Conflict and Wealth

Oskar Nupia*

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Abstract
This paper studies how the interaction between group-size, wealth, and its distribution affects both conflict intensity and group success probabilities in a society. In our framework conflict is due to differences in preferences for social outcomes, which are not necessarily related to the individual wealth. Some examples of this type of conflict are, cities or neighborhoods competing for different locations of a public facility or for public projects, industries struggling for government support, people contributing to political campaigns, cities competing to celebrate some international sport event, and even a civil war by the political power. Using a contest model between interest groups and considering prizes with different characteristics - public and mix private-public prizes - we show that under some conditions less between-group income inequality can generate more conflict intensity. We also prove that, when the contest’s prize has pure public characteristics, a sufficiently high income inequality between a small and a large group can explain the group-size paradox. To observe this outcome, the total wealth of the smaller group must not be necessarily higher than the total wealth of the larger group. We present some evidence that support our findings by using information on U.S. House campaign race.

* Ph.D. (c), Universitat Pompeu Fabra. Contact: oscar.nupia@upf.edu
1. INTRODUCTION

There is a common belief that income inequality increases the social unrest and so the level of conflict in a society. Moreover, some scholars (e.g. Sen (1972)) have stressed the strong connection between these elements and have claimed that inequality might be the source of social revolutions. However, few theoretical studies have analyzed this relationship and only recently some empirical studies have explored if income distribution can explain the likelihood of conflict, mainly of civil wars.

Commonly, the theoretical studies that have analyzed this relationship have assumed that inequality is the direct cause of conflict. In other words, these models assume that the conflict is directly over wealth (e.g. Grossman (1994), and Horowitz (1993)). When this is the case it is unsurprising that income redistribution might generate a decrease in the level of conflict.

Nevertheless, other conflicts in a society are not directly over wealth but over group interests. In this context conflict is understood as a between-groups contest for social choices where no collective decision rule is necessarily established. When this is the case, it is not clear how income redistribution may affect the conflict intensity. A priori, one can think that a bad distribution of wealth might have two opposite effects on potential conflicts in a society. First, a higher level of inequality could motivate the poorest to get into a conflict in order to capture, via their social preferences, some resources from the others. If this is the case, the level of conflict is expected to be high. Second, conflicts consume resources, and generally the winning probabilities depend on the quantity of resource allocated by a group in supporting its cause. Hence the poorest have little chances to win and so they do not have any incentive to get into a conflict. If this is the case, the intensity of conflict might be low.

In this paper we deal with this notion of conflict, i.e. conflict on group interest. Thus, in contrast to the traditional studies on this topic, here conflict is due to differences in preferences for social outcomes, which are not necessarily related to individual wealth. Some examples of this type of conflict are cities or neighborhoods competing for different locations of a public facility (hospital, park, library, etc.) or a public project, industries struggling for government support, people contributing to political campaigns, cities competing to celebrate some international sport event (e.g. Olympic Games, Football World Cup), and even a civil war by the political power.

In this context we are going to study the effect of wealth and its distribution on the level of conflict. Additionally, since conflict is between different groups, then group-size will also matter whenever both number of people in a group and their wealth affects between and within-group income inequality. Thus, our purpose is to study how the interaction between group-size, wealth, and its distribution affects both conflict intensity and group success probabilities in a society.

Following some previous studies in this area we will use a framework of pure contest, i.e. where the utility derived from the people engaged in the conflict comes only from their most preferred choice. The model assumes that the society is divided in groups whose members share the same preferences for the social outcomes but they do not necessarily have the same level of wealth. We also assume that the success probability of each group depends on the resources spent by its members in supporting their
preferred outcome. Under this conditions each person in each group has to decide how much contribute to the cause in order to maximize her expected utility. The total resources spent in the conflict by the groups will measure the level of conflict in the society.

We start by studying the case where the contest’s prize is a pure public good. In this case our results show that most of the time very poor people are not willing to engage in any conflict, i.e. they prefer to take their total wealth for themselves instead of spending any money in the contest. Then if only very poor people compose a group, this group might be marginalized from any social choice.

With regard to the equilibrium winning probabilities we find the following results. First, wealthier (in terms of average wealth) and larger groups are more successful than poorer and smaller groups. Second, when the groups have the same average wealth, larger groups spend more on conflict than smaller groups and then attain a higher winning probability. Third, it is not necessarily true that larger groups are more successful or that wealthier groups are more successful, it depends on the interaction between group-size and average wealth. Thus, even though the contest’s prize is totally public, it is possible to see smaller groups in a society being quite successful because a higher average wealth. We show that in order to observe this outcome, the total wealth of the smaller groups need not be higher than the total wealth of the larger groups.

We explore the effect of between-group income redistribution over the level of conflict by transferring wealth from a richer to a poorer group (progressive transfer of income). By doing so we find that income equality does not necessarily imply less conflict intensity, it depends on the relative size (number of people) of the implied groups and its winning probabilities. We identify three cases. First, when the poorer group is smaller or equal than the richer – and so the winning probability of the former is smaller than the respective probability of the latter - then a progressive transfer of income increases the level of conflict. Second, when the poorer group is larger and its winning probability is higher than that of the richer group, a progressive transfer of income decreases the level of conflict. Finally, there is an ambiguous effect when even being larger the poorer group its winning probability is smaller than that of the richer group.

The intuition behind these results is the following. As it was mentioned above, these findings depend on two factors, the relative group-size and the relative winning probabilities. In our framework the winning probabilities are concave in the group-average wealth, i.e. that the marginal probability decreases as the group-average wealth increases. Then, if there is an exogenous rise in the average wealth of any group, this group will have more incentive to increase the optimal contribution when its winning probability is low. On the other hand, the relative group-size will define the individual relative transfer. For instance, when the poorer group is smaller than the richer, a progressive transfer implies that the increase in the individual wealth of a person who belongs to the poorer group is relatively higher to the decrease in the individual wealth of a person who belongs to the richer group. In this case we say that there is a high relative transfer. The opposite occurs when the poorer group is larger than the richer one. In this case we say that there is a low relative transfer.

Now let’s combine the two effects. When the poorer group is smaller than the richer, the marginal probability of the former is large. Moreover, any between group progressive
transfer implies a high relative transfer. Then, each individual in the poorer group will allocate a higher fraction of the transfer to the conflict than the fraction that was allocated by each individual in the richer group from this transfer. The final result is an increase in the level of conflict. The contrary occurs when the poorer group is larger (low relative transfer) and its winning probability higher (low marginal probability). The ambiguity appears when the two effects go in the opposite direction, i.e. when poorer group even though being larger (low relative transfer) has a smaller probability (high marginal probability) than the richer group.

We also explore the effect that a within-group progressive transfer of income has over the level of conflict. We find that within-group income inequality usually does not affect the conflict intensity. Actually this result is a corollary of the Neutrality theorem for private provision of public goods (Warr, 1983). The novelty in our result is that this neutrality still remains when there is an interest conflict with other groups for the provision of the good. However, in the same direction of Bergstrom et al. (1986), we show that in the presence of corner solutions this neutrality not necessarily holds.

