rightarrow 0} u(c) = -\infty, \text{ and } \lim_{c \rightarrow \infty} u(c) = +\infty$$

$$(A2) \ v : [0; 1] \rightarrow \mathbb{R} \text{ is continuously differentiable, with } v' \leq 0.$$

2.2 Equilibrium population shares

There is a continuum of individuals in the economy, with wages distributed according to some continuously differentiable cumulative probability distribution function F .⁴ We assume that there is a positive density $f(w) = F'(w)$ at all positive wage levels w , and that no individual has zero wage. Thus $F(0) = 0$ and $F(w)$ increases monotonically toward 1 as w increases toward plus infinity. Suppose also that the wage distribution F has a finite mean \bar{w} , and let its median be w . Let F^{-1} denote the inverse function to F .

Each individual takes the tax rate t , transfer T , and population share x of transfer recipients as exogenously given when she decides whether to work or live on the transfer. For every combination of these three parameters, such that $0 \leq t < 1$, $T > 0$, and $0 \leq x \leq 1$, there exists a unique critical wage rate such that all individuals with lower wages choose not to work and those with higher wages choose to work. The critical wage, $w^*(t; T; x)$, is the unique solution to the equation

$$u[(1-t)w] = u(T) + \beta \int_0^x v(x) dx. \quad (2)$$

Taking the inverse of the strictly increasing sub-utility function u for consumption one sees that the critical wage is strictly increasing in the tax rate t and transfer T , and that it is continuous and non-decreasing in the population share x of transfer recipients:

$$w^*(t; T; x) = \frac{1}{1-t} u^{-1} [u(T) + \beta \int_0^x v(x) dx]. \quad (3)$$

Having found the critical wage rate that separates workers from transfer recipients, we may identify the population share x of transfer recipients with the population share of individuals with wages below this critical level:

$$x = F[w^*(t; T; x)]. \quad (4)$$

⁴We take this distribution to be fixed and given, thus neglecting the possibility that taxes and transfers may (at least in the long run) influence factor incomes.

Conceptually, this is an equilibrium condition: If all individuals expect a population share x that satisfies this equation, then, and only then, will they, in aggregate, make such individual choices that this population share will be realized. Mathematically, (4) is a fixed-point equation in x , with exogenous parameters t and T . The right-hand side in the equation is a continuous function of x , mapping the unit interval $[0; 1]$ into itself. Hence, there exists at least one population share x^* satisfying equation (4), for any given tax rate $t < 1$ and transfer $T > 0$. Whether there exists more than one such population share (for a given tax rate and transfer) depends on the sub-utility functions u and v as well as on the wage distribution ω . A solution x^* to (4) will be called an equilibrium population share.

In the special case when preferences are "non social," i.e., when the disutility from deviating from the norm is independent of the population share x of transfer recipients, then the equilibrium population share x^* is unique. Inserting $v(x) = 0$ into equations (3,4) we obtain

$$x^* = \frac{\bar{A} \int u^{j-1} [u(T) + \omega] d\omega}{1 - t} \quad (5)$$

In general, however, the fixed-point equation (4) may have more than one solution. This is illustrated in Figure 1, with y on the vertical axis and x on the horizontal. The diagonal in both diagrams represents $y = x$, where x is the left-hand side of equation (4). The horizontal line in Figure 1 (a) represents the right-hand side of equation (4), the population share of individuals with wages below the critical wage, in the case of "non-social" preferences. (This is also the right-hand side of eq. (5).) By contrast, the curve in Figure 1 (b) represents the right-hand side of equation (4) in a case of "social" preferences where the disutility $v(x)$ decreases rapidly from a high to a low value at an intermediate value of x . As shown in that diagram, equation (4) then has three solutions. The intuition for this multiplicity is that if the population share of transfer recipients is low (high) then the disutility from living on the transfer is high (low) and hence few (many) individuals do the same.⁵

Each equilibrium population share x gives rise to a particular disutility $v(x)$ associated with deviations from the norm to work. Thus, economies with the same taxes and transfers (t and T), factor incomes (ω) and preferences (u , v and \bar{A}) may differ in terms of the share of transfer recipients (x) and the social stigma ($v(x)$) associated with this. In this respect the relative strengths of economic incentives and of the desire to adhere to the social norm, respectively, are endogenous. In one equilibrium economic incentives may dominate over the social norm ($v(x)$ small) while in another equilibrium the social norm may dominate over economic

⁵The cause for the multiplicity of equilibrium population shares is similar to that observed in Becker's [2] analysis of restaurant pricing. In his model a consumer's demand is positively related to the aggregate demand.

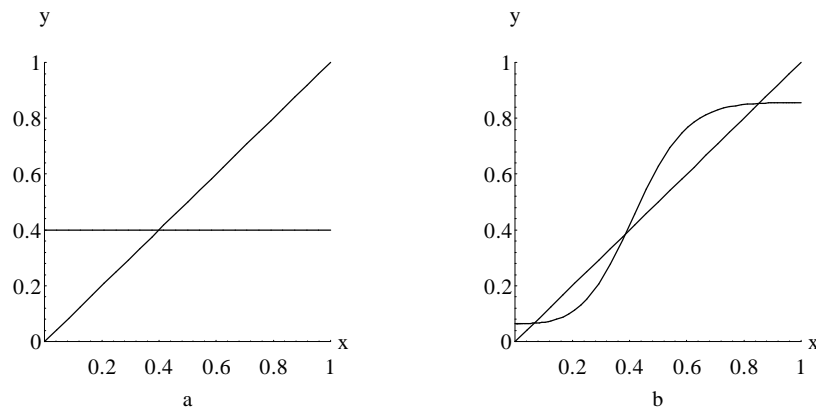


Figure 1: Illustration of the fixed-point equation (4).

incentives ($v(x)$ large). The latter obviously corresponds to a situation with fewer transfer recipients.

These observations raise a number of policy questions. In particular, one may ask how the set of equilibrium population shares depends on the two policy instruments, the tax rate t and transfer T . The following section considers this question in some detail. As will be seen, a budget constraint on governmental expenditure has the effect of selecting precisely one equilibrium population share for each tax/transfer pair.

3 Balanced Budget Equilibria

3.1 Macro states

The subsequent analysis requires some more notation and terminology. First, by a macro state we mean a triplet $s = (t; T; x)$ such that t is a non-negative tax rate not exceeding one, T is a non-negative transfer, and x is a population share satisfying equation (4). Without loss of generality for the following analysis we exclude the case when all income is taxed and no transfer is given, i.e., when $t = 1$ and, at the same time, $T = 0$. The set of macro states thus is⁶

$$S = \{ (t; T; x) \mid t \in [0; 1], T \in \mathbb{R}_+, x \in [0; 1]: (t; T) \neq (1; 0) \text{ and (4) holds} \}. \quad (6)$$

⁶We thus incorporate into the subsequent analysis also the boundary cases (i) $t < 1$ and $T = 0$, and (ii) $t = 1$ and $T > 0$. In the first case, no individual asks for the transfer, hence $w^a(x; t; 0) = 0$, and accordingly $x^a = 0$ by (4). In the second case, all individuals prefer the transfer (irrespective of x), so then $w^a(x; 1; T) = +1$ for all x , and accordingly $x^a = 1$, by (4).

For every tax/transfer pair (except when $t = 1$ and $T = 0$) there exists at least one population share x such that the associated triplet $s = (t; T; x)$ constitutes a macro state, $s \in S$. This was shown in the preceding section for all tax/transfer pairs with $t < 1$ and $T > 0$. When $t = 1$ and $T > 0$ we clearly have a unique equilibrium population share, $x^* = 1$, since then work gives zero consumption and thus all individuals ask for the transfer. When $t < 1$ and $T = 0$ we again have a unique population share, this time $x^* = 0$; then the transfer gives zero consumption and thus all individuals choose to work.⁷

3.2 Budget balance

So far, no connection has been assumed between the tax rate and the transfer. We will restrict the subsequent analysis to those tax/transfer combinations that balance the government budget. In view of the possibility that to a tax/transfer combination there may correspond multiple equilibrium macro states, we impose the requirement of budget balance directly on the latter.

The tax base of the economy is simply the aggregate income from all individuals who work. This aggregate can be expressed in terms of the truncated expected-value function $a : \mathbb{R}_+ \rightarrow \mathbb{R}_+$, defined by

$$a(w) = \int_w^{\infty} w^0 f(w^0) dw^0. \quad (7)$$

Thus $a(w)$ is the wage sum for individuals with wages above w , normalized to per capita units. Clearly a is continuously differentiable, and $a(w)$ is decreasing from the positive mean value \bar{w} of the full wage distribution f toward zero as w increases from zero toward infinity.⁸ The tax base, normalized to per capita units, is simply the value of this function evaluated at the critical wage rate $w^*(t; T; x)$: in any macro state $s = (t; T; x)$ all individuals with higher wages work and pay the income tax, and no individual with a lower wage works. Since the income tax here is proportional, at rate t , the aggregate (per capita) tax revenue is simply $t a [w^*(t; T; x)]$.

Similarly, aggregate (per capita) government expenditure on transfer payments is the transfer times the population share of transfer recipients. Thus a macro state $s = (t; T; x)$ balances the government budget if and only if

$$T x = t a [w^*(t; T; x)]. \quad (8)$$

Macro states $s \in S$ that satisfy this equation will be called balanced macro states, and the set of such macro states will be denoted S^* .

