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CLASS, COMMUNITY, INEQUALITY

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Abstract

We investigate how voluntary contributions to community-specific public goods affect (a) the relationship between inequality of incomes and inequality of welfare outcomes, and (b) individuals' material incentives for supporting income redistribution. We show that the nominal distribution of income could give quite a misleading picture of real inequality and tensions in society, both within and between communities. We also analyze the impact of alternative patterns of income growth on welfare inequality, and show that, somewhat paradoxically, individuals sometimes have incentives for opposing redistribution programs from which they themselves stand to receive income increments. This arises because of the complicating role of public goods, and has strong implications for class and community solidarity.

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1. INTRODUCTION

In this paper, we investigate how voluntary contributions to community-specific public goods affect (a) the relationship between inequality of incomes and inequality of welfare outcomes, both within and between communities, and (b) individuals' material incentives for supporting redistribution of income. We show that income differences can understate the extent of welfare inequality, both between rich and poor individuals and amongst poorer individuals, within and across communities. Such differences can also overstate the extent of welfare inequality among richer individuals. We also analyze the impact of alternative patterns of income growth on welfare inequality, and on individuals' incentives for opposing income redistribution programs even when they themselves stand to gain income increments from such programs.

In analyzing the determinants of inequality in welfare outcomes among individuals, economic analysis has traditionally focused on the role of, and interaction between, two institutions: the market and the state. How patterns of income distribution generated by the market can, are, or should be altered by state efforts at redistribution; and, conversely, how state policies influence the distribution of market incomes, are questions that have been examined.

Apart from the market and the state, however, there exists a third institution that plays a critical role in determining the actual distribution of welfare among individuals: civil society, or *community*. Often it is the case that individuals acquire access to certain kinds of goods and resources simply by virtue of their membership of a community. Conversely, how individuals allocate their personal incomes is also determined to a significant extent by the activities of other members of the community. Thus, processes inside the community have an important bearing on how a given distribution of personal *incomes* (itself a consequence typically of the interaction between forces of the market and those of the state) translates itself into a specific distribution of welfare *outcomes*. Yet economic analysis of distributive questions has typically neglected the role of the community, preferring to focus almost exclusively instead on the market and the state.

Once community (or civil society) is recognized as a key determinant of inequality, two broad questions immediately suggest themselves. First, how exactly does the mediation of community convert inequality in personal incomes into inequality in personal welfare outcomes? Second, how are individual attitudes towards, and tolerance of, inequality in personal incomes influenced by the nature of community? The first issue is important because a priori, it is conceivable that identifying the distribution of welfare with that of personal incomes may be seriously misleading. Yet it is welfare inequality, rather than income inequality per se, that is relevant for egalitarian social welfare functions. The second issue is important for the analysis of distributive conflicts. It provides the foundations for a material self-interest based rational choice theory of individual ideological attitudes and locations vis-à-vis wealth redistribution, and of changes in such locations; attitudes and shifts that can appear inconsistent or contra material self-interest to observers who focus only on inequalities in personal incomes.[1] Investigating these issues is the main purpose of this paper.

How can one formally interpret the notion of 'belonging' to a community? Intuitively, the perception of belonging to a group of individuals often seems to connote the existence of something which is beneficial and *common* (in the sense of being equally available) to all members, but from the benefits of which non-members are excluded (at least in the sense of having more restricted access, or access only at a higher cost). The definition of ethnicity in anthropology and sociology recognizes the role of physical markers but concludes that, "ultimately the key to identifying communal groups is not the presence of a particular trait or combination of traits, but rather the shared perception that the defining traits, whatever they are, set the group apart."[2] The psychological literature has uncovered the deep-seated drive among humans to form groups, even in relation to initially randomly assigned labels. Once the process starts, however, group cohesion is strengthened through sharing within the group and (at least

[1] Marxists of course have often been perplexed by apparent failures of workers to behave according to their class interest, and ascribed such apparent failures to 'false consciousness'. Conversely, revolutions have a habit of catching both friends and foes unawares. That political quietude of the poor may be due more to 'hegemony', i.e., indirect control exercised by the rich through civil society institutions that generate cultural and political consensus, than to the coercive powers of the state, is a thesis developed in depth by Gramsci (1971) in his celebrated attempt to understand the rise of Fascism in Italy.

[2] Gurr (1993), quoted in Uvin (1996).

partial) exclusion of those not in the group.[3] A natural way for economists to formally capture this dual notion of sharing and exclusion, which is widely recognized as a key characteristic feature of a community, is through the notion of a community-specific public good.[4] Common examples of such community-specific public goods include religious activities, religious schools and places of worship, literary and cultural production within specific ethno-linguistic traditions, ethnic rituals and festivals, sports clubs, or, when community members live in geographic proximity, civic/neighborhood amenities (including parks, museums and other cultural/recreational facilities) and security.

A second feature of community, which demarcates it from the state, appears to be its decentralized, *voluntary* character. State provision of cultural, ethnic or religious public goods is, of course, not uncommon. Nor, indeed, are mechanisms for self-governance within communities, which try to overcome some of the inefficiencies of decentralized decision rules. Yet, it is also often the case that a significant portion of the public good that defines a community is generated through voluntary contributions of individual community members, over and above any compulsory contribution that may be mandated either by the state or by a governance structure internal to the community (such as the one within the Catholic Church). Seen in this light, it becomes clear that, suitably amended, the standard model of voluntary contributions to public goods, as systematized by Bergstrom, Blume and Varian (1986), provides a powerful metaphor for formalizing the notion of community. The existing literature in this area has however largely concentrated on the implications of inequality in distribution of personal incomes for the aggregate level of supply of the public good; i.e., on how (income)

[3] Brown (1986) and Wetherell (1996). Akerlof and Kranton (2000) explore the connections between group identity and economics.

[4] Such a public good-based definition of a community is the basis of the theory of clubs, as introduced in the seminal paper by Buchanan (1965). See Cornes and Sandler (1996) for a survey of club theory. More recently, there has been considerable interest in the costs and benefits of various group exclusionary practices (see, for example, Bowles and Gintis, 2000). Alesina, Baqir and Easterly (1999), citing earlier literature, argue, in the context of urban US, that each ethnic group's utility level for a given public good may be reduced if other groups also use it. Extreme examples of this are found in the historical operation of the caste system in India, where notions of ritual pollution often implied that public goods would become 'polluted', and thus unfit for consumption, if used by individuals belonging to other caste or religious groups. Members of community A may actively seek to prevent non-members from having access to their public good. Alternatively, non-A individuals may themselves choose not to access the public good of A, because of high entry costs (as may be the case with attempts to access the literature of a foreign language, or with attempts to geographically relocate) or because they derive zero or negative utility from it (as may be the case with religious or ethnic rituals not one's own, or because it is considered 'polluted').

inequality affects community.[5] Our focus, in contrast, is on the opposite side of the relationship, viz., how community affects (welfare) inequality.

The benchmark result in the literature on voluntary provision of public goods is the famous *neutrality* proposition (Warr, 1983; Bergstrom, Blume and Varian, 1986), which states that when individual contributions aggregate through summation to form the community public good, and every member of the community is a contributor, the equilibrium level of the public good is independent of the distribution of incomes. Moreover, with identical preferences, in a fully contributory equilibrium all utilities are equalized regardless of the distribution of incomes (Itaya, de Meza and Myles, 1997). This equalization result has strong implications. It says that calculating inequality measures on observed incomes will give a misleading picture of the inequality of welfare outcomes. Inequality in personal incomes generated by the market or the state will in fact be completely counterbalanced by processes within the community.

With identical preferences, however, the poorer members of the community may not contribute towards the public good, or, more generally, if membership requires a common minimum contribution (a 'membership fee'), poorer members may contribute exactly this minimum 'fee', and no more. What if this is indeed the case, but, by virtue of their membership of the community, poorer members cannot be excluded from the benefits of the public good? What is the relationship between inequality of incomes and inequality of welfare outcomes within a given community in this situation? How will an increase in the income of a rich contributory member affect the inequality of welfare (real income) between another rich member and a poor non-contributory member? And what will it do to inequality between two non-contributory members who have different incomes? How is welfare inequality between individuals with identical incomes, but different community affiliations, affected by economic growth? What implication does the fact of public goods provision by the rich within their own community carry for poor people's attitudes towards the wealth of the rich? How do these attitudes change with growth? These are the questions we answer in this paper.

We model community in terms of a game of voluntary contributions to a community-specific public good among agents with identical preferences who vary in terms of their personal incomes. We first analyze the distribution of welfare, and attitudes towards redistribution, within

[5] See Cornes and Sandler (1996) for an overview. Alesina and La Ferrara (2000) and La Ferrara (2000) analyze how income inequality affects individual incentives to join groups and participate in group activities.

a given community. We show that, under reasonable restrictions on preferences, the following must be true. The mediation of community processes makes the absolute gap in real (or welfare) outcomes between two non-contributory members larger than that in their nominal incomes. Thus, community *exacerbates* the welfare consequences of income inequalities among the poor. With a large number of rich individuals, this is true of the gap between rich and poor individuals as well. Both results are driven essentially by the fact that any given amount of the public good is worth less to the poorer (non-contributory) individual. The welfare gap between a contributory and a non-contributory individual increases as income growth generates more rich individuals, or increases the incomes of individuals who are already rich, as does the welfare gap between two non-contributory individuals with different incomes. These results are generated primarily by the fact that additional units of the public good are worth less to the poorer (non-contributory) individual. For the same amount of gain in personal income, poorer individuals would be willing to impose larger costs on the rich. Middle or lower middle class individuals have an incentive to oppose measures to expropriate the wealth of the rich, even if they themselves stand to gain large increments in their personal incomes from such measures. Paradoxically, growth can turn opponents of redistribution in the middle and lower middle classes into its supporters, thus expanding the potential social base for redistributive politics.