We also study the case where the prize has a varying mix of public and private characteristics. Since under these conditions part of the prize decreases as the group-size increases, then it is not more necessarily true that the winning probability of a group (and so the level of conflict) increases as its group-size increases. When this result still holds the effects of a between-group progressive transfer of income over the level of conflict are similar to those found for the pure public prize case. Conversely, when this is not the state of affairs (i.e. the winning probabilities decreases with the group-size), in most of the situations the effect of a between-group redistribution of income over the conflict intensity is ambiguous. Nevertheless, we prove that independently on the degree of publicness of the prize, when the poorer group is smaller than the richer group a low between-group income inequality always increases the conflict intensity.

We present some empirical support to our theoretical findings by using information of U.S. state campaign spending in House race. Under the assumption that people in each city compete with people in other cities of the same state in order to get their preferred set of candidates elected, we find that states with a higher between-city income inequality spend less in House campaigns that those with a lower inequality.

There are three groups of theoretical papers closest in spirit to ours. In the first set are those studies in which the conflict is directly over wealth, e.g. Grossman (1994), Horowitz (1993), and Harms and Zink (2002). When this is the case a redistribution of income always generates a decrease in the level of conflict. In the second group are those that share our same notion of conflict, e.g. Hirshleifer (1991), Skaperdas (1992 and 1998), Esteban and Ray (1999), Esteban and Ray (2001). These studies have not cared about the role of the individual wealth in the conflict intensity. In our paper we combine the notion of conflict of the latter with the inequality issues of the former studies. Finally, the paper is also related with the rent-seeking and the collective action literature (e.g. Katz, Nitzan and Rosenberg (1990), and Nitzan (1991)). These papers have mainly concentrated on the effect of the free-riding behavior on the group winning probabilities, but have not paid attention to any income inequality issue.

There are some empirical studies which are also related to our, e.g. Collier and Hoeffler (2001), Collier, Hoeffler and Söderbom (2001), Hegre, Gissinger and Gleditsch (2002).
These studies have found not effect of income inequality (Nationwide Gini coefficients) on (armed) conflict. From the point of view of our findings, this evidence might be biased because of some measurement errors. As we shall see in detail later on, the key point is that both between-group income inequality and within-group inequality may affect the level of conflict in a different way. Nationwide Gini coefficients measure the inequality in a society as a whole, and they do not separate these two issues.

The remainder of the paper is as follows. In section 2 the model and its characteristics are described, and section 3 presents and discusses the main results. Section 4 makes a brief discussion on the relationship between wealth and group-success, and section 5 extends the model to the case where the contest’s prize has a mix of public and private characteristics. Section 6 presents some empirical evidence that supports our theoretical findings about the relationship between inequality and conflict. Conclusions are presented in the last section.

2. A CONTEST MODEL WITH INCOME INEQUALITY

Suppose that a society composed by \( n \) individuals with different wealth must choose an outcome from a finite set of issues \( G \). Think of these options as different locations of a public facility or a public project (hospital, park, library, etc.), political candidates receiving contributions, a law that might favor an economic sector, the selection of a city to celebrate some international event, etc.

Individuals not only differ in wealth but also in their valuation of these outcomes. Assume that each person derives utility only from her most preferred outcome. We fix this gain to one. Thus if an individual prefers outcome \( g \in G \) over all other outcomes and this is chosen by the society, this player gets an extra unit of utility, otherwise she does not receive anything. Moreover all those who rank a certain option \( g \) first form a group. We identify this group also by \( g \). The number of people in a group is denoted by \( n_g \), where \( \sum_{g \in G} n_g = n \).

We assume that preferences for the outcomes are distributed randomly among individuals, not necessarily correlated with their wealth. In other words, we allow for the existence of any within-group income distribution. Notice that a particular case is when everybody with the same wealth has the same favorite option. This could be the case of different neighborhoods competing for the location of a public facility, where the people in each of them have the same level of wealth.

Let’s denote by \( i \) (and some times by \( j \)) individuals. Each individual \( i \) has an exogenous wealth \( w_i \) and spends a nonnegative amount of resources \( r_i \) in the contest in order to maximize her expected utility. We assume that individuals cannot borrow and that individual wealth is public information. With the required normalization we define the individual wealth net of conflict expenditure by \( c_i = w_i - r_i \). Assuming that utility is separable between net wealth and the contest prize, the expected utility of an individual who belongs to group \( g \) is given by:

\[
EU_i = p_g + f(c_i)
\]  
(1)
where $p_g$ is the success probability of group $g$, and $f(.)$ is a function that is assumed to be continuous, thrice differentiable, with $f'(.) > 0$, $f''(.) < 0$, and $f'''(.) > 0$. Also, we assume that $\lim_{c_i \to 0} f'(c_i) = \infty$.

We assume that the winning probability of a group depends on the effort contributed by its members in support their preferred outcome$^1$. Denoting by $R_g$ the total amount of resources contributed by group $g$ in the conflict (i.e. $R_g = \sum_{i \in g} r_i$), and by $R$ the total amount of resources expended by the society in the conflict (i.e. $R = \sum_g R_g$), this probability is defined as follows:

$$p_g = \frac{R_g}{R}$$  \hspace{1cm} (2)

for all $g=1, \ldots, G$, provided that $R>0$. If $R=0$ then the winning probabilities are given by an arbitrary vector $\{\tilde{p}_1, \ldots, \tilde{p}_G\}$. We assume that this vector is such that $R_g' > 0$ for some $g' \neq g$.

Observe that $R$ can be interpreted as an indicator of the conflict scale or conflict level. Let’s define $R_i = R - r_i$ and $R_g = R - R_g$. Summarizing, each individual in each group takes as given the efforts contributed by everyone else in the society and chooses $r_i \geq 0$ to maximize equation 1 subject to 2. The resources expended by an individual $i$ who belongs to group $g$ is described by the following conditions (see the appendix):

$$\frac{1}{R}(1 - p_g) = f'(c_i) \quad \text{if} \quad f'(w_i) < \frac{R_{-g}}{R_{-i}}$$  \hspace{1cm} (3a)

$$r_i = 0 \quad \text{if} \quad f'(w_i) \geq \frac{R_{-g}}{R_{-i}}$$  \hspace{1cm} (3b)

Under interior solution equation 3a describes the usual condition that at equilibrium, the marginal utility of the contribution must be equal to its marginal disutility. In this framework a Nash equilibrium is a vector of individual contributions such that equation 3a is satisfied for every individual in every group. Some times we shall refer to the people whose best response is given by $r_i = 0$ as inactive people, whereas we shall call active people those who the best response implies $r_i > 0$. Using the same criteria we will differentiate between inactive groups, those with $r_i = 0 \ \forall \ i \in g$, and active groups, those with $r_i > 0$ for at least one $i \in g$.

