Public Goods Provision in Egalitarian Societies[*]

(preliminary draft)

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Abstract

We consider a voluntary public good provision problem in a society, where egalitarian social norms force rich individuals to share some part of their wealth with their poor relatives. We study the level of public good provision by varying the degree of egalitarianism and ex-ante income inequality. We show that contributions to the public good are increasing in the degree of ex-ante income inequality, but ambiguous in the degree of egalitarianism. Surprisingly, purely egalitarian societies have efficient levels of public goods provision and the highest total welfare independent of the initial income distribution. In addition, our model predicts that heterogeneous societies in terms of ethnicity have lower contribution rates compared to homogeneous societies.

1 Introduction

Egalitarian norms and ethical values prescribing the right to subsistence are widespread in Sub-Saharan Africa, the Philippines and Vietnam (see Platteau 1991, 2000). In egalitarian societies, traditional social obligations often press rich individuals to share their income in order to support their poorer relatives. How much a wealthy individual has to transfer is generally driven by two factors: the degree of egalitarianism and the level of ex-ante income inequality. By ex-ante income inequality, we mean the inequality level observed in the beginning of the period when the income

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distribution is realized, and, by egalitarian society, we mean a society with egalitarian social norms that impose redistributive transfers. At this point, it is important to note that the degree of egalitarianism and the level of ex-ante income inequality are not perfectly correlated.[1]

We consider a voluntary public goods provision problem in an egalitarian society, where the contributions to the public good and the amount of redistribution are simultaneously determined. We show that public goods provision depends on both the level of ex-ante income inequality and the level of egalitarianism. The aim of the paper is to compare the public goods provision between egalitarian and non-egalitarian societies. The main questions that we ask are: Do egalitarian societies cooperate better on public good provision compared to non-egalitarian societies? How are the voluntary contributions of individuals to a public good affected if there are social obligations to share wealth? Is there a monotonic relationship between the degree of egalitarianism and the amount of public good provision? What is the net effect of the *degree of ex-ante income inequality* and *the degree of egalitarianism* on public good provision? For example, does a society with less ex-ante inequality and stronger egalitarian norms provide more or less public good than a society with more ex-ante inequality and lower degree of egalitarianism?

In his seminal work, Olson (1965) makes an argument in favour of income inequality, suggesting that higher levels of (pure) public goods will be achieved with higher levels of inequality. Bergstrom, Blume and Varian (1986) show that the wealth distribution among the set of contributors does not matter for the amount of public goods provision (distribution-neutrality result); any transfer from a non-contributor to a contributor increases the public good provision. Itaya et al. (1997) argues that creating a wealthy individual (a sole provider of the public good) by increasing income inequality can raise welfare.

When the model is extended to cover more general collective goods, the effect of inequality may become ambiguous. Bardhan et al. (2002, 2004) analyze the effects of inequality in the distribution of endowments of private inputs, which are complementary in production with collective goods. In their model, they consider impure public goods and common property resources as well as pure public goods. They show that while production surplus increases with greater equality within the group of contributors and the group of non-contributors to the collective input, in

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[1]The existence of social obligations implies lower income inequality compared to the ex-ante income distribution. Therefore, there is a correlation between the degree of egalitarianism and the ex-post income inequality in the society. However, degree of egalitarianism and the ex-ante income inequality are not perfectly correlated since income realization in the beginning of a period may be determined partly by some random factors.

some situations there is an optimal degree of inequality between the two groups. Baland and Platteau (1997, 1998, 1999 and forthcoming) also investigate the effects of inequality on common property resources. They demonstrate that, in unregulated settings, inequality has an ambiguous effect on voluntary contributions to a common good: higher inequality tends to increase wealthier individuals' contributions, but decreases poorer individuals' contributions; whereas in regulated settings, inequality has a negative impact. The growing empirical literature confirms that land inequality is negatively correlated with the maintenance of collective goods. For example, Bardhan (2000) and Dayton-Johnson (2000) report a negative relationship between land inequality and maintenance status for irrigation systems. Khwaja (2003) finds a negative relationship between land inequality and infrastructure projects. There is some weak evidence that the relationship is non-linear; the effect is weaker at higher levels of inequality.

However, these papers do not address to the issue of the impact of egalitarianism on public goods provision. Although, there is a large literature on income inequality and collective goods, the literature on the *degree of egalitarianism* and the *degree of efficiency* is surprisingly little. The only theoretical paper we are aware of is, Ray and Ueda (1996). In a joint production context, they show that production increases in the degree of egalitarianism embodied in the social welfare function. A group of agents is collectively engaged in a joint production activity, where the output will be distributed among the agents. Each agent chooses an observable effort level, followed by a move of the social planner. However, social planner cannot credibly commit in advance, and, therefore, the cost of labor to receive one more unit of output is lower if the society is more egalitarian. We will show that public goods provision may not increase in the degree of egalitarianism. In Ray and Ueda, the redistribution comes from welfare functions, however, we will have a different notion of redistribution which is derived by social norms of the society.[2] Another difference is that in their model efficiency is one to one correlated with production. However, lower public goods provision may not imply a decrease in the total welfare of the society if the wealth distribution is very unequal. In this paper, we show that if the wealth distribution is not very unequal, then efficiency increases in public goods provision, however, if wealth distribution is very unequal, a decrease in public goods contributions may actually increase the total welfare of the individuals by increasing the amount of

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[2]Instead of having a social planner, we only have social norms in the society. If the agents in the society have separable utilities, then the amount of public good provided would not change in their notion of egalitarianism, which is to have a social planner who is maximizing some welfare function. For pure public goods, a social planner would always divide the ex-post income equally between the agents independent of the welfare function.

transfers.

