'Us' and 'Them': Origins of Identity and Economic Implications*

B. Curtis Eaton† Mukesh Eswaran‡ Robert J. Oxoby§

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A nation is a society united by delusions about its ancestry and by a common hatred of its neighbors. – William Ralph Inge (1860 - 1954)

1 Introduction

The ability to make sharp distinctions between 'Us' and 'Them' appears to be a psychological trait that is universal and well-entrenched in the human psyche. Whether in tribal warfare in which the Hutus in Rwanda murder the Tutsis in cold blood or in the religious wars of the Crusades in Europe or in trade negotiations in the present day, there is a clear distinction in the minds of each group between what it identifies as 'Us' and what it deems to be 'Them'. This distinction defines identity or, since identity is multifaceted, at least a major component of it. In this paper, we attempt to provide a theory for the emergence of the sense of identity.

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†Department of Economics, University of Calgary, eaton@ucalgary.ca.

‡Department of Economics, University of British Columbia, eswaran@econ.ubc.ca.

§Department of Economics, University of Calgary, oxoby@ucalgary.ca.

Our premise is Darwinian: our hypothesis is that identity emerges as a vehicle to enhance the probability of survival. The propensity to separate perceived insiders and outsiders evolved, in our view, because it increased biological fitness (the number of surviving and fertile offspring) in the environment of our forebears. Because its basis is evolutionary, the predisposition to carve out an identity in terms of 'Us' and 'Them' is universal—it cuts across cultural, geographical, and temporal boundaries.

By allowing preferences to be genetically determined and shaped by natural selection in an environment of tribal conflict in the African savannas, we obtain evolutionarily stable preferences regarding those considered to be 'insiders' and those deemed 'outsiders'. These preferences are seen to put different weights on the wellbeing of insiders and outsiders. Our model furnishes an answer to the question, 'Who do I identify with?'. Embedded in the answer to this question is also the answer to the more fundamental question, "Who do I take myself to be?".

We do not intend to suggest that tens of thousands of years ago humans formed rigid definitions of group members, which have subsequently become fossilized. Rather, we espouse the view that humans have evolved the *capacity* to instinctively define these groups, depending on the context. We believe that humans are hardwired with this psychological machinery that has the facility to classify groups as insiders or outsiders or as 'Us' and 'Them', and then to identify themselves more firmly with 'Us' than with 'Them'. After providing an evolutionary framework that generates this tendency, we work out some of the economic consequences in today's environment, suggesting simple explanations for some persistent empirical findings.

In the field of economics, Akerlof and Kranton (2000, 2004) were the first to address the issue of identity. They illustrated why identity is important in economic matters and how it may be incorporated into economic analysis.[1] In this paper, we address the question of

[1] More recently, Fang and Loury (2005) have examined how dysfunctional identities may actually serve long-run interests. Darity et al (2006) have investigated the formation of racial identies in an evolutionary

where identity comes from. Our answer is that the capacity to adopt identities was fashioned by natural selection and that identities are formed because they enhance survival. This claim is transparent when we consider the most fundamental form of identity: the awareness of oneself as a person with a particular physical body. The probability of survival would clearly be considerably lower had Nature not created the facility to tenaciously identify with one's physical frame as a separate entity. But this identification is operational also at a psychological level—and this comprises the subtler, but no less tenacious sense, of who we take ourselves to be, our identity. It is not an accident that feelings of self-worth and self-validation—not to mention the intensity of pleasure in activities—are at their peak in those circumstances that are most conducive to promoting our survival (and that of our genes).

We operate in milieus that are substantially different in myriad ways from those of our forebears of the hunter-gatherer past. Consequently, there is a mismatch between our hard-wired tendencies and present-day environments. Our actions frequently contain visceral elements that are not readily accommodated by rational thought, though the former may well have had rationales of their own in the past.[2] By persisting with the standard assumption of purely egoistic preferences, we run the risk of explaining observed phenomena with increasingly strained explanations that may be logically consistent but which do not ring true. Thus, it is worthwhile investigating how preferences get shaped and there has been a spate of research activity in this direction [Bester and Guth (1998), Bolle (2000), Possajennikov (2000), Kockesen and Ok (2000), Kockesen, Ok, and Sethi (2000), Ely and Yilankaya (2001), Eaton and Eswaran (2003), Eswaran and Kotwal (2004), Dekel, Ely and Yilankaya (2006)].

In recent years, economists have realized that self-interest may not only promote production and exchange by comparative advantage in a market economy but may also motivate

setting.

[2] In fact, our thinking often operates on a premise chosen by our emotional baggage and works to rationalize our unconscious conclusions.

appropriative behavior.[3] Insightful theories of conflict have been proposed recently, where violence is seen as a rational and often necessary aspect of self-interest.[4] But one might well wonder why violence needs to extend so far as genocide. Did the acquisition of power by the Hutus in Rwanda require them to slaughter upwards of 800,000 Tutsis in 1994? Was it necessary for the Serbs to kill 200,000 Muslims in the Bosnian purge of the 1990s? Violence on this scale suggests that it arises from deep-seated feelings that those who constitute 'Them' are, in some sense, perhaps not quite human—certainly less human than 'Us'. These instances, admittedly extreme, only reveal that there seems to be a very fundamental tendency in us to draw distinctions between 'Us' and 'Them'. These are seen in milder forms in everyday life but nevertheless seriously impinge on our welfare and the speed with which economic development is feasible, as the increasingly mounting evidence suggests.

The environments of today often lead people into identifications that turn out ultimately to prove maladaptive. Those who participate in gangs or revel in underaccomplishment are examples [e.g. those cited in Akelof and Kranton (2000)]. But these are aberrations that, arising in rapidly changing environments, would be weeded out were the discipline of natural selection still in operation. Whether natural selection still functions among humans is an open question; various institutions and the widespread availability of effective birth control devices have undermined the process by which maladaptive behavior is ultimately purged. But the instinctive tendency to construct identities based on a separation between 'Us' and 'Them' is intact and we believe that this has important economic and social consequences.

After demonstrating how different preferences for 'Us' and 'Them' emerge in an evolutionary setting, we apply this to explain some persistent empirical findings in contemporary economic settings. With the aid of a simple rent-seeking model in which people have different preferences over in-group and out-group members, we show how and why rent-seeking is

[3] See Skaperdas (2003) for a compelling case for this view.

[4] Recall Clauswitz's famous definition of war as an extension of policy.

exacerbated in societies with heterogeneous groups. This is consistent with the empirical findings on corruption [Mauro (1995)], on crime [Banerjee and Somanathan (2001), Lederman, Loayza, and Menendez (2002)], on pollution [Sigman (2002)], on depletion of common resources [McWhinnie (2006)], and political lobbying [Banerjee, Iyer, and Somanathan (2005)].

We also reconsider the public goods problem in the presence of insiders and outsiders, both when there is a social planner who chooses the optimal allocation of resources to public and private goods, and when there is no planner. We show that societies that are not homogeneous will have public goods than those that are. This is consistent with the empirical findings of [Alesina, Baqir, and Easterly (1999), Alesina, and Ferrara (2000), Banerjee, Iyer, and Somanathan (2005), Easterly and Levine (1997), Luttmer (2001), Miguel, and Gugerty (2005), and Vigdor (2004). In other words, we show how evolutionarily stable preferences from our hunter-gatherer past can explain, in a minimalist framework, the pervasive economic effects of ethnic fragmentation and polarization.

The paper is organized as follows: in Section 2 we review social identity theory; in Section3 we consider the evolutionary origins of the 'Us' and 'Them' distinction, and in Section 4 we consider some of the implications of this pervasive social distinction.

We warn the reader that this is an early draft, and parts of the paper are still rough and/or incomplete.

2 Social Identity Theory

Central to social identity theory is an individual's self-concept as perceived from their perceived membership in various social groups. That is an individual uses her membership in a social group to define the "us" and "them" in any given situation (Tajfel, 1971; Tajfel and Truner, 1979). This is to be distinguished from the notion of an individual's personal identity, referring to self-knowledge deriving from the individual's unique characteristics. It

is this defining of individuals in social groups that motivates the psychological process of intergroup discrimination (Tajfel and Turner, 1979; Turner, 1982). This sort of discrimination is usually perceived as discrimination in favour of the in-group, although it can often equally well be see as discrimination against the our-group.

Tajfel and Turner (1979) identify the three variables which contribute to the emergence of in group favoritism. First, individuals must engage in *categorization* by which individuals put themselves and others into categories or apply labels (e.g. ethnic or religious names) to one another. Secondly individuals must *identify* with the groups to which they belong (i.e. identify with the "us" they view themselves as part of). This identification implies two facets of behavior: first individuals may view themselves as part of a group, specifically putting the ideals, goals, and aspiration of the group above those of one's personal identity. Secondly, identification in this sense implies that individuals view themselves as similar (in some dimension) to those with whom they share a group membership. Finally, social identity theory involves *social comparisons* with both in group and outgroup members. This typically means that individuals measure themselves against the behaviors and outcomes on ingroup and outgroup members. This typically follows the ideas of positive and negative distinctiveness, in which individuals see their group as relatively better than other groups and tend to minimize the differences between groups so that their own group can be seen more favorably.

In the economics literature, Akerlof and Kranton (2000, 2005) were the first to formalize identity within an economic framework. In this vein, an individual's identity is accompanied by a set of behavioral prescriptions which accompany group membership. As such individuals within a group develop group-specific norms which affect relations with individuals from within and from outside the group. The benefits of identity in this environment arise from increased coordination and direct non-pecuniary benefits from group membership. Similarly

Fang and Louury (2005) present a model in which identity is strategically chosen to maximize one's payoff in a repeated game. Given this environment, an individual may find it optimal to choose a "dysfunctional identity" which, while counter to one's preferences, yields higher payoffs within the repeated game. Finally, Benabou and Tirole (2006) present a model of identity in which individuals' beliefs about themselves are assets which increase utility. In such an environment, an individual may choose behaviors and group memberships to maximize the value of these assets.