It is also possible to define the equilibrium in terms of the success probabilities and $R$, rather than in terms of the personal contributions. Given that $f'(.)$ decreases monotonically, from equation 3 the individual best response can be written as:

$$r_i = Max\left\{0, w_i - f'^{-1}\left(\frac{1}{R}(1 - p_g)\right)\right\}$$  \hspace{1cm} (4)

$^1$ Contest success probabilities have been axiomatized by Skaperdas (1996). Here we assume a simple form for the success probabilities.
Combining equation 2 and 4 we get:

$$p_g = \frac{1}{R} \sum_{i \in g} \max \left\{ 0, w_i - f'^{-1} \left( \frac{1}{R} (1 - p_g) \right) \right\}$$  \hspace{1cm} (5)$$

Equilibrium can now be interpreted as a vector \( p \ (G \times I) \) of success probabilities (such that \( p_g \geq 0 \ \forall \ g \), and \( \Pi = \sum g p_g = 1 \)) and a positive scalar \( R \), such that equation 5 is satisfied for every group. Notice that 5 implicitly defines \( p_g \) as a function of \( R \). With the system of \( G \) equations given in 5 plus the condition that \( \Pi = 1 \), we can solve for the equilibrium vector \( \langle p, R \rangle \).

**Proposition 1.** There always exist an equilibrium vector \( \langle p, R \rangle \) such that equation 5 is satisfied for each group \( g \), \( p_g \geq 0 \ \forall \ g \), and \( \Pi = \sum g p_g = 1 \). Moreover, this equilibrium is unique.

The proof of proposition 1 and the rest of propositions are in the appendix. From equation 5 (and also from equation 3) it can be seen that the equilibrium winning probabilities, and so the level of conflict, are a function of both the individual wealth and the group size. In what follows we care about the role played by these two exogenous variables in the conflict. We shall start by studying the simplest case where everybody with the same wealth has the same favorite outcome and so belongs to the same group. We shall refer to that as the within-group income equality case. Later we shall extend our findings to the within-group income inequality case, i.e. where groups consist of people with different wealth. From now on we are going to assume that there exists an interior solution for every individual. Only in some special cases we are going to relax this assumption.

### 3. ANALYSIS

**Within-group income equality case**

For the moment let’s assume that everybody with the same wealth has the same favorite outcome and so belongs to the same group. In this case for any group \( g \), \( w_i = w_g \ \forall \ i \in g \), where \( w_g \) is the common individual wealth of group \( g \). It is also the case where \( w_g = \bar{w}_g \), where \( \bar{w}_g \) denotes the average wealth of group \( g \). We denote by \( W_g \) the total wealth of group \( g \) (i.e. \( W_g = \sum_{i \in g} w_i \)).

Replacing \( w_i \) by \( \bar{w}_g \) in equation 3a it follows that \( r_i = r_g \ \forall \ i \in g \). Thus the winning probability for group \( g \) can be rewritten as \( p_g = \frac{n_g r_g}{R} \) and equation 3a can be represented as follows:

$$\frac{1}{R} (1 - p_g) = f' \left( \bar{w}_g - \frac{p_g R}{n_g} \right) \text{ if } f'(w_g) < \frac{1}{R - \bar{w}_g}$$  \hspace{1cm} (6)
From equation 6 it can be inferred that \( p_g \) and \( R \) are completely defined by \( \bar{w}_g \) and \( n_g \).

We start our analysis by stating the effect that these variables have over the equilibrium. Our strategy consists in examining how success probabilities change over the cross-section of groups (i.e. how \( \Pi = \sum_g p_g(\bar{w}_g, n_g, R) \) change) when either \( \bar{w}_g \) or \( n_g \) change, keeping constant the level of conflict. Since \( \Pi \) decreases as \( R \) increases (see proof of proposition 1), once we know how \( \Pi \) changes it can be inferred how \( R \) must move in order to recover a new equilibrium (i.e. in order to recover \( \Pi = 1 \)).

**Proposition 2:** Assume that people with the same wealth share the same favorite outcome in the society (i.e. there is within-group income equality) and that there is an interior solution for everybody, then:

(a) Both the level of conflict and the winning probability of group \( g \) are strictly increasing in the average wealth of group \( g \).

(b) Both the level of conflict and the winning probability of group \( g \) are strictly increasing in the group-size of \( g \).

It is possible to extract more conclusions from proposition 2. First, wealthier (in terms of average wealth) and larger groups are more successful than poorer and smaller groups. Second, when the groups have the same average wealth, larger groups spend more on conflict than smaller groups and then attain a higher winning probability. This means that Olson’s paradox does not necessary hold under our framework\(^2\). Actually, it replicates the result found by Katz et al. (1990) for rent-seeking activities over public goods. Third, it is not necessarily true that either larger groups are more successful or wealthier groups are more successful.

The key point in the conclusions above is that group-success depends on the interaction between group-size and average wealth. Thus, at the end of the day it is possible to see smaller groups being quite successful because of a higher average wealth. This could be an explanation, alternative to the free-rider effect, to explain the aforementioned paradox. In section 6 we explore this interaction in more detail.

Consider now corner solutions. When for a certain group, say group \( g \), \( f'(w_i) = f'(\bar{w}_g) \geq 1/R_{-g} \), people in this group are not going to participate in conflict.

The condition implies that groups with a small enough average wealth (given its size) might be out of the social conflict\(^3\). This issue can explain why in some societies there

\(^2\) Actually the free-riding effect exists. Equation 6 implies: \( w_i - r_i = \bar{w}_i - p_i R/n_i \quad \forall i \in g \). then, at the same level of conflict \( R \), if there is an extra member coming into group \( g \) we already known that \( p_g \) will increase. Because the probability is bounded above it follows that \( \Delta n_i > \Delta p_i \). Thus, since \( R \) and \( \bar{w}_g \) are assumed constant, \( \bar{w}_g - p_g R/n_g \) should increase as \( n_g \) does, which implies that \( r_i \) should decrease. However, at the end of the day the contribution of the new member compensates the decreases in the contribution of the current members.

\(^3\) Notice that when \( \bar{w}_g \) is small, \( f'(\bar{w}_g) \) is high (in fact when \( \bar{w}_g \) goes to zero, \( f'(\bar{w}_g) \) goes to infinity). However it is not enough to have a corner solution whenever \( R_{-g} \) also matters. *Ceteris paribus* from proposition 2 we can infer that \( R_{-g} \) decreases with \( n_g \). Thus if \( n_g \) is high, in order to have a corner solution for group \( g \) it is required a smaller average wealth. In fact, this average wealth must satisfy \( \bar{w}_g \leq f^{-1}(1/R_{-g}) \).
are very poor marginalized groups from the social choices even when these are large in size.

Let’s come back to the case when there is an interior solution for every group. Now we are going to analyze the effect of income inequality over the equilibrium. Since, for the moment, we are interested in keeping the within-group income equality, in this section we are going to analyze only the effect of a between-group progressive transfer of income over the level of conflict. By such a transfer we refer to the case when a richer group (call it group $h$) transfers part of its total wealth to a poorer group (call it group $l$) keeping constant both the total wealth in the society and the within-group income distribution. Within-group transfers of income will be studied in the next section.