An empirical finding is presented by Gennaiolo and Rainer (2005) where by using an anthropological data set, Ethnographic Atlas, they show that egalitarian societies in Africa have higher levels of public goods compared to non-egalitarian societies in Africa. They define egalitarian societies as societies that do not have class distinctions or have only wealth distinctions that are not crystallized into distinct and hereditary social classes; non-egalitarian societies are defined as societies with an Elite class where Elite derives its superior hereditary status from control over scarce resources (particularly land), from traditionally ascribed nobility and from occupation. Therefore, their egalitarianism measure is discrete: egalitarian or not. However, we believe that egalitarianism is a continuum not an absolute entity. We would like to study what happens as the degree of egalitarianism change.

We focus on a specific collective good, a *pure* public good, and an ethnic group with strong social norms for redistribution and solidarity. Consider, a group of agents with known wealth levels are making observable voluntary contributions in order to provide a pure public good. Once the public good is provided, there will be a redistribution of wealth in a way specified by the social norm. The social norms for redistribution have two opposite effects on public good provision. Keeping the other agents' contributions constant, higher contributions to the public good guarantees lower transfers to the society (substitution effect). This implies that the cost of providing one more unit of a public good is now lower, which has a positive effect on the total provision of the public good. However, redistribution leads to lower consumption for richer agents, and, therefore has a negative effect on contributions to the public good (income effect). In egalitarian societies, the threat of obligations to share income increases the contributions to public goods if the former effect dominates the latter.

Societies with egalitarian norms are more likely to have a more equal ex-ante wealth distribution. However, equality in ex-ante income has a negative effect on total contributions to voluntary provision of pure public goods. The intuition behind this argument is that free riding problem decreases as more wealth is accumulated at the hands of fewer individuals, since voluntary contributions to the public good are perfect substitutes. Therefore, in general, the total effect of egalitarianism on the level of public goods is ambiguous. However, if the society is purely egalitarian the net effect is no longer ambiguous. Surprisingly, purely egalitarian societies have efficient levels of public good provision and the highest possible total welfare independent of the initial income distribution.[3] Our results come from two assumptions: i) transfers

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[3]It has been argued that the trade off between equality and efficiency disappears when individuals'

depend on net wealths, ii) norms are perfectly enforced.

Our model implies that ethnically fractured societies have lower contribution rates to the public goods, which is consistent with the empirical evidence. For example, Alesina, Baqir and Easterly (1999) show that ethnic fragmentation and public goods spending are inversely related. Gugerty and Miguel (2004) find lower spending on primary schools and lower quality on school facilities in ethnically diverse societies. The inefficiency comes from the fact that although individuals are obliged to share their wealth with their ethnic groups, they are not obliged to support individuals from different ethnic groups.

A paper that is closely related to ours is by Falkinger (1996), although he does not consider egalitarian norms. He introduces a mechanism which efficiently provides public goods.[4] He proposes the following incentive scheme: Each individual receives a subsidy if his/her contribution is greater than the mean contribution and pays a tax if his/her contribution is lower than the mean contribution, where mean contribution may be the average contribution of the whole population or the average contribution of the income class to which the individual belongs. However, he focuses only on the interior equilibrium, and therefore, he can only guarantee the efficient equilibrium only when income distribution is not very unequal. In contrast, in my model, efficient provision is possible independent of the initial wealth distribution. Moreover, total welfare will be higher for any level of public good contributions since redistribution depends on the net wealth of agents instead of the contributions itself.

Next, we give some evidence on egalitarian norms. In section 3, we introduce the model with Cobb-Douglas preferences, and we demonstrate public goods provision increases in social obligations. Then, we show that this result is not generally true due to two opposite effects on public goods contributions.[5] Finally, we show that our model also has a testable implication: it predicts lower contribution rates in heterogeneous societies. The conclusions will follow.

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contributions are partially complementary or when there is complementarities between voluntary contributions and private inputs (for example, Cornes and Sandler (1996) and Bardhan et al. (2002)). I show that Pareto efficiency is possible for purely egalitarian societies even in the absence of any type of complementarities.

[4]It has been shown that this mechanism is indeed very succesful at increasing the levels of public goods provision (Falkinger et al. (2000)).

[5]If we have enough reasons to believe that a representative agent in the economy has Cobb-Douglas preferences, then we can also test the prediction that public goods contributions are higher in more egalitarian societies given similar income distributions.

2　Egalitarian Norms

Strong egalitarian norms emerge, for example, in tribal societies, which are especially numerous in Sub-Saharan Africa and in the mountainous areas of Asia and Latin America. In these societies redistributive norms arise due to three main characteristics of these societies (see Platteau (2000)). First, social classes are absent in tribal societies. They resist against class differentiation and therefore any attempts at rising above the rest of the group economically. Next, there is the fear that individuals with high realized income may leave the mutual insurance mechanisms by accumulating enough resources. Private wealth accumulation is recognized as an attempt to break away from the traditional solidarity networks. Redistributive norms prevent excessive wealth accumulation, which helps to preserve the mutual insurance mechanism. Finally, in tribal societies, success is mostly attributed to luck. Therefore, persistent success is believed to be unfair and rich individuals are forced to share their income with others.[6] The feelings of envy and jealousy are involved in bringing about redistribution of income between presumably lucky and unlucky individuals.