⁷Note the discontinuity at the point $(t; T) = (1; 0)$. If we approach this point by letting $t \rightarrow 1$ and $T = 0$ we obtain $x^* = 0$ in the limit. If we instead approach $(t; T) = (1; 0)$ by letting $t = 1$ and $T \neq 0$, then we obtain $x^* = 1$ in the limit.

⁸By definition, we have $a(0) = \bar{w}$, and $a(w) < \bar{w}$ for all $w > 0$. It follows that $\lim_{w \rightarrow \infty} a(w) = 0$, and, by Leibnitz' formula, $a'(w) = -f(w) < 0$.

It is easy to see that the subset $S^a \cap S$ is non-empty: If both the tax rate and the transfer are zero, then all individuals prefer to work, and the government budget is balanced (at zero).⁹ This establishes the "zero-tax zero-transfer" triplet $s = (0; 0; 0)$ as a balanced macro state. The full set S^a of balanced macro states is characterized in the following subsection.

3.3 Balanced macro states

First, it is easily established that to any tax/transfer pair there corresponds at most one population share such that the corresponding macro state is balanced. To see this, consider any tax rate $t \in [0; 1]$ and transfer $T \geq 0$ such that $(t; T) \in (1; 0)$. First suppose $T > 0$. Then the left-hand side (aggregate transfer payments) in the budget equation (8) is strictly increasing in x , while the right-hand side (aggregate tax revenues) is non-increasing. Thus the budget equation is met by at most one population share x in this case. Second, suppose $T = 0$. Then all individuals choose to work, and hence $x = 0$ in the macro state associated with such a tax/transfer pair.

Conversely, we will show below that for every population share of transfer recipients x below 1 there exists exactly one tax/transfer pair such that the corresponding macro state is balanced: In other words, if at least some individuals work in a balanced macro state, then the associated population share x uniquely determines both the tax rate and the transfer. This fact will be very useful for the subsequent analysis. Mathematically, it allows us to define two functions, f and F , that map each population share $x < 1$ to the associated unique tax rate $t = f(x)$ and transfer $T = F(x)$ that together make the triplet $s = (t; T; x)$ a balanced macro state.

In order to establish this fact, consider the function $H : (0; 1) \times [0; 1] \rightarrow \mathbb{R}$ defined by

$$H(x; t) = u^h(1 - j - t)^{\otimes i - 1}(x) - j - u^a \frac{t}{x} \cdot u^h \otimes i - 1(x) - j - \otimes + v(x). \quad (9)$$

The function value $H(x; t)$ has an economic interpretation: it is the utility difference between the two choice alternatives - to work or not to work - for "the critical individual" in a balanced macro state $s = (t; T; x)$ with $x \in (0; 1)$. By "the critical individual" we mean an individual who earns the "critical" wage $w^a(t; T; x)$.

To see the suggested interpretation of $H(x; t)$, first note that $\otimes i - 1(x)$ equals the critical wage $w^a(t; T; x)$, an equality that follows directly from the fixed-point equation (4). Hence, $(1 - j - t)^{\otimes i - 1}(x)$ is the disposable income to the critical individual if he or she chooses to work. Accordingly, the first term in the expression

⁹Formally $s^0 = (0; 0; 0)$ is a macro state, since by (3), $w^a(0; 0; 0) = 0$, and (4) is satisfied. Clearly also (8) is met, and thus $s^0 \in S^a$.

for $H(x; t)$ is the utility resulting from this choice. Moreover, the budget balance requirement (8) forces the associated transfer to equal $t^a [\textcircled{i}^{-1}(x)] = x$. Thus the second term in the expression for $H(x; t)$ is the sub-utility of consuming that transfer (all individuals have the same preferences and so no reference to the critical individual is needed here). The third term is (minus) the utility from enjoying full time leisure, and the fourth term is the disutility from living on the transfer. Accordingly, the second, third and fourth terms together represent the utility associated with the choice to live on the transfer. The right-hand side of equation (9) thus indeed represents the utility difference for the critical individual between her two choice alternatives.

By definition, the critical individual is indifferent between working and living on the transfer. Hence, in a balanced macro state it is necessary that

$$H(x; t) = 0 \tag{10}$$

In a sense, this is a "balanced-budget equilibrium" extension of equation (3). In addition to determining the critical wage for given taxes and transfers, equation (10) also requires that the tax rate and transfer balance the government budget.

It turns out that equation (10) defines the above-mentioned functions f and F and, moreover, implies that these functions are (continuously) differentiable, a property that will be handy for the subsequent analysis. We first establish this result for all positive populations shares x and afterwards include the case $x = 0$.

Proposition 1 There exist continuously differentiable functions $f : (0; 1) \rightarrow [0; 1]$ and $F : (0; 1) \rightarrow \mathbb{R}$ such that, for any $x \in (0; 1)$, $s = (t; T; x)$ is a balanced macro state if and only if $t = f(x)$ and $T = F(x)$. Moreover,

$$t = f(x) \quad , \quad H(x; t) = 0$$

and

$$F(x) = f(x)^a \textcircled{i}^{-1}(x) = x \quad \forall x \in (0; 1) .$$

(See Appendix for a proof.)

Consider the case $x = 0$. Recall that there exists at least one balanced macro state with no transfer recipients, namely the zero-tax zero-transfer state $s = (0; 0; 0)$. This is the only balanced macro state with no transfer recipients, since $w^a(0; t; T) = 0$ by (4), and thus $T = 0$ by (3). When T is zero, so must t be, by the budget equation (8). Thus there exists exactly one balanced macro state with $x = 0$, namely $s = (0; 0; 0)$. Hence, we may extend the domain of f and F to include $x = 0$ by setting $f(0) = F(0) = 0$. Indeed, one can show that both functions are continuous at $x = 0$: both the tax rate and the transfer approach zero as the share of transfer recipients goes to zero (in a balanced macro state).

For $x = 1$, however, there exists no balanced macro state. To see this, suppose $s = (t; T; 1) \in S$. By (4) we would then have $w^a(t; T; 1) = +1$, and thus $Tx = 0$,

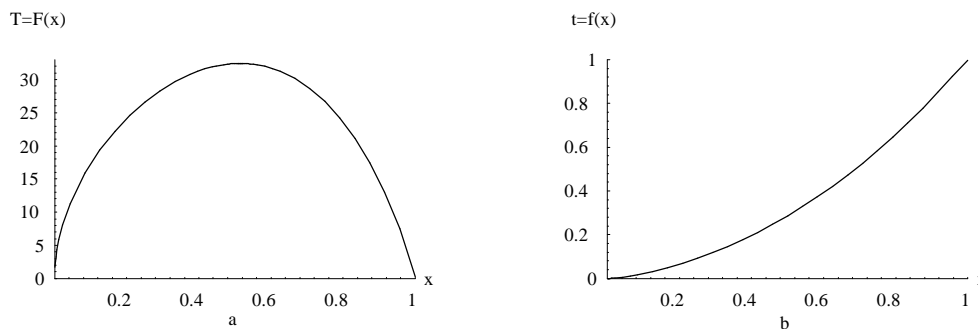


Figure 2: Example of a transfer function F and an accompanying tax function f .

by (8). Hence $T = 0$. But if $T = 0$, then all individuals prefer to work, i.e., $x = 0$, a contradiction. Despite this fact both the tax rate and the transfer approach limit values as the share of transfer recipients goes to one. Not surprisingly, the limit tax rate is one and the limit transfer is zero.

Proposition 2 Let $f : [0; 1) \rightarrow [0; 1]$ and $F : [0; 1) \rightarrow \mathbb{R}_+$ be defined for all $x \in [0; 1)$ as in proposition 1, and for $x = 0$ by $f(0) = F(0) = 0$. Then f and F are continuous, $\lim_{x \rightarrow 1^-} f(x) = 1$, and $\lim_{x \rightarrow 1^-} F(x) = 0$.

What more can be said about the functions f and F in general? Clearly F cannot be monotonic since it approaches zero at both ends of its domain. By contrast, f takes its minimum value, zero, at one end of its domain and approaches its supremum value, one, at the other end. The larger the population share of transfer recipients in a balanced macro state is, the higher one would expect the associated tax rate to be. Indeed, if individuals' preferences are "non-social," i.e., independent of aggregate behavior x , then f is increasing. This also follows formally from the model (proposition 1).¹⁰ See Figure 2 for an illustration of the functions F and f in this case.

Corollary 1 For given u and \bar{c} there exists an $\epsilon > 0$ such that if $v^0(x) > \bar{c} - \epsilon$ for all $x \in [0; 1]$, then $f^0(x) > 0$ for all $x \in [0; 1]$.

¹⁰Note that the inverse wage-distribution function \bar{c}^{-1} is strictly increasing, and that the truncated-expectation function \bar{a} is strictly decreasing. Hence, $\bar{a} \circ \bar{c}^{-1}(x) = x$ is also strictly decreasing. If $v(x) > 0$, then equation (9) implies that $H(x; t)$ is strictly increasing in x (for any fixed tax rate t between zero and one). Since $H(x; t)$ is strictly decreasing in t , it follows from the identity $H[x; f(x)] > 0$ that f has to be strictly increasing, when preferences are non-social. By continuity, $H(x; t)$ is strictly increasing in x whenever the sub-utility function v is sufficiently flat, i.e., when its derivative is everywhere small.