Similarly as before, the effect of a between-group transfer can be analyzed by looking how the success probabilities change over the cross-section of groups when the transfer is done and $R$ is kept constant. Notice that by taking one unit of money from $\bar{w}_h$ (richer group average wealth) and transferring it to group $l$, the poorer group average wealth ($\bar{w}_l$) will increase by $n_h/n_l$. Taking this into the account, the change in $\Pi$ when there is a progressive transfer can be computed as:

$$
\Delta \Pi|_R = \left. \frac{\partial p_l}{\partial \bar{w}_l} \right|_R \frac{n_h}{n_l} - \left. \frac{\partial p_h}{\partial \bar{w}_h} \right|_R
$$

From proposition 2 we already know the derivatives implied in 7. Then replacing those and manipulating algebraically we obtain:

$$
\Delta \Pi|_R = Rn_h \left[ \frac{1}{R^2 - \Omega_l} - \frac{1}{R^2 - \Omega_h} \right]
$$

where $\Omega_g = \frac{n_g}{f''(\bar{w}_g - p_g R/n_g)} < 0$ for $g=h,l$. Thus, when $\Omega_l<\Omega_h$ ($\Omega_l>\Omega_h$), the transfer makes $\Pi$ smaller (higher) than one, and in order to recover the equilibrium conditions, $R$ must decrease (increase) whenever $p_h$ and $R$ are negatively related. Notice that $\Omega_l<\Omega_h$ if and only if $\frac{n_l}{n_h} > \frac{f''(\bar{w}_l - p_l R/n_l)}{f''(\bar{w}_h - p_h R/n_h)}$. The opposite is true when $\Omega_l>\Omega_h$. These results are stated in the following proposition.

**Proposition 3**: Assume that people with the same wealth share the same favorite outcome in the society (i.e. there is within-group income equality) and that there is an interior solution for everybody. Then a progressive transfer of income generates a decrease in the level of conflict if $\frac{n_l}{n_h} > \frac{f''(\bar{w}_l - p_l R/n_l)}{f''(\bar{w}_h - p_h R/n_h)}$. When this inequality is reversed, the transfer generates an increase in the level of conflict. If both terms are equal the transfer does not affect the level of conflict.
Whether $\Omega_l$ is smaller or larger than $\Omega_h$ depends critically on the implied parameters and, some times, on the concavity of $f(.)$. Notice that there are two forces involved in these inequalities, the relative group-size ($n_l/n_h$) and the relation between $f(.)$’s second derivatives. The relative group-size will define the individual relative transfer. For instance, when the poorer group is smaller than the richer, a progressive transfer implies that the increase in the individual wealth of a person who belongs to the poorer group is relatively higher to the decrease in the individual wealth of a person who belongs to the richer group. If this is the case, we will say that there is a high relative transfer. The opposite will happen when the poorer group is larger than the richer one, if so we will say that there is a low relative transfer. With regard to the ratio of second derivatives we will give some intuition later on.

We want to see under which conditions income redistributions might increase or decrease the level of conflict. In order to classify in a systematic way our result, it is important to remember the relationship among wealth, group-size, and winning probabilities. Using the result of proposition 2, when $n_l=n_h$ then $p_l<p_h$. Similarly, when $n_l<n_h$ then $p_l<p_h$. However, when $n_l>n_h$ the relationship between the equilibrium probabilities is not clear. It might be that $p_l>p_h$ if the number of members in the poorer group is high enough to offset the negative effect coming from its smaller average wealth. If this is not the case, then it must be again that $p_l<p_h$. Keeping in mind these facts the effects of a between-group transfer on the conflict intensity are stated in the following proposition.

**Proposition 4**: Assume that people with the same wealth share the same favorite outcome in the society (i.e. there is within-group income equality) and that there is interior solution for everybody.

a) If either $n_l=n_h$ or $n_l<n_h$ then a progressive transfer of income increases the level of conflict.

b) If $n_l>n_h$ and $p_l<p_h$ (i.e. number of members in the poorer group is not enough to compensate for the smaller average wealth) then the effect of a progressive transfer of income over the level of conflict is ambiguous.

c) If $n_l>n_h$ and $p_l \geq p_h$ (i.e. number of members in the poorer group is enough to compensate for the smaller average wealth) then a progressive transfer of income reduces the conflict intensity.

Proposition 4 shows that in our framework income equality does not necessarily generate a decrease in the conflict intensity. Only when the poorer group has a higher winning probability (i.e. group-size compensates its small average wealth), income redistribution reduces the conflict intensity. The only ambiguity found occurs when $n_l>n_h$ and $p_l<p_h$. Note that if $n_l$ is high enough compared to $n_h$ such that the probabilities are not too different (keeping $p_l$ still smaller than $p_h$) then the population ratio will tend to be greater than the ratio of second derivatives\(^{4}\). If this is the case then the level of conflict will decrease. Nevertheless, even when $n_l$ is high but the probabilities are further one from each other, the final result will depend not only on the implied parameters but also on the concavity of $f(.)$. If $f''(.)$ increases quite fast then the opposite result might be found.

\(^{4}\) Notice that if $p_l$ and $p_h$ are close, equation 6 implies that $\bar{w}_l - p_lR/n_l$ is also close to $\bar{w}_l - p_lR/n_h$. 

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As it was mentioned above these findings depend on two forces, the relative group-size and the relation between \( f(.) \)'s second derivatives. We already know that the relative group-size will define the individual relative transfer. Now let's consider the ratio of second derivatives \( f''(c_i)/f''(c_h) \). We have shown that there is an inverse relation between this ratio and the ratio of probabilities \( (p_i/p_h) \) (see the proof of proposition 5), so we can relate this force to the relative winning probabilities. It is easy to show that the winning probabilities are concave in the group-average wealth, i.e. that the marginal probability decreases as the group-average wealth increases. Then, if there is an exogenous increase in the average wealth of any group, this group will have more incentive to increase the optimal contribution when its winning probability is low.

Now let's combine the two effects. When \( n_i=n_h \) there is both an equivalent relative transfer – i.e. the relative group-size effect is absent – and a high marginal probability in the poorest group. Thus when there is a progressive transfer of income, the poorer group will spend a higher proportion of the transfer in the conflict than the proportion that was spent by the richer group from the same amount of wealth. In the new equilibrium the intensity of conflict will increase. We conclude that the “pure” effect of income redistribution over the level of conflict is positive.

When the poorer group is smaller than the richer, there is both a high relative transfer and a high marginal probability. In this case the relative winning probabilities effect is reinforced by the relative group-size effect. Similar as before, the final result is an increase in the level of conflict. The contrary occurs when the poorer group is larger (low relative transfer) and its winning probability higher (low marginal probability). The ambiguity appears when the two effects go in the opposite direction, i.e. when poorer group even though being larger (low relative transfer) has a smaller probability (high marginal probability) than the richer group.

To conclude this section let’s consider again groups with corner solution. Notice that if it is the case, a progressive transfer of income done from an active to an inactive group that is not sufficiently high to turn active the poorest group after the transfer decreases the level of conflict. In this case the persons in the poorer group will find more profitable to take the money coming from the transfer for themselves and still keep away from the conflict. In the new equilibrium the poorer group does not reinvest the total proportion of the transfer that was spent in the conflict by the richer group, and so the conflict intensity will decrease.

**Within-group income inequality case**

Now we concentrate on the more general case when people with different wealth form groups. In this case it can be shown that equation 6 also characterizes the equilibrium (See appendix). Then it is possible to generalize proposition 2 though 5 for this case.