Egalitarian norms are probably strongest within an extended family. The following two citations are taken from Platteau (2000):

"Demand to provide jobs for a wide range of kin, irrespective of their qualifications, and requests for cash donations or gifts of varying amounts from a stream of 'visitors' are probably the most frequent claims. (...) Businessmen [in Africa] are often expected to finance education of nephews, nieces and younger siblings..." [Kennedy, 1988:169]

"Where the extended family exists, any member of the family whose income increases may be besieged by correspondingly increased demands for support from a large number of distant relations. (...) In primitive societies men fear the effects of witchcraft if they offend their families, and it may be fear, rather than affection, which drives them to nepotism." [Lewis, 1955:114]

Redistribution of income is ensured by powerful sanctions in the form of social pressure, violence (physical harm), economic losses such as loss of employment or destruction of property, social ostracism and witchcraft accusations and practices. For example, in South Africa, those named and killed as witches were often wealthy. Poisoning or other forms of killing are not necessarily applied to the wealthy individuals themselves. In most cases, living animals that belong to the deviant are harmed

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[6]In societies where success is mostly attributed to luck, redistribution from rich to poor is higher. Alesina and Angeletos (forthcoming) show that higher redistribution policies in Europe compared to United States is because Europeans belive that luck and connections have strong effect on wealth whereas Americans believe that personal effort determines wealth.

first as a warning that a more severe punishment will follow.

In addition, weak egalitarian norms emerge, for example, in village communities. In Southeast Asian village communities, egalitarian norms require that everyone should have at least subsistence levels of income (Scott, 1976). Redistributive norms, however, do not require perfect equality.

Sharing is a very well known characteristics of many hunting and gathering societies as well. Woodburn (1982) classifies hunting and gathering societies into two major categories, those with immediate-return systems and those with delayed-return systems. Most immediate-return foragers are strongly or assertedly egalitarian, representing the extreme sharing. These societies have closest approximation to equality known in any human societies; they systematically eliminate distinctions of wealth, of power and of status. There are sanctions against accumulation, which cannot always be explained by the fact that possessions should be readily portable. However, with delayed-return systems people hold rights over valued assets of some sort.

3   The Model

We assume that there is one private good, one pure public good and $n > 1$ agents. Each agent i has an exogenous endowment, w_i, and has to decide on the amount of contribution to the public good, g_i. The total amount of public good provision is $G = \sum_{i=1}^{n} g_i$. Let $G_{-i} = \sum_{j \neq i} g_j$ denotes the sum of the contributions by all individuals except i, and $g_{-i} = (g_1, ..., g_{i-1}, g_{i+1}, ..., g_n)$ denotes the contributions by all individuals except i. Suppose, each individual will make or receive a transfer depending on their wealth levels net of public good contributions. More formally, the transfer that they will receive or make is determined by a function $c : R_+ \times R_+ \times R_+^{n-1} \to R$ where

$$c(w_i, g_i, g_{-i}) = \gamma[(w_i - g_i) - \frac{1}{n} \sum_{j=1}^{n} (w_j - g_j)] \tag{1}$$

with $0 \leq \gamma \leq 1$ determines the level of the redistribution; γ is taken as exogenous and is assumed to be derived by the norms in the society. For example, $\gamma = 1$ for a society that requires perfect equality of agents. And, as γ decreases, the amount of redistribution decreases (i.e., there will be no transfers when $\gamma = 0$).

Denote the net private consumption by $y_i = w_i - g_i - c(w_i, g_i, g_{-i})$. Therefore, the budget constraint for individual i is:

$$y_i + g_i + c(w_i, g_i, g_{-i}) = w_i \tag{2}$$

Suppose each agent is solving the following maximization problem:[7]

$$\max_{y_i, g_i} \ \log y_i + \log G$$
$$s.t. \ y_i + g_i + c(w_i, g_i, g_{-i}) = w_i \tag{3}$$
$$g_i \geq 0$$

The first order condition is simply,

$$y_i \leq (1 - \frac{n-1}{n}\gamma)G \tag{4}$$

It holds with equality if $g_i > 0$. Therefore, the contribution of individual i is:[8]

$$g_i = \max\{0, \ w_i + \frac{\gamma W}{(1-\gamma)n} - (1 + \frac{2\gamma}{(1-\gamma)n})G\} \tag{5}$$

where $W = \sum_{i=1}^{n} w_i$. Note that, g_i is positively related to w_i and, therefore, $w_i < w_j$ implies $g_i \leq g_j$. Let $w_1 < w_2 < ... < w_n$ and $j = \min\{k : g_k > 0, \ k = 1, 2, ..., n\}$.[9] The aggregate wealth of all contributors and non-contributors are given by

$$W_c(\gamma) = \sum_{i=j}^{n} w_i \text{ and } W_{nc}(\gamma) = \sum_{i=1}^{j-1} w_i,$$

respectively. Since the aggregate wealth of contributors has to be allocated between the net private consumption, transfers to society and the public good, we have $W_c(\gamma) = G + \sum_{i=j}^{n} y_i + \sum_{i=j}^{n} c_i$, where $c_i = c(w_i, g_i, g_{-i})$. Therefore, the public good provision is given by:

$$G(\gamma) = \frac{(1-\gamma)W_c(\gamma) + \frac{\gamma}{n}(n-j+1)W}{(1-\gamma) + (n-j+1)[1 - \gamma + \frac{2}{n}\gamma]} \tag{6}$$

From equation (6), it is easy to see that public good provision depends on the total wealth of contributors and therefore any redistribution of wealth between the contributors, that do not change the set of contributors, will not change the total amount provided. This is known as distribution-neutrality result [Bergstrom et al. (1986)]. However, any transfer from non-contributors to contributors will increase the public good provision. Another important observation is that any transfer from a contributor to the other contributors that decrease the set of contributors also

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[7]Note that this model is not equivalent to proportional taxation.