Extending these results to societies with multiple communities, each with its specific public good, we show that welfare inequality between individuals belonging to different communities can rise with income growth, even if nominal inequality falls. Some patterns of income growth generate incentives for poorer individuals to support cross-community redistributive alliances structured along class lines, while others reduce or eliminate such incentives.

Section 2 lays out the basic model. Section 3 presents our formal results regarding the relationship between inequality in personal incomes and inequality in welfare outcomes within a given community. Section 4 discusses the issue of individual attitudes towards redistribution of incomes, and incentives for supporting or opposing redistributive measures, again in the context of a single community. We discuss the extension of our results to societies with multiple communities in Section 5. Section 6 concludes.

2. THE BASIC MODEL

Let there be n individuals in a community, $n \geq 2$. The set of individuals is $N = \{1,...,n\}$. Each individual consumes a private good and a public good. For any individual $i \in N$, amounts of the private and the public good consumed are, respectively, x_i and y. Preferences are given by a strictly quasi-concave and twice continuously differentiable utility function $u(x_i, y)$. To focus on income inequality as the source of heterogeneity, we assume agents have identical preferences. To have membership of the community, i.e., to be able to consume the public good, every agent must contribute at least an amount, c, of the public good; $c \geq 0$. We call this mandatory payment, c, a community 'membership fee'.[6]

Agent i has own money (or nominal) income I_i, $(I_i - c) \in R_{++}$. Income distribution within the community is represented by the n-dimensional vector $I = (I_1,..., I_n)$. Agents belong to a finite number, t, of income *classes*, $t \geq 2$.[7] Let $T = \{1,...,t\}$ denote the set of income classes. Nominal income of any agent belonging to income class $k \in T$ is I_k. Richer agents belong to the higher classes, i.e., $I_t > ... > I_1$. Income class k contains n_k individuals; thus, $\sum_{k=1}^{t} n_k = n$.

Individual i takes the amount of the public good contributed by all other agents, y_{-i}, as given and chooses the allocation of her own expenditure between the two goods. For notational simplicity, we shall assume that all prices are unity. First consider an individual i who chooses membership of the community, i.e., one who decides to spend at least c on the public good. Such an agent i's optimal consumption bundle is given by the solution to the following problem.

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[6] The community-specific public good is thus characterized by non-rivalry in consumption, but not necessarily non-excludability (even within a given community). States or governance structures internal to a community often can, and do, exclude otherwise eligible individuals from accessing the community's public good unless they fulfil certain minimal obligations to the community. We model these situations by allowing the possibility of a positive 'membership fee'. This fee can alternatively be thought of as a pure cost of accessing the public good which does not increase the amount of the latter. Our substantive analysis will not change under this alternative formulation.

[7] Formulating the problem in terms of a continuous distribution, while complicating the notation and exposition, does not yield any additional insight.

$\underset{x_i, y}{Max} \; u(x_i, y)$ subject to the budget constraint:

$$x_i + y = I_i + y_{-i}, \tag{2.1}$$

and the additional constraint:

$$y \geq y_{-i} + c. \tag{2.2}$$

The solution to the maximization problem, subject to the budget constraint (2.1) alone, yields, in the standard way, the unrestricted demand functions: $[y = g(I_i + y_{-i})]$, and $[x_i = h(I_i + y_{-i})]$.

Our first main assumption is the following.

A1. (a) $g', h' > 0$, and (b) $\left[\underset{[I_i + y_{-i}] \to \infty}{Lt} g(I_i + y_{-i}) = \infty\right], \left[\underset{[I_i + y_{-i}] \to \infty}{Lt} h(I_i + y_{-i}) = \infty\right]$.

Part (a) of A1 is simply the assumption that all goods are normal goods. Part (b) implies that no demand function is bounded from above in its range, i.e., one can generate any arbitrary level of demand, for either good, by suitably choosing the income level.

Let I_c be defined by $[g(I_c) = c]$; clearly, $[I_0 = 0]$. A1 ensures that such an income level is well defined. We assume that the 'membership fee', *c*, is low relative to income, in the sense that: $[I_1 \geq I_c]$. It is easy to see that, given A1(a), this suffices to ensure that all agents will indeed choose to be members of the community, i.e., they will contribute at least the mandatory 'membership contribution', *c*.

By A1(a), there must exist a unique Cournot-Nash equilibrium in the voluntary contributions game.[8] Thus, the Nash equilibrium generates group demand functions: $[x_i = X^i(c, I)], [y = Y(c, I)]$; where $I = (I_1, ..., I_n)$ and $i \in N$. In any Nash equilibrium, it must be the case that:

$$y = max[y_{-i} + c, g(I_i + y_{-i})] \text{ for all } i \in N. \tag{2.3}$$

It can be checked that, given A1, the Nash equilibrium must be symmetric, i.e., all agents who have identical incomes must make identical contributions to the public good.

An agent *i* is *non-contributory* in a Nash equilibrium if and only if, in that Nash equilibrium, $[y_{-i} + c \geq g(I_i + y_{-i})]$, and *contributory* otherwise. By a non-contributory agent, we thus mean one who only contributes the minimum amount that is necessary for community membership.

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

Contributory agents provide a positive amount over and above the mandatory membership fee. Given any $y_{-i} \geq 0$, let $\underline{I}(y_{-i}, c)$ be defined as the solution to: $[y_{-i} + c = g(I_i + y_{-i})]$.

Remark 2.1. Given A1, the following must be true.

(i) $\underline{I}$ is well defined and increasing in its arguments.

(ii) Agent *i* is non-contributory in a Nash equilibrium if, and only if, in that Nash equilibrium, $I_i \leq \underline{I}(y_{-i}, c)$.

(iii) In any Nash equilibrium, $y_i > c$ if, and only if, in that Nash equilibrium, $I_i > \underline{I}(y_{-i}, c)$.

(iv) For every $i, j \in N$, (a) if $y_i > y_j$, then $I_i > I_j$, and (b) if $I_i > I_j$, and $y_i \leq y_j$, then $y_i, y_j = c$.

Corresponding to any consumption bundle $\langle x_i, y \rangle$, let the *real income* of agent *i*, $r(x_i, y)$, be defined as the solution to: $[u(x_i, y) = V(r_i)]$; where V is the agent's indirect utility function. Thus the real income is simply the minimum expenditure required to generate the same utility as that provided by the consumption bundle the agent actually consumes in the Nash equilibrium. It is her real income, rather than her nominal income, that constitutes the true monetary measure of an agent's welfare in the Nash equilibrium. If an agent is non-contributory her consumption bundle in that Nash equilibrium is, obviously, $\langle I_i - c, y_{-i} + c \rangle$. It is evident that we can write:

$$[r(I_i - c, y_{-i} + c) = I_i + y_{-i} - f(I_i - c, y_{-i} + c)], \tag{2.4}$$

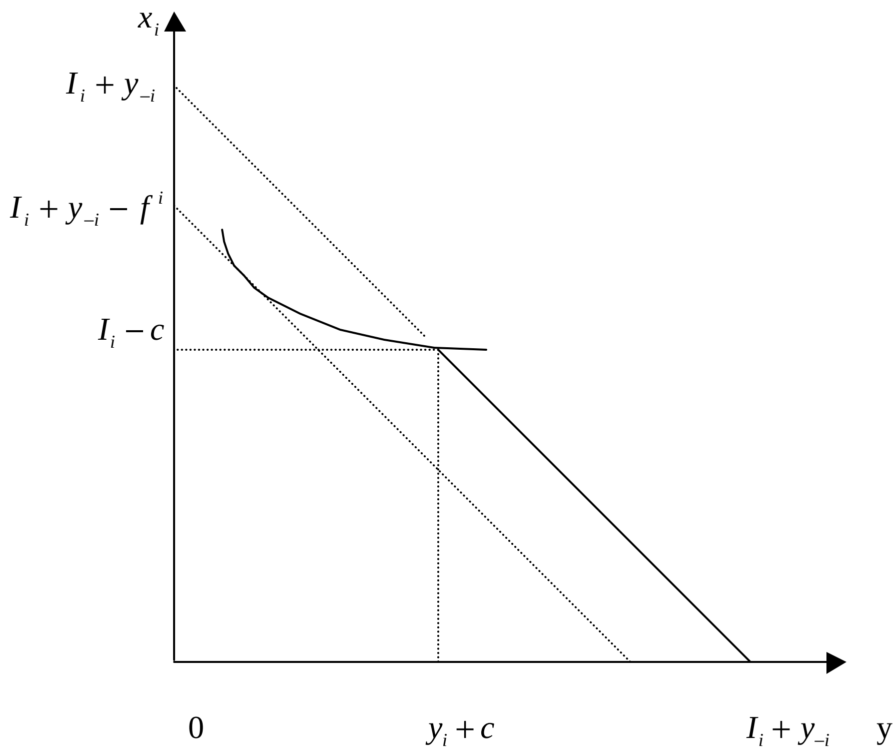
such that:

$$f(I_i - c, y_{-i} + c) = 0 \text{ if } I_i \geq \underline{I}(y_{-i}, c), \text{ and } f(I_i - c, y_{-i} + c) \in (0, y_{-i}) \text{ otherwise.}$$

The expression (2.4) has the following interpretation. When all other agents together spend y_{-i} on the public good, it is as if agent *i* receives an income support, in kind, of that amount of the public good. When *i* is contributory, this de-facto commodity transfer is equivalent, in terms of its effect on *i*'s welfare, to a cash transfer of y_{-i} dollars. However, when *i* is non-contributory, the in-kind, rather than cash, nature of the transfer generates a welfare loss for her. The monetary value of this welfare loss is measured by the *loss function* f, as illustrated in Figure 1.