Under these circumstances it makes also sense to study the effect of a within-group progressive transfer. By such a kind of transfer we refer to the case when the richer people in a group transfer part of its total wealth to the poorer people in the same group, keeping constant the total wealth of that group. It is direct from equation 6 that neither
the winning probabilities nor the conflict intensity are affected for such a kind of transfers\(^5\).

Nevertheless, within-group distribution might affect the equilibrium when there are some inactive people in a group (the equilibrium condition in this situation is stated in the appendix). If this is the case, any within-group redistribution from the inactive to the active people increases the average wealth of the latter, and thus increases both the group winning probability and the level of conflict. Notice that in this case the number of active people keeps constant. When the redistribution goes in the other way around and the number of active people changes it is hard to make a prediction, the final effect shall depend on how both the number of active people and their average wealth change. When these two variables increase after the redistribution, both the group winning probability and the level of conflict increase. On the other hand, when these two variables decrease the opposite result comes about\(^6\).

Actually this result it is a corollary of the Neutrality theorem for private provision of public goods (Warr, 1983). This theorem says that regardless of the differences in individual preferences the private provision of a public good is unaffected by the redistribution of income\(^7\). Notice that in our case the winning probability is a public good for the group and it is provided privately. The novelty in our result is that this neutrality still remains when there is an interest conflict with other groups for the provision of the good. However, in the same direction of Bergstrom et al. (1986), we also show that in the presence of corner solutions this neutrality not necessarily holds.

Some political scientists have argued that group heterogeneity (for instance, in wealth) matters for the success of collective action (e.g. Marwell and Oliver, 1993) and then there should be something missing in the Neutrality theorem. In this line, some authors have shown that there are others assumptions, apart from the absences of corner solutions, than may change this result. For instance, linearity in the production function

\(^5\) It follows from equation 6 that for any group, say group \(g\), keeping constant \(R\) and \(Wg\), \(\frac{\partial p_i}{\partial w_i}\bigg|_{xg} = 0\) \(\forall i \in g\). Thus a within-group progressive transfer does not affect \(R\). Actually, this result comes directly from equation 3a. We already know that at equilibrium \(w_i - r_i = k \forall i \in g\), where \(k\) is a positive constant. Solving for \(r_i\) and summing up over \(i\) we get \(R_x = W_x - n_x k\). Thus within-group income distribution does not matter. The important fact of the previous analysis is that we know how \(k\) looks and so we can generalize the propositions in the previous sections.

\(^6\) Notice that when there is a transfer of income from active to inactive people four cases may come about: The active people and their average wealth decreases, the active people and their average wealth increases, the active people increases but their average wealth decreases, and the active people decreases but their average wealth increases. In the last two cases the final effect will depend on the specific values that these endogenous variables (\(w^*_i\) and \(n^*_i\)) take at the new equilibrium.

\(^7\) Our neutrality result assumes that preferences are the same for everybody in the group. It is easy to extend this result when this is not the case. Assume that each individual \(i\) in each group values the prize at \(x_i \in (0,1]\). So her expected utility is given by \(EU_i = x_i p_x + f(c_i)\) and the interior solution requires \(x_i (1 - p_x) / R = f'(w_i - r_i)\). This condition implies that for each pair of active members of \(g\), say \(i\) and \(j\), there exists a \(\theta_{ij} \in (0, \infty)\) such that \(\theta_{ij} (w_i - r_i) = w_j - r_j\). Following the same steps that we used to get equation 5A in the appendix the equilibrium condition can be written as \(1/R (1 - p_x) = 1/x_i f'\left(\frac{n_x w_i - p_x R}{\theta_i}\right)\), where \(\Theta = \sum_{i \in g} \theta_{ij}\). From this condition it follows that neither the level of conflict nor the winning probability are affected for a within-group redistribution.
of the public goods, the “pureness” of the public good, and the existence of perfect markets (e.g. Cornes and Sandler, 1994, 1996 (pp. 184-190); Bardhan, et al. 2002).

4. WEALTH AND GROUP-SUCCESS

The relationship between group-success and group-size has received special attention in the collective action theory. As we saw in section 4, the explicit inclusion of wealth in the analysis opens a new and, to our knowledge unexplored perspective in which this relationship can be affected. In this section we shall study more carefully how the interaction between wealth and group-size may affect the success of a group involved into a contest.

The most representative thesis in this respect is due to Olson (1965). In his theory on collective action he concedes that because of the free-riding effect and because pay-offs are not always pure public goods, larger groups are less successful than smaller groups in looking for their interests. This result is known as the “group-size paradox”. Using our framework, in this section we shall explore if wealth has also this effect over group success.

From proposition 2 we know that when two groups have the same average wealth, the larger group will spend more on conflict than the smaller group and will attain a higher winning probability. A corollary of this result is that smaller and poorer groups (in terms of average wealth) are less successful than larger and richer groups. These facts imply that the group-size paradox does not necessary hold in our framework.

Nevertheless, proposition 2 also suggests that it may be possible to observe a smaller group being more successful than a larger group if the former has enough wealth to compensate by its size. At that time, we are interested in knowing under which conditions this outcome might come about. Plainly, a necessary condition to get this result is that the average wealth of the smaller group must be higher than the average wealth of the larger group. However, as example 1 illustrates, it is not a sufficient condition.

**Example 1**: Assume that there are two groups (group \( s \) and \( b \)) in contest and \( f(c_i) = \ln(c_i) \). Let \( n_s=3 \), and \( n_b=30 \). For any pair \((\bar{w}_s, \bar{w}_b)\) we can solve for the equilibrium vector \( (p_s, p_b, R) \). The table below shows some computations. Notice that with \( \bar{w}_s \) enough high then \( p_s > p_b \). However, even though \( \bar{w}_s > \bar{w}_b \) this result can be reverted. That is the case when \( (\bar{w}_s, \bar{w}_b) = (103,100) \).

<table>
<thead>
<tr>
<th>( \bar{w}_s )</th>
<th>( \bar{w}_b )</th>
<th>( p_s )</th>
<th>( p_b )</th>
<th>( R )</th>
</tr>
</thead>
<tbody>
<tr>
<td>161</td>
<td>100</td>
<td>0.60</td>
<td>0.40</td>
<td>59.5</td>
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<tr>
<td>112</td>
<td>100</td>
<td>0.51</td>
<td>0.49</td>
<td>50.6</td>
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<tr>
<td>103</td>
<td>100</td>
<td>0.49</td>
<td>0.51</td>
<td>48.6</td>
</tr>
<tr>
<td>71</td>
<td>100</td>
<td>0.40</td>
<td>0.60</td>
<td>39.7</td>
</tr>
</tbody>
</table>
Therefore, in order to observe a smaller group with a higher winning probability, we must impose some extra conditions on either its average wealth or its total wealth. Example 1 brings an additional clue to this respect. Notice that in the two first cases when \( p_s > p_b \), the total wealth of the smaller group is smaller than the total wealth of the larger group. Thus, although it is required that \( \bar{w}_s > \bar{w}_b \) in order to get \( p_s > p_b \), \( W_s > W_b \) is not a necessary condition. Putting it in another way, richer groups – in terms of total wealth – are not necessarily more successful.

We start analysing the case when there are only two groups in contest (\( G=2 \)). Call \( s \) and \( b \) these groups, and assume that the former is smaller in size than the later, i.e. \( n_s < n_b \). Then in this case we have \( n = n_s + n_b \), and \( W = W_s + W_b \).