[8]For $\gamma = 1$, there is no unique equilibrium, and therefore indivual contributions cannot be determined from this formula.

[9]This set is non-empty since the richest individual definitely contributes to public good.

increases the public good provision. Think of it as a 2-step procedure. The first step is to transfer wealth from a contributor until that contributor becomes indifferent between contributing and not contributing. This will not change the public good provision. Second step is to transfer more, which is same as transferring from a non-contributor, and, therefore total amount of public good will increase.

Fact 1: *Public good provision increases with inequality (for a given γ).*

Highest amount of public goods provision will be reached when all wealth is transferred to one individual. In that case, (6) implies that $G = \frac{W}{2}$. Although inequality is increasing public goods provision, it does not necessarily increase the welfare of the society. We will later on argue that strongly egalitarian societies are the ones with the highest possible welfare.

Denote the public goods provision by $G(0) = \frac{W_c(0)}{n-j+2}$, when there is no pressure for redistribution and $W_c(0)$ stands for the aggregate wealth of contributors when there is no pressure for redistribution.[10]

If everybody contributes in the equilibrium, then equation (6) simplifies to:

$$G(\gamma) = \frac{W}{(n+1) - (n-1)\gamma}$$

In this case, it is very easy to see that efficiency is increasing in the degree of egalitarianism. Below, we will also argue that this result is independent of the number of contributors.[11]

Fact 2: *All contributors have equal utility.*

This can be seen from the fact that, for all contributors, the first order condition given by equation (4) will hold with equality. Hence, they all have same ex-post wealth.

Fact 3: *Contributors have greater utility than non-contributors.*

Note that, if individual i is a contributor, and, individual j is a non-contributor, then $w_j \leq -\frac{\gamma W}{(1-\gamma)n} + (1 + \frac{2\gamma}{(1-\gamma)n})G = w_i - g_i$.

Fact 4: *The socially optimal level of provision is $G = \frac{W}{2}$.*

To find the optimal level of provision, we write the social planner's problem:

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[10]When there is no social pressure, our model becomes identical to the one in Bergstrom et al. (1986).

[11]The only exception is that when all wealth is accumulated in one person, the contibution level is independent of the degree of egalitarianism.

$$\max_{y_i, G} \sum_i (\log y_i + \log G)$$

This is equivalent to maximizing $\log \frac{(W-G)}{n} + \log G$ over G. And, therefore, $G = \frac{W}{2}$.

Proposition 1 *Suppose individuals have Cobb-Douglas utility functions. Public good provision (weakly) increases as the degree of egalitarianism increases; i.e., $G(\gamma)$ is (weakly) increasing in γ.*[12]

Next, we give an example to demonstrate this proposition.[13]

Example 2 *Consider three agents with wealth levels: $w_1 = 5$, $w_2 = 5$ and $w_3 = 50$. Suppose they all contribute to the public good, then $G = \frac{60}{4-2\gamma}$. First order conditions should hold, and, therefore*

$$w_1 - g_1 = (1 - \frac{2\gamma}{3})\frac{60}{4 - 2\gamma}.$$

Since $(1 - \frac{2\gamma}{3})\frac{60}{4-2\gamma} > 10$ for $0 < \gamma < 1$, $g_1 < 0$, which is a contradiction. Therefore, only agent 3 will contribute with

$$G = g_3 = \frac{(1 - \frac{2\gamma}{3})w_3 + \frac{\gamma}{3}(w_1 + w_2)}{2(1 - \frac{2\gamma}{3})} \tag{7}$$

which is clearly greater than $\frac{w_3}{2}$, public good provision without social obligations, for any $\gamma > 0$. Indeed, public good provision increases in the degree of egalitarianism.

Now, consider an extreme case, where all individuals have equal incomes: $w_1 = w_2 = w_3 = 20$. Then, everybody contributes to the public good, and, therefore $G = \frac{60}{4-2\gamma}$. When we compare G with equation (7), we see that for any γ, public good contributions are lower. This shows that equality is indeed affecting public good provision negatively. In general, the net effect of inequality and egalitarianism, therefore, depends on the magnitudes of these two effects. In the two extreme cases, however, the net effect is not ambiguous: If all wealth is accumulated in one agent, then $\frac{W}{2}$ will be achieved independent of the γ. The same amount of provision will be achieved if the society is purely egalitarian (independent of the ex-ante income

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[12] This proposition would hold strictly if we do not allow any agent to end up with a zero income.
[13] The proofs of the theorems are in the appendix.

distribution). In the latter case, however, the total welfare in the society is higher than the former case. Indeed, purely egalitarian societies have highest possible welfare.