From Figure 1 it is clear that the real income function r is invariant with respect to increasing monotonic transformations of the utility function. It follows from (2.4) that the loss function f is invariant with respect to such transformations as well. Assuming standard properties of the utility function, the loss function is twice differentiable at all $\langle I_i, y_{-i}\rangle$ such that $I_i \in (0, \underline{I}(y_{-i}, c))$ and $y_{-i} \in R_{++}$. The notion of real income and that of the loss function can be illustrated with the help of the following simple example. Suppose $u = \ln x_i + \ln y$; and suppose $c = 0$. Then $\underline{I}(y_{-i}) = y_{-i}$. Suppose $I_i < y_{-i}$, which implies agent *i* is non-contributory. It is easy to check that $r_i = 2\sqrt{I_i y_{-i}} = I_i + y_{-i} - \left(\sqrt{I_i} - \sqrt{y_{-i}}\right)^2$. Thus, the loss function $f(.)$ in this example is simply $\left(\sqrt{I_i} - \sqrt{y_{-i}}\right)^2$ if $I_i < y_{-i}$, and *0* otherwise.

Figure 1



We now introduce two more restrictions on preferences.

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

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

Note that A2(b) is strictly weaker than the assumption that agents are risk-averse VNM expected utility maximizers: if preferences can be represented by some utility function with features (a) and (b) above, then any monotonic transformation of that utility function constitutes a permissible representation of preferences as well, even if that monotonic transformation itself does not exhibit feature (a) or (b). Similarly, A3(b) is weaker than the assumption that agents are non-risk-averse expected utility maximizers. Both A2 and A3 comprise of quite standard restrictions on utility functions. The Cobb-Douglas, Stone-Geary and CES functional forms all satisfy A2. Any additively separable utility function that satisfies A1(a) must satisfy A2 as well. Multiplicative utility functions such as the Cobb-Douglas and the Stone-Geary satisfy A3.

With this background, we can now derive some important properties of the loss function, which we will use extensively later in deriving our substantive results. Let $g^{-1}(c) = I_c$.

Lemma 2.1. *Given A1, (a) for all* $y_{-i} > 0, \left[\underset{I_i \to I_c}{Lt} f = y_{-i}\right]$ *when* $[I_c = 0]$, *and (b) if* $I_i < \underline{I}(y_{-i}, c)$, *then: (i)* $f_{y_{-i}} \in (0,1)$, *(ii)* $f_{I_i} < 0$, *(iii) given A2,* $f_{y_{-i} I_i} < 0$, *and (iv) given A3,* $f_{I_i I_i}, f_{y_{-i} y_{-i}} \ge 0$.

Proof: See the Appendix.

The elements of the lemma all concern individuals who are non-contributory. Lemma 2.1(a) says that the value of other agents' spending on the public good to an individual is negligible when her cash income is negligible; 2.1(b(i)) that an additional dollar of public good provision is worth a positive amount, but less than a dollar, of cash income to non-contributory individuals. For these individuals, the value of an additional dollar of the public good does not increase at higher levels of public good provision (Lemma 2.1(b(iv))). Their valuation of a given amount of the public good (2.1(b(ii))), and of an additional dollar of the public good (2.1(b(iii)), both increase with their cash income. The former increases at a non-increasing rate (2.1(b(iv))).[9] A2

[9] In debates over state support for public radio, television and the arts, it is often argued that the middle classes benefit more from such state expenditure than the poor. Lemma 2.1((b(ii)) and (b(iii))) provides formal support for this view. Note that the difference in benefits arises in spite of identical preference orderings.

and A3 are sufficient, but not necessary, to derive the restrictions indicated in Lemma 2.1(b(iii)) and 2.1(b(iv)), respectively.

3. INEQUALITY

In our community, rich members contribute more to collective goods than the poor (Remark 2.1(iv)). Does this imply that inequality in welfare outcomes is less than inequality in personal incomes inside the community? How exactly does the public good technology convert inequality in nominal incomes to inequality in welfare outcomes? Alternatively, what happens to inequality in welfare outcomes when a community forms, i.e. the public good technology becomes available, in what was till now a *private consumption economy*?[10] How does the pattern of welfare inequality change with growth in personal incomes? We now address these questions.

Let the real income gap between class *j* and class *l* individuals be denoted by R_{jl}, and the nominal income gap M_{jl}. Using (2.4), we write:

$$R_{jl} = M_{jl} + (y_l - y_j) + \left[f\left(I_l - c, \sum_{k \in T} n_k y_k - y_l + c \right) - f\left(I_j - c, \sum_{k \in T} n_k y_k - y_j + c \right) \right]. \qquad (3.1)$$

Clearly, it is the pair-wise *real income gap*, rather than the nominal income gap, which provides the true measure of pair-wise inequality in welfare outcomes. In what follows we shall investigate the relationship between these two gaps.

Proposition 3.1. *Suppose, in a community* S*, agents of class* $\boldsymbol{c}$ *are contributory, and agents below class* $\boldsymbol{c}$ *are non-contributory, in the Nash equilibrium. Then, given A1:*

(a) for all $j, l \in \{\boldsymbol{c}, ..., t\}$, $j > l$, $\lfloor R_{jl} - M_{jl} \rfloor = -M_{jl}$;

(b) for all $j, l \in \{1, ..., \boldsymbol{c} - 1\}$, $j > l$, $\lfloor R_{jl} - M_{jl} \rfloor > 0$;

[10] In his classic study of nationalism, Anderson (1983) drew attention to the critical role played by a community-specific public good, language, in the construction of modern national identities. A technological innovation, modern print technology, made individual contributions towards the use, systematization and development of a language accessible to others at low cost. The availability of language as a public good generated distinct language communities, and such language communities, in turn, developed national identities.

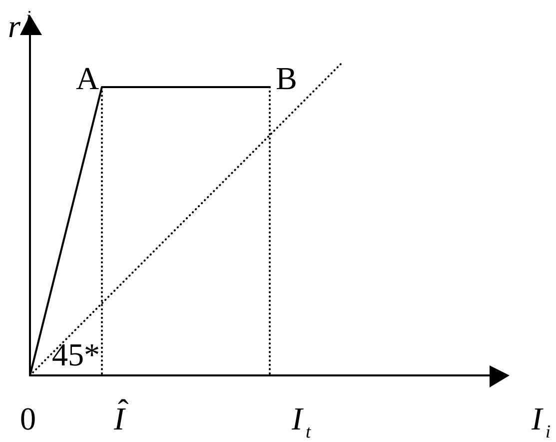
(c) for every $k \in \{c,...,t\}$*, there exists* n_k^* *such that, if* $\sum_{s=k}^{t} n_s > n_k^*$*, then, for all* $j,l \in T$ *such that* $k \geq j \geq \chi > l$, $\lfloor R_{jl} - M_{jl} > 0 \rfloor$*;*

(d) when c = 0, and $\sum_{k=\chi}^{t} n_k \geq 2$*, there exists* $\tilde{I} \in (0, I_\chi)$ *such that, if* $I_{\chi-1} \leq \tilde{I}$*, then, for all* $j,l \in T$ *such that* $j \geq \chi > l$, $\lfloor R_{jl} - M_{jl} > 0 \rfloor$.

Proof: See the Appendix.

Note that Proposition 3.1 is derived independently of both A2 and A3. The relationship between the nominal earning of an agent and her real income in the Nash equilibrium is illustrated by the schedule OAB in Figure 2 below. Individuals earning $\hat{I}$ or less are non-contributory; those who earn more are contributory.[11]

Figure 2



By Proposition 3.1(a), regardless of the nominal income gap, the real gap between any two classes is zero when both classes are contributory.[12] This is because the entire additional income of the richer agent is spent on the public good. Since richer individuals are contributory, it follows that the public goods technology equalizes welfare outcomes among the wealthier

[11] The stretch OA need not be linear. If only one type of agents contributes, then A and B will coincide. If only one agent is contributory, the point B must lie on the 45* line.
[12] Thus, in particular, if in a group of two agents both agents are contributory, their real incomes will be identical. This is the result of Itaya, de Meza and Myles (1997).

segment of the community. The nominal income gap will overstate the extent of inequality in welfare outcomes between individuals belonging to different income classes in this segment.[13]

The situation is interestingly different when it comes to the non-contributory (i.e. poorer) segment of the community. By Proposition 3.1(b), the real (pair-wise) gap between agents of different income classes belonging to the non-contributory segment of the population is actually higher than the corresponding nominal inequality. Intuitively, this happens because the public good is worth more to wealthier individuals in this segment. Thus, the public goods technology has the impact of magnifying nominal gaps between the very poor and moderately poor (or middle class) groups in the community, when both these groups are non-contributory. The nominal income gap will understate the extent of inequality in welfare outcomes between individuals belonging to different income classes within the non-contributory segment.

Lastly, how do nominal and real gaps compare between contributory and non-contributory agents? Contradictory effects are at work here. Contributions by the contributory agent serve to reduce inequality. However, the contributory agent benefits from contributions by other agents more than the non-contributory agent, which serves to increase inequality. Consider any contributory income class k. Proposition 3.1(c) implies that, if the total number of individuals who earn at least I_k is sufficiently large, then the second effect will dominate the first. Thus, intuitively, in a community with a large number of rich contributory individuals, public spending by the rich leads to the nominal income gap actually understating the true magnitude of differences in welfare outcomes between the rich and the poor.[14] Proposition 3.1(d) implies that the second effect will also dominate the first when the nominal income gap between the rich and the poor is sufficiently large. Consequently, in either case, inequality in welfare outcomes between (rich) contributory agents and (poor) non-contributory agents will be higher than the corresponding inequality in nominal incomes.

What is the relationship between real and nominal values of the standard aggregate measure of inequality based on pair-wise income gap comparisons, viz., the Gini coefficient?

[13] The neutrality result need not hold when the production technology for the public good does not take the summation form (see Cornes (1993)). In that case, complete equalization of welfare will not occur. However, our basic claim, that welfare outcomes of contributors are less unequal than their incomes, would still hold in general.