Experimentally, social psychologists have often used a minimum group paradigm to create identity. In this paradigm, minimal cues (e.g. name badges, the allocation of rewards) are manipulated to induce categorization and comparison among individuals and groups, ideally leading to identification with individuals in similar circumstances. The manipulation of minimal cues is often sufficient to motivate identification between individuals. The essential aspect of such cue manipulations is the recognition of different groups (Mackie, 1986; Nass et al, 1996). This recognition appears to be strongly re-enforced in environments in which there is an "interdependence of fate" within a group. For example, Rabbie and Horowitz (1969) use a simple chance at a win or loss (i.e. a coin toss) to motivate identity within groups. This cue (winning or losing) is sufficient to yield differences in the ways individuals form first impressions regarding in-group and out-group members. Similarly, Wilder (1990) manipulated social identity by having participants wear badges and congregate in labelled rooms indicating their group membership. This seemingly innocuous manipulation resulted in participants being more influenced by messages from in-group members (even when these messages were identical in all dimensions except the originating group). Mackie (1986) promoted intergroup competition, thereby motivating identity among the groups through differentiation and emphasizing in-group/out-group norms based on this competition. Results indicate an identity effect regarding polarization and norm adherence: when participants listened to identical

taped discussions from perceived group members, participants in the intergroup competition treatment perceived group norms to be more extreme and showed greater attitude polarization than participants in the control group. With these and other manipulations, group identity has been shown to influence attitude formation (Mackie et al, 1990), cooperation (Wit and Wilke, 1992), reciprocity (Stroebe et al, 2005), punishment (McLeish and Oxoby, 2006), and the efficiency of negotiations (Kramer et al, 1993). Similarly, through unfavorable out-group biases, identity can yield polarization (Mackie, 1986) and the differential treatment of out-group members with whom one does not identify as strongly (Bernard et al, 2006; Durlauf, 1999, Gerber, 1998; Wann and Grieve, 2005).

These effects of identity are not limited to laboratory experiments. For example Goette et al (2006) incorporate group identity into an experiment through the use of randomly assigned Swiss Army platoons, finding that in-group pairs are significantly more cooperative than out-group pairs and that third-party punishment is higher when the recipient of the punishment has "wronged" a member of the third party's own group. In a similar vein Bernard et al (2006) conducts 2-player dictator game experiments in which subjects are members of one of two tribes from Papua New Guinea and a third party observer (also from one of the two tribes) is allowed to engage in punishment of the dictator. As in Goette et al (2006), they find that punishment is higher when the recipient of a low offer (interpreted as a violation of a social norm) and the third party are of the same group. However, controlling for the group affiliation of the recipient, third parties punish dictators who are members of their own tribe less than dictators who are members of the other tribe.

Our approach focuses directly on the ideas of social identity theory as characterized by Tajfel and Turner (1979) and others. That is, we focus on the processes of categorization, identification, and comparison. Our evolutionary model begins with a simple team production environment (i.e. the commons) in which team members generate positive externalities

for one another while members of other teams generate negative externalities. Categorization in our model arises through individuals' preferences evolving in such a way that they account for the material well-being of other individuals. The processes of identification and comparison arise in the evolutionary process and are characterized by the weights individuals ascribe to others' biological fitness (i.e. fitness of own- and other-team members) in their preferences. This follows previous research in evolutionary game theory (e.g. Eaton and Eswaran, 2003) and provides an evolutionary foundation for much of the literature regarding social preferences in which individuals positively account for the welfare of others in decision-making (Bolton and Ockenfels, 2000; Charness and Rabin, 2002; Fehr and Schmidt, 1999; Oxoby and McLeish, 2004).

3 The Emergence of 'Us' and 'Them'

In this section, we use the tools of evolutionary game theory to examine the emergence of the Us versus Them distinction. We assume that there are many players in an environment that supports hunting and gathering. In each period players are matched to form teams of size two, and the teams compete for a common access resource. (This minimal team size is chosen as a matter of convenience, and is not we think crucial to our results.) Competition is localized, so each team competes with just one other. Localized competition is not an unreasonable assumption since, in any geographical setting, only a few teams can compete for the local biota. After appropriating some of the resource, each team then processes the resource, generating a consumption good which the team members share equally. Team effort, then, is involved both in the appropriation of the resource and in the processing of the resource to produce the consumption good.

Consider the interaction between teams in the commons. Let x_{ij} denote the *appropriative effort* of Player $i \in \{1, 2\}$ in Team $j \in \{1, 2\}$. The amount of the resource captured by Team

j, R_j, is

$$R_j = (x_{1j}x_{2j})^{1/2}\left[\gamma - \delta(x_{1k}x_{2k})^{1/2}\right] \quad k \neq j, \gamma > 0, \delta > 0. \tag{1}$$

$\gamma > 0$ parameterizes resource abundance: the larger is γ the more abundant is the resource. $\delta > 0$ parameterizes the congestion externality that Team k imposes on Team j in the appropriation of the common access resource: greater appropriative effort by either member of Team k lowers the marginal productivity of the appropriative effort of members of Team j by an amount that is proportional to δ.[5]

The consumption good is produced by combining the appropriated resource with the processing efforts of team members. The output, Q_j of team $j \in \{1, 2\}$ is given by the linearly homogeneous production function:

$$Q_j = (R_j)^{\alpha}(y_{1j}y_{2j})^{\beta/2}, \quad \alpha > 0,\, \beta > 0,\, \alpha + \beta = 1, \tag{2}$$

where y_{ij} is the *processing effort* of Player i of Team j. The greater the amount of resource appropriated, the higher is the marginal product of a player's processing effort.

The biological fitness, F_{ij}, of Player i in Team j is given by

$$F_{ij} = \frac{1}{2}Q_j - \frac{\theta}{2}(x_{ij} + y_{ij})^2, \quad \theta > 0 \tag{3}$$

where the first term is the player's consumption (one half of team output) and the second is the player's cost of effort (appropriative and processing). The parameter $\theta > 0$ characterizes the cost of effort which, in the context of biological fitness, can be regarded as the extent to which effort dissipates calories.

Subsequently, we shall presume that Nature endows humans with preferences, which they maximize. We will assume that these preferences (which determine behavior) are transmitted

[5] This parameter can also reflect the extent to which the productivity of appropriation effort in the commons is affected by physical violence by the rival team. Among hunter-gatherers, war was often motivated by the need for resources [see Gat (2000a, 2000b)].

genetically, and we will find evolutionarily stable preferences. In this context, natural selection works by promoting the preferences that induce behavior which generates the highest fitness (Dawkins, 1979; Weibull, 1995). But first, to establish context, we consider evolutionarily stable strategies.

3.1 Evolutionarily Stable Strategies

Obviously, a player's strategy is just (x_{ij}, y_{ij}). The evolutionarily stable strategy, $ESS = (x_{ess}, y_{ess})$, has the following property: if all players in the population, save one whom we will call the mutant, adopt (x_{ess}, y_{ess}), then the strategy that maximizes the mutant's fitness is (x_{ess}, y_{ess}). This property guarantees that if all players are using ESS, it is impossible for a mutant to achieve higher fitness by adopting another strategy (Hamilton, 1964a,b; Weibull, 1995).

This property also tells us how to find the evolutionarily stable strategy. Let Player 1 of Team 1 be the mutant, and consider the maximization problem in which (x_{11}, y_{11}) is chosen to maximize the fitness of Player 1 of Team 1: (equation 3)

$$\max_{x_{11}, y_{11}} \quad \frac{1}{2}Q_1 - \frac{\theta}{2}(x_{11} + y_{11})^2. \tag{4}$$

The first order conditions (using equations 1 and 2) for this maximization problem are

$$x_{11} \quad : \quad \frac{\alpha}{4}\left(x_{11}\right)^{\alpha/2-1}\left(x_{21}\right)^{\alpha/2}\left[\gamma - \delta(x_{12}x_{22})^{1/2}\right]^{\alpha}\left(y_{11}y_{21}\right)^{\beta/2} = \theta(x_{11} + y_{11}), \tag{5}$$

$$y_{11} \quad : \quad \frac{\beta}{4}\left(x_{11}x_{21}\right)^{\alpha/2}\left[\gamma - \delta(x_{12}x_{22})^{1/2}\right]^{\alpha}\left(y_{11}\right)^{\beta/2-1}\left(y_{21}\right)^{\beta/2} = \theta(x_{11} + y_{11}). \tag{6}$$

Since ESS is, in effect, a best response to itself, we get a characterization of the evolutionarily stable strategy by setting $x_{ij} = x_{ess}$ and $y_{ij} = y_{ess}$ in these first order conditions (Harsanyi, 1973; Weibull, 1995)

$$x_{ess} \quad : \quad \frac{\alpha}{4}\left(x_{ess}\right)^{\alpha-1}\left[\gamma - \delta\, x_{ess}\right]^{\alpha}\left(y_{ess}\right)^{\beta} = \theta(x_{ess} + y_{ess}), \tag{7}$$

$$y_{ess} \quad : \quad \frac{\beta}{4}\left(x_{ess}\right)^{\alpha}\left[\gamma - \delta\, x_{ess}\right]^{\alpha}\left(y_{ess}\right)^{\beta-1} = \theta(x_{ess} + y_{ess}). \tag{8}$$

Then, since the left hand sides of these equations (7 and 8) must be the same, it follows that

$$y_{ess} = \left(\frac{\beta}{\alpha}\right) x_{ess}. \tag{9}$$

Hence we get the following proposition:

Proposition 1 *The evolutionary stable strategies* (x_{ess}, y_{ess}) *solve*

$$\frac{\alpha}{4}\left[\gamma - \delta\, x_{ess}\right]^{\alpha} \left(\frac{\beta}{\alpha}\right)^{\beta} = \theta\left(\frac{1+\beta}{\alpha}\right) x_{ess}, \tag{10}$$

$$y_{ess} = \left(\frac{\beta}{\alpha}\right) x_{ess}. \tag{11}$$

In the ESS players choose appropriative and and processing efforts, both of which are subject to moral hazard. So in the ESS, team members shirk in the appropriative environment and in the team processing environment. In this section we compare the ESS to the second-best outcome (in which each team internalizes the externality across team members) and the first best outcome (in which all externalities are internalized). In the next section we explore the extent to which evolutionarily stable preferences limit shirking and internalize the externalities in both environments.