An interesting question is, "do non-egalitarian societies which nevertheless collect taxes for the provision of public goods always perform better at public goods provision compared to traditional societies with egalitarian norms (where public good provision is totally voluntary)"? The following example shows that the belief that modern societies perform at least as good as traditional egalitarian societies without government could be wrong. Olszewski and Rosenthal (2004) shows that political processes may impose non-Pareto outcomes if the initial distribution of wealth is very unequal in a "small" society.

Example 3 *Take $w_1 < \frac{40}{3}$, $w_2 = w_3 = 30$. It is easy to see that agent 1 will not contribute. Therefore,*

$$G = \frac{(1 - \frac{\gamma}{3})(w_2 + w_3) + \frac{2\gamma}{3}w_1}{(3 - \frac{5\gamma}{3})}.$$

$G(\gamma) \to \frac{W}{2}$ *as $\gamma \to 1$. Olszewski and Rosenthal (2004) demonstrates that with majority voting on proportional taxation, median voter will prefer a tax rate $t = \frac{1}{2}$, which gives $G = \frac{W}{2}$. However, this hurts the poor agent. On the other hand, in a purely egalitarian society there is no ex-post inequality.*

Also, if the agents cannot agree on a positive tax rate, then public good will be provided by voluntary contributions only. For example, in the first example, median voter would set $t = 0$. In that case, we have already shown that, the amount provided will be less compared to the provision in the egalitarian societies $(\gamma > 0)$.[14]

Next, we would like to see how much of the above results can be extended to a general result. Suppose, now, the maximization problem is:

$$\max_{g_i} \ u(\mathrm{y}_i) + v(G)$$
$$s.t. \ y_i + g_i + c(w_i, g_i, g_{-i}) = w_i$$
$$g_i \geq 0$$

where $u(.)$ and $v(.)$ are strictly increasing, strictly concave, twice continuously differentiable functions and satisfy Inada conditions. Assuming everybody contributes in the equilibrium, the first order condition will be:

$$u'(y_i)[1 - \frac{n-1}{n}\gamma] = v'(G) \tag{8}$$

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[14]However, if this increases the welfare in the society is still ambiguous, although my conjecture is that welfare is increasing in γ.

If everyone contributes in the equilibrium, there will be no redistribution of wealth followed by the public goods provision. In equilibrium $y_i = y_j$ for all i and j. Therefore, $y_i = w_i - g_i$, which does not depend on γ. It is not difficult to see that public good provision increases as γ increases.

Fact 5: *If everyone contributes in the equilibrium at γ_1, then for any $\gamma_2 > \gamma_1$ everyone will continue to contribute in the equilibrium. Moreover, each individual increases their contributions as the degree of egalitarianism increases.*

In order to show that total welfare also increases, we will find the Pareto efficient public good provision. Social planner maximizes $\sum_{i=1}^{n}[\mathrm{u}(\mathrm{y}_i) + v(G)]$, and, therefore has to divide the ex-post wealth equally. So, the social planner has the following problem:

$$\max \ u(\frac{W - G}{n}) + v(G)$$

and the first order condition is,

$$u'(y)\frac{1}{n} = v'(G). \tag{9}$$

Note that, equation (8) converges to (9) as $\gamma \to 1$.

Fact 6: *If everyone contributes in the equilibrium, then total welfare is increasing in the degree of egalitarianism.*

Similar to the Cobb-Douglas case, any transfer of wealth between contributors that does not change the set of contributors does not change the amount of public good provided. To see this, let everyone change their contribution to the public good by exactly the same amount the change in their wealth levels. Clearly the first order conditions will continue to be satisfied. In order to see this is the unique equilibrium, we will first suppose it is not true. Suppose, there are two equilibria G and G'. Without loss of generality $G' > G$. Therefore, there exists an individual i such that $g'_i > g_i$,

$$u'(w_i - g'_i - c(w_i, g'_i, g'_{-i}))[1 - \frac{n-1}{n}\gamma] = v'(G'),$$

and

$$u'(w_i - g_i - c(w_i, g_i, g_{-i}))[1 - \frac{n-1}{n}\gamma] \geq v'(G).$$

This implies:

$$w_i - g_i - c(w_i, g_i, g_{-i}) < w_i - g'_i - c(w_i, g'_i, g'_{-i}),$$

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or, equivalently

$$(1-\gamma)(w_i - g_i) + \gamma(\frac{W-G}{n}) < (1-\gamma)(w_i - g_i') + \gamma(\frac{W-G'}{n}).$$

However, this contradicts to $G' > G$.

Similarly, for any γ, transferring wealth from non-contributors to contributors or from contributors to contributors that decrease the set of contributors increase the public good provision. Therefore, transferring all wealth to only one individual maximizes the total amount provided. However, total welfare is highest when $\gamma \to 1$, and this result does not depend on the initial wealth distribution.

If we assume everybody contributes in the equilibrium, we have already said that $G(\gamma)$ increases in γ. For example, if ex-ante wealth distribution is perfectly equal, then everybody contributes in the equilibrium, and, public good provision increases as the social pressure to sharing ex-post wealth increases. However, it is also important to know what will happen if there are non-contributors since in the real world we observe many cases where poor individuals do not have enough resources to contribute to the public goods. Every contributor has to satisfy the following condition:

$$u'((1-\gamma)(w_i - g_i) + \gamma\frac{W-G}{n})[1 - \frac{n-1}{n}\gamma] = v'(G) \qquad (10)$$

As the degree of egalitarianism increases, the cost of producing one more unit of public good decreases, which implies a higher contribution than before. However, equation (10) differs from equation (8) since now marginal utility of a contributor depends on γ. Therefore, as γ increases private consumption of a contributor decreases, keeping the public good contribution constant. The second effect implies a lower contribution. Hence, the total effect depends on the utility function of the agents.