[14] This is true regardless of the value of c. It is easy to show that, if $c > 0$, then, for any given number of contributory agents, the real income gap between a contributory and a non-contributory agent must be greater than the corresponding nominal income gap if the number of *poor (non-contributory) agents* is sufficiently large.

Corollary 3.1. *There exists* n_t^* *such that, if* $n_t > n_t^*$, *then* $Gini_R > Gini_N$.

Proof: See the Appendix.

If the community contains a sufficiently large number of individuals in the richest nominal income category, only such individuals will be contributory.[15] Then, the Gini coefficient calculated on the basis of nominal income gaps must understate aggregate inequality in real income (or welfare outcomes), measured according to the corresponding Gini coefficient.[16]

Consider now the problem in its dynamic context. Suppose that, due to growth, over time, some individuals move up into higher income classes. In other words, for every income class *k*, the number of agents who earn at least *k* does not fall, and this number increases for at least one income class. Formally, we can think of such, apparently progressive, income growth as involving a stochastically dominating change of the first degree in the income distribution. What impact will such growth have on real inequality?

Proposition 3.2. *Suppose, in some community* S^*, *agents of class* $\boldsymbol{c}$ *are contributory, and agents below class* $\boldsymbol{c}$ *are non-contributory in the Nash equilibrium. Let* $\hat{S}$ *be another community with identical preferences, income classes and membership fee such that, (i)* $\left[\forall k \in \{\boldsymbol{c},...,t\}, \sum_{j=k}^{t} \hat{n}_j \geq \sum_{j=k}^{t} n_j^*\right]$, *the inequality holding strictly for at least one* $k \in \{\boldsymbol{c},...,t\}$, *and (ii)* $\left[\hat{n} \geq n^*\right]$. *Suppose further that A1 is satisfied. Then,*

(a) for every pair $\langle j,l \rangle$ *such that* $j \in \{\chi,...,t\}$ *and* $l \in \{1,2,...,\boldsymbol{c}-1\}$, $\left[\left(\hat{R}_{jl} - R_{jl}^*\right) > 0\right]$, *and*

(b) given A2, for every pair $\langle j,l \rangle$ *such that* $j,l \in \{1,2,...,\chi-1\}$ *and* $j > l$, $\left[\left(\hat{R}_{jl} - R_{jl}^*\right) > 0\right]$.

Proof: See the Appendix.

Consider two individuals of income classes *j* and *l*, $j > l$, and suppose *l* was non-contributory initially. Now suppose these two individuals maintain their own nominal incomes,

[15] See the appendix for proof. Fries, Golding and Romano (1991) allow preferences as well as incomes to vary, and show that, for an economy having a finite number of types, and *N* individuals of *every* type, only one type of agents will be contributory when *N* is greater than some number N_0. We show (under identical preferences) that only one type of agents will contribute when the number of the richest agents is greater than some value N_0, *irrespective of* the number of agents in other types.

[16] In fact, the result stated in Corollary 3.1 is true for any aggregate inequality measure which is (a) increasing in pair-wise income gaps, and (b) normalized by the value of that measure when the entire income of the community accrues to a single individual.

but other individuals move up the income ladder in the manner already described. Then Proposition 3.2 implies that inequality in welfare outcomes between these two individuals must increase, even though their nominal income gap remains invariant. This happens for the following reason. As other people earn more, their collective spending on the public good increases. This additional spending however is worth more to the class *j* individual than the poorer, class *l* individual. This effect increases the real income gap between the two. Additionally, if the *j* agent was contributory initially, then his contribution will fall when other people spend more. This will reinforce the effect already discussed and increase real inequality still further. Note that we do not require A3 to derive Proposition 3.2. Note further that the restriction $\left[\hat{n} \geq n^*\right]$ is not necessary for our results if community members cannot be excluded from consuming the public good, i.e., if $c = 0$.

The result is illustrated in Figure 3, where we assume that initially only the richest individuals are contributory. When the number of such individuals increases, the real income schedule shifts upward from OAB to OA'B'. Real inequality between every pair of income classes increases.[17]

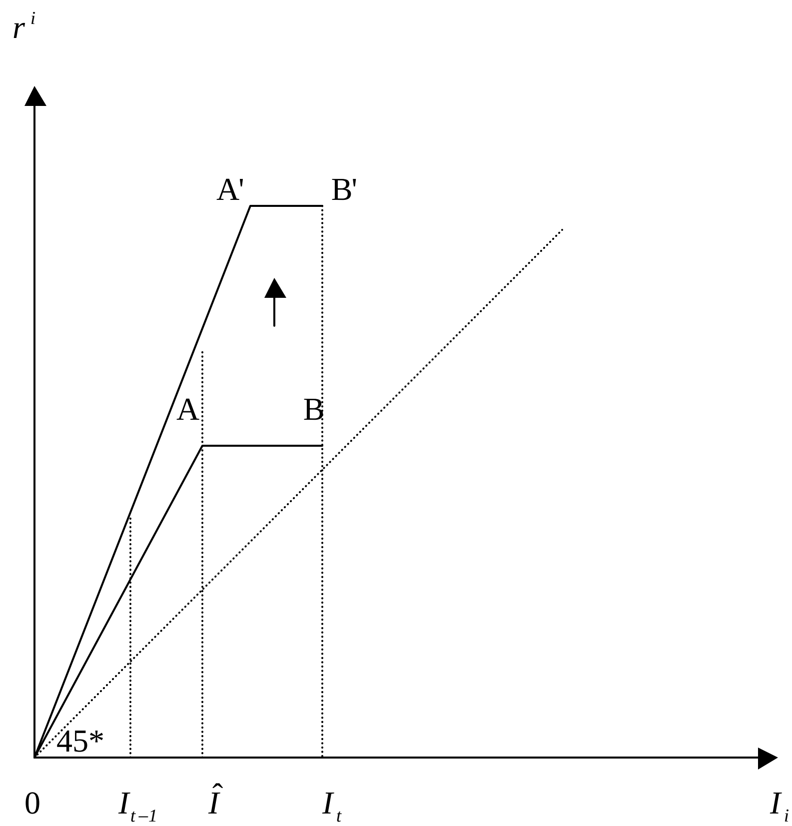
Remark 3.1. Given A1, A2 and A3, if the nominal incomes of two non-contributory agents belonging to different income classes increase by the same amount, then the real income gap between them will not rise.

Remark 3.2. Given A1, A2 and A3, if the 'membership fee', *c*, increases, then the real income gaps between (a) any contributory agent and any non-contributory agent, and (b) any two non-contributory agents belonging to different income classes, must all rise. In this sense, communities whose membership norms are more stringent are also more unequal.

We now explain some of the main implications of the formal analysis presented in Propositions 3.1 and 3.2. For simplicity, let the community consist of three income classes, rich (R), middle (M) and poor (P). That the presence/introduction of a public good technology has an equalizing influence on welfare outcomes within the wealthier (contributory) segment of the community (Proposition 3.1(a)) would seem to suggest that the community might be more *polarized* than suggested by the distribution of nominal incomes. To see this, let the population proportions in

[17] Note that, with the expansion, non-contributory individuals must continue to remain contributory, while some contributory individuals may now turn non-contributory.

Figure 3



R, M and P be 1/4, 1/4, and 1/2, respectively. Suppose that R and M individuals are contributory, but P individuals are not. Then, in terms of real incomes, the community will be actually split into two classes, R and P, with equal population shares. It can be shown that, under certain conditions, the measures of polarization developed by Esteban and Ray (1994), Wolfson (1994) and Zhang and Kanbur (2000) are higher for real than for nominal incomes.

Consider now the effects of income growth in this community. Start with a situation in which only R individuals are contributory. Now suppose a process of income growth propels some M individuals into the R class. From Proposition 3.2, all of the remaining M individuals will find themselves relatively worse off, in terms of the gap in real income, vis-à-vis R individuals, and relatively better off vis-à-vis P individuals (even though the corresponding nominal income gaps remain invariant). The real gap between M and P and between R and P will increase. In fact, it is possible (though not necessary) that after such a change a P individual may move up to the M income level, yet still find that she has become relatively worse off vis-à-vis an R individual.

As another illustration, suppose incomes are redistributed from some of the R individuals to P individuals. Suppose further that the recipients of the transfer move up to M income levels, while the R individuals who suffer the loss move down to either M or P income categories. Then, assuming that M individuals remain non-contributory, Proposition 3.2 implies that the real income gap between the remaining R individuals and P individuals who receive the transfer must fall by *more than* the nominal amount of the transfer. Indeed, even the real gap between P individuals who do not receive the transfer and M/R individuals must fall as well, as must that between M and R individuals. In this sense, the presence of the public goods technology actually increases the effectiveness of measures to redistribute nominal income in reducing inequality in welfare outcomes—the redistribution of real income is greater than that suggested by simply looking at the nominal income changes.[18]

4. CLASS CONFLICT

In most countries, suffrage was initially extended to (male) property-holders because the upper classes believed that the poor would try to use their vote to expropriate the rich. Yet, contrary to the initial expectations of friends and foes of redistribution alike, universal suffrage in the twentieth-century did not lead to the expropriation of the rich. Significant sections of the poor and lower middle classes, who were supposed to benefit from redistribution, were in fact found to be hostile to the politics of redistribution. A variety of reasons have been offered in explanation.[19] Yet, material incentives generated by the role of the rich in providing public goods, community in our usage, have by and large escaped analytical attention in this context.

What does the presence of community imply for the attitudes of self-interested individuals towards proposals to redistribute income? Every non-contributory individual would gain from a proposal to raise some amount from the rich and transfer it entirely to her. However, she would lose from an identical proposal for any *other* non-contributory individual, simply because such a

[18] A redistribution of this kind, which will reduce the amount of the public good, may (but need not) be inefficient. See Cornes and Sandler (2000).