3.1.1 Second and First-Best Strategies

To find the second-best outcome, in maximization problem (4) we set $x_{21} = x_{11}$ and $y_{21} = y_{11}$ before optimization. The first order conditions for the second-best maximization problem are

$$x_{11} \quad : \quad \alpha(x_{11})^{\alpha-1}\left[\gamma - \delta(x_{12}x_{22})^{1/2}\right]^{\alpha}(y_{11})^{\beta} = \theta(x_{11}+y_{11}), \tag{12}$$

$$y_{11} \quad : \quad \beta(x_{11})^{\alpha}\left[\gamma - \delta(x_{12}x_{22})^{1/2}\right]^{\alpha}(y_{11})^{\beta-1} = \theta(x_{11}+y_{11}). \tag{13}$$

To find the first-best outcome, in maximization problem (4) the appropriative and processing effort levels of all players are set to a common values x_{fb} and y_{fb} before optimization.

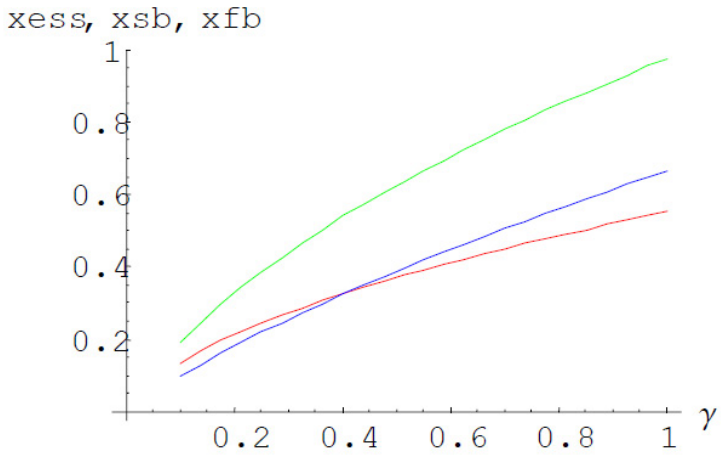

Figure 1: The appropriation effort levels in the ESS (red), Second Best (green), and First Best (blue) outcomes as functions of resource abundance. Parameter values: $\alpha = \beta = 0.5$, $\delta = 0.4, \theta = 0.1$.

The first order conditions for the first-best maximization problem are

$$x_{fb} \quad : \quad \alpha(x_{fb})^{\alpha-1}\left[\gamma - \delta x_{fb}\right]^{\alpha}(y_{fb})^{\beta} - \alpha\delta\,(x_{fb})^{\alpha}\left[\gamma - \delta x_{fb}\right]^{\alpha-1}(y_{fb})^{\beta} - 2\theta(x_{fb} + y_{fb}) = 0, \tag{14}$$

$$y_{fb} \quad : \quad \beta(x_{fb})^{\alpha}\left[\gamma - \delta x_{fb}\right]^{\alpha}(y_{fb})^{\beta-1} - 2\theta(x_{fb} + y_{fb}) = 0. \tag{15}$$

3.1.2 Comparisons

The model thus far has five exogenous parameters: $\alpha, \beta, \gamma, \delta$,and θ, all of which are positive. While analytic solutions for the ESS, second and first best outcomes are unavailable, the solutions can be readily obtained numerically. Figures 1, 2, and 3, display the appropriative and processing effort, and fitness levels in the ESS, second best, and first best outcomes, respectively, as functions of the parameter γ, the measure of resource abundance. We notice from Figure 1 that in the second best outcome, where each team acts as a monolithic unit, the appropriative effort vastly exceeds its analogues in the ESS and the first best outcomes for the chosen parameter values. When the resource is scarce (i.e., γ is low), even the ESS

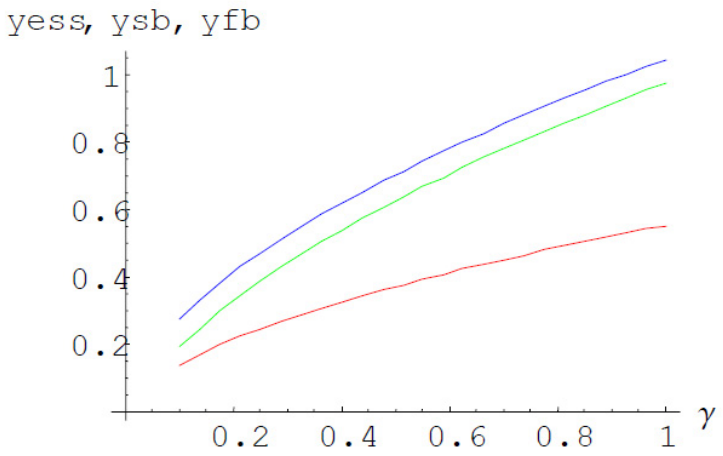

Figure 2: The production effort levels in the ESS (red), Second Best (green), and First Best (blue) outcomes as functions of resource abundance. Parameter values: $\alpha = \beta = 0.5$, $\delta = 0.4, \theta = 0.1$.

appropriation effort exceeds the first best level. In the *ESS*, recall, the efforts of team members are subject to moral hazard. Despite this, the first best appropriation effort is exceeded by the *ESS* counterpart because the *ESS* ignores the externalities imposed on the other team. The productive effort in the second best outcome, as seen from Figure 2, naturally enough, exceeds that in the *ESS* because in this case the externality (which is entirely within teams) is internalized in the former. However, the second best productive effort falls short of the first best level since too much effort is devoted to appropriation in the former. Figure 3 reveals that the fitness level in the second best outcome is *lower* than that in the ESS outcome when the resource is scarce. When teams behave as monolithic units, then, they may exacerbate the inter-team externality in resource appropriation. In the *ESS*, the within-team moral hazard in appropriative effort works to the team's advantage by preventing excessive dissipation of effort in the commons.

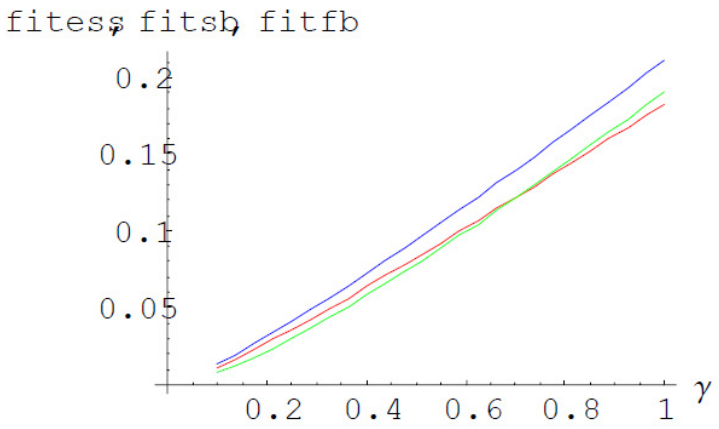

Figure 3: The fitness levels in the ESS (red), Second Best (green), and First Best (blue) outcomes as functions of resource abundance. Parameter values: $\alpha = \beta = 0.5$, $\delta = 0.4, \theta = 0.1$.

3.2 Evolutionarily Stable Preferences

Here we posit utility functions, or preferences, for players that differ from their fitness functions, and we suppose that players maximize utility by choice of their appropriative and processing effort levels. We examine the evolution of preferences, as opposed to strategies. We are building on the approach used in Eaton and Eswaran (2003) and Eswaran and Kotwal (2004).

We assume that player i inherits, as part of her genetic make-up, a utility function that puts a weight of 1 on her own fitness, a weight of μ_i on the fitness of her teammate, and a weight of ν_i on the fitness of the players on the opposing team. While these weights are exogenous to particular players, they are subject to natural selection. Individuals choose the behaviors (effort levels) that maximize utility and, via natural selection, evolution ensures the survival of those preferences that induce equilibrium behaviors that yield higher levels of fitness. Given this framework, a player's fitness is determined by her own preferences and

the preferences of the others with whom she interacts.

Obviously, player i's preferences are just (μ_i, ν_i). The evolutionarily stable preferences, $ESP = (\mu^*, \nu^*)$, have the following property: if all players in the population, save one whom we will call the mutant, adopt (μ^*, ν^*), then the preferences that maximize the mutant's fitness are (μ^*, ν^*). This property guarantees that if all players are using ESP, it is impossible for a mutant to achieve higher fitness by adopting different preferences. It also tells us how to find the evolutionarily stable preferences.

The defining property of evolutionarily stable preferences is this: if all players in the population except the mutant adopt (μ^*, ν^*), then the preferences that maximize the mutant's fitness are (μ^*, ν^*). This property tells us how to find ESP.