Example 4 *Suppose $u(x) = v(x) = -\frac{1}{x}$. Suppose there are 2 agents with wealth levels w_1 and w_2, where $w_2 >> w_1$ so that only agent 2 contributes to the public good. If $\gamma = 0$, agent 2 provides $G = \frac{w_2}{2}$. However, as $\gamma \to 1$, agent 2 provides $G = 0.41(w_1 + w_2)$. Since $w_2 >> w_1$, public good provision in a non-egalitarian society will be higher than in a purely egalitarian society. For example, if $w_2 = 45$ and $w_1 = 5$, $G = 22.5$ when $\gamma = 0$ and $G = 20.711$ when $\gamma = 1$. See Appendix B for graphical demonstration.*

Public good provision do not have to be monotonic in γ (see Appendix B for an example), however, my conjecture is that total welfare is monotonic in γ.

3.1 Welfare Analysis

Until now we mostly discussed what would happen to the amount of public good provision. However, it is crucial to look at the welfare effects of egalitarianism and inequality in incomes. Increasing inequality between agents may have different welfare implications. It may bring a Pareto improvement and therefore may raise welfare (see Itaya et al. (1997)). However, if inequality is too high, Pareto improvements may not be possible.

In egalitarian societies, although Pareto improvements are not possible, we see that welfare monotonically increases in the degree of egalitarianism, if everyone contributes in the equilibrium. When there are non-contributors monotonicity may disappear. However, we have already argued that as γ approaches 1, welfare approaches to the highest possible welfare. Therefore, a purely egalitarian society has the highest welfare independent of the ex-ante income distribution.

4 Extention to Heterogeneous Societies

Our model predicts that a heterogeneous society would do poorly compared to a homogeneous society in the provision of public goods. In heterogeneous societies, individuals are obliged to share their wealth with their kin, however, they are not obliged to support individuals from different kin (for example, see Barth, 1967).

It is well known that size of a group can affect public good provision.[15] Therefore, assume the size of the heterogeneous society is equal to the size of the homogeneous society, n. Similarly, assume the wealth distribution of the two societies are the same. Therefore, heterogeneity is only along ethnic lines. Suppose, there is a unique ethnic group in the homogeneous society, and, there are two ethnic groups in the heterogeneous society. Let the size of the majority group is n_1 and the size of the minority group is n_2. Hence, $n > n_1 > n_2 > 1$. Suppose the social pressure between the societies and the ethnic groups are the same, say γ with $0 < \gamma < 1$. However, one ethnic group is not obliged to share ex-post wealth with the other ethnic group. So, the social obligations are within ethnic groups. Denote W_1 and W_2 as the total wealth of individuals in the majority and minority group, respectively. Let g_i (s_i) is the contribution of individual i with wealth w_i if he/she is in the homogeneous

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[15] Olson (1965) argues that there is an inverse relationship between the group size and the level of collective action. However, Olson's result can be reversed when the collective good is public (e.g., Sandler (1992)). Isaac and Walker (1988) present an experimental study on this topic. They show that increasing the group size, when accompanied by a decrease in marginal return from the public good, decreases the efficiency.

(heterogeneous) society.

An agent in a homogeneous society has to satisfy the following condition:

$$u'((1-\gamma)(w_i - g_i) + \gamma\frac{W-G}{n})[1 - \frac{n-1}{n}\gamma] \geq v'(G). \tag{11}$$

An agent with the same wealth level, w_i, has to satisfy,

$$u'((1-\gamma)(w_i - s_i) + \gamma\frac{W_1-S_1}{n_1})[1 - \frac{n_1-1}{n_1}\gamma] \geq v'(S), \tag{12}$$

if he/she belongs to majority in heterogeneous society; otherwise has to satisfy

$$u'((1-\gamma)(w_i - s_i) + \gamma\frac{W_2-S_2}{n_2})[1 - \frac{n_2-1}{n_2}\gamma] \geq v'(S). \tag{13}$$

where S_i denotes the total contributions of each group and S denotes total contributions in the heterogeneous society..

Assumption: *The first order condition in equation (11) holds with equality for all agents.*

We assume everybody contributes in the homogeneous society; but, we do not put any restrictions for the heterogeneous group, since we would like to see the effects of heterogeneity. In a homogeneous society, the presence of a public good equalizes the ex-post utilities of individuals. Therefore, there is no ex-post inequality between the agents of a homogeneous society. However, in a heterogeneous society, the first order conditions imply that independent of the initial wealth distribution, contributors in the minority group have higher ex-post utility compared to contributors in the homogeneous society. Next, we would like to compare the amounts of public good provision in these societies.

Proposition 5 *Homogeneous societies have higher public good provision rates compared to heterogeneous societies, i.e., $G > S$.*

Next, we make a welfare comparison of these societies.

Corollary 6 *Homogeneous societies have higher welfare than heterogeneous societies.*

The intuition behind the above result is very simple. Although ex-ante these two societies have exact same wealth distribution, higher levels of public good will be provided in the homogeneous society. Incontrary, heterogeneous societies suffer from lower amount of public goods and inequalities in terms of ex-post private consumption.