[19] Some popular reasons are the following. (1) The rich have scarce productive talents, which would be withdrawn in response to harsh taxation, lowering the incomes of the poor. The poor recognize this. (2) Poor individuals hope that they themselves or their descendents will become rich some day and oppose redistribution for fear of hurting their own future selves or their descendents. (3) All individuals believe that individuals deserve their wealth. (4) The rich convince the poor of their usefulness in terms of (1), even though such usefulness is actually negligible, by means of propaganda disseminated through media under their control. See Putterman (1997) for a discussion.

measure would reduce her own welfare by reducing the supply of the public good. Thus, a non-contributory individual's attitude towards a proposal to tax the rich and distribute the proceeds among non-contributory (poor) individuals would be determined by her net benefit, i.e., by the relative strengths of these two contradictory effects. For example, in a three-person community with two non-contributory individuals, A and B, and one contributory individual, C, consider a proposal to raise \$2 by taxing C and pay A and B \$1 each. A gains from the transfer of \$1 from C to A. However, A loses from the transfer of \$1 from C to B, because this reduces the amount of the public good available to A. Thus, whether A will support the proposal or not will depend on whether the former effect is stronger than the latter. We now investigate this issue formally.

Consider an income redistribution policy which increases the nominal incomes of all but the richest individuals, i.e., all individuals with nominal incomes $I_k, k \in \{1,...,t-1\}$, by an identical, given, amount, ΔI, funding this by taxes on the richest, i.e. class *t*, individuals. The tax revenue required to fund the distributive program is *D*. We confine our attention to cases where the redistribution, if implemented, will keep the set of contributors unchanged.[20] Given ΔI, let the supremum of the set of total tax burdens imposed on class *t* agents which are compatible with this restriction be $\overline{D}$. Thus, we assume that $0 < D < \overline{D}$. Then, by the neutrality property, it is only the total amount of the tax burden, *D*, net of total transfers received by contributory agents, which will determine the total provision of the public good in the post-redistribution Nash equilibrium, according to some function $w\left(\sum_{k\in\{c,...,t\}} n_k I_k - \left(D - DI \sum_{k\in\{c,...,t-1\}} n_k\right)\right)$, $w' > 0$, where only agents in the income classes c or higher are contributory in the pre-redistribution equilibrium. Thus, the redistributive intervention, by reducing the total income of the contributory individuals, will also reduce total supply of the public good. Let the amount of the public good in the pre and post redistribution equilibria be given by, respectively, y^* and $\hat{y}$, and let that under the maximum possible burden on the *t* class be given by $\bar{y}$.

Let the change in the real income of an individual belonging to income class $k \in T - \{t\}$, in case the policy is implemented, be given by Dr_k. We then have:

$$Dr_k = r(I_k + DI - c, \hat{y}) - r(I_k - c, y^*). \tag{4.1}$$

[20] This restriction is for convenience of exposition and can be relaxed without changing our conclusions.

Remark 4.1. We assume that $r\left(I_k + DI - c, \bar{y}\right) < r\left(I_k - c, y^*\right)$. It is easy to see that, given A1, Dr_k must be decreasing in D. It follows that, given a Nash equilibrium, for every $k \in T - \{t\}$, there exists a unique $D_k < \overline{D}$ such that: $Dr_k \overset{>}{\underset{<}{=}} 0$ iff $D \overset{<}{\underset{>}{=}} D_k$. Thus, D_k is the maximum tax burden on the *t* class that a class *k* individual would accept. Obviously, $D_t = 0$.

For a given gain in nominal income accruing to all members of the community save the richest, D_k measures the maximum amount of cost that an individual in the class *k* would be willing to inflict on the wealthiest segment of the community as a whole. D_k can thus be interpreted as a measure of the degree of *class antagonism*[21] felt by individuals vis-à-vis the rich as a collective entity. Alternatively, one may interpret the inverse of D_k as a measure of the extent to which the possession of their wealth by the rich appears to be *legitimate* in the eyes of a type *k* individual. We call individuals of class *j* more *radicalized* than those of class *l* if $D_j > D_l$. How does class antagonism, and levels of radicalization within a community, formalized in this sense, relate to income distribution and growth?

Proposition 4.1. *Suppose, in some community S^*, agents of class $\boldsymbol{c}$ are contributory, and agents below class $\boldsymbol{c}$ are non-contributory in the Nash equilibrium. Let $\tilde{S}$ be another community with identical preferences, income classes and membership fee such that, $\left[\forall k \in T, \sum_{j=k}^{t} \tilde{n}_j \geq \sum_{j=k}^{t} n_j^*\right]$, the inequality holding strictly for at least one $k \in \{\boldsymbol{c},...,t\}$. Suppose A1, A2 and A3 are satisfied. Then:*

(a) for every $k \in \{\boldsymbol{c},...,t\}$, $\left[D_k^* = 0\right]$,

(b) for every $k \in \{2,...,\boldsymbol{c}-1\}$, $\left[D_{k-1}^* > D_k^* > 0\right]$, and

(c) if $g'' \leq 0$, for every $k \in \{1,...,\boldsymbol{c}-1\}$, $\left[\tilde{D}_k > D_k^*\right]$.

Proof: See the Appendix.

Proposition 4.1(a) implies that all contributory agents, regardless of their own income, perceive no class antagonism whatsoever vis-à-vis the rich, since they are all better off without

[21] But not class *envy*. Individuals in our model do not care about relative income levels as such.

any redistribution. Proposition 4.1(b) states that all non-contributory individuals perceive positive levels of class antagonism, but individuals get less radicalized as one moves up the nominal income ladder. This happens because a given reduction in the public good causes higher losses of real income as nominal income increases, while the real gain accruing from a given gain in nominal income does not increase. Proposition 4.1(c) states that, if either the number of contributory individuals increases, or some contributory individuals achieve nominal income gains, then every non-contributory individual will get more radicalized. This is because such an expansion, by increasing the amount of the public good, also increases the real gain accruing to non-contributory individuals from a given gain in nominal income. The real loss to such individuals from a given reduction in public good provision does not, however, increase.

The results presented in Proposition 4.1 have important implications for understanding *attitudes* of self-interested individuals belonging to different economic classes towards redistribution, and the composition of *potential* social bases of support for redistributive agendas and ideologies directed against the rich.[22] Consider a community with four income groups: the rich (R), the middle classes (M), the lower middle classes (LM) and the poor (P). Suppose that R and M individuals are contributory, while LM and P individuals are not. Consider a proposal to confiscate part of the wealth, amounting to D^*, of the R group and distribute it among the other three groups. By Proposition 4(a), all M individuals would oppose such a proposal, even though they themselves stand to receive income transfers if it is implemented. Indeed, M individuals would resist such a program even if they themselves receive transfers much larger than those received by LM and P individuals. The presence of the public good equalizes real incomes between M and R individuals (Proposition 3.1(a)), in spite of (possibly large) nominal income differences between them. Thus, any redistribution, however small, from R to LM/P individuals amounts to a confiscation of M individuals' own wealth. One could therefore observe the apparent paradox of middle class individuals adopting extremely conservative political ideologies of social unity and exhibiting hostility towards even those redistributive programs from which they themselves stand to make large monetary gains.

[22] How such attitudes may be aggregated and reflected in actual political-economic outcomes is a question we do not address. Our focus is on providing a prior theory of individual political attitudes, and of perceptions of class antagonisms, not of political-economic equilibria. Roemer (1998) sets up a political economy model with two partisan parties and two issues, economic and non-economic, and shows that, under some restrictions on voter preferences, in equilibrium the party representing the poor will propose less than complete equalization of wealth.

By Proposition 4.1(b), all LM and P individuals would support some amount of redistribution. However, the amount of cost that a P individual would be willing to inflict on the R group, D_P, would be higher than that an LM individual would, D_{LM}, even if they both stand to receive the same monetary transfer. Indeed, a P individual may be willing to impose a larger cost on the R group even if she receives a *lower* transfer than an LM individual.

When both P and LM individuals have very low incomes, $D^* < D_P, D_{LM}$, and all such individuals would support the redistribution proposal. In this sense, the potential social basis for populist or left wing political ideologies, which emphasize class divisions within the community, in a poor economy will consist of the poor and the lower middle classes. Now suppose pro-poor economic growth increases the market incomes of both P and LM individuals, while keeping those of M and R individuals invariant. Beyond a point, we will have $D_{LM} < D^* < D_P$; LM individuals will find that the redistributive agenda they had supported earlier has now become too costly for them, though P individuals will continue to support the program. Thus, the social support base for redistributive politics will get fragmented, with lower middle class individuals bringing their political attitudes more into line with those of individuals in the conservative rich/middle class bloc.[23] One may thus find increasing support for right wing ideologies of ethnic, religious or national unity among the lower middle classes. Note that these shifts in political attitudes and extent of class antagonism occur even though the income levels, and public goods contributions, of middle class and rich individuals remain invariant.

Suppose now that initially $D^* > D_P, D_{LM}$, so that there is absolutely no support for the proposal to redistribute. Consider a process of growth that is pro-middle class, in that only members of the M group achieve gains in their market incomes, which moves some of them to the R group. Then, by Proposition 4.1(c), all P and LM individuals will get more radicalized. If a sufficiently large number of M individuals become rich, then $D^* < D_P, D_{LM}$, so that all P and LM individuals will start supporting the proposal to redistribute. Indeed, it is even possible that the remaining M individuals will turn non-contributory and support the proposal as well. Clearly, this will also happen if it is the R individuals who receive market gains. Thus, a process

[23] A possible reflection of this can be read in conflicts between moderate and radical, Jacobin and Sans Coulotte, Bolshevik and Menshevik, Social Democrat and Communist, etc. The deeply ambivalent response that Pasternak's Dr. Zhivago, an enthusiastic consumer of elite cultural public goods, displays towards the Soviet revolution can also perhaps be explained these lines.

of pro-rich/middle class market growth will enlarge the potential support base for left-wing politics by (a) radicalizing the poor and the lower middle classes, and (b) fragmenting the middle classes and bringing one section closer, in its political views, to the P and LM groups.[24] Interestingly, such an alignment of political interests comes about even as welfare inequality increases for every pair of income groups (Proposition 3.2).[25]

It is often argued, in accordance with the idea of Kuznet's curve, that in the early stages of economic development, economic growth has a distinctly pro-upper class bias. This can happen, for example, because of labor displacing technological progress,[26] or because of surplus labor reserves in a dual economy (of the sort analyzed by Lewis (1954)). Our results provide one explanation for the intense class conflicts one usually associates with the initial phases of the industrial revolution, and for the middle/upper middle class origins of many a professional revolutionary and union organizer.