**Proposition 5**: Assume that \( G=2 \), \( R \) is the equilibrium level of conflict, and both \( s \) and \( b \) are active groups.

(a) The smaller group \( (s) \) will be more successful than the larger group \( (b) \) if:

\[
W_s - \frac{n_s}{n} W \geq \left(1 - \frac{n_s}{n}\right) R
\]

(9)

(b) Even though \( \bar{w}_s > \bar{w}_b \), the smaller group \( (s) \) will be less successful than the larger group \( (b) \) if:

\[
0 < W_s - \frac{n_s}{n} W \leq \left(\frac{1}{2} - \frac{n_s}{n}\right) R
\]

(10)

Condition 9 is a sufficient requirement to have the smaller group being more successful than the larger group. Notice that the second term in the left-hand side of this inequality \( (n_sW/n) \) can be interpreted as the wealth that group \( s \) would have if the total wealth in the society were distributed equally among all its individuals. Then part (a) of proposition 5 says how large should be the income inequality between the two groups in order to have the smaller group being more successful than the larger group. The required inequality is a fraction \((1-n_s)/n\) of the equilibrium level of conflict. Thus, for a level of conflict \( R \) this inequality must be higher as smaller is \( n_s \). On the other hand, part (b) says that when the between-group income inequality is not too high, this outcome can be reverted. It can be checked that these conditions are satisfied in example 1.

Notice that condition 9 can be written as \( W_s \geq \frac{n_s}{n_b} W_b + R \), which not necessarily implies \( W_s > W_b \). Then for \( R \) and \( n_s \) small enough it can happen, as in example 1, that 9 holds but \( W_b > W_s \). Additionally, notice that 9 can be also written in terms of \( s \) and \( b \)’s
average wealth as follows: \( \bar{w}_s - \bar{w}_b \geq \frac{1}{n_s} R \). This condition shows directly the minimum income inequality required between \( s \) and \( b \) in order to have \( p_s > p_b \). 

In the appendix we generalize previous conditions for the case where there are more than two groups \((G > 2)\). Different to 9 and 10, the new conditions include the sum of equilibrium probabilities of the other groups \((\Pi^-)\). In this case, for a given level of \( R \), the income inequality required between \( s \) and \( b \) to get \( p_s > p_b \) is higher as \( \Pi^- \) goes to one.

From this discussion we can extract two conclusions. First, a sufficiently high income inequality between a small and a large group can explain the group-size paradox when the contest’s prize has pure public characteristics. Second, to observe this outcome, the total wealth of the smaller groups must not be necessary higher than the total wealth of the larger groups.

5. EXTENSION: MIX PRIVATE-PUBLIC PRIZE

So far in previous section we have studied the effect of income distribution over both the level of conflict and the winning probabilities when the contest’s prize is a pure public good. In this section we consider the case of a prize with a varying mix of public and private characteristics. To this end we assume the prize has a public component \( P \), which is equally enjoyed by all the groups’ members irrespective of the groups size (i.e. does not have any congestion); and a private component \( M \) (say money), which for simplicity we assume is equally divided among the group’s members.

One could assume another type of distributive rule for the private part of the prize. For instance, \( P \) might be distributed accordingly the individual contributions. Actually, this rule makes sense when the members’ group have different levels of wealth and so different contributions. However, with such a kind of rule it is not possible to extract general analytical results from our framework. In what follows, we are going to restrict our self to the equally distributive rule.

Following Esteban and Ray (2001), we call \( \lambda \in [0,1] \) the share of publicness of the prize. Thus if the group \( g \) wins the contest it will receive a prize \( z_g \) given by:

\[
z_g = z(\lambda, n_g) = \lambda P + (1 - \lambda) \frac{M}{n_g}
\]

Therefore, the expected utility of an individual who belongs to group \( g \) is given now by:

\[
\theta < \bar{w}_s - \bar{w}_b \leq \left( 1 - \frac{n}{2n_b} \right) \frac{1}{n_s} R.
\]

Notice that the term in the right hand side of the inequality is smaller than \( \frac{1}{n_s} R \), but it is still positive.
Equation 11 replaces equation 1. The rest of the framework keeps the same. Thus, taking as given the contribution of everybody else each individual $i$ maximizes 11 subject to equation 2. Assuming interior solution for every individual, similar to section 3 it can be shown that the unique equilibrium vector $(p, R)$ must satisfy (see the appendix):

$$
\frac{I}{R} (1 - p_g) z_g = f'(\overline{w}_g - \frac{p_g R}{n_g})
$$

with $p_g \geq 0 \ \forall \ g$;

and $\Pi = \sum_g p_g = I$

Since part of the prize decreases as the group-size increases, then it is not necessarily true that the winning probability of group $g$ (and so the level of conflict) increases as $n_g$ increases. Actually, Esteban and Ray (2001) have already studied the group-size effect when there is a mix public-private prize. Here we restate their main results to this respect in term of our framework and use it in order to study how between-group income distribution affects both the winning probabilities and the conflict intensity.

To do so it is useful to define two new variables. First call $\theta_g$ the share of publicness as perceived for an individual of group $g$ as:

$$
\theta_g = \frac{\lambda P}{\lambda P + (1 - \lambda) M / n_g}
$$

Additionally, from the utility function $\overline{u}_g = z_g + f(\overline{c}_g)$ with $\overline{c}_g = \overline{w}_g - \overline{r}_g$, we define for each group $g$ the average elasticity of the marginal rate of substitution (MRS) with respect the effort ($\eta_g$) as follows:

$$
\eta_g(\overline{w}_g, \overline{r}_g) = \frac{\partial \text{MRS}/\partial M}{\partial M/\partial \text{MRS}} = -f''(\overline{w}_g - \overline{r}_g) \frac{\overline{r}_g}{f'(\overline{w}_g - \overline{r}_g)} > 0
$$

With these two variables we can state the following results.

**Proposition 6:** Consider the prize $z_g$ and assume that there is an interior solution for everybody in the game described above, then:

---

9 When group $g$ wins the contest, an individual $i$ who belongs to this group gets utility $w_i - f(w_i - r_i)$. Evaluating this utility on the average individual (i.e. that with wealth equals $\overline{w}_g$, and contribution $\overline{r}_g$) we get $\overline{u}_g$. For this individual the marginal rate of substitution equals to $MRS = \frac{\partial \overline{u}_g/\partial \overline{r}_g}{\partial \overline{u}_g/\partial z_g}$. 

---
(a) Both the level of conflict and the winning probability of group $g$ are strictly increasing in the average wealth of group $g$.

(b) Both the level of conflict and the winning probability of group $g$ are strictly increasing in the group-size of $g$ if and only if $\eta_g(.) > (1 - \theta_g)$.

**Corollary:** The level of conflict and the winning probability of group $g$ are strictly increasing in the group-size of $g$ if either: (i) For any $\lambda \in [0,1]$, $\eta_g(.) > 1$; or (ii) the prize is totally public ($\lambda = 1$).