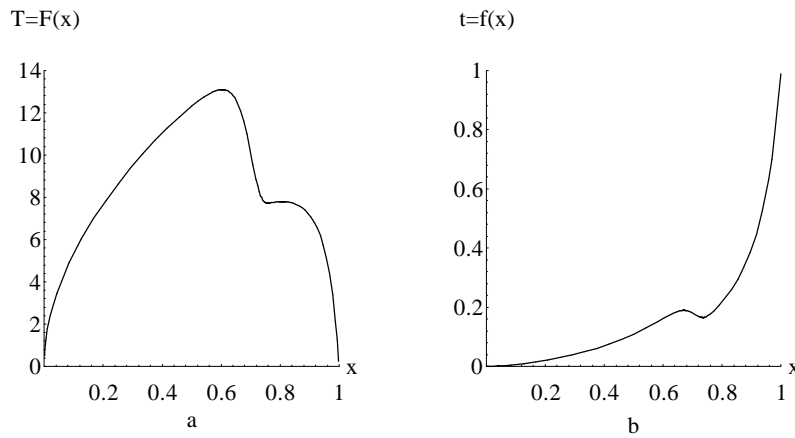


Figure 3: A non-concave transfer function F and an accompanying non-monotonic tax function f .

However, in general f need not be monotonic. The reason is that if the embarrassment of living on the transfer decreases drastically for a small increase in the population share of transfer recipients, say from x to $x + \epsilon$; then transfers become much more attractive and thus T must decrease in order for $x + \epsilon$ to be an equilibrium. If the compensating reduction in T is large enough then the budget balance requires the tax rate t to decrease too (see Figure 3 for an illustration).

It should be noted, though, that while non-monotonic tax functions are possible in the present framework they only occur if the disutility of deviating from the norm is very sensitive to changes in x in some interval.¹¹

Figure 4 shows the set S^a of balanced macro states in the numerical example behind Figure 3. As is seen in this diagram, S^a is a curve that runs from the origin, $t = T = x = 0$, to the point where $t = x = 1$ and $T = 0$. The functions f and F shown in Figure 3 are the projections of this curve to the $(t; x)$ - and $(T; x)$ -plane, respectively.

4 Political equilibrium

4.1 Unbeatable policies

The purest political equilibrium notion for this model seems to be that of an unbeatable policy, by which we mean a balanced-budget tax/transfer pair such that there is no other budget-balanced tax/transfer pair that a majority of the

¹¹The proof of Corollary 1, given in the appendix, provides an exact condition for $f^0(x)$ to be positive at a point x .

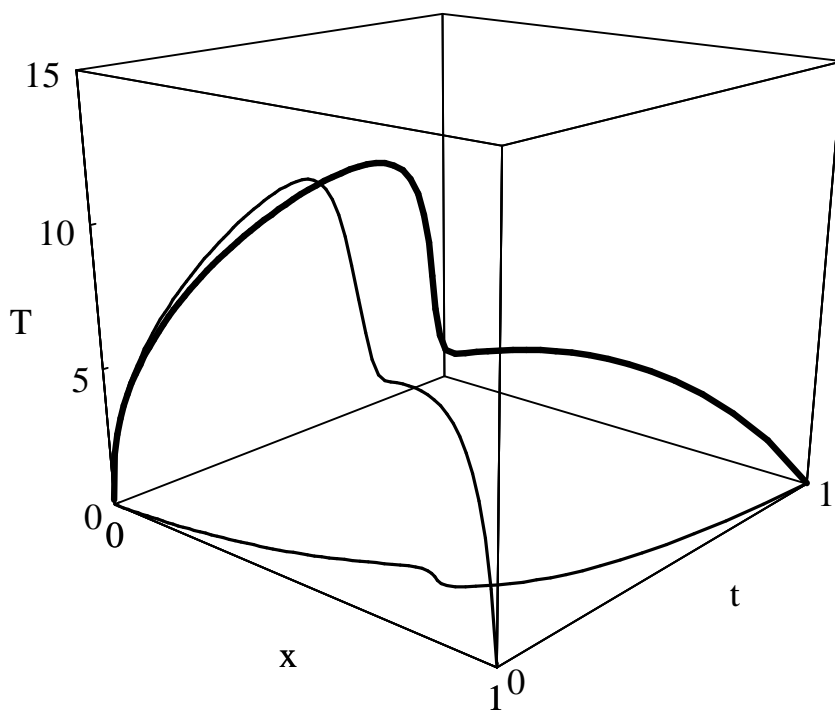


Figure 4: The set of balanced macro states and its projections in the $(T; x)$ and the $(t; x)$ planes.

population would prefer. In order to render this concept precise and operational, some definitions and preliminaries are needed.

We call a tax/transfer pair $p = (t; T)$ a balanced policy if there exists some population share $x \in [0; 1]$ of transfer recipients such that the triplet $s = (t; T; x)$ constitutes a balanced macro state. Let $P^{\pi} \subseteq [0; 1]^2$ be the set of balanced policies. The set P^{π} is clearly non-empty: we already know that the zero-tax zero-transfer macro state $s^0 = (0; 0; 0)$ is balanced, hence the policy $p^0 = (0; 0)$ is balanced. (Indeed, the set P^{π} is simply the projection of the set S^{π} on the $(t; T)$ -plane, see Figure 4.)

By definition of a balanced policy there exists exactly one population share x of transfer recipients such that the corresponding macro state is balanced. Conversely, by propositions 1 and 2 there exists exactly one balanced policy for each population share x below one. Hence, we have established a one-to-one relationship between balanced policies and population shares of transfer recipients:

Corollary 2 There exists a one-to-one mapping $\pi : P^{\pi} \rightarrow [0; 1)$ such that $(t; T; x) \in S^{\pi}$ if and only if $(t; T) \in P^{\pi}$ and $x = \pi(t; T)$.

Using this fact, we may without ambiguity define individual preferences over policies. The utility to individual i under a balanced policy $p = (t; T)$ is simply the highest of two utility levels, one for each of the two economic choices that are available to the individual:

$$U_i(p) = \max \{ u[(1 - t)w_i]; u(T) + \pi_i v(x) \}, \quad (11)$$

where $x = \pi(p)$. We say that individual i prefers policy p^0 to policy p if $U_i(p) < U_i(p^0)$. Accordingly, policy p^0 beats policy p - in a majority vote - if there are more individuals who prefer p^0 to p than there are individuals who prefer p to p^0 .¹² It is not difficult to show that $U_i(p)$ and $U_i(p^0)$ are always well-defined numbers. More precisely, for any pair of balanced policies $p \neq p^0$ there exists a "swing wage" $\bar{w}(p; p^0) \geq 0$ such that either (a) all individuals with wages below $\bar{w}(p; p^0)$ prefer p to p^0 and all individuals with wages above $\bar{w}(p; p^0)$ prefer p^0 to p , or (b) all individuals with wages below $\bar{w}(p; p^0)$ are indifferent between p and p^0 and all individuals with wages above $\bar{w}(p; p^0)$ prefer p to p^0 , or (c) all individuals with wages below $\bar{w}(p; p^0)$ prefer p to p^0 and all individuals with wages above $\bar{w}(p; p^0)$ are indifferent between p and p^0 . We call a balanced policy p unbeatable if there exists no balanced policy that beats it.

4.2 Characterizing the set of unbeatable policies

It is evident that no policy that results in a positive but small share of transfer recipients is unbeatable, since such a policy would be beaten by the "zero-tax zero-transfer" policy $p^0 = (0; 0)$. Individuals who work in the proposed balanced macro

¹²Hence, indifferent voters are assumed to give equal votes to the two policies.

state would be better p^0 under p^0 , and they constitute a majority. Consequently, an unbeatable policy either is the zero policy p^0 or else it has a positive tax rate and transfer such that a majority of individuals choose not to work in equilibrium.

The range of potentially unbeatable policies can be narrowed down further. Let

$$\hat{X} = \arg \max_{x \in (0,1)} (u[F(x)] - v(x)). \quad (12)$$

This is the subset of population shares x that are optimal from the viewpoint of a transfer recipient. We will show that a necessary condition for a balanced policy p with a positive tax rate to be unbeatable is that the resulting population share $\pi(p)$ belongs to the set \hat{X} . In fact, one may sharpen this condition to the requirement that the resulting population share be the smallest element of \hat{X} . Formally, it is then necessary that $\pi(p) = \hat{x}$, where

$$\hat{x} = \min \hat{X}. \quad (13)$$

Thus \hat{x} is the smallest population share among those that are optimal from the viewpoint of transfer recipients. The reason why only this element of \hat{X} is consistent with political equilibrium is that this population share results in the lowest tax rate in the set \hat{X} . Thus wage earners vote against policies corresponding to other population shares in \hat{X} .

The following result is a crucial step for showing the above claims. Using propositions 1 and 2 it is not difficult to verify that the set \hat{X} is non-empty and compact, and thus that \hat{x} is indeed well-defined by (13). Moreover, using the critical individual's indifference between working and not working, one obtains that, inside the set \hat{X} , higher population shares correspond to higher tax rates.

Lemma 1 \hat{X} is non-empty and compact. f is strictly increasing on \hat{X} .

With the help of this result one can show that the only alternative to $x = 0$, when it comes to political equilibrium, is $x = \hat{x}$:

Proposition 3 If $p = (t; T)$ is an unbeatable balanced policy and $t > 0$, then $\pi(p) = \hat{x} \leq \frac{1}{2}$.