Now consider a process of income growth across the board, which increases market incomes of all classes except the rich. What impact would this have on the extent of class antagonisms? In light of our preceding discussion, it is clear that two contradictory effects will be at work. The increase in the incomes of the poor and lower middle class groups will reduce class antagonism, but the increase in the number of rich individuals will increase it. If the latter effect dominates, we will see an increase in class antagonism, not only among P and LM individuals, but possibly also among M individuals, with former supporters in this class turning hostile to the rich.[27]

Note that non-contributory individuals are always better off if their additional income comes from other non-contributory individuals, rather than the rich. Indeed, they are better off even if it is the rich who expropriate other non-contributory individuals. This provides an explanation as to why the rich may find it easy to get sections of the poor to support their attempts to

[24] With market led growth, one would expect the skilled professional, entrepreneurial and trading elements within the middle classes to achieve significant income gains, while government employees and knowledge workers in educational institutions would see their incomes stagnate, or grow less rapidly. Broad-based political movements of the left typically consist of social alliances between sections of the poor and lower middle classes, public sector workers and middle class intellectuals.

[25] Alternatively, if some LM individuals move into the M group, then all P and all remaining LM individuals (but not M individuals) will get more radicalised. Interestingly, this increase in P/LM hostility towards the rich comes about even though nominal incomes of rich individuals and their numbers both remain unchanged.

[26] Hicks (1969) argued that this factor played a major role in keeping real wages roughly constant in Britain during the sixty odd years of the industrial revolution.

[27] Essentially identical conclusions can be derived, in essentially identical ways, by considering instead the maximum amount of income gain for every non-rich individual that members of different non-rich classes would be willing to support.

expropriate other sections of the poor, even if the nominal payment for such support is negligible. On the other hand, if the poor all contribute to some public good, their individual incentive to break ranks and expropriate each other is reduced. This explains why movements of the left often actively encourage the idea of the poor constituting a separate community, with its own public goods which are distinct from the public goods provided and consumed by the rich, and impose sanctions on individuals contributing to, or consuming, public goods of the rich.[28]

It can be shown that, given A1, A2 and A3, an increase in the community membership fee will necessarily increase the extent of class antagonism vis-à-vis the rich. Thus, communities characterized by more stringent membership norms will also exhibit more distributive conflict.

Models of capital labor conflict[29] commonly argue that workers may find it in their own interest not to expropriate capitalists, because such expropriation would reduce capitalists' investment, and, thereby, workers' future incomes. Our analysis shows that workers could have such incentives even without any investment by capitalists, i.e., even if capitalists were parasitic rentiers and consumed their entire income. Secondly, models of capital labor conflict do not analyze the incentives faced by poor individuals who are not economically dependent on the rich through the employment relationship. Yet, in many countries, especially developing countries, independent self-employed individuals such as small peasants, artisans, service providers, shopkeepers and petty traders constitute a significant section (indeed, often a majority) of the poor. In highlighting the aspect of community, our analysis clarifies why even such sections may have incentives to restrain demands for redistribution. Thirdly, our analysis brings into focus how different patterns of income growth can sustain/disrupt multi-class redistributive alliances, an issue that two-class models can only assume away.

[28] This was particularly prominent in the efforts of the German Social Democratic movement to encourage separate workers' social clubs, libraries and reading circles, youth groups etc. See Hayek (1944). Arguably, Socialist and Communist attempts to establish a specifically 'proletarian' cultural and aesthetic practice can be understood in this way. This also provides an explanation of why Marx considered factory workers, who lived in close proximity and shared local and neighbourhood public goods, as the specific engine of social revolution, rather than the poor per se.

[29] See, for example, Lancaster (1973), Przeworski and Wallerstein (1982), Alesina and Rodrik (1994) and Somanathan (2001).

5. MULTIPLE COMMUNITIES

We now explore some implications, of our results, for societies consisting of multiple communities. We focus on the situation where individuals are born into, and grow up in, historically given communities, defined by common and equal access to a community-specific public good, and contribute only to their own community-specific public good, if at all.

Consider a society with two communities, I and II. In each community let there be the same two income classes, R and P. To fix ideas, these communities can be thought of as separate ethnic/religious groups, each defined in terms of its own public good. For convenience of exposition, we shall assume that the community 'membership fee' is zero, so that all individuals have costless access to the public goods of both communities.

Then, an individual *i* belonging to community m, $m \in \{I, II\}$, can consume an amount y_m of the public good specific to community m, and an amount y_{-m} of the public good specific to the non- m community. We assume that preferences are given by the utility function: $u(x_i, y_m + a_m y_{-m})$; where $a_m \in [0,1)$. The parameter a_m measures the extent to which, for an individual belonging to community m, a unit of the other community's public good substitutes for her own community's public good. Complete non-substitutability vis-à-vis the other community's public good is obviously a special case with $a_m = 0$.[30] Note that, through this formulation, we rule out the possibility that individuals contribute positive amounts to the public goods of both communities.

If both income classes in both communities contribute positive amounts to their respective public goods, then a special case of Proposition 3.1 says that there is no inequality of real incomes within each community (Itaya, de Meza and Myles, 1997). Real incomes of members are determined by the total income of the community. The only real inequality in society is *between* communities, determined by the difference in total community incomes. In this situation, the inequality of observed incomes overstates real inequality. In fact, in the literature

[30] Alternatively, this can be interpreted as modelling the situation where a_m proportion of the other community's public good is available to members of community m for free, but a prohibitively high membership fee needs to be paid for access to the remainder, so that m individuals choose to consume only a_m proportion of the other community's public good.

on the ethnic dimensions of inequality, analysts have often "decomposed" overall inequality of incomes, as derived from a national sample survey, into "between ethnic groups" and "within ethnic groups" components. It often turns out that the former is relatively small compared to the latter, which some authors argue is evidence that broad policies of "ethnic balance" are less important than policies which address inequalities within each community (Anand, 1983). It is seen that when most members of an ethnic group are contributory, this inference from the observed distribution of income is not valid. In fact, if the national distribution of income changes such that the "between ethnic groups" component rises, but the "within ethnic groups" component falls so much that overall measured inequality falls, the tensions in society may be misread altogether. The same can be true when the groups are regional in nature. It can be argued that some of these forces may have been present, for example, in Indonesia in the 1990s.

Suppose now that, in the initial Nash equilibrium, R individuals are contributory in both communities, and community I has a higher amount of the public good (because I contains more R individuals), $a_I \geq a_{II}$. Though P and R individuals in I earn the same amount as their respective counterparts in II, they have higher real incomes (Lemma 2.1(b(i)), because they share in the higher total income of 'their' rich through access to the latter's higher public goods contributions. The welfare gap between rich and poor individuals is also higher in the richer community I (Proposition 3.2(a)). P individuals in community I would be more radicalized, i.e., they would be willing to impose a higher cost on R individuals in their own community, for the same nominal income gain, than their counterparts in community II (Proposition 4.1(c)).

Consider now the situation when the nominal income of every poor individual, in both communities, increases by an identical amount, and all P individuals remain non-contributory. All P individuals in both groups are made better off. The real incomes of contributory (R) individuals stay unchanged. So real (as well as nominal) inequality between R and P individuals, both within and across communities, must fall. Paradoxically, however, the welfare gap between P individuals in I and those in II must *increase.*[31] The intuition behind this is that P individuals in community I are consuming a higher level of the public good. Thus, the same increase in cash income is worth more to them than to P in community II, which has a lower level of the public good. Indeed, P individuals in II can be relatively worse off, compared to those in I, even if they attain larger nominal income gains than the latter. Thus, community-neutral, pro-poor growth

[31] This follows immediately from (2.4), (3.1) and Lemma 2.1(b(iii)).

magnifies the cross-community gap in welfare outcomes among the poor, itself the consequence of a cross-community gap in public good provision.

Consider now the case where R individuals belong overwhelmingly to community I, whereas both communities contain P individuals. Proposition 4.1(b) implies that, at low levels of income, we will observe horizontal cross-community congruence in political attitudes among the poor. P individuals in community I will support measures to expropriate 'their' rich, even though part of the benefits accrue to P individuals in community II. This will change, however, with growth in incomes of P individuals. Rhetoric and ideologies of communal solidarity will come to trump those of class solidarity because of the increasing importance of the implicit redistribution brought about by community specific public goods. On the other hand, as pro-rich income growth takes place, P individuals in community I, who were earlier opposed to a redistributive policy, because it would entail large 'leakage' to members of the other community, would now support such a policy (Proposition 4.1(c)). Vertical identifications along community lines would be supplanted by cross-community horizontal identifications along class lines. Note that P individuals in community II would always support redistribution. In fact, individuals in community II can have much higher nominal incomes and yet appear more radicalized than P individuals in community I, simply because they are unaffected by the reduction in public goods provision consequent on redistribution.