5 Some Related Literature

Our work is also related to Hoff and Sen (2005), where they basically focus on "extended family system" or simply "kin system". It is commonly observed that individuals in an extended family system who could have made transfers in kin in cash, instead make them in-kind, which might take the form of hiring kin in their firms or allowing them to share their city homes. We may say this is a direct way of supporting poorer relatives versus the indirect way of supporting them by helping the whole society instead of the kin specifically, which we assume in our model.

Our paper differs from the previous literature on social norms since in our model agents do not have desires for social acceptance depending on their contributions. For example, Hollander (1990) considers a voluntary public good provision game when individual contributions are motivated by social approval. In his model, agents are identical and the effect of individual's contributions on supply is neglected since he assumes that the population is large. Therefore, in equilibrium, agents cooperate on a positive level of contribution since agents would receive social disapproval if they contribute less then this amount. In our model, agents are differentiated in their wealth levels and their contributions have an impact on the supply of the public good. Although social emotions may still play a role in individuals' contribution decision, we disregard them in order to focus on the effects of social obligations to share.

6 Conclusion

We demonstrate that if everybody is a contributor in the equilibrium, there will be no transfers of wealth since public good contributions are equalizing the wealth levels. Moreover, public good provision is monotonically increasing in the degree of egalitarianism because marginal cost of contributing to the public good is now lower. However, when there are non-contributors, total contributions to the public good may decrease in the degree of egalitarianism. Therefore, the levels of public goods in purely egalitarian societies could be higher or lower than less egalitarian societies. However, we demonstrate that purely egalitarian societies have the highest total welfare. In addition, our model has a very nice implication: heterogeneous societies in terms of ethnicity have lower contribution rates compared to homogeneous societies.

Moreover, egalitarian societies are generally associated with more equal income distributions. Therefore, we need to take into account the effect of less inequality in income. The net effect of inequality and egalitarianism is ambiguous. However, if

the society is purely egalitarian, the net effect is no longer ambiguous. Surprisingly, purely egalitarian societies have the highest possible total welfare independent of the initial income distribution.

Although the results of the paper supports a purely egalitarian structure for provision of public goods, we cannot generalize this to private investment decisions. If private investments are observable, social obligations will have a negative effect since the marginal gain of investing one more unit is now lower. Therefore, if the society is going through certain technological changes and therefore private investments are necessary for development, purely egalitarian societies will have slower rates of development.

The model can be extended to see if there is fracturing in public good provision in ethnically heterogeneous societies. Consider a society with two kin groups. Each individual has to decide between contributing to a global public good or to a local public good. A global public good benefits everyone in the society equally, whereas a local public good only benefits the kin group itself. If the contributions to the global public good are not observable (or only observable with some probability), then the contributors of the global public good do not get the full credit of contributing and this may lead people to avoid contributing to the global public good. Since this creates inefficiencies in the society, there is an important policy implication of this result. In heterogeneous societies, efficiency could be raised if the government is the one responsible for the provision of the public good.

In addition to these topics, it is also interesting to see the effects of egalitarianism on public good provision when the income distribution is not exogenous but instead endogenously chosen depending on the sharing rule. Lewis (1955) presents this possibility: "There are many reports from Asia and Africa of able men who have refused promotion because the material benefit would accrue mostly to relatives whose moral claims they do not recognize." For simplicity, suppose there are two periods. In the first period, each individual decides on an effort level, which determines the income of the individual. In the second period, they contribute to the public good, which is followed by a redistribution of incomes (the amount of redistribution depends on the degree of egalitarianism). If an individual decreases his or her effort level due to the threat of social obligations to share, the total income of the more egalitarian society may be lower than the non-egalitarian society. This may reverse the previous findings, i.e. non-egalitarian societies may have higher levels of public goods.

Appendices

A Proofs

Proof of Proposition. Suppose $0 < \gamma < \lambda < 1$. The public good provision corresponding to γ and λ are G_γ and G_λ, respectively. Suppose $G_\gamma > G_\lambda$. Hence there exists i such that $g_i(\gamma) > g_i(\lambda) \geq 0$. The following two equations have to hold:

$$g_i(\gamma) = w_i + \frac{\gamma W}{(1-\gamma)n} - (1 + \frac{2\gamma}{(1-\gamma)n})G_\gamma$$

and

$$g_i(\lambda) = \max\{0, w_i + \frac{\lambda W}{(1-\lambda)n} - (1 + \frac{2\lambda}{(1-\lambda)n})G_\lambda\}.$$

Therefore,

$$w_i + \frac{\gamma W}{(1-\gamma)n} - (1 + \frac{2\gamma}{(1-\gamma)n})G_\gamma > w_i + \frac{\lambda W}{(1-\lambda)n} - (1 + \frac{2\lambda}{(1-\lambda)n})G_\lambda.$$

We use the fact that $G_\gamma = G_\gamma - G_\lambda + G_\lambda$. Rearranging,

$$\frac{2G_\lambda}{n}(\frac{\lambda}{1-\lambda} - \frac{\gamma}{1-\gamma}) > \frac{W}{n}(\frac{\lambda}{1-\lambda} - \frac{\gamma}{1-\gamma}) + (1 + \frac{2\gamma}{(1-\gamma)n})(G_\gamma - G_\lambda). \qquad (14)$$

However, equation (14) implies that $2G_\lambda > W$, which is a contradiction since public good provision cannot be greater than $\frac{W}{2}$. ∎

Proof of Proposition 5. Suppose $S \geq G$. There exists an individual i such that $s_i \geq g_i$. This implies:

$$u'((1-\gamma)(w_i - g_i) + \gamma\frac{W-G}{n})[1 - \frac{n-1}{n}\gamma] = v'(G) \qquad (15)$$

and,

$$u'((1-\gamma)(w_i - s_i) + \gamma\frac{W_a - S_a}{n_a})[1 - \frac{n_a - 1}{n_a}\gamma] = v'(S) \qquad (16)$$

where a is either 1 or 2 depending on which group i belongs, S_a denotes the total contributions of group a.