Assume that all players other than the mutant have identical preferences, (μ, ν), and denote the mutant's preferences by (μ_1, ν_1). Without loss of generality, we can assume that the mutant, after being randomly matched with another individual, is Player 1 of Team 1. Utility functions can then be written as

$$U_{11} = F_{11} + \mu_1 F_{21} + \nu_1(F_{12} + F_{22}), \tag{16}$$

$$U_{21} = F_{21} + \mu\, F_{11} + \nu\,(F_{12} + F_{22}), \tag{17}$$

$$U_{12} = F_{12} + \mu\, F_{22} + \nu\,(F_{11} + F_{21}), \tag{18}$$

$$U_{22} = F_{22} + \mu\, F_{12} + \nu\,(F_{11} + F_{21}). \tag{19}$$

To find (μ^*, ν^*) we proceed in stages. In the first stage, we find equilibrium effort levels, given (μ, ν) and (μ_1, ν_1); that is, we find the Nash equilibrium effort levels for the game in which these four players each choose their appropriative and processing effort levels to maximize their own utility, given their preference parameters. Utility maximization yields 8 equations in the 8 effort levels. However, since the utility functions of the players on Team 2 are symmetric, there are just 6 distinct equilibrium effort levels and they can be characterized

by the first order conditions for the players on Team 1 and the first order conditions for one of the players on Team 2. Regrettably, there is no closed form solution to these equations, so we have used numerical techniques to solve them. Substituting the equilibrium effort levels into the mutant's fitness function, we can express the equilibrium fitness of the mutant as a function of the 4 preference parameters. Denote the mutant's equilibrium fitness by $\widehat{F}_{11}(\mu_1, \nu_1, \mu, \nu)$.

In the second stage, to find (μ^*, ν^*) we use the property that $(\mu_1, \nu_1) = (\mu^*, \nu^*)$ is the solution to the following maximization problem:

$$\max_{\mu_1, \nu_1} \widehat{F}_{11}(\mu_1, \nu_1, \mu^*, \nu^*).$$

To determine the evolutionarily stable values of these preference parameters, we first find two best response functions, $\mu^{br}(\nu)$ and $\nu^{br}(\nu)$, that arise out of maximization problem:

$$\mu^{br}(\nu) = \arg\max_{\mu_1} \quad \widehat{F}_{11}(\mu_1, \nu, \mu, \nu), \tag{20}$$

and

$$\nu^{br}(\nu) = \arg\max_{\nu_1} \quad \widehat{F}_{11}(\mu, \nu_1, \mu, \nu). \tag{21}$$

Then, we intersect the best response functions to find the ESP:

$$\mu^* = \mu^{br}(\nu^*) \quad and \quad \nu^* = \nu^{br}(\mu^*). \tag{22}$$

In our model, there are two distinct sources of moral hazard that natural selection may "attempt" to resolve, at least partly, by selecting the right mutations in preferences. One is the moral hazard in the appropriation activity and the other is the moral hazard in processing or production activity. From equations 1 and 2 we see that the appropriative effort of Player 1 is a *strategic complement* of the appropriative effort of Player 2; likewise for processing efforts. Since the marginal worth of each player's effort increases with that of her teammate,

the scope of both forms of moral hazard can be reduced by Nature if it bequeaths preferences that put a positive weight on insiders' fitness levels ($\mu^* > 0$).

On the other hand there are strategic considerations with regard to the rival team. From equation 1 the appropriative efforts of members of team j reduce the productivity of the appropriative efforts of members of team k: in other words, the appropriative effort levels of players on opposing teams are *strategic substitutes*. Therefore, if Nature bequeaths preferences in which members of team j put a negative weight on the fitness of their rivals ($\nu^* < 0$), this would shift out the reaction functions (in effort space) of members of team j, and in the Nash equilibrium the equilibrium appropriative efforts of Team j would be higher, implying that they appropriate more of the resource from the commons.

3.2.1 Results

The reasoning outlined above suggests that we would expect group solidarity $\mu^* > 0$ and intergroup hostility $\nu^* < 0$ to respond to different features of the economic environment. In this section we explore comparative statics with respect to resource abundance (γ), the common access externality (δ), and the relative importance in production of the consumption good of appropriation and processing (α).

As with ESS, analytic solutions for the evolutionarily stable preference parameters are unavailable, so we use numerical techniques to find stable preferences and to explore comparative statics. At this point we do not have a complete set of results, because there are still some unresolved issues.

In Figure 4, we illustrate the response of (μ^*, ν^*) to changes in resource abundance (that is, the parameter γ increases). Notice first that our intuition is confirmed: $\mu^* > 0$ and $\nu^* < 0$. This suggests a theory of ethnic identity that does not rely on kinship. Hamilton (1964a,b) resolved the biological puzzle of how altruism may be sustained in an evolutionary world by introducing the notion of 'inclusive fitness', capturing the idea that sacrifices towards kin may

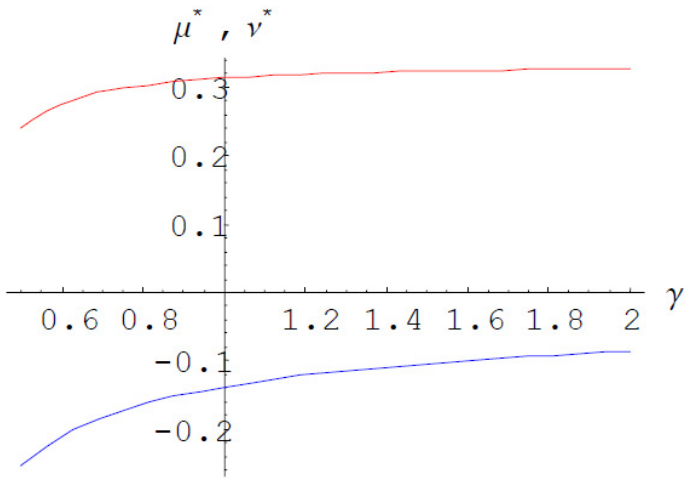

Figure 4: The Evolutionarily Stable Preference parameters as functions of resource abundance (μ^* in red; ν^* in blue). [Parameters values: $\alpha = \beta = 0.5$, $\delta = 0.3$, $\theta = 0.1$]

be warranted and sustained if the beneficiaries carry some common genes with the altruists. Evolutionary psychologists have recently been applying this idea of kin selection to explain the emergence and persistence of ethnic loyalties (Goetz and James, 2004). But the population sizes of ethnic communities can run into the millions, and it stretches credulity to imagine that kinship could sustain altruism in the manner suggested. Naturally, such explanations have been met with skepticism.[6] Our theory proposes that the roots of ethnicity lie, not in kinship, but rather in the economics of team production and exploitation of common access resources, and externalities that exist in environments of this sort. Team activity has been modeled here as appropriation from the commons, which involves conflicts with rival teams, and processing activities. A more elaborate model could very well include defense of the band against other bands as another team activity. Arguably, these more elaborate models would result in the evolution of similar preferences.

We see in Fig. 4 that, when γ is low (that is, when the common access resource is

[6] See, for example, Hislope (1998) and Harvey (2000) for critiques of this approach.

scarce), ν^* is quite negative. In these circumstances, Nature finds it expedient to induce aggressive appropriation effort by contriving considerable intergroup hostility. Since it is important for effort to be diverted towards appropriation, Nature favors only a mild feeling of intergroup solidarity: though positive, μ^* is small. As the resource becomes more abundant, the extent of intergroup hostility falls, and to counteract free-riding in production effort (which now becomes the more important constraint on fitness), Nature brings about an increase in intergroup solidarity.

These effects provide evolutionary arguments that bolster the claims of Homer-Dixon (1991, 1994). He has persuasively argued that environmental scarcities brought about, for example, by increasing population densities, environmental disasters, etc. tend to generate violent conflicts, sometimes by making ethnicity more salient as a result of mass migrations.[7] While conflicts can be explained on the basis of self-interest stemming from purely egoistic preferences ($\mu = \nu = 0$), preferences that draw a distinction between 'Us' and 'Them' facilitate the process by lowering the threshold beyond which violence becomes a credible option. In fact, the savagery that frequently accompanies the appropriation of resources suggests that more than pure self-interest is at work—it seems to require the perpetrators to dehumanize outsiders to some extent (that is, $\nu < 0$).

Carneiro (1970, 1988) has proposed that the "state" as an entity arose only around 4,000 B.C. and had its origins in land scarcity. He argues that, when the extensive margin of settlements is well-defined ('circumscribed'), war ensues frequently as a means of appropriating land. In response, previously independent villages consolidated themselves into chiefdoms for greater strength, and these subsequently further consolidated themselves into empires. If this is true, the very origins of countries would have harnessed different feelings towards

[7] That population pressures may feed expansionist tendencies in nations is an idea that has a long history. As far back as 1938, Hankins (1938) attributed the Japanese invasion of Manchuria in 1937 to population pressures in Japan.

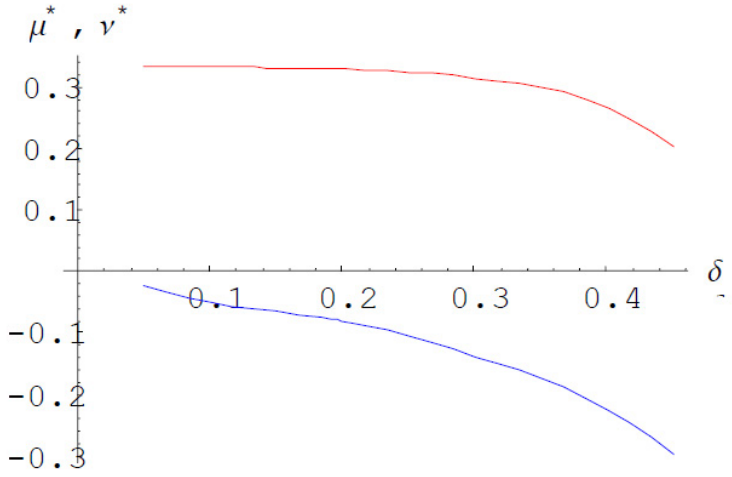

Figure 5: The Evolutionarily Stable Preference parameters as functions of externality

insiders and outsiders that would have been shaped in hunter-gatherer bands.