The effect of wealth on both the winning probabilities and the conflict intensity is similar to that found for the pure public prize case. However, the effect of the group-size on these variables can differ from that found in section 3. Now it depends on whether the average elasticity of the marginal rate of substitution is higher, equal, or smaller than the share of privateness of the prize.

Let us study the income inequality effect. Notice that under interior solution the within-group income distribution neutrality still holds. Thus, in what follows we care on the between-group income inequality. We employ the same strategy used in section 3 to study the effect of a between-group progressive transfer. We obtain the following results.

**Proposition 7.** Consider the prize $z_g$ and assume that there is an interior solution for everybody in the game described above, then:

(a) If $\eta_g(.) > (1 - \theta_g)$, the results in propositions 4 and 5 apply.

(b) If $\eta_g(.) < (1 - \theta_g)$: (i) If $n_l < n_h$ and $p_l < p_h$ then a progressive transfer of income increases the conflict intensity; (ii) If either $n_l < n_h$ and $p_l > p_h$ or $n_l > n_h$, then the effect of a progressive transfer of income over the level of conflict is ambiguous.

Proposition 7 says that when the winning probabilities increase with the group-size, the results of a between-group progressive transfer of income over the level of conflict are similar to those found for the pure public prize case. However, when this is not the state of affairs (i.e. the winning probabilities decreases with the group-size), the possibilities and the results differ. For instance, now it is possible to have the poorer group being more successful than the richer because of its smaller (and not its larger) size. On the other hand, when the poorer group is larger it never can be more successful. In these two cases the effect of a between-group redistribution of income over the conflict intensity is ambiguous.

We end this discussion by remarking an important result. Notice that independently on the degree of publicness of the prize, when the poorer group is smaller than the richer group a low between-group income inequality always increases the conflict intensity.

### 6. EMPIRICAL EVIDENCE: POLITICAL CAMPAIGNS

The model developed in previous sections predicts that income inequality affects the level of conflict positive or negatively depending on the relative group-size. When the prize is totally public, from Propositions 4 we know that if poorer groups in the society
are smaller or equal in size than richer groups, a higher between-group income inequality implies a smaller level of conflict. This is also true when the prize is a mix of public and private characteristics. Nevertheless, the opposite result may come about when poorer groups are larger (enough) in size than richer groups. If this is the case, a higher between-group income inequality might imply a higher level of conflict.

In this section we try to find some empirical evidence on these predictions. To do so we are going to use information on U.S. campaign contributions in the House race. We have chosen the political campaign example for two reasons. First, it fits well our theoretical framework; second, there is a comprehensive data set available for U.S. campaigns during the last decades.

In the literature there are two theoretical approaches to explain campaign contributions or expenditure. The “political man” theory, which assumes that contributors are passive consumers of the position selected by a candidate; and the “economic man” theory, which assumes that contributors are investors who buy the position of the candidates in order to seek for some rents. In the former case, candidates pre-select their political positions and people or interest groups (like Political Action Committees (PACs) in the U.S. case) contribute to the candidate whose position is closest to their interest. In the later case, people or interest groups contribute to the campaign of the candidate whose position has been bought\(^{10}\).

Notice that whatever the assumption over the individual behaviour is made (consumer or rent-seeker), before people make any contribution they choose a candidate or a set of candidates on the basis of their preferences. In terms of our model, conflict in the political campaigns case is due to these differences in the individual (or the interest group) preferences for candidates. In this context, people invest resources in their preferred candidate (or candidates) in order to get her elected. Thus, the political campaigns example is a good case to test for the empirical prediction of our model.

As we said before, it is not easy to collect information in order to contrast empirically our theoretical findings. For instance, although there are some interesting data sets on internal conflicts around the world, there is not information on wealth for the groups in conflict. The studies in this topic have included nationwide income inequality measures to explain either civil war initiation or duration. Nevertheless, this kind of measure accounts for the inequality in a society as a whole and it does not separate the between-group from the within-group income inequality. In previous sections, we have shown that these two inequalities may affect in a different way the level of conflict. Thus, by exploiting the available information on political campaigns, and by making some rational assumptions on the people behavior, we are able to overcome these information restrictions.

We concentrate on the state campaign spending in House race. We have collected information for the three political cycles during the period 1991-1996. Actually, the information corresponds to a panel data with three periods but since there are not important variations over time, we work with the time-average for each variable (in other words we present between-group estimations). The information about the

\(^{10}\) A survey on these theories can be found in Mueller (2003), chapter 20.
financing of the campaigns is from the U.S. Federal Election Commission (FEC). Our measure of conflict will be the expenditure in House campaigns at the state level.

Before defining a good proxy for the between-group income inequality, we must identify the groups in conflict. Once it is done, we can look for a measure of group wealth. Actually, we do not have any direct information that allows us to identify groups. A priori, people or interest groups are joined by their preference for a candidate or a set of candidates but this information is not available. A reasonable assumption is that groups are defined by geographical characteristics, in particular by the city where their members live. This implies that in each state, people from a city compete with people from others cities in order to get their set of preferred policies applied. From now on we identify each city as a group and we take the per capita income in each of them as the measure of group average wealth. Information of per capita personal income for each Metropolitan Statistical Area (MSA) in U.S. is from the Bureau of Economics Analysis. With this information we are able to compute different measures of between-city income inequality in each state.

At this point our purpose is to estimate a reduced equation that explains the campaign spending in House race in terms of the between-cities income inequality. We also shall include other control variables that have been usually included in previous analysis of political campaigns: the state per capita personal income, the state per capita government spending, the state population, and the number of campaigns in race. Basic statistics are reported in table 1 for the 40 states with complete information.

What is our expected relationship between campaign spending and between-group income inequality? As we said at the beginning of this section, the expected effect of the between-group income inequality on the level of conflict depends on the relative group-size (and also on the prize characteristics). Thus, we need to check the relationship between group-size and average wealth among cities from the same state.

From our sample the mean of the MSA correlation between per capita personal income and population is 0.66. This patter is similar in almost all the state, although the values of the correlations run from 0.1 to 1.0. Thus we can say that in almost all the states those cities with a higher per capita income have in average a higher population as well.

In order to explore more this relationship, we computed for each state all the possible population ratios between pairs of MSA that have in the numerator the population of a richer city and in the denominator the population of a poorer one. From now on we refer to these relative measures as the population ratios. Table 1 also reports the average

---

11 This information is available at: http://www.fec.gov. The file for each electoral cycle (time for electing Representatives to House is every even numbered year) contains information on the campaigns of all individuals who have registered under the Federal Election Campaign. We excluded campaigns that have not received contributions or made expenditures aggregating in excess of $5,000 (i.e. candidates who are not statutory candidates under the 1979 Amendments to the FEC).

12 Information on state’s government spending and population is from U.S. Census Bureau, and number of campaigns from FEC.

13 15 of the 55 states were excluded from the analysis because of missing value observations (specially in campaign expenditure). The states excluded were: Alaska, American Samoa, Delaware, District of Columbia, Guam, Hawaii, Montana, New Hampshire, North and South Dakota, Puerto Rico, Rhode Island, Vermont, Virginia Island, and Wyoming.

14 The only exception is Nevada where this correlation is negative.
for these ratios and for the percentage of cases where they are equal or higher than one. From this statistics we can also infer that in general, the populations of the richer cities are higher than the populations of the poorer ones\textsuperscript{15}.