6. CONCLUSION

How are economists to understand the nature of community, and the consequences of community formation and community activities on inequality and distributive conflicts? Individuals belong to many communities and have multiple identities—nation, class, ethnicity, language group, community, family, etc. What distinguishes each of these from the other? These are difficult questions to formulate and answer, and clearly there is no unique approach to advancing our understanding. This paper explores the consequences of identifying a community with a public good: (a) to which all members of the community have equal access, and (b) from the benefits of consuming which non-members are partially or totally excluded, whether because of preference differences or because of higher access costs. Thus our approach comes close to that of the large literature on the theory of clubs started by the seminal work of Buchanan (1965).

Our focus is on how inequalities, and attitudes of materially self-interested individuals towards measures to reduce inequalities, are both affected by the presence of community-specific public goods.

Within the framework of voluntary contributions to community-specific public goods, we have presented, interpreted and discussed a number of propositions on the relationship between the distribution of nominal and real incomes, how changes in the former affect the latter, and also how they affect individual incentives to support or oppose agendas and ideologies of income/wealth redistribution. Our general conclusion is that the nominal distribution of income could give quite a misleading picture of inequality and tensions in society, both within and between communities. Caution should therefore be exercised in drawing such simple conclusions from the evolution of the nominal distribution of income, in situations where community-specific public goods drive a wedge between it and the real patterns of inequality in society. Otherwise we may underestimate, for example, the polarization between rich and poor in a one-group society, or the extent of social cleavage when there are many groups. In the latter case, ideologies of communal solidarity may well trump those of class solidarity because of the implicit sharing of community resources brought about by community specific public goods.

Our framework has a number of shortcomings, of course. The specification of the community -specific public good is standard—individual contributions simply sum to the total supply of the public good, which all members of the group enjoy. But not all group public goods are best described by this "summation" technology. As (Cornes (1993)) has analyzed in some detail, other specifications overturn many of the standard results in the literature, including the famous neutrality propositions. Such alternative specifications (e.g. "weakest link" formulations, where the public good is the minimum of the individual contributions, as would be the case for contributions to infectious disease control) will in general have their own implications both for the relationship between the inequality of incomes and the inequality of outcomes, and for individual attitudes towards redistribution. An investigation of these implications is an important task for further research.

Our specification of the nature of community membership is also restrictive in at least two major ways. First, we assume that an individual can belong at most to one group. But in reality, individuals have multiple identities and have membership of multiple communities. In our terms, the same individual can contribute to several community specific public goods at the same time. For example, inter-ethnic marriage is perhaps best characterized not as giving up one group specific public good for another, but moving to have equal access to the public goods of two communities simultaneously.[32] The contribution/non-contribution equilibrium is much more complicated in this case. Second, individuals can and do switch communities and self-identifications. Migration and religious conversion are two important examples. How does the pattern of income growth affect the propensity for such intermingling and switching between groups? In the framework of community specific public goods adopted here, the question becomes one of relative valuations placed on the public goods that define different groups, and how income growth affects these valuations. The extent and possibilities of such intermingling and switching clearly have important implications for inequality and distributive conflicts as well. We leave these questions for future research.

[32] As a traditional piece of advice in some cultures puts it, "Don't think of it as losing a daughter but as gaining a son-in-law."

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Appendix

Proof of Lemma 2.1.

(a) Let $m(x_i, y) = \dfrac{u_x(x_i, y)}{u_y(x_i, y)}$, and consider any $y \in R_{++}$. Then, by A1(a), we have:

$\left[\underset{x_i \to 0}{Lt}\, m(x_i, y) = \infty\right]$. This implies $\left[\underset{x_i \to 0}{Lt}\, u(x_i, y) = u(0,0)\right]$. Thus, we have: for all $y_{-i} \in R_{++}$,

$\left[\underset{I_i \to 0}{Lt}\, r(I_i, y_{-i}) = 0\right]$. Using (2.4), Lemma 2.1(a) is immediate.

(b(i)) Consider any $I_i, y_{-i} \in R_+$ such that $I_i < \underline{I}(y_{-i}, c)$. Let $r^* = r(I_i - c, y_{-i} + c)$.

Furthermore, let $x^* = h(r^*)$ and $y^* = g(r^*)$, where h, g are the standard (unrestricted) demand functions for the private and public goods, respectively. Then, by the definition of real income,

$$u(I_i - c, y_{-i} + c) = u(x^*, y^*), \tag{X.1}$$

Noting that, since i is non-contributory, the amount of the public good consumed by her is y_{-i}, we then have from (X.1):

$$u_y(I_i - c, y_{-i} + c) = \left[u_{x_i}(x^*, y^*)h'(r^*) + u_y(x^*, y^*)g'(r^*)\right]r_{y_{-i}}(I_i - c, y_{-i} + c). \tag{X.2}$$

Since r^* is the minimum expenditure required to generate the utility level $u(I_i - c, y_{-i} + c)$, it must be the case that:

$$\left[u_{x_i}(x^*, y^*) = u_y(x^*, y^*)\right], \tag{X.3}$$

and

$$\left[h'(r^*) + g'(r^*) = 1\right]. \tag{X.4}$$

Together, (X.2), (X.3) and (X.4) yield:

$$u_y(I_i - c, y_{-i} + c) = \left[u_y(x^*, y^*)\right]r_{y_{-i}}(I_i - c, y_{-i} + c). \tag{X.5}$$

Note now that $\left[\dfrac{du_y}{dy}\Big|_{u=\bar{u}} = \left[\dfrac{u_{yy}u_{x_i} - u_{x_i y}u_y}{u_{x_i}}\right]\right]$. A1(a) implies:

$$\frac{\partial\left[u_{x_i}/u_y\right]}{\partial y} = \left[\frac{u_y u_{x_i y} - u_{yy}u_{x_i}}{u_y^{\,2}}\right] > 0. \tag{X.6}$$

Using (X.6), we then have:

$$\frac{du_y}{dy}|_{u=\overline{u}} < 0\,. \tag{X.7}$$

Noting that $y^* < y_{-i} + c$, we have, from (X.7),

$$u_y(I_i - c, y_{-i} + c) < u_y(x^*, y^*). \tag{X.8}$$

Together, (X.5) and (X.8) imply:

$$r_{y_{-i}}(I_i - c, y_{-i} + c) \in (0,1)\,. \tag{X.9}$$

Lemma 2.1(b(i)) immediately follows from (2.4) and (X.9).

(b(ii)) By an argument exactly analogous to that used to establish (X.9), one can show that:

$$r_{I_i}(I_i - c, y_{-i} + c) > 1\,. \tag{X.10}$$

Lemma 2.1(b(ii)) follows from (2.4) and (X.10).

(b(iii)) Let $\tilde{V}(r)$ be the indirect utility function corresponding to $W(x_i, y)$. Then,

$$W(I_i - c, y_{-i} + c) = \tilde{V}(r(I_i - c, y_{-i} + c))\,.$$

We thus have: $\left[W_y(I_i - c, y_{-i} + c) = \tilde{V}_r(r(I_i - c, y_{-i} + c))r_{y_{-i}}\right]$, which yields:

$$\left[W_{yx_i}(I_i - c, y_{-i} + c) = \tilde{V}_{rr}(r(I_i - c, y_{-i} + c))r_{y_{-i}} r_{I_i} + \tilde{V}_r(r(I_i - c, y_{-i} + c))r_{I_i y_{-i}}\right]. \tag{X.11}$$

Noting that $\tilde{V}_r > 0$, A2, (X.9), (X.10) and (X.11) together imply:

$$r_{I_i y_{-i}}(I_i - c, y_{-i} + c) > 0\,. \tag{X.12}$$

Lemma 2.1(b(iii)) follows from (2.4) and (X.12).

(b(iv)) The proof of part (b(iv)) is analogous to that of part (b(iii)) and is omitted. ◊

In order to establish Proposition 3.1 and Proposition 3.2, we shall need the following results.

Lemma X.1. *Suppose, in some community S^*, agents of class $\boldsymbol{c}$ are contributory, and agents below class $\boldsymbol{c}$ are non-contributory in the Nash equilibrium. Let $\hat{S}$ be another community with identical preferences, income classes and membership fee such that, (a) $\left[\forall k \in \{\boldsymbol{c},...,t\}, \sum_{j=k}^{t} \hat{n}_j \geq \sum_{j=k}^{t} n_j^*\right]$, the inequality holding strictly for at least one $k \in \{\boldsymbol{c},...,t\}$, and (b) $\hat{n} \geq n^*$. Then, given A1, $\left[\hat{y} > y^*\right]$.*

Lemma X.2. *Suppose that agents belonging to some income class k are contributory in a Nash equilibrium. Then, given A1, and given any* $\boldsymbol{a} > 0$*, there exists* n_a *such that, if* $n_k > n_a$*, then, for all* $j \in \{1,2,...,k\}$*,* $y_j < \boldsymbol{a} + c$*, where* y_j *is the individual contribution of every class j agent.*

Proof of Lemma X.1.

Case (i): $\left[\sum_{j=c}^{t} \hat{n}_j = \sum_{j=c}^{t} n_j^*\right]$.

Suppose $\lfloor \hat{y} \le y^* \rfloor$. Since all agents of class $\boldsymbol{c}$ are contributory in S^*, it follows from Remark 2.1(iv(b)) that all agents of higher class must be contributory in S^* as well. Then, by (2.3) and A1(a), it must be the case that: $\forall j \in \{\boldsymbol{c},...,t\}, \lfloor \hat{x}_j \le x_j^* \rfloor$, where x_j is the individual private consumption of every class *j* agent. This in turn implies that, $\forall j \in \{\boldsymbol{c},...,t\}, \lfloor \hat{y}_j \ge y_j^* > c \rfloor$, where y_j is the individual public contribution of every class *j* agent. Noting that, by construction, $\left[y^* = \sum_{j=c}^{t} n_j^* (y_j^* - c) + n^* c\right]$, we then have $\left[y^* \le \sum_{j=c}^{t} n_j^* (\hat{y}_j - c) + n^* c\right]$. Now, since $\forall j \in \{\boldsymbol{c},...,t\}$, $\lfloor \hat{y}_j > c \rfloor$, Remark 2.1(iv(b)) implies that: $\left[\hat{y} > \sum_{j=c}^{t} n_j^* (\hat{y}_j - c) + n^* c\right]$. It follows that $\lfloor \hat{y} > y^* \rfloor$, a contradiction which establishes our claim.