Figure 5 displays the effect on evolutionarily stable preferences of increases in the parameter δ (capturing the extent of the intergroup externality in the commons). We see that higher δ increases intergroup hostility, raising appropriation effort for strategic reasons and, to facilitate this, lowering intergroup solidarity. The results in Figures 4 and 5 suggest that intergroup solidarity and intergroup hostility are negatively related. If warfare between groups is simulated as an increase in δ, then these results suggest that this would lead to intergroup hostility, consistent with the finding of Cashdan (2001).

Figure 6 shows the effects of an increase in the exponent, α, of the resource input in the Cobb-Douglas production function (equation 2) of the consumption good. An increase in α implies that appropriation effort is more important relative to production effort. As one would expect, this is accompanied by an increase in intergroup hostility at the expense of intergroup solidarity. Equivalently, the more important within-group teamwork is (the higher is $\beta = 1 - \alpha$), the more will Nature curtail the dissipation of effort in strategic expenditures in the commons.

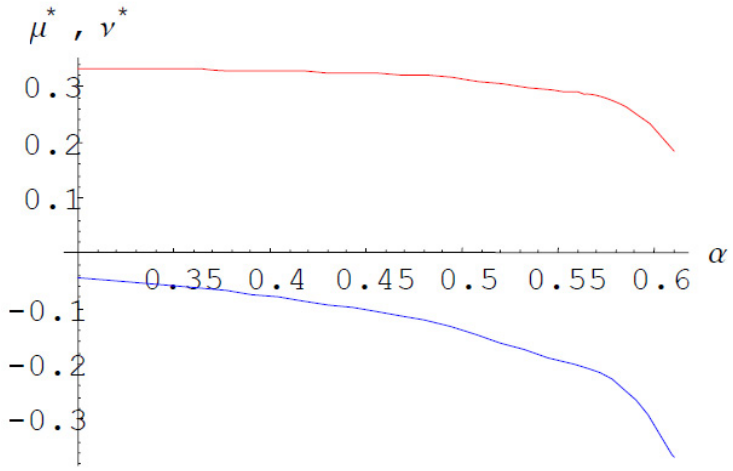

Figure 6: The Evolutionarily Stable Preference parameters as functions of the resource

It is conceivable that the parameter α may have been different for women and men in our evolutionary past. Hunting was largely (but not exclusively) the domain of men, and gathering that of women. Since game are mobile, it is quite reasonable to assume that hunting required a greater expenditure of energy than did gathering (that is, α was higher for men). Moreover, it is likely that in their hunting activities men would have encountered the intervention of rival band members more frequently than did women (that is, δ too may have been higher for men). Despite the fact that hunter-gatherers were nomadic there is evidence that their movements were restricted to circumscribed territories, especially when these are abundant in the resources critical to survival (Dyson-Hudson and Smith, 1978).[8] Given the high nutritional value of meat compared to other food sources, anthropologists expect that hunting was a greater source of violent conflict than was gathering (Gat, 2000a). If the claims that α and δ were both higher for men are reasonable, then on both counts Nature would have evolved greater intergroup hostility in men than in women.[9]

[8] But even in Australia, where the population density was very low, the hunter-gatherer Aborigines had well-defined boundaries (see Gat, 2000a).

[9] Research in experimental psychology and experimental economics suggests that there are differences

Violence in contemporary ethnic conflicts is perpetrated largely by men; women are usually victims, not perpetrators.[10] The salience of ethnicity is brought home by the fact that ethnic polarization results in lower growth rates (Montalvo and Reynal-Querol, 2005) and higher likelihood of civil wars (Montalvo and Reynal-Querol, 2005), ethnic conflicts cause and are caused by the displacement of people (Salehyan and Gleditsch, 2006), and reduce life expectancies even in the long-term [Plumper and Neumayer (2006)]. Female life expectancy relative to male has been shown to decline in ethnic conflicts and the decline is greater if these conflicts take place in 'failed states', that is, those states in which the government and, therefore, law and order, has collapsed (Plumper and Neumayer, 2006).[11] The greater damage done to women relative to men in ethnic wars, especially in failed states, provides circumstantial evidence of the added vehemence that conflicts assume when ethnic identities are at stake.

Our model may shed some light on why there are gender differences in the proclivity for aggression. Men display more physical aggression than do women. Psychologists have offered two theories to explain this [see Archer (2004) for a review of the evidence and the theories]. One explanation is evolutionary, and is based on sexual selection. Following Trivers (1972) this theory argues that, since males can not sexually reproduce unless they have access to females, there is greater variation in the reproductive success of males than of females. As a result, Nature favors greater risk-taking behavior in males and this, in turn, promotes

between men and women with respect to social, intertemporal, and risk preferences (Andreoni and Vesterlund, 2001; Charness and Gneezy, 2004; Eckel and Grossman, 1998). It has been argued that these differences are due to evolutionary forces that differ between men and women (Eckel and Grossman, 2002; Wilson and Daly, 2003).

[10] Women are not necessarily always passive victims in ethnic wars, however. Hutu women actively participated in perpetrating the Rwandan genocide (Sharlach, 1999).

[11] In all wars, women are direct casualties (when they are killed, usually as noncombatant civilians) and are also indirect casualties (when they die because of greater sexual violence, reduced access to healthcare, clean water, etc.)

greater aggression in them. The other explanation, referred to by psychologists as social role theory, argues that gender differences in physical aggression are due to a socialization process in which girls are assigned different roles than boys are and different expectations permit aggression in boys but not in girls.

Implicit in our model is a different theory of gender differences in physical aggression. Given the importance of war for resource appropriation, one would thus expect war or conflict to have had evolutionary consequences that are discernible in the sexes today. This is what our model suggests: suppose a division of labor obtained in which hunting was predominantly a male activity and gathering female.[12] This would be characterized by higher relative values of δ and α for men and a higher relative value of γ for women. In this case, Nature would have favored more aggression in males for reasons that would have had nothing to do with either sexual selection or with socially constructed expectations of gender-specific roles. A differential proclivity for physical aggression would have arisen, rather, simply as a consequence of the fact that the productivity in appropriation activity is enhanced by greater inclination towards violence.[13] In our model this would imply greater intergroup hostility (that is, ν^* to be more negative) in males than in females. More generally, to the extent that war has been a male preserve one would expect males to have stronger preferences against outsiders.[14]

[12] This division of labor may have arisen because women have been more important in the raising of children or because men have had comparative advantage in aggression and defense because of greater physical strength, which may itself have been a result of sexual selection.

[13] To get a sense of the gender disparity in the propensity for violence, consider these statistics: of all homicides committed in the U.S. during 1976-2004, men perpetrated 88.7% and women 11.3% (U.S. Department of Justice, Bureau of Justice Statistics).

[14] The recent increase across the globe in the proportion of females enlisting in the armed forces and the prevalence of female warriors in antiquity imply, however, that war was never an exclusively male preserve.

4 Implications

We now turn our attention to some social implications of the evolutionary stable preferences discussed above. Throughout we assume that individuals distinguish *insiders* and *outsiders*, and that in their decision making they put a positive weight μ on the well-being of insiders and a negative weight ν on the well-being of outsiders. The weights μ and ν are exogenous. To focus our analysis and relate it to an important body of recent literature, we use the weights μ and ν to construct indices of the *fractionalization* and *polarization* of societies. We examine the comparative statics of a number of models of social interaction with respect to these indices. The first two models are adaptations of the familiar Tullock model of rent seeking and rent dissipation, and the third and fourth are adaptations of familiar approaches to the public goods problem.

4.1 Rent Seeking with Insiders and Outsiders

Corruption, crime, competition for transfer payments, and the explotation of the commons in its many guises all involve an element of rent seeking, and consequent rent dissipation. There is an emerging body of evidence that indicates that these activities are more prevalent in fragmented and polarized societies. In this section we introduce insider/outsider preferences into the Tullock model of rent seeking in an attempt to explain these patterns (Tullock, 1980).

With respect to societies marked by strong identities within subgroups, Mauro (1995) has shown that corruption is positively correlated with ethnolinguistic fractionalization.[15] In the U. S., Alesina et al (1999) have found that in areas with greater ethnic fragmentation govenrment spending tends to be financed more by intergovernmental transfers than by local

[15] Shleifer and Vishney (1993) have argued that corruption is more dissipative in non-homogeneous societies because it is conducted inefficiently.

taxes. This suggests that ethnically fragmented societies tend to display more rent-seeking behavior. Banerjee and Somanathan (2001) have shown that districts in India with greater ethnic fragmentation exhibit higher levels of almost every type of crime. Finally, Glaeser et al (2000) and Hardin (2002) find that trust and trustworthiness, an important component of social capital, increases when individuals are "closer" socially. Lederman, Loayza, and Menendez (2002) show that the extent to which people believe others can be trusted, a measure of social capital that is known to depend inversely on ethnic fragmentation within countries, is inversely correlated to the incidence violent crime.

4.1.1 Version 1: Seeking A Private Good

There are $J \in \{1, 2, ...J\}$ groups each with n members. By expending resources the members of each group pursues an exogenously fixed prize, the worth of which is normalized to unity. In version 1 of our rent seeking model, the prize is a private good. Let x_{ij} denote the amount of resources expended by person i of group j. Denote by X_j the aggregate amount of resources spent by group j: $X_j = \sum_k x_{kj}$. The probability, p_{ij}, that member i of group j wins the prize is

$$p_{ij} = \frac{x_{ij}}{X_j + X_{-j}}, \tag{23}$$

where X_{-j} denotes the aggregate expenditure all groups other than j. Note that the prize is individual specific, accruing to only one agent in one group. We assume that group members do not coordinate their expenditures.