Claim: Everybody is a contributor in group a.

Proof: Suppose not. Let j does not contribute.

$$u'((1-\gamma)w_j + \gamma\frac{W_a - S_a}{n_a})[1 - \frac{n_a - 1}{n_a}\gamma] > v'(S)$$

18

Therefore, $w_j < w_i - s_i \leq w_i - g_i = w_j - g_j$, which is a contradiction, since $g_j \geq 0$. Q.E.D.

Since everybody contributes in group a, everybody has the same net wealth, which is equal to $w_i - s_i$. Therefore, equations (15) and (16) simplify to:

$$u'(w_i - g_i)[1 - \frac{n-1}{n}\gamma] = v'(G) \qquad (17)$$

and

$$u'(w_i - s_i)[1 - \frac{n_a - 1}{n_a}\gamma] = v'(S) \qquad (18)$$

Since $v'(S) < v'(G)$ and $1 - \frac{n-1}{n}\gamma < 1 - \frac{n_1-1}{n_1}\gamma < 1 - \frac{n_2-1}{n_2}\gamma$, the following has to hold:

$$(w_i - s_i) > (w_i - g_i).$$

But this contradicts to $s_i \geq g_i$.

Hence, individuals in heterogeneous society contribute less than the individuals in homogeneous society. ∎

Proof of Corollary 6. First, suppose heterogeneous society has a lower public good provision but no inequality. Since everyone contributes in the homogeneous society, everybody consumes the same amount $\frac{W-G}{n}$. We have already said that $u(\frac{W-G}{n}) + v(G)$ is increasing in G until G^*, where G^* is the amount of equilibrium provision when $\gamma = 1$. Since $\gamma < 1$, welfare is increasing in the amount of public good provision. In other words, welfare decreases if the amount of public good provision decreases.

Finally, we know that heterogeneous society actually has inequality, which would decrease the welfare even further. ∎
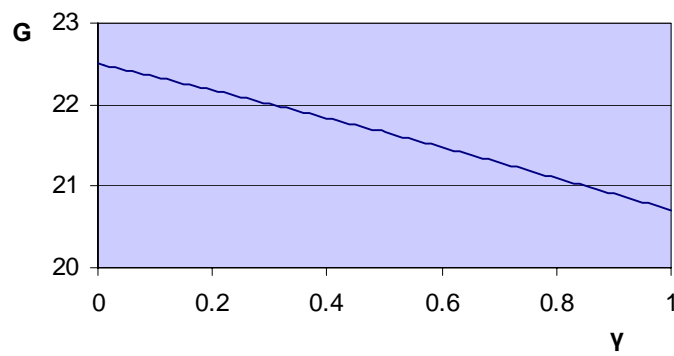
B Figures

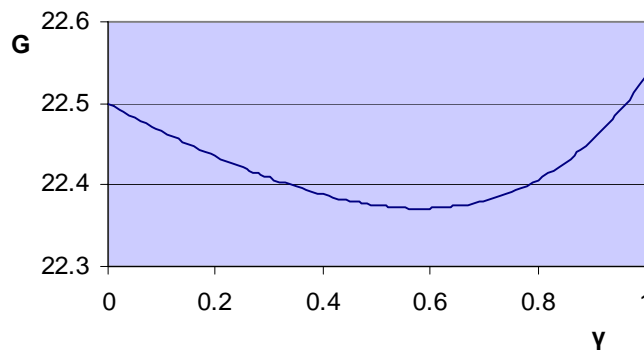For the following figures we assume $w_2 = 45$ and $w_1 = 5$.

Case i) $u(.) = v(.) = 2\sqrt{x}$
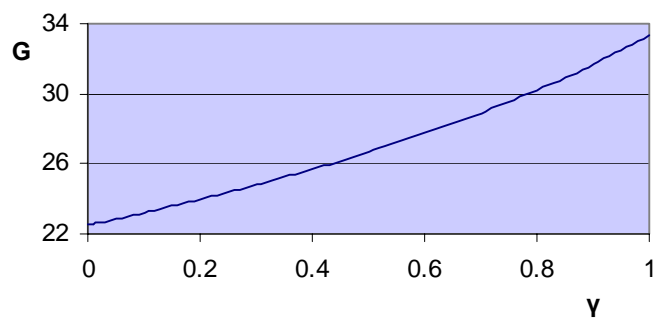
Case ii) $u(.) = v(.) = -\frac{1}{x}$

Case iii) $u(.) = v(.) = -\frac{x^{-0.4}}{0.4}$

G

22.6

22.5

22.4

22.3

0   0.2   0.4   0.6   0.8   1

γ

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