Case (ii): $\left[\sum_{j=c}^{t} \hat{n}_j > \sum_{j=c}^{t} n_j^*\right]$.

Let $\tilde{S}$ be a community with preferences, income classes and membership fee all identical to S^*, such that: $[\tilde{n} = \hat{n}]$, $\lfloor n_j^* = \tilde{n}_j \forall j \in \{\boldsymbol{c}+1,...,t\} \rfloor$ and $\left[\tilde{n}_c = n_c^* + \left[\sum_{j=c}^{t} \hat{n}_j - \sum_{j=c}^{t} n_j^*\right]\right]$. By the argument used to establish Case (i) above, it follows that $[\hat{y} \ge \tilde{y}]$. Therefore, to establish Case (ii), it suffices to show that:

$$\lfloor y^* < \tilde{y} \rfloor. \tag{X.13}$$

Suppose not. Then, (2.3) and A1(a) together imply that:

for all $j \in \{\boldsymbol{c},...,t\}$, $\lfloor x_j^* \geq \tilde{x}_j \rfloor$. (X.14)

But then, since nominal income remains constant for every class, (X.14) implies:

for all $j \in \{\boldsymbol{c},...,t\}$, $\lfloor c < y_j^* \leq \tilde{y}_j \rfloor$. (X.15)

Then, noting that $\left[\tilde{y} > \sum_{j=c}^{t} n_j^*(\tilde{y}_j - c) + n^* c\right]$, and $\left[y^* = \sum_{j=c}^{t} n_j^*(y_j^* - c) + n^* c\right]$, we have from (X.15), $y^* < \tilde{y}$. This contradiction establishes (X.13). ◊

Proof of Lemma X.2.

Suppose class k agents are contributory in a Nash equilibrium, and A1 holds. We first show that:

given any $\boldsymbol{a} > 0$, there exists n_a such that, if $n_k > n_a$, then $y_k < \boldsymbol{a} + c$. (X.16)

Suppose not. Then it must be the case that,

for every $n_k \in \{1,2,3,...\}$, $y \geq n_k(\boldsymbol{a} + c)$. (X.17)

Note now that, by A1, for every $j \in T$, there must exist a (finite) $\underline{y}(I_j)$ such that all j individuals are non-contributory if $y_{-j} \geq \underline{y}(I_j)$, where y_{-j} is the total contribution made by all non-j individuals. It follows from (X.17) that there exists n_k^* such that, if $n_k > n_k^*$, then $\lfloor y_k = c \rfloor$. This contradiction establishes (X.16). Together, (X.16) and Remark 2.1 (ivb) establish Lemma X.2. ◊

Proof of Proposition 3.1.

(a) Since agents have identical preferences, their contributions would be identical in the Nash equilibrium when they have identical incomes. Proposition 3.1(a) then follows immediately from the neutrality result for voluntary contributions public goods games.

(b) Proposition 3.1(b) follows immediately from (2.4), (3.1) and Lemma 2.1(b(ii)).

(c) Consider any arbitrary $k \in \{\boldsymbol{c},...,t\}$, and construct a community $\tilde{S}$ with preferences and membership fee identical to S, such that:

$[\forall \boldsymbol{s} \in \{1,...,k-1\}, [\tilde{n}_s = n_s]]$, and $[\forall \boldsymbol{s} \in \{k+1,...,t\}, [\tilde{n}_s = 0]]$. Lemma 2.1(b(i)), Lemma X.1, Lemma X.2 and (3.1) together imply that, in this community $\tilde{S}$:

there exists n_k^* such that, if $\tilde{n}_k > n_k^*$, then, for all j, l such that $k \geq j \geq \boldsymbol{c} > l$,

$[\tilde{R}_{jl} - M_{jl} > 0]$. (X.18)

Note now that, if $\left[\sum_{s=k}^{t} n_s = \tilde{n}_k\right]$, then, by Lemma X.1, $[y \geq \tilde{y}]$. Hence, in that case, by A1(a) and (2.3), we have: $[\forall s \in \{1,...,k\},[y_s \leq \tilde{y}_s]]$. Using (2.4), (3.1) and Lemma 2.1(b(i)), we immediately derive Proposition 3.1(c) from (X.18).

(d) If $\sum_{k=\chi}^{t} n_k \geq 2$, then, for all $k \in \{\chi,...,t\}$, $y_k < y$. Lemma 2.1(a), Lemma 2.1(b(ii)), (2.4) and (3.1) immediately yield Proposition 3.1(d). ◊

Proof of Corollary 3.1.

We first show that:

there exists $\hat{n}_t$ such that, if $n_t = \hat{n}_t$, then only *t* agents are contributory. (X.19)

Suppose not. Then, for all n_t, in the corresponding Nash equilibrium we have (using Remark 2.1 (ivb) and (2.3)); $[x_t = x_{t-1}]$, which implies $[x_t \leq I_{t-1}]$. This however violates (X.16), thereby establishing (X.19). It is easy to check that, if only *t* agents are contributory when $n_t = \hat{n}_t$, then this must be true for all $n_t > \hat{n}_t$ as well. It then follows from (X.19), Proposition 3.1(b) and Proposition 3.1(c) that:

there exists n_t^* such that, if $n_t > n_t^*$, then $\left[\sum_{j\in N}\sum_{l\in N}|R_{jl}| > \sum_{j\in N}\sum_{l\in N}|M_{jl}|\right]$.

By Lemma 2.1(a), pair-wise differences in real income are identical to their corresponding nominal values when the entire nominal income of society accrues to one individual. Thus, the denominator is identical for the two Gini coefficients. Corollary 3.1 follows. ◊

Proof of Proposition 3.2.

(a) By A1(a), contributory agents of every type must reduce their contribution if total provision of the public good increases. Then, (2.4), (3.1), Lemma 2.1(b(i)) and Lemma X.1 together yield the required inequality when $j \in \{c,...,t\}$.

(b) By A1(a), non-contributory agents must remain non-contributory if total provision of the public good increases. Then, together, (2.4), (3.1), Lemma 2.1(b(iii)) and Lemma X.1 yield the required inequality when $j \in \{1,..., c-1\}$. ◊

Proof of Proposition 4.1.

(a) This follows immediately from Proposition 3.1(a).

(**b**) That $D^*_{c-1} > 0$ is trivial. Consider any I_k such that $k \in \{2,...,c-1\}$, and any $Dy > 0$. By Lemma 2.1(b(iii)) (suppressing the 'membership fee', *c*, for notational simplicity),

$$[f(I_{k-1}, y^*) - f(I_{k-1}, y^* - Dy) > f(I_k, y^*) - f(I_k, y^* - Dy)]. \qquad \text{(X.20)}$$

Since, by Lemma 2.1(b(iv)), $f_{I_i I_i} \geq 0$, using Lemma 2.1(b(ii)), we have:

$$[f(I_{k-1}, y^* - Dy) - f(I_{k-1} + DI, y^* - Dy) \geq f(I_k, y^* - Dy) - f(I_k + DI, y^* - Dy)]. \qquad \text{(X.21)}$$

Combining (X.20) and (X.21), we get:

$$[f(I_{k-1}, y^*) - f(I_{k-1} + DI, y^* - Dy)] > [f(I_k, y^*) - f(I_k + DI, y^* - Dy)]. \qquad \text{(X.22)}$$

Define now $Dy^*_k = y^* - w((.) - D^*_k)$. From (2.4) and (4.1), we have: for all $k \in \{1,...,c-1\}$,

$$Dy^*_k = DI + [f(I_k, y^*) - f(I_k + DI, y^* - Dy^*_k)]. \qquad \text{(X.23)}$$

(X.22) and (X.23) together imply:

$$Dy^*_k < DI + [f(I_{k-1}, y^*) - f(I_{k-1} + DI, y^* - Dy^*_k)];$$

and therefore, using (4.1), we have:

$$r(I_{k-1} + DI, w((.) - D^*_k)) - r(I_{k-1}, y^*) > 0.$$

Noting that w is decreasing in *D*, and using Lemma 2.1(b(i)), we get Proposition 4.1(b).

(c) Consider any $Dy > 0$. Since $\tilde{y} > y^*$ (Lemma X.1), and $f_{y_{-i} y_{-i}} \geq 0$ (Lemma 2.1(b(iv)));

$$[f(I_k + DI, y^*) - f(I_k + DI, y^* - Dy) \leq f(I_k + DI, \tilde{y}) - f(I_k + DI, \tilde{y} - Dy)]; \qquad \text{(X.24)}$$

and, by Lemma 2.1(b(iii)),

$$[f(I_k, y^*) - f(I_k + DI, y^*) < f(I_k, \tilde{y}) - f(I_k + DI, \tilde{y})]. \qquad \text{(X.25)}$$

Combining, we get:

$$[f(I_k, y^*) - f(I_k + DI, y^* - Dy) < f(I_k, \tilde{y}) - f(I_k + DI, \tilde{y} - Dy)]. \qquad \text{(X.26)}$$

Using (2.4) and (X.26), we have:

$$r(I_k + DI, \tilde{y} - Dy^*_k) - r(I_i, \tilde{y}) > 0. \qquad \text{(X.27)}$$

(X.27) and Lemma 2.1(b(i)) together imply that $D\tilde{y}_k > Dy^*_k$. It is easy to see that, if $g'' \leq 0$, then, given the same amount of total tax burden *D*, imposed on the class *t*, the magnitude of reduction in the public good under $\tilde{S}$ cannot be more than that under S^*. Proposition 4.1(c) follows. ◊

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