Consequently, if preferences and wages are such that the population share \hat{x} is less than one half, then the only alternative political equilibrium is the zero-tax zero-transfer policy. In view of proposition 3 one is led to the more general question under what conditions the zero tax policy $p^0 = (0; 0)$ and/or the positive tax policy $\hat{p} = (f(\hat{x}); F(\hat{x}))$ is politically unbeatable. The following two results will give precise answers to part of this question.

First, a necessary and sufficient condition for the zero-tax policy p^0 to be unbeatable can be given. For this purpose, let

$$\bar{u} = u(w) + \max_{x \in [\frac{1}{2}, 1)} (u[F(x)] - v(x)). \quad (14)$$

This is the highest possible utility level for transfer recipients in any balanced macro state in which they constitute a weak majority. The condition in question is simply that this utility level does not exceed the utility to the median wage earner from his or her untaxed wage:

Proposition 4 The zero-tax policy p^0 is unbeatable if and only if $u(w) \geq \bar{u}$. No other policy is unbeatable when $u(w) > \bar{u}$.

Second, granted that the positive-tax policy \hat{p} results in a strict majority of transfer recipients, a necessary and sufficient conditions for its unbeatability is that the resulting utility to a transfer recipient is not lower than the utility to the median wage earner from his or her untaxed wage:

Proposition 5 Suppose $\hat{x} > \frac{1}{2}$. Then the positive-tax policy \hat{p} is unbeatable if and only if $u(w) \geq \bar{u}$.

We conclude this section by illustrating propositions 3 through 5 by means of computer calculations. Both diagrams in Figure 5 show the graph of the balanced-budget transfer function F , along with one (downward sloping) indifference curve for a transfer recipient. This indifference curve is the locus of all pairs $(T; x)$ where the utility to a transfer recipient, $u(T) + v(x)$, equals the median wage earner's utility $u(w)$ from consuming her untaxed wage.

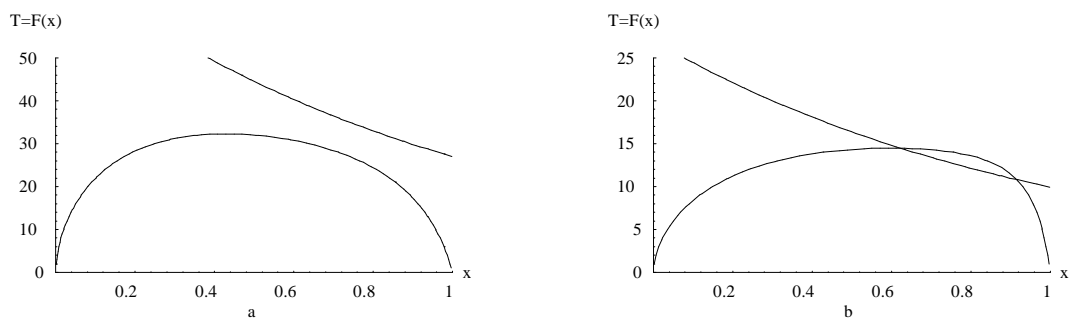


Figure 5: The transfer function F , and the indifference curve of a transfer recipient whose utility equals that of the median wage earner under the zero tax policy.

According to proposition 3 the only candidates for an unbeatable policy are (i) the zero-tax zero-transfer policy and (ii) a certain policy that gives maximal

$$T=F(x)$$

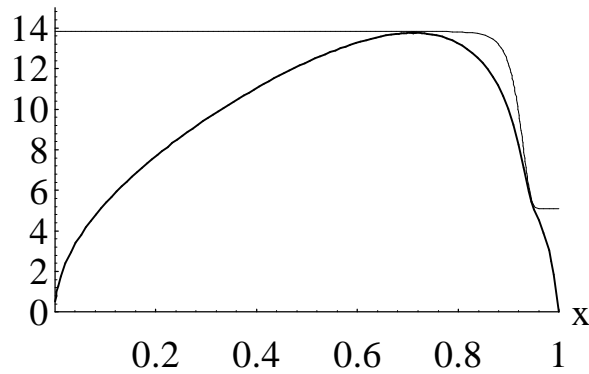


Figure 6: An example where the median voter is indifferent between p^0 and two positive tax policies.

utility to transfer recipients. In Figure 5(a) the median wage earner obtains more utility from her untaxed wage than from living off the transfer in any balanced macro state. By proposition 4, the zero-tax zero-transfer policy then is the unique unbeatable policy. By contrast, in Figure 5(b) the median wage earner obtains more utility from living off the transfer in certain balanced macro states. The diagram shows that this occurs for population shares in an interval to the right of $x = \frac{1}{2}$. Hence $\bar{v} > u(w)$ in this case, and so, by proposition 4, the zero-tax zero-transfer policy is beatable. The curvatures of the transfer function and the indifference curve together suggest a unique tangency point between the transfer function and some higher indifference curve. By definition, this tangency occurs at \hat{x} , and we see that \hat{x} exceeds one half. Hence, by proposition 5, the associated policy \hat{p} is unbeatable.

In general, \hat{X} need not be a singleton set: transfer recipients can have an indifference curve that is tangential with the transfer curve $T = F(x)$ at more than one point. See Figure 6 for such an example. Here individual preferences are quite "social": the disutility function v has been made very sensitive to changes in the population share x for values of x near 0.9.

5 Equilibrium Properties

In this section we examine the properties of balanced-budget equilibria and political equilibria. We consider in turn the cases of non-social and social preferences. In the first case we study effects of shifts in the preference for leisure and in the wage distribution. In the latter case we examine gradual changes in the indi-

vidual's sensitivity to social norms, and we also look at gradual changes in the policy instruments.

In our computer calculations we focus on the special case of a logarithmic subutility function for consumption: $u(c) = \log(c)$ for all $c > 0$: Equation (10) then gives the following explicit expressions for the tax function f and transfer function F (see proposition 1):

$$f(x) = \frac{x^{\otimes_i - 1}(x)}{x^{\otimes_i - 1}(x) + a [\otimes_i - 1(x)] \exp[\otimes_i v(x)]} \quad (15)$$

$$F(x) = \frac{\otimes_i - 1(x)^{a [\otimes_i - 1(x)]}}{x^{\otimes_i - 1}(x) + a [\otimes_i - 1(x)] \exp[\otimes_i v(x)]}. \quad (16)$$

It follows from these expressions that a shift in the wage distribution such that all individuals' wages are multiplied by the same factor, $> > 0$; results in no change in the tax function f and a proportional change in the transfer function F . This results from the observation that $\otimes_i - 1(x)$ and $a [\otimes_i - 1(x)]$ then are replaced by $> \otimes_i - 1(x)$ and $>^{a [\otimes_i - 1(x)]}$, respectively.

Throughout this section the graphic illustrations are based on Weibull distributed wages. The Weibull distribution is governed by three parameters. One determines the lower end of its support, another determines the scale along its support. The third, which will here be denoted c , determines the concentration of the distribution. High values of c correspond to a high degree of concentration (low dispersion).¹³

5.1 Non-social preferences

5.1.1 Changes in the valuation of leisure

If preferences are non-social, i.e., if $v(x) < 0$, then agents are only concerned about the effects on their consumption and leisure. Hence, the set X simply consists of those points x where the transfer $T = F(x)$ is maximal. The point x is its smallest element. It turns out that the higher the value \otimes of leisure the larger is the population share of transfer recipients at which the transfer is maximal. This is illustrated in Figure 7. Panel (a) is based on a more unequal (less concentrated) wage distribution than panel (b). Note that the latter curve lies below the former. This suggests that a positive tax policy is more likely to be unbeatable in the case of a more unequal wage distribution, in the sense that x then exceeds $\frac{1}{2}$ for a wider range of \otimes -values (see proposition 3).

¹³More precisely, a random variable X is Weibull $(a; b; c)$ distributed if for all $x \in \mathbb{R}$:

$$\Pr(X \leq x) = 1 - \exp\left(-\left(\frac{x-a}{b}\right)^c\right).$$

We keep a and b fixed throughout, with $a = 0$.

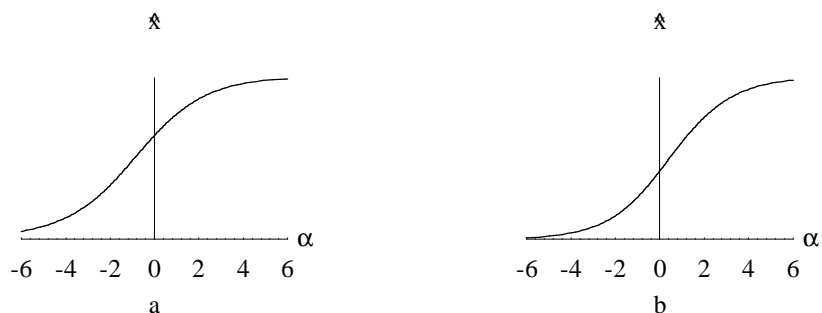


Figure 7: The transfer-maximizing population share as a function of α ; the value of leisure. The left graph is based on a less equal income distribution than the right graph.