Since the value of the prize is 1, the expected earnings of by person i of group j is just $p_{ij} - x_{ij}$. Individuals put a weigh of 1 on their own expected earnings, a positive weight μ on the expected earnings of other members of their own group, and a negative weight ν on the expected earnings of members of other groups. Thus the choice problem of member i of

team j is

$$\max_{x_{ij}} \quad p_{ij} \ - x_{ij} + \mu \left(\sum_{k \neq i} (p_{kj} \ - x_{kj}) \right) + \nu \left(\sum_{m \neq j} \sum_{k} (p_{km} \ - x_{km}) \right). \tag{24}$$

The first order condition for this problem is

$$\frac{1}{X_j + X_{-j}} - \frac{x_{ij} + \mu \sum_{k \neq i} x_{kj}}{(X_j + X_{-j})^2} - \frac{\nu \sum_k \sum_{m \neq j} x_{km}}{(X_j + X_{-j})^2} - 1 = 0. \tag{25}$$

Given the symmetry of the model, the equilibrium is symmetric. Letting x^* denote the equilibrium expenditure of any peron in the model, equation (25) yields the follwoing characterization of equilibrium:

$$\frac{1}{n\,x^* + (J-1)nx^*} - \frac{[1 + (n-1)\mu]\,x^*}{[n\,x^* + (J-1)nx^*]^2} - \frac{(J-1)n\nu x^*}{[nx^* + (J-1)nx^*]^2} - 1 = 0, \tag{26}$$

which yields the solution

$$x^* = \frac{(J\,n - [1 + (n-1)\mu] \ - (J-1)\,n\,\nu}{J^2 n^2}. \tag{27}$$

In equilibrium, the aggregate rent dissipation, $D^* = nJx^*$, is then

$$D^* = 1 - \frac{[1 + (n-1)\mu] \ + (J-1)\,n\,\nu}{Jn}. \tag{28}$$

The comparative statics with respect to μ and ν are readily obtained:

$$\frac{dx^*}{d\mu} < 0, \frac{dD^*}{d\mu} < 0 \text{ and } \frac{dx^*}{d\mu} < 0, \frac{dD^*}{d\mu} < 0. \tag{29}$$

Although insiders are also viewed as competitors for the prize, intra-group solidarity tempers competition. An increase in this solidarity (i.e. an increase in μ), results in an individual internalizing part of the externality imposed on own group members. This leads individual group members to reduce the resources they expend in appropriating a prize for themselves. On the other hand, an increase in inter-group hostility (i.e. a more negative ν) induces an individual to become more aggressive in her rent-seeking, incurring larger costs reduce the probability that someone outside her group receives the prize.

Setting $\mu = \nu = 0$, we obtain for comparison the corresponding expression for the Tulllock:

$$D^*_{Tullock} = 1 - \frac{1}{Jn}. \tag{30}$$

Rrelative to the Tullock model, a positive weight placed on insiders' earnings ($\mu > 0$) lowers aggregate rent dissipation and a negative weight placed on outsiders' earnings ($\nu < 0$) increases aggragate rent dissipation.

When the number of groups, J, increases individuals see more and more people as outsiders. Thus for any $\mu > 0$ and $\nu < 0$, as J becomes sufficiently large the aggregate expenditure will necessarily exceed that in the Tullock model. Interestingly, since $\nu < 0$, the aggragate dissipation can exceed unity (the value of the prize).

Proposition 2 *If*

$$\nu < -\left(\frac{1 + (n-1)\mu}{(J-1)n}\right),$$

then $D^* > 1$.

Proof. Follows directly from equation 28. ■

Fractionalization As we have remarked earlier, there is a growing literature on the effect of ethnic diversity on economic development (e.g. Easterly and Levine, 1997). They argued (and subsequent papers have shown) that fractionalization promotes rent-seeking, corruption, ethnic conflict, and lowers provision of public goods. *Fractionalization* is typically defined as the probability that two individuals drawn at random will be from different groups.

Our simple model generates some of the effects of fragmentation in a minimalist framework. Formally, the natural index of fractionalization in our model is J. Writing the total number of people in the society, $J\,n$, as N, so that $n = N/J$, we may rewrite equation (**??**) as

$$D^* = 1 - \frac{1-\mu}{N} - \frac{\mu}{J} + \left(1 - \frac{1}{J}\right)|\nu|\,. \tag{31}$$

We see from the above expression that, holding population constant, an increase the number of groups increases aggregate rent dissipation. The more fractionalized a society is (the higher the J), the greater is the waate attributable to rent-seeking behavior.

Proposition 3 *Consider an economy with a fixed population divided over a finite number of J groups. In such an economy*

$$\frac{dD^*}{dJ} > 0.$$

Polarization *Polarization* refers to the disparity between groups along a single dimension, for example average wealth of group members, or the preferred policy of the group (in some spectrum of policies). Indices of polarization have been derived and utilized to understand ethnic and distribution conflicts (Esteban and Ray, 1994, 1999). Recently, Montalvo and Reynal-Querol (2005) have proposed an index of polarization along ethnic and religious lines. They empirically demonstrated that polarization can explain conflict (civil wars).

The parameters μ and ν afford a measure of polarization that is somewhat richer than than the measures used in the literature (which depend only on the proportional sizes of the groups comprising the society). In our model, a high value of μ combined with a high value of $|\nu|$ (indicating considerable perceived heterogeneity *across* groups), seem to capture much of what Esteban and Ray (1994) have emphasized as the hallmark of polarized societies. When both μ and $|\nu|$ are large, individuals draw trenchant distinctions between 'Us' and 'Them'. Such societies would conform to any intuitive notion of high polarization since there is solidarity within groups and alienation across groups.

Suppose $\mu = |\nu| = \xi$. Then ξ (the distance between μ and ν) is an index of polarization. Thus we have the following:

Proposition 4 *Consider a society comprised of J groups in which all agents have identical preference parameters μ and ν. Then*

$$\frac{dD^*}{d\xi} = \frac{(J-1)n-(n-1)}{Jn} > 0.$$

Proof. Follows from equation (**??**). ■

This proposition considers an increase in intra-group solidarity accompanied by an increase of equal magnitude in inter-group hostility; the former lowering and the latter increasing rent seeking expenditures. Since for groups with equal numbers there are fewer insiders $(n-1)$ than outsiders (at least n), the aggregate rent dissipation on balance rises.. In general, of course, the direction of this result will depend on the number of insiders and outsiders. But it has been argued in the literature (Kalai and Kalai, 2001; Montalvo and Reynal-Querol, 2005) that polarization is at a maximum when there are only two groups with roughly the same number of members. In this scenario, higher ξ certainly increases aggregate rent-seeking expenditure in our model.

4.1.2 Version 2: Seeking a Public Good

Here we adapt the previous model to a situation where different groups vie for a public good. The public good could be the location of a public facility in one's neighborhood (e.g. a hospital, school, or library), or the absence of an undesirable public facility in one's neighborhood (a NIMBY good), or funding for some group activity.

To adapt the model to this purpose, we assume that each member of a group sees the prize (still normalized to unity) as a non-rivalous good that is enjoyed by all members of his group . Initially we assume that there are two groups with n_1 and n_2 members, respectively. From (23), it follows that the probability that group j is awarded the public good, P_j, is given by

$$P_j = \frac{X_j}{X_j + X_{-j}}. \tag{32}$$

Assuming, as before, that members of each group do not coordinate their actions, member i of group j chooses x_{ij} to solve

$$\max_{x_{ij}} \quad [1+(n_1-1)\mu]P_j - x_{ij} - \mu\left(\sum_k x_{kj}\right) + \nu[n_2(1-P_j) - \sum_{m\neq j} X_m]. \tag{33}$$

In the equilibrium, within a group all members will have identical expenditures. Let $x_j^\dagger$ denote the equilibrium expenditure of a member of group j. The equilibrium is characterized by the following first order conditions reduce to

$$\frac{1}{n_1 x_1^\dagger + n_2 x_2^\dagger} - \frac{[1+(n_1-1)\mu]x_1^\dagger + n_2\nu x_2^\dagger}{(n_1 x_1^\dagger + n_2 x_2^\dagger)^2} - 1 = 0,$$

and

$$\frac{1}{n_1 x_1^\dagger + n_2 x_2^\dagger} - \frac{[1+(n_2-1)\mu]x_2^\dagger + n_1\nu x_1^\dagger}{(n_1 x_1^\dagger + n_2 x_2^\dagger)^2} - 1 = 0.$$

Solving these equations we get the equilibrium values.

$$x_i^\dagger = \frac{[1+(n_i-1)\mu + n_{-i}\nu]^2(1+(n_{-i}-1)\mu + n_i\nu)}{n_i[2+(n_i+n_{-i})(\mu+\nu)]^2}, \quad i=1,2. \tag{34}$$

The comparative statics with respect to μ and ν are readily obtained:

$$\frac{dx_i^\dagger}{d\mu} > 0 \text{ and } \frac{dx_i^\dagger}{d\mu} < 0 \tag{35}$$

Now an increase in intragroup solidarity μ increases rent-seeking expenditure as group members do not perceive one another as competitors. Of course, the free-riding inherent in public good situations tends to lower each member's expenditure, so depending on the relative group sizes and the relative magnitudes of μ and $|\nu|$, individual expenditures could be higher or lower when the prize is a public good compared to when it is a private good. When it is a public good, the standard free-rider problem that plagues groups is countered by intragroup solidarity (positive μ), so much so that for sufficiently high μ an individual's expenditure may be higher than when the prize is a private good. As before, inter-group hostility (negative ν) increases rent-seeking expenditures for strategic reasons. Thus goodwill towards insiders