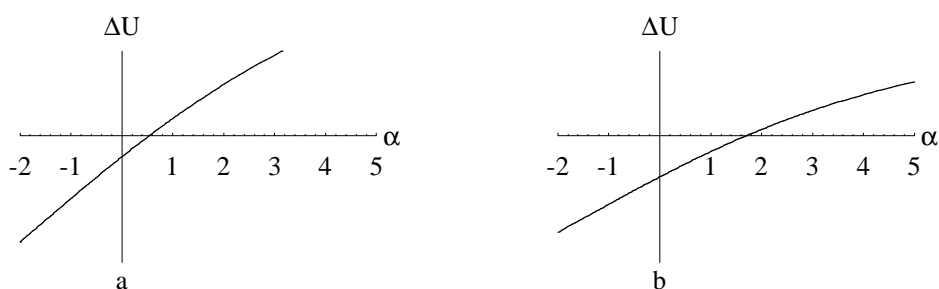


Figure 8: The difference in utility for the median wage earner between living on the transfer and on her untaxed wage, as a function of α , the value of leisure.

This is supported by the graphs in Figure 8. According to proposition 5 the policy supporting \bar{x} is politically unbeatable if the median wage earner rather lives on the transfer $T = F(\bar{x})$ than works under the zero-tax policy. Figure 8 illustrates the utility difference, ΔU ; between these two alternatives for the median wage earner as a function of α . The wage distributions in panels (a) and (b) are the same as in Figure 7. Not surprisingly, both graphs show that transfers become more attractive as the value of leisure, α ; increases. Indeed, for a sufficiently high valuation of leisure a certain positive-tax policy becomes unbeatable, i.e., the median wage earner prefers to live on the transfer. The critical value of α , below which the zero-tax policy, p^0 ; is unbeatable, depends on the wage distribution. In Figure 8 the critical values are approximately 0.6 and 1.7.

The effect of an increasing valuation of leisure on political equilibrium is il-

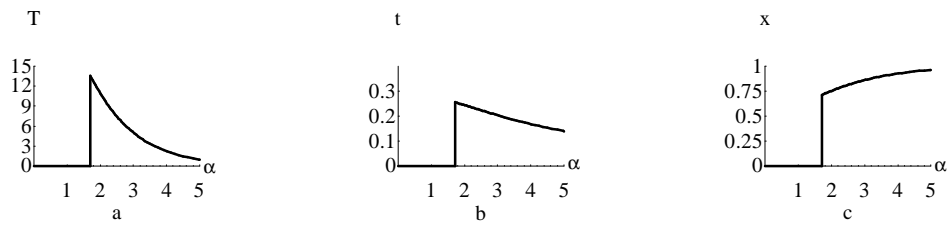


Figure 9: The unbeatable policy, and the corresponding x , as functions of the utility of leisure, α .

illustrated in Figure 9 using the same wage distribution as in panel (b) in Figures 7 and 8. For α below the critical value, 1.7, the zero-tax policy is unbeatable. Above the critical value, however, α determines the properties of the unbeatable policy. As may be expected, a higher valuation of leisure increases the political support, x , for a positive tax policy (panel (c)). Moreover, an increase in α simultaneously leads to lower per capita transfers (panel (a)). This is accompanied by a decreasing tax rate (panel (b)). Thus, starting from a situation where the zero-tax policy is unbeatable a gradual increase in the valuation of leisure will eventually induce a sudden shift in the political equilibrium outcome. Further increases in α however leads to lower transfers, albeit to an increasing fraction of the population.

It turns out that the above mentioned two effects do not hinge on the logarithmic form of the utility function: they hold in general for non-social preferences. In equations (9) and (10) it is easy to see that the maximal transfer decreases in α . Consider the effect of an increase α for any given x . Equation (10) implies that t must decrease, which, for a given x , means that T decreases in the same proportion. Since this holds for all $x \in (0; 1)$ both functions F and f shift point-wise down in α . Consequently, the maximal T -value must decrease. To show that the corresponding population share (or political support) x is non-decreasing in α is straightforward but somewhat tedious.¹⁴

5.1.2 Changes in the wage distribution

We here consider changes in the wage distribution, ceteris paribus. Recall that Figure 8 indicated that the critical value of α ; above which the median wage earner prefers transfers, is higher when the wage distribution is more concen-

¹⁴Consider an increase in α from α_0 to α_1 . (i) If $F_0(x_i) = F_0(x_j)$ and $x_i < x_j$ then $F_1(x_i) < F_1(x_j)$. The reason is that after the increase the tax rate must decrease with a factor θ so that $u[(1 - \theta t_i)w_i] = u[(1 - t_i)w_i]$ ($u[\theta F_0] = u[F_0]$) where $\theta F_0(x_i) = F_1(x_i)$: If $x_i < x_j$ then $w_i < w_j$ and $t_i < t_j$: Consequently, $\theta_i < \theta_j$. (ii) The above observation, that for all x with the same transfer level this level will fall more at lower x , implies that x is non-decreasing in α :

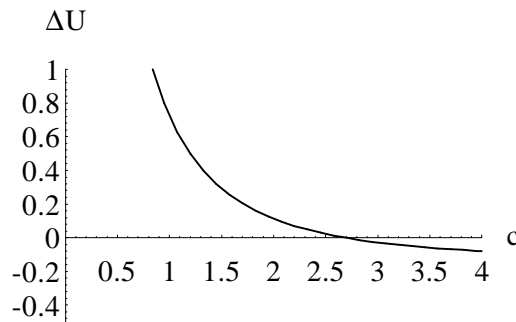


Figure 10: The difference in utility for the median voter between living on transfers and working in a zero tax society as the wage concentration c increases.

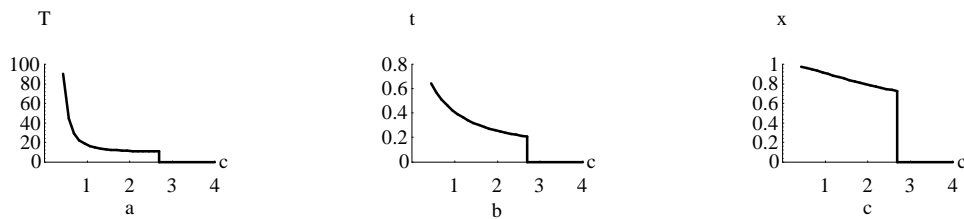


Figure 11: The unbeatable policy, and the corresponding x , as functions of the wage concentration c .

trated. In our computer calculations it turns out that a sufficiently concentrated wage distribution renders the zero tax policy unbeatable. Like Figure 8, Figure 10 illustrates the utility difference for the median wage earner between living on the maximal transfer and on her untaxed wage, but now as a function of a wage distribution parameter, c . Higher values of c correspond to a more concentrated wage distribution. (The value of leisure is kept constant at $\bar{l} = 2$.)

We illustrate the effect of changes in the concentration of the wage distribution on the properties of unbeatable positive tax policies in the same way as in Figure 9. Figure 11 shows that as the wage distribution becomes more concentrated the political support for the transfer decreases as does the tax rate and the per capita transfer. A more concentrated wage distribution offers less scope for redistribution since the tax base for positive tax policies becomes smaller.

The conclusion in the present case of non-social preferences conforms with Meltzer's and Richard's [8] result that redistribution increases when the ratio of the mean to the median wage increases.

5.2 Social Preferences

Let us first clarify the role of social preferences in determining the equilibrium population share of transfer recipients, x^* , without imposing the balanced budget constraint. The fixed-point equation (4) determines this share for any given tax/transfer pair. In the discussion of Figure 1 we noted that for non-social preferences ($v(x)$ independent of x) this equation has exactly one solution, while for social preferences ($v(x)$ dependent on x) there may be more than one solution. The interplay of social norms and economic incentives may thus result in qualitatively different properties from those of a model based solely on economic incentives.

A graphical illustration of the effect of social norms, based on Figure 1, may be given as follows. Imagine that we gradually change the preferences in the economy in question by letting the disutility function v become more and more sensitive to x . For instance, let v_0 be as in Figure 1 (a), and let v_1 be as in Figure 1 (b). Now imagine that for each $\zeta \in [0; 1]$, v_ζ is a disutility function that changes continuously with ζ from v_0 at $\zeta = 0$ to v_1 at $\zeta = 1$. With such a parametrization the apparent dichotomy between non-social and social preferences disappears. For low values of the parameter ζ , equation (4) will have a unique solution, just as in the case with non-social preferences, while for high values of ζ this equation will have three solutions. At some intermediate value of ζ the single solution splits into three.¹⁵ Thus, a gradual shift from non-social to social preferences will at some point lead to a qualitative change in the set of potential aggregate behaviors, and the quantitative strength of this change will increase (the three equilibria will drift more and more apart) as preferences become more social.¹⁶

However, we also noted, in Section 3, that the multiplicity of solutions to the fixed-point equation (4) vanishes when one imposes the public budget constraint. For each tax/transfer pair there then exists at most one population share x of transfer recipients. Nevertheless, there remains, at least a priori, the possibility that there for certain tax rates t exist more than one "transfer/recipient" pair $(T; x)$ that balances the public budget. Multiplicity of this type implies a certain relation between the associated transfer/recipient pairs: if both $(T; x)$ and $(T^0; x^0)$ are compatible with budget balance at the same tax rate t , and the transfer T^0 is higher than T , then the population share x^0 must be smaller than the population share x . Because otherwise public spending would be higher in $(T^0; x^0)$ while the tax base would be smaller (the tax rate is by hypothesis the same). Such multiplicity, at a given tax rate, clearly requires social preferences. If fewer

¹⁵This can be illustrated in a graph with ζ on the horizontal and x^* on the vertical axis. At an intermediate ζ the solution correspondence will have a branching point where the solution graph looks like a horizontal hay fork.

¹⁶The middle branch of the "hay fork" is unstable with respect to perturbations in x : if individuals do not predict x exactly right, an iteration in expectations and adaptation of individual behavior will lead away from the middle branch. This just makes the qualitative difference between non-social and social preferences even starker.

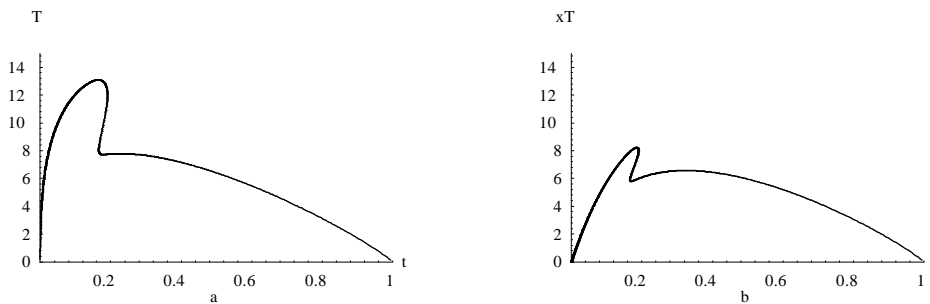


Figure 12: (a) The set of balanced policies, i.e., the projection on the $(T; t)$ plane of the balanced macro states in Figure 4. (b) The corresponding "Laffer curve".

individuals choose the higher transfer T^0 then the social norm against living on transfers must be stronger in $(T^0; x^0)$ than in $(T; x)$.

Figure 12 (a) illustrates that multiplicity of transfer/recipient pairs $(T; x)$ is a real possibility in our model for certain tax rates. The curve represents the set P^* of balanced policies $(t; T)$, based on the same numerical specification as Figure 4. Indeed, the shown curve is just the projection of the curve S^* running through the cube in that diagram to the $(t; T)$ -plane. Note the folding of the curve above an interval of tax rates near 20%. For each of these tax rates t there are three values of T such that the point $(t; T)$ belongs to the curve (at the end of this interval there are two such values of T). Let these three points be denoted $(t; T)$, $(t; T^0)$ and $(t; T^0)$, with $T < T^0 < T^0$. By Corollary 2 there exists exactly one population share of transfer recipients for each of these policies such that the associated macro state is balanced. Let these population shares be denoted x , x^0 and x^0 , respectively. As argued above we must have $x > x^0 > x^0$. In sum: for such tax rates t there exist three transfer/recipient pairs.

Consider the following thought experiment in connection with Figure 12 (a). Suppose the government for some (here unexplained) reason starts out with a low tax rate and a transfer that balances the budget. This corresponds to a point $(t; T)$ on the curve to the left of its folding interval. Suppose also that government gradually increases the tax rate t and adjusts the transfer T so as to maintain budget balance. This leads to a gradual increase in the transfer. As the tax rate enters the interval below the fold multiplicity in budget-balanced transfer levels arises. However, inertia in expectation formation suggest that the point $(t; T)$ continues to slide smoothly along the upper side of the fold. At the point where this branch of the curve turns vertically down, a further marginal increase of t results in a finite jump down in T , after which further increases in the tax rate results in gradual decreases in the transfer. At the critical tax rate, where the jump takes place, a sizeable population share suddenly switches from work to the

transfer, and at the same time the transfer makes a sizeable fall. The switching individuals accepts the fall in the transfer because it is accompanied by a rise in the share of transfer recipients, and hence a fall in the discomfort associated with violating the social norm to live on one's own work. A gradual shift in economic policy has resulted in a shock to the social value attached to work.

A reversal of the above thought experiment, starting out from a high tax rate (above the fold interval) and gradually reducing this rate results, under the same presumption of inertia in expectations formation, in a policy $(t; T)$ that slides along the lower side of the fold, and then jumps up. In this case we would witness a sudden fall in the share of transfer recipients accompanied by a sudden rise in the transfer. Note, however, that this upward jump takes place at a lower tax rate than the downward jump described in the preceding paragraph.

Multiplication of a (per capita) transfer payment T with an associated population share x of transfer recipients yields total government expenditures (per capita). Plotting this quantity, xT , against the tax rate t gives rise to the "Laffer curve," see Figure 12 (b). Note that the fold in diagram (a) is carried over to this new curve. Thus, in contrast to the case of non-social preferences, the Laffer curve is not the graph of a function. Instead we have what one may call a "Laffer correspondence" that is non-convex-valued over an interval of tax rates.

6 Altruism

An obvious limitation of the above model is that it is half-hearted when it comes to "social" preferences. We allowed for social preferences in the sense that an individual's private economic decision may be influenced by the choices of others. But we assumed that each individual's political voting decision is independent of the policy consequences for other individuals in society. Presumably most real-life individuals have social preferences also in this respect. Here we provide an extension of the model in this direction.

We focus on "Rawlsian altruism," i.e., an altruistic concern for those who are worst off in society. The earlier assumption (section 2.1) that all individuals have the same preferences over their own consumption and leisure has two helpful implications for the analysis. First, the difficulty of interpersonal utility comparisons does not arise. Second, the minimal private subutility, across all individuals in a macro state $s = (t; T; x)$ with $x > 0$, is simply $u(T) + \int v(x)$. We add the assumption that all individuals in society are equally altruistic, and that they have additively separable utility functions that combine "private" utility from own consumption, leisure, and source of subsistence, with "altruistic" utility from others' welfare.^{17 18}

¹⁷Thus those who are worst off in terms of their private utility are also worst off in terms of their total utility (including their altruistic concern for others).

¹⁸An alternative interpretation of this model extension is that individuals are instead uncer-

Letting a non-negative weight α be attached to the altruistic component, we obtain the following extension of the model developed in the previous sections.¹⁹ The total utility of a transfer recipient in a macro state $s = (t; T; x)$ is

$$(1 + \alpha) [u(T) + v(x)], \quad (17a)$$

and the (total) utility of an individual i who works and earns wage w_i is

$$u[(1 - t)w_i] + \alpha [u(T) + v(x)]. \quad (18)$$

Since the altruistic term is the same in both expressions, altruism has no effect on individuals' economic decisions: all individuals with wages above (below) the critical wage $w^*(t; x; T)$ still choose to work (live on the transfer).

However, altruism does potentially affect each individual's political behavior. Consider again individual i with wage w_i , now faced with a voting decision between two (balanced-budget) policies p and p^0 . Let the induced macro states be s and s^0 . In section 4.1, we defined $U_i(p)$ and $U_i(p^0)$ as the individual's "private" utility from these two alternatives (see equation (11)). Let $\hat{U}_i(p)$ and $\hat{U}_i(p^0)$ be her total (private and altruistic) utility from the alternatives. Then

$$\hat{U}_i(p) = U_i(p) + \alpha [u(T) + v(x)], \quad (19)$$

and likewise for $\hat{U}_i(p^0)$; granted that $x = x(p) > 0$ and $x^0 = x(p^0) > 0$.

The special case of assigning zero weight to altruism corresponds to the original model. If individuals instead are altruistic, i.e., if α is positive, then, unlike in the original model, the zero-tax policy can never win an election. This follows from our assumption (A2) that the utility from zero consumption is minus infinity, along with the assumption that there are individuals with (virtually) zero wage. Hence, an altruist prefers to give some transfer to these.

So what policy will now play the role of the zero-tax policy p^0 ? We will show below that workers (in a given macro state) with different wages will in general prefer different transfer levels. Hence, no single policy plays the role of p^0 . However, if the utility for consumption is logarithmic then it turns out that all those who work will have the same preferences over transfers. In order to substantiate these claims, first note that the (total) utility to a working individual i in some macro state $s = (t; T; x)$ is $W_i(x)$, where $t = f(x)$, $T = F(x)$, and

$$W_i(x) = u[(1 - f(x))w_i] + \alpha (u[F(x)] + v(x)). \quad (20)$$

We see from this definition that $W_i(x) \rightarrow -\infty$ as $x \rightarrow 0$ and as $x \rightarrow 1$, and thus all workers in any macro state prefer shares of transfer recipients that lie

tain as to their own (future) income, and thus workers may have an insurance motive when voting for a (future) transfer.

¹⁹We feel that it is natural to allow for the possibility that the weight attached to the worst off individuals may depend on the distribution of gross incomes; hence α .

strictly between zero and one. Consequently, $T = F(x) > 0$ in any unbeatable policy.

A necessary condition for some population share $x \in (0; 1)$ to maximize $W_i(x)$ is the first-order condition $W_i'(x) = 0$, which is equivalent to

$$u^0([1 - f(x)]w_i)w_i f'(x) = \lambda(\alpha) [u^0(F(x))F'(x) - v^0(x)]. \quad (21)$$

In general, the solution (set) to this equation depends on w_i , the individual's wage. However, if the utility from consumption is logarithmic, $u(c) = \log(c)$, then all w_i cancel and all workers prefer the same $x > 0$. Furthermore, suppose that the above first-order condition has a unique solution x^+ , and let p^+ be the associated policy, i.e., $p^+ = (t^+; T^+)$, where $t^+ = f(x^+)$ and $T^+ = F(x^+)$ are both positive.