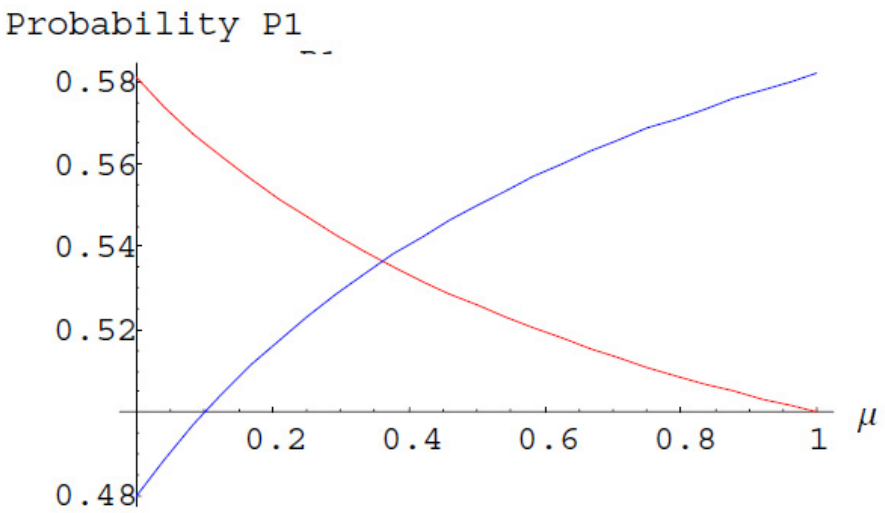

Figure 7: Probability that Group 1 wins for $n_1 = 3$, $n_2 = 2$, and $\nu = -0.1$.(Red for private good; Blue for public good)

and malevolence towards outsiders both work to increase rent-seeking expenditures when the good is public.

Figure 7 displays the probability that someone in Group 1 (with $n_1 = 3 > n_2 = 2$) wins the good as a function of intragroup solidarity, μ. This probability is declining in μ (but is always remains higher than 0.5) when the good is private. Stronger feelings of group solidarity lower the larger group's aggregate expenditure for the private good by more and so the probability that the prize accrues to someone in this group is reduced. But when the good is public, this probability starts out lower than 0.5 (due to greater free-riding in the larger group) but is increasing in μ.

Figure 8 displays the probability that someone in Group 1 (the larger group) wins the prize as a function of the inter-group hostility, ν. The probability is declining in $|\nu|$, irrespective of whether the good is private or public, but when it is public the probability falls below 0.5 for sufficiently large $|\nu|$. Thus we see that *smaller* groups may have a higher probability of

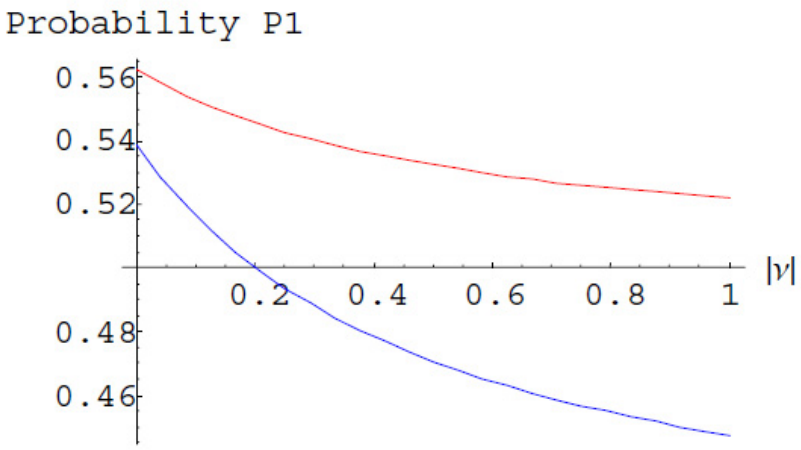

Figure 8: Probability that Group 1 wins for $n_1 = 3$, $n_2 = 2$, and $\mu = 0.2$.(Red for private good; Blue for public good)

winning the prize. This is not possible in the standard version of the Tullock model. When $\mu = \nu = 0$, we see from equation (34) that the aggregate expenditures of the two groups are the same, irrespective of their sizes, and so they have an equal probability of winning.

If we allowed for heterogeneous preferences, it would be easy to demonstrate that small groups with well-honed feelings of 'Us' and 'Them' (large μ and $|\nu|$) may well have higher rent-seeking expenditures individually and in aggregate than larger groups with more diffused preferences.

If we have J identical groups, each with n members, an individual's equilibrium expenditure, $x^{\dagger}$, is

$$x^{\dagger} = \frac{[1 + (n-1)\mu - (J-1)n\nu](J-1)}{J^2 n}. \tag{36}$$

The aggregate dissipation, $D^{\dagger}$, in this symmetric case is

$$D^{\dagger} = [1 + (n-1)\mu - (J-1)n\nu]\left(1 - \frac{1}{J}\right). \tag{37}$$

We thus have the following:

Proposition 5 *If $\mu > 0$ and $\nu < 0$, there exists J such that $n < D^{\dagger}$ as characterized in equation (37).*

This proposition indicates that there exists a sufficiently large J such that aggregate expenditure exceeds the value of the prize to the group that wins it, which is just n. Further, this outcome is more likely when there are many groups present. For example, if $\mu = 0.2$, $\nu = -0.1$, $n = 3$, and $J > 7$, then $D^{\dagger} > 3$. The level of J such that rent-seeking exceeds the value of the prize to the group is increasing in μ and decreasing in ν, implying that in societies with greater polarization rent-seeking will also be exacerbated. This suggests that large and ethnically diverse populations (like those in India and in African countries) will witness a great deal of rent-seeking relative to the stakes available. In contrast, in the Tullock (1980) model (in which $\mu = \nu = 0$) for a finite population the aggregate rent-seeking expenditure is always less than the prize.

4.1.3 Interpretation

These insights have important implications. Osborne (2000) argues that multiculturalism in societies invites rent-seeking and has examined this in the model of Tullock (1980). We find the view compelling that, by validating ethnic groups ingrained sense of identity, multiculturalism promotes rent-seeking. Our model here makes the further point that openly promoting multiculturalism in societies characterized by strong group identities (strong feelings of 'Us' and 'Them'), the rents dissipated could be much greater than what is suggested by the Tullock (1980) model. This follows in the above framework where the size of the prize available to rent-seekers in aggregate is assumed to be fixed. The problem confronting governments committed to multiculturalism, however, could be far worse: the amount of funds available to promote multiculturalism is likely endogenous and would almost surely increase to accommodate lobbying by various cultural groups. This waste is compounded by our result above

that the aggregate rent-seeking expenditure can exceed the amount of funds dispensed by the government (even greatly, if there are many groups vying for funds).

The moral hazard inherent in collective action that Mancur Olson (1965) first discussed in his *Logic of Collective Action* is partly resolved by a strong feeling of group identity. Following the broad definition of social capital as social interactions in Putnam (2000), feelings of group identity would certainly be deemed an integral part of a nation's or group's social capital. Recent literature on social capital has identified it as an important contributor to nation-building. Our model also shows that moral hazard in the collective action of a group is also partly resolved, perversely, by a common feeling of malevolence towards other well-identified groups in society. History provides ample evidence of nations that have mobilized their citizens' efforts by drawing on their common antipathy for minorities or for citizens of other nations. In the model of rent-seeking considered here, both benevolence towards group members and malevolence towards members of other groups work to the detriment of the society of which they form a part. The social capital within groups, in this context, is a curse for the nation.[16] In the political arena, strong bonds between people with common interests that help mobilize them to lobby for rents dispensable by the government is another example of the negative effects of social capital.[17] Social capital of this sort, however, would

[16] This is consistent with the spirit of the critique of the social capital literature by Portes and Landolt (1996) in that there is a downside to social capital that is not adequately appreciated. In their investigation of the effect of social capital on violent crime (homicides), Lederman et al (2002) find that social capital as measured by membership in religious and social organizations does not yield unambiguous effects. They speculate that this may be because such membership does not necessarily reflect society-wide social capital. They find, in sharp contrast, that homicide rates are unambiguously correlated negatively with trust—a different measure of social capital which captures a general characteristic of the entire society, not just of specific groups.

[17] Osborne (2001) offers a persuasive rent-seeking explanation for why reservations along caste lines of seats in parliament, educational institutions, government jobs, etc. has persisted in India despite the increasing economic irrelevance of caste since independence.

be beneficial to societies that are homogeneous because it would unambiguously lead to a decline in rent-seeking.

4.2 The Provision of Public Goods

Recent literature has drawn attention to the fact that regions with greater ethnic fragmentation also tend to have lower levels of public goods. A seminal paper by Easterly and Levine (1997) attributed much of the tragic failure of African countries in living up to their considerable growth potential to the fact that core public goods are under-provided as a result of ethic fragmentation. Alesina et al (1999) have shown that in the U.S. ethnic fragmentation tends to reduce levels of public goods provision, which they explain with a theory based on the premise that different ethnic communities have preferences for different public goods.