Now the logic of section 4.2 kicks in. The set \hat{X} is still the ideal set for transfer recipients - their utility has only been multiplied by the constant and positive factor $1 + \lambda(\alpha)$. Lemma 1 still holds, so \hat{p} is still a candidate for an unbeatable policy. Proposition 3 is modified only in that the condition " $t > 0$ " is replaced by " $t > t^+$ " and Propositions 4 and 5 remain intact if λ is replaced by

$$\lambda^+ = [1 + \lambda(\alpha)]^{-1}, \quad (22)$$

and $u(w)$ is replaced by

$$\hat{u}(w) = u^h(1 - t^+)w^i + \lambda^+(\alpha) [u^3(T^+) + \alpha^0 - v(x^+)]. \quad (23)$$

The qualitative features of the analysis of political equilibrium in section 4 thus remain intact. The only difference is that the zero-tax policy p^0 is replaced by a positive-tax policy p^+ . In other words, the political equilibrium is either the "high-tax" policy \hat{p} supported by a majority of transfer recipients, or the "low-tax" policy p^+ supported by a majority of workers - taxing themselves for altruistic reasons.

7 Conclusions and directions for further research

In this paper we have aimed at providing an analytical model of the interplay between economic incentives and social norms. Rather than dealing with the issue in the abstract, we have chosen to apply the analysis to an issue in the political economy of the modern welfare state: what is the political equilibrium outcome in a society where individuals can choose whether to live on their own work or on welfare state benefits?

In the present model each individual faces two choices, one economic and one political. The economic choice is binary: whether to work or to live on public transfers. The public transfer is available to all who do not have any other income, and it is financed by a proportional wage tax. In this decision individuals take

the tax rate and transfer as fixed and given. In her political choice, however, the individual votes on alternative combinations of tax rates and transfers. Political equilibrium is defined as a budget-balanced tax/transfer combination that wins a majority of votes against all alternative such combinations.

In both her choices, the economic and the political, the individual acts in accordance with her preferences for consumption and leisure, as well as in accordance with a certain social norm: that one should live off one's own work. The strength of this norm, more exactly the disutility from living on the work of others (via the transfer), is assumed to be a decreasing function of the population share of individuals who deviate from it, i.e. live on transfers. We assume perfect foresight: when the individual decides whether to work or live on the transfer, she correctly anticipates the population share of transfer recipients, and thus also the strength of the social norm. Likewise, when voting, all individuals correctly anticipate the population share of transfer recipients resulting from each tax/transfer combination.

When social norms are introduced in a political economy model one might fear that a great number of outcomes become possible - that "anything can happen." This fear turns out to be unjustified in the present setting. The range of possible outcomes is in fact highly restricted. Essentially, there are only two alternatives: a low-tax society with a minority of transfer recipients or a high-tax society with a majority of transfer recipients. Which of these two potential equilibria will materialize depends on preferences (assumed to be identical) and on the wage distribution (taken to be exogenous).

When the social norm is important to the individual in comparison with her preference for consumption and leisure, and when the disutility from deviating from this norm is highly sensitive to the fraction of deviators, then it turns out that certain tax rates are consistent - in the sense of fulfilled expectations and balanced budget but not necessarily political equilibrium - with multiple combinations of per capita transfer levels and fractions of benefit recipients. The alternative equilibria associated with a given tax rate differ not only in their accompanying transfer levels but also in the social value attached to work. In a high per-capita transfer equilibrium (with a small share of transfer recipients) a high value is attached to work (high disutility of living from others work), while in a low transfer equilibrium (with a large share of transfer recipients) a low value is attached to work. In this sense social values may be endogenous.

The assumption of perfect foresight in individuals' economic and political choice may be unrealistic. Perhaps more so in the political choice, since it concerns a whole menu of alternative and yet unrealized tax rates and transfer levels with accompanying population shares of transfer recipients. It is tempting to speculate that individuals' perception of changes in the number of beneficiaries is subject to some inertia when changes in the tax rate and/or transfer level are considered by the electorate. Thus, one may hypothesize that voters, when faced with a policy proposal, underestimate the resulting change in the population

share of transfer recipients.

Citizens in a low-transfer society may therefore vote for more generous programs than if they had correctly anticipated the long term socio-economic adjustment. If the benefit systems become more generous then more individuals than expected may choose to live on benefits because others do. In this sense the welfare state may overshoot. As a consequence a budget deficit may emerge. Restoring budget balance may require either increased tax rates or a reduced transfer level. If the first path - increased tax rates - is followed it would become even more attractive to live on the transfer, which may generate a vicious circle of more and more beneficiaries and yet higher tax rates. If instead the per capita transfer level is cut, then it will be necessary to accept a lower transfer level than initially planned.

The present analysis leaves several avenues for future research open. First, it might be valuable to formalize the heuristic discussion above about inertia. Second, an obvious modification of our model is to allow for marginal adjustments in individual hours of work. It may also be worthwhile to allow for individual differences in preferences and in the access to benefit systems. For instance, individuals may differ in their sensitivity to social norms and they may also have differing entitlements to transfer payments. Finally, it might be valuable to model a more realistic political process than the simple majority rule used in this paper; by instead studying such political institutions as representative democracy and political parties.

8 Appendix

8.1 Proof of proposition 1

We proceed as follows. First, we define a function $f : (0; 1) \rightarrow (0; 1)$ such that $t = f(x)$ if and only if $H(x; t) = 0$. Second, we show that this function is continuously differentiable, and that the identity $F(x) = f(x)^a [\phi^{-1}(x)] = x$ defines a continuously differentiable function $F : (0; 1) \rightarrow \mathbb{R}_+$. Third, we show that $t = f(x)$ and $T = F(x)$ if $(t; T; x) \in S^a$. Fourth, and finally, we show that $(t; T; x) \in S^a$ if $t = f(x)$ and $T = F(x)$.

Step 1: The equation (10) has a unique solution in $t \in (0; 1)$ for any given value of $x \in (0; 1)$. This follows from the following observation: let $x \in (0; 1)$ be fixed, and note that $H(x; t)$ is continuous and strictly decreasing in t , from $+1$ at $t = 0$ to -1 at $t = 1$. Thus, by monotonicity and Bolzano's Intermediate Value Theorem, there indeed exists exactly one $t \in (0; 1)$ such that $H(x; t) = 0$. Denote this t -value $t = f(x)$: this defines a function $f : (0; 1) \rightarrow (0; 1)$ as claimed.

Step 2: The function $H : (0; 1)^2 \rightarrow \mathbb{R}$ is continuously differentiable with $\frac{\partial H(x; t)}{\partial t} \neq 0$ for all $(x; t)$. By the Implicit Function Theorem, this implies that f is continuously differentiable. Since f^a and ϕ^{-1} are continuously differentiable, $F(x) = f(x)^a [\phi^{-1}(x)] = x$ defines a continuously differentiable function $F : (0; 1) \rightarrow \mathbb{R}_+$.

Step 3: Suppose $(t; T; x) \in S^a$ and $x \in (0; 1)$. Then $t < 1$ (since $x > 0$) and $T > 0$ (since $x < 1$). Equations (3) and (4) give

$$u[(1-t)\phi^{-1}(x)] = u(T) + \theta_j v(x). \quad (24)$$

Likewise, (3) and (8) give

$$T = t^a \phi^{-1}(x) = x. \quad (25)$$

Substitution of this equation into eq. (24) results in eq. (10). Thus $t = f(x)$ and $T = F(x)$.

Step 4: Suppose $x \in (0; 1)$, $t = f(x)$, $T = F(x)$, and let $w = \phi^{-1}(x)$. Since $t = f(x)$, we have $H(x; t) = 0$. Substitution of w for $\phi^{-1}(x)$, and T for $\frac{t^a}{x} [\phi^{-1}(x)]$ in the expression for $H(x; t)$ gives

$$u[(1-t)w] = u(T) + \theta_j v(x). \quad (26)$$

It follows from (3) that $w = w^a(t; T; x)$. Consequently, the triplet $(t; T; x)$ satisfies the fixed-point equation (4). Thus $s = (t; T; x) \in S$. Moreover, since

$$T = \frac{t^a}{x} \phi^{-1}(x) = \frac{t^a}{x} (w) = \frac{t^a}{x} [w^a(t; T; x)],$$

$s = (t; T; x)$ satisfies the budget equation (8), and thus $s \in S^a$.

8.2 Proof of proposition 2

By definition (9) of the function H:

$$\lim_{x \downarrow 0} H(x; t) = i - 1 \quad \text{and} \quad \lim_{x \uparrow 1} H(x; t) = +1 - 8t^2 \quad (0; 1) \quad (27)$$

$$\lim_{t \downarrow 0} H(x; t) = +1 \quad \text{and} \quad \lim_{t \uparrow 1} H(x; t) = i - 1 - 8x^2 \quad (0; 1): \quad (28)$$

Since f satisfies the identity $H(x; f(x)) \geq 0$, it follows from (27,28) that $\lim_{x \downarrow 0} f(x) = 0$ and $\lim_{x \uparrow 1} f(x) = 1$. Moreover, by continuity of H:

$$0 = \lim_{x \downarrow 0} H(x; f(x)) = \lim_{x \downarrow 0} \left[u[\odot^{i-1}(x)] + u\left[\frac{f(x)}{x}\right] + v(0) \right] \quad (29)$$

Since $u[\odot^{i-1}(x)] \leq i - 1$ as $x \downarrow 0$, (29) implies $u\left[\frac{f(x)}{x}\right] \geq +1$ as $x \downarrow 0$: Hence $\lim_{x \downarrow 0} f(x) = x = 0$. By proposition 1:

$$\lim_{x \downarrow 0} F(x) = \lim_{x \downarrow 0} \frac{f(x)}{x} \odot^{i-1}(x) = \lim_{x \downarrow 0} \frac{f(x)}{x} = 0: \quad (30)$$

$$\lim_{x \uparrow 1} F(x) = \lim_{x \uparrow 1} \frac{f(x)}{x} \odot^{i-1}(x) = \lim_{x \uparrow 1} \odot^{i-1}(x) = 0: \quad (31)$$

8.3 Proof of Corollary 1

Differentiation of the identity $H[x; f(x)] \geq 0$ gives

$$\frac{\partial H}{\partial x} + \frac{\partial H}{\partial t} f'(x) \geq 0. \quad (32)$$

By eq. (9), $\frac{\partial H}{\partial t} < 0$ for all $t \in [0; 1]$, and

$$\frac{\partial H}{\partial x} = (1 - t) \frac{\partial \odot^{i-1}}{\partial x} u^0 + (i - t) \frac{\partial}{\partial x} \left[u \odot^{i-1}(x) \right] + v'(x): \quad (33)$$

The sum of the first two terms on the right-hand side is positive for all $t \in [0; 1]$ and $x \in (0; 1)$. Moreover, the limit of this sum is positive as $x \downarrow 0$. Since the sum thus can be extended to a positive continuous function on the compact set $[0; 1]^2$, it takes a positive minimum value on $[0; 1]^2$. Call this " ϵ ". Thus, if $v'(x) > -\epsilon$ for all $x \in [0; 1]$, then $\frac{\partial H}{\partial x}(x; t) > 0$ for all $(x; t) \in [0; 1]^2$. Consequently, $f'(x) > 0$ for all $x \in [0; 1]$.

8.4 Proof of Lemma 1

Since $v : [0; 1] \rightarrow \mathbb{R}$ and $F : [0; 1] \rightarrow \mathbb{R}_+$ are continuous, and $F(x) \downarrow 0 = F(0)$ as $x \downarrow 0$, the maximand in (12) is a continuous function on $(0; 1)$ that approaches $i - 1$ as $x \downarrow 0$ and as $x \uparrow 1$. Hence, the set

$$Z = \left\{ x \in [0; 1] : u[F(x)] + v(x) \geq u\left[F\left(\frac{1}{2}\right)\right] + v\left(\frac{1}{2}\right) \right\}$$

is a compact subset of $(0; 1)$, and $\hat{X} = \arg \max_{x \in Z} (u[F(x)] + v(x))$. By Weierstrass' Maximum Theorem, this shows that \hat{X} is non-empty and compact. Thus it has a minimal element, \hat{x} .

We next show that f is strictly increasing over the set \hat{X} . Suppose $x, x^0 \in \hat{X}$ and $x < x^0$. By definition of \hat{X} : $u[F(x)] + v(x) = u[F(x^0)] + v(x^0)$. The critical wage earner in each of the two macro states (corresponding to x and x^0 , respectively) is indifferent between working and living off the transfer. Hence, we also have $(1 - t)^{-1}w_i = (1 - t^0)^{-1}w_i$, where $t = f(x)$ and $t^0 = f(x^0)$. Consequently, since $x < x^0$ implies $(1 - t)^{-1}w_i < (1 - t^0)^{-1}w_i$, we arrive at the conclusion $t < t^0$.

8.5 Proof of proposition 3

Suppose $p = (t; T)$ is a balanced policy, and assume $t > 0$ and $x = \hat{x}(p) < \frac{1}{2}$. Individuals with wages exceeding the critical wage $w^c(t; T; x)$ then work and constitute a strict majority. Moreover, they would have higher utility in the zero-tax zero-transfer state $s^0 = (0; 0; 0)$ than in the proposed state $s = (t; T; x)$, simply because $u(w_i) > u((1 - t)w_i)$. Thus $p^0 = (0; 0)$ beats p . Hence, if p is unbeatable and $t > 0$, then $x \geq \frac{1}{2}$.

Suppose $p = (t; T)$ is balanced and unbeatable, $t > 0$, and $x = \hat{x}(p) \geq \frac{1}{2}$. Then individuals with wages below the critical wage $w^c(t; T; x)$ constitute a weak majority. Assume $x \notin \hat{X}$. Let $x^0 \in \hat{X}$ and p^0 is unbeatable, where $x^0 = \hat{x}(p^0)$. Then the weak majority of transfer recipients under p would have higher utility under p^0 than they have under p . For under p their utility is $u(T) + v(x)$ while under p^0 the utility to any individual i is

$$U_i(p^0) = \max \{ u(T^0) + v(x^0); u((1 - t^0)w_i) \} \\ \geq u(T^0) + v(x^0) > u(T) + v(x).$$

By continuity also some wage earners under p (those with wages just above the critical wage) would have higher utility under p^0 . Thus p is beaten by p^0 . Hence $x \geq \hat{x} \setminus \frac{1}{2}$ if p is unbeatable and $t > 0$.

Suppose finally that $p = (t; T)$ is balanced and unbeatable, $t > 0$, and $x \in \hat{X} \setminus \frac{1}{2}$, but $x \notin \hat{x}$. Then the (possibly weak) majority of transfer recipients under p would have at least the same utility under \hat{p} as they have under p , since both x and \hat{x} belong to \hat{X} , and transfer recipients under p may choose, under \hat{p} , to stay on the transfer. Moreover, the positive population share of workers under p have higher utility in \hat{p} . Under p the utility of a worker i is $u([1 - f(x)]w_i)$ while under \hat{p} his utility is

$$\max \{ u(F(\hat{x}) + v(\hat{x}); u([1 - f(\hat{x})]w_i) \} \geq u([1 - f(\hat{x})]w_i) > u([1 - f(x)]w_i).$$

Consequently p is beaten by \hat{p} .

In sum: $x = \hat{x} \setminus \frac{1}{2}$ if p is balanced, unbeatable and $t > 0$.

8.6 Proof of proposition 4

First, suppose $u(w) \leq \bar{u}$. Let p^0 be the zero-tax policy, and let $p^1 = (t^1; T^1)$ be a balanced policy with $t^1 > 0$. Let $x^1 = \gg(p^1)$. Clearly p^0 is not beaten by p^1 if $x^1 < \frac{1}{2}$, since then the workers under p^1 constitute a (possibly weak) majority, and they pay a positive income tax in s^1 . Assume $x^1 > \frac{1}{2}$. The critical individual in s^1 earns pre-tax wage $w^1 = \phi^{-1}(x^1) > w$. In $s^1 = (t^1; T^1; x^1)$ all individuals with wages below w^1 prefer the transfer to work, so their utility is $u(T^1) + \phi(x^1) > \bar{u}$. However, $u(w^1) > u(w) \leq \bar{u}$, a contradiction. Hence no such policy p^1 exists. Thus p^0 is unbeatable.

Second, suppose $u(w) < \bar{u}$. Let $p^0 = (t^0; T^0)$ be balanced, with $x^0 = \gg(p^0) < \frac{1}{2}$ and $u(T^0) + \phi(x^0) = \bar{u}$ (such a policy p^0 exists by definition of \bar{u}). Then the median wage earner is a transfer recipient in s^0 (since $u(w) < \bar{u}$) and has higher utility under p^0 than under p^0 . This is also true for all individuals with lower wages, and, by continuity, also for individuals with wages slightly above w so a strict majority prefers p^0 over p^0 . Thus p^0 is not unbeatable.

Third, suppose $u(w) > \bar{u}$. In order to show that no policy $p \notin p^0$ is unbeatable, it suffices, by proposition 1, to show that \hat{p} is beaten by p^0 . But this follows from the simple fact that if $u(w) > \bar{u}$ then the median wage earner, along with all individuals with higher wages, and, by continuity also some individuals with slightly lower wages, chooses to work under \hat{p} . Clearly this strict majority prefers policy p^0 to \hat{p} .

8.7 Proof of proposition 5

Suppose $\hat{x} > \frac{1}{2}$. First, suppose $u(w) > \bar{u}$. Then no other policy than p^0 is unbeatable, by proposition 2. This proves the "only if" part of the statement. Second, suppose $u(w) \leq \bar{u}$, and let $\hat{s} = (t; \hat{T}; \hat{x})$. The utility to a transfer recipient in this macro state is $u(\hat{T}) + \phi(\hat{x}) = \bar{u}$. In particular, the median wage earner has at least as high utility in \hat{s} as in the zero-tax macro state s^0 , so all individuals with lower wages prefer \hat{p} to p^0 . Since $\hat{x} > \frac{1}{2}$, p^0 does not beat \hat{p} . Can any other policy p beat \hat{p} ? If $x = \gg(p) < \hat{x}$, then the transfer recipients in \hat{s} , a strict majority, receive more utility in \hat{s} than in $s = (t; T; x)$, and hence \hat{p} is not beaten by any such policy p . If instead $x = \gg(p) \geq \hat{x}$, then the transfer recipients in \hat{s} receive the same utility in s as in \hat{s} . However, all tax payers in \hat{s} receive more utility in \hat{s} than in s . Thus, while transfer recipients in \hat{s} are indifferent, all tax payers in \hat{s} prefer \hat{p} to p , so \hat{p} is not beaten by p . In sum: \hat{p} is unbeatable if $u(w) \leq \bar{u}$.

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