Alesina and Ferrara (2000) have argued on theoretical grounds that greater racial or ethnic heterogeneity may lead to lower participation in group memberships (which is a frequently used measure of social capital) and have provided empirical evidence for this using U.S. data. Vigdor (2004) has shown that participation in the U.S. Census, which has substantial localized public benefits (but almost no private benefits) in terms of receipts of Federal grants, is inversely related to the ethnic fragmentation in the geographical area. Luttmer (2001) has shown that self-reported attitudes towards welfare spending in the U.S. favor greater spending in areas where a greater proportion of local recipients are from the respondent's race. All these papers propose theories that draw a distinction between preferences for one group over another. Miguel and Gugerty (2005) have found that school funding in Kenya is lower in areas that exhibit greater ethnic diversity, which they explain by positing that free-riding is more easily controlled in ethnically homogeneous communities because imposing sanctions against non-contributors is easier. Banerjee et al (2005) have shown using district-level data from India that regions exhibiting higher levels of social fragmentation also have lower access

to public goods. Finally, Lee and Roemer (2001) and Alesina et al (2001) find that differences between the welfare and redistribution systems in the US and Europe are attributable to a particular type of fragmentation, namely racism.

So, as a matter of fact, it appears to be the case that in a cross section of societies the quantity of public goods is inversely related to social fragmentation and possibly polarization. In the model laid out below, fragmentation and polarization sap the willingness of societies to provide public goods and so in our model the inverse relationship is causal.

As before, there are J groups, each with n members. Every person has the same income, z, which is allocated to consumption of a composite private good or the public good. The *private* utility function of member i of group j, $u_{ij}(G, c_{ij})$, is

$$u_{ij}(G, c_{ij}) = P(G) + H(c_{ij}) \tag{38}$$

where G is the quantity of the public good and c_{ij} is the quantity of a private composite good (which is assumed to be essential). The functions P and H are strictly concave and differentiable. Using the budget constraint, we can express the individual's contribution to the public good as $g_{ij} = z - c_{ij}$, so quantity of the public good is $G = \sum_{l,m} g_{lm}$. The *full* utility function of member i of group j, $U_{ij}(G, c_{ij})$, is

$$U_{ij}(G, c_{ij}) = u_{ij}(G, c_{ij}) + \mu(n-1)G + \nu nJG \tag{39}$$

In this model, concern for insiders and outsiders works though the quantity of the public good. When one's insiders (respectively, outsiders) enjoy more of the public good, one's utility increases (respectively, decreases). We consider two standard mechanisms for providing the public good, one where there is a welfare maximizing social planner and another where individuals noncooperatively choose their own contributions to maximize their own utility.

4.2.1 The Planner's Solution

The planner will choose the allocation of income to private consumption and the public good that maximizes the full utility of representative person in the society. We assume that the public good is financed by a lump sum tax, and that everyone pays an equal share of the cost of the public good, G/N, where $N = nJ$ is the population of the society. Using the definitions and relationships set out above, we can then write the full utility of a representative person in this society as a function of G, $U_R(G)$:

$$U_R(G) = P(G) + H(z - G/N) + \mu(n-1)G + \nu(N-n)G. \tag{40}$$

The planner chooses G to maximize $U_R(G)$, so the following derivative is of interest.

$$\frac{\partial U_R(G)}{\partial G} = [P'(G) + \mu(n-1) + \nu(N-n)] - (1/N)H'(z - G/N)]$$

The first term in square brackets is the representative person's marginal benefit of the public good, and the second is her marginal opportunity cost. The marginal benefit term includes the effect on the representative person's private utility, $P'(G)$, an effect driven by her positive concern for insiders, $\mu(n-1)$, which works to increase her marginal benefit, and an effect driven by her negative concern for outsiders, $\nu(N-n)$, which works to decrease her marginal benefit.

If the derivative $\partial U_R(G)/\partial G$ evaluated at $G = 0$ is negative, the planner will choose a 0 quantity of of the public good. Of course, if the condition in this proposition is not satisfied, then the planner will choose a positive quantity of the public good, and the solution to the planner's problem is characterized by the condition that marginal benefit equal marginal cost.

Proposition 6 *(a) If* $P'(0) + \mu(n-1) + \nu(N-n) < (1/N)H'(z)$*, then* $G^* = 0$*.*

(b) If $P'(0) + \mu(n-1) + \nu(N-n) \geq (1/N)H'(z)$*, then* G^* *is characterized by the following*

condition

$$P'(G^*) + \mu(n-1) + \nu(N-n) = (1/N)H'(z - \frac{G^*}{N}).$$

(c) The comparative statics are given by

$$\frac{dG^*}{d\mu} > 0, \frac{dG^*}{d\nu} > 0, \frac{dG^*}{dN} \gtreqless 0.$$

The first two comparative static results in the proposition are intuitive. Increasing either μ or ν increases the marginal benefit of the public good, and therefore the optimal quantity of the good. The ambiguity of the third result is perhaps surprising. Increasing the size of the population, while holding constant the size of individual groups, decreases the marginal opportunity cost of the public good because the cost of the good is spread over a larger group, but because the newcomers are outsiders from the perspective of the existing groups, the marginal benefit of the public good diminishes. If $|\nu|$ is large enough, then the second effect swamps the first, and quantity of the public good decreases as the population increases.

Relative to the standard case of purely egoistic preferences, insider/outsider preferences distort the marginal benefit of the public good, and this distortion can be seen in the proposition immediately above. The magnitude of the distortion, Ω, is just

$$\Omega = \mu(n-1) + \nu(N-n)$$

which can be either positive or negative, so the qualitative effect of the distortion is uncertain. Using the fact that $N = nJ$, the distortion can be written as

$$\Omega = \mu(n-1) + n|\nu| - Jn|\nu|$$

J is, of course, an index of fractionalization. Since $\partial\Omega/\partial J = -n|\nu| < 0$, it is clear that as fractionalization increases, the planner is less and less inclined to divert resources from private consumption to the public good. So, in this model, the greater is the fractionalization of the society, the smaller is the optimal quantity of the public good.

Further, if the number of groups in this society is large enough, that is, if

$$J > 1 + \frac{\mu}{|\nu|}(1 - \frac{1}{n})$$

then $\Omega < 0$, and the quantity of the public good is less than it would be if preferences were egoistic. This last inequality is satisfied for $J \geq 2$ if $\mu \leq |\nu|$. More generally if $\mu \leq I|\nu|$, then it is satisfied for $J \geq I$.

For societies that are even moderately fractionalized, it is also the case that as polarization increases, the planner is less and less inclined to divert resources from private consumption to the public good. If we set $\mu = |\nu| = \xi$, we get

$$\Omega = \xi[1 + n(2 - J)]$$

Notice that the term is square brackets is negative if J is greater than 2, in which case polarization also saps the willingness of the planner to supply the public good—the more polarized is the society, the less willing is the planner to provide the public good.

4.2.2 Private Provision of Public Goods

If there is no social planner with the power and insight to solve the public goods problem, then any public goods that are provided will have to provided in some other way. Here we examine the implications of insider/outsider preferences for the standard private provision mechanism, in which individuals noncooperatively make voluntary contributions to maximize their own utility. In this setting, it is clear that the quantity of the public good will be smaller than the quantity that the planner would choose. Beyond that, we will see that the effects of fractionalization and polarization on quantity of the public good are qualitatively the same as when the planner is in charge.

The full utility of member i of group j can be written as a function of her own voluntary

contribution, g_{ij}, and the voluntary contributions of all others, $G_{-ij} = \sum_{k\neq i, l\neq g} g_{kl}$

$$\widetilde{U}(g_{ij}+G_{-ij}) = P(g_{ij}+G_{-ij})+H(z-g_{ij})+\mu(n-1)(g_{ij}+G_{-ij})+\nu(N-n)(g_{ij}+G_{-ij}). \quad (41)$$

Differentiating with respect to g_{ij} we get

$$\frac{\partial \widetilde{U}}{\partial g_{ij}} = P'(g_{ij}+G_{-ij}) + \mu(n-1) + \nu(N-n) - H'(z-g_{ij}). \quad (42)$$

If this derivative is negative at the point where all contributions are 0, in equilibrium all contributions will be 0. This yields the following proposition. Of course, if the condition in the above proposition is not satisfied, there will be a positive quantity of the public good in equilibrium, and in the equilibrium the marginal benefit of the public good will be equal to the marginal opportunity cost.

Proposition 7 *(a) If* $P'(0) + \mu(n-1) + \nu(N-n) < H'(z)$*, then* $g^* = 0$*.*

(b) If $P'(0) + \mu(n-1) + \nu(N-n) \geq H'(z)$*, then* g^* *is characterized by the following condition*

$$P'(Ng^*) + \mu(n-1) + \nu(N-n) = H'(z-g^*).$$

(c) The comparative statics are given by

$$\frac{dg^*}{d\mu} > 0, \frac{dg^*}{d\nu} > 0, \frac{dg^*}{dN} \gtreqless 0.$$

Comparing these propositions with the corresponding propositions for the planner's solution, it is obvious that the private provision mechanism is less likely to generate a positive quantity of the public, and when it does generate a positive quantity the quantity will be smaller than in the planner's solution. The reason is also apparent: when the planner is in charge, the individual' marginal opportunity cost is just $(1/N)H'$, but when there is no planner it is H'.

Notice that, relative to the case of egoistic preferences, under both mechanisms insider and outsider preferences distort the marginal benefit of the public good in exactly the same

way. Hence, under both mechanisms, the quantity of the public good is inversely related to fractionalization. In addition, if fractionalization is even moderately high, quantity of the public good is inversely related to polarization as well.

4.2.3 Interpretation

As a matter of fact, it appears to be the case that in a cross section of societies, the quantity of public goods is inversely related to fragmentation and possibly polarization. We would argue the inverse relationship is causal—that fragmentation and polarization sap the willingness of societies to provide public goods. If this interpretation is accepted, and if the view that this correlation is problematic is also accepted, then the problem would appear to be the preferences themselves. Our view is that insider/outsider preferences were forged in an environment very different from the one in which we currently live, and they do not serve us well in our current environment.

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