In terms of our model, this information suggests that we are in the case where poorer groups in the society are smaller in size than richer groups. Thus, independently on whether people are able to extract some private benefits from elections (i.e. a mix private-public prize) we expect that those states with a higher between-city income inequality spend less money in the House race. In other words we expect a negative parameter for this relationship. Nevertheless, whenever both the correlation between population and income and the percentage of population ratios equal or higher than one are low in some states, the sign of this parameter might be the opposite for some of them.

The estimation results are reported in table 2. As measure of between-group income inequality it is used the standard deviation of the log of the MSAs’ per capita income\textsuperscript{16}. The columns differ in the control variables included. Standard deviations are robustly estimated. In the line of some recent studies (e.g. Ansolabehere, et al. (2002)), there is evidence that campaign contributions are not a form of policy-buying, but rather a form of political consumption. This conclusion comes from the fact that the government spending is not relevant in explaining campaign spending whereas personal income is. The income elasticity is quite near to that found in previous studies.

Concentrate now in the between-group inequality. Column 2 in table 2 presents the results when the campaign spending is controlled for this variable. As we expected, the sign of the respective parameter is negative, i.e. a higher between-group income inequality implies a lower level of conflict. Moreover, this parameter is significantly different from zero. This evidence supports the predictions of our theoretical model.

Columns 3 through 6 in table 2 report some results that exploit explicitly the relationship between population and income. We do it by using the three measures mentioned above. The first one is the correlation between population and the per capita wealth. We create dummy variables for different intervals of the correlation, and estimate different specifications with the interaction between these binary variables and the between-group inequality. We do not find any significant effect. Column 3 reports the regression with the best fit, where the dummy variable takes the value of one when the correlation is smaller than 0.2 and 0 otherwise. Alternatively, we include an interaction between the correlation and the between-group inequality. This variable is not significant (Columns 4).

The second variable is the percentage of cases where the population ratios are equal or higher than 1. Again we create dummy variables for different intervals of this percentage, and introduce interaction between that and the between-group inequality. There is not any significant effect. Column 5 reports the regression with the best fit, where the dummy variable takes the value of one when the percentage is smaller than 50% and 0 otherwise.

\textsuperscript{15} Again, Nevada is the only exception.

\textsuperscript{16} The results are quite similar when we use alternative inequality measures as the variance of MSAs’ per capita income, or Gini coefficients.
Finally, we use the log of the average of population ratios. We introduce an interaction between this variable and the between-group inequality, which may allow us to obtain not only a different magnitude for the inequality effect in each state but also a different sign for those states where the average of the ratios is smaller than one. The parameter related to this interaction is negative, as we expect, but is not significantly different from zero.

As our theoretical model predicts, the results for the political campaign spending case support the idea that the between-group income inequality affects the level of conflict in a society, and that this effect depends on the relationship between group size and income. For this particular case we have found that in almost all the states a higher between-city income inequality implies a lower level of campaign spending. This effect holds for all the states in the sample, including those where the correlation between population and wealth is positive but small.

7. CONCLUSIONS

This paper studies how the interaction between group-size, wealth, and its distribution affects both conflict intensity and group success probabilities in a society when there is a contest for either a pure public prize or a mix private-public prize. Different to the traditional studies on this topic, in this paper we assumed that conflict is due to differences in preferences for social outcomes, which are not necessarily related to the individual wealth, and in particular is not generated by income inequality.

Using a contest model between interest groups that introduces explicitly the individual wealth we find some interesting results. First, poorest people generally are not willing to engage in any conflict. Second, less inequality does not imply less conflict intensity. In fact the “pure” effect that income redistribution has over the level of conflict is positive. Only under some especial conditions (when the poorer groups have a higher winning probability than the richer ones), income redistribution reduces the conflict intensity.

Third, neither winning probabilities nor conflict intensity are affected by the within-group income inequality in the absence of corner solutions. However, when there are inactive people in a group, this result does not hold any more and the final effect on the level of conflict depends on how both the number of active people and their average wealth changes. We consider important to explore others assumptions, apart from the absences of corner solutions, than may change this neutrality result. In particular, introducing non-perfect substitutibility in the winning probability function may be an appealing variation to take into the account in our framework. At this point we leave it in the open agenda.

Fourth, the interaction between group-size and wealth can explain why very small groups with high average wealth are more successful than larger groups with smaller average wealth when groups are competing for public goods. In particular free-rider behavior can be motivated by a low group average income. We show that to observe this outcome, the total wealth of the smaller group must not be necessary higher than the total wealth of the larger group.
Since many of the internal armed conflicts around the world are not directly over wealth, previous findings can partially explain why income inequality (measured by nationwide Gini’s coefficients in a society) has been irrelevant in explaining civil wars likelihood in a country. Nationwide Gini coefficients measure the inequality in a society as a whole but, as we have seen, the between-group and the within-group inequality may affect in a different way the level of conflict. Information in a nationwide Gini mixes these two issues. Unfortunately there is not available information on group wealth to test this issue for the internal conflict case. We presented some evidence for the U.S. campaign race case supporting the hypothesis that between-group income inequality in fact affects the level of conflict.
APPENDIX’S PROOFS

Individual Optimal Contributions

Plugging equation 2 in 1 and taking as given the contribution of the rest of people, each individual \( i \) who belongs to group \( g \) maximizes:

\[
\begin{align*}
\text{Max}_{r_i} & \quad E U_i = \frac{R_g}{R} + f(c_i) \\
\end{align*}
\]

It can be verified that \( E U_i \) is strictly concave in \( r_i \). From the first order condition we get:

\[
\begin{align*}
\frac{R - R_g}{R^2} &= f'(c_i) \\
\end{align*}
\]

Reorganizing terms and using the winning probability function we get equation 3a. Since \( \lim_{r_i \to 0} f'(c_i) = \infty \) then the individual contribution will be always smaller than the individual wealth. On the other hand note that \( \frac{\partial EU_i}{\partial r_i} \bigg|_{r_i=0} = \frac{R_g}{R} - f'(w_i) \). This marginal utility is positive if and only if \( f'(w_i) < R_g / R^2 \). Thus, when this inequality holds the total amount spent by individual \( i \) is strictly positive and completely described by equation 3a. On the other hand whenever \( f'(w_i) \geq R_g / R^2 \) the marginal utility is not positive any more, and the best response of agent \( i \) is \( r_i=0 \).

Proposition 1

To prove it we use equation 5. This equation implicitly defines \( p_g \) as a function of \( R \). It can be readily verified that \( p_g \) is a continuous function of \( R \). Using the implicit function theorem it can be shown that for \( p_g > 0 \), \( p_g \) is strictly decreasing in \( R \). From equation 5:

\[
\begin{align*}
\frac{\partial p_g}{\partial R} = -\frac{I}{R^2} \sum_{i \in g} \left\{ w_i - f'(1 - p_g) / R \right\} - \frac{I}{R} \sum_{i \in g} \left\{ f''(1 - p_g) / R \right\} \frac{1}{R} (1 - p_g) \frac{1}{R} \\
\end{align*}
\]

Since \( f''(.) < 0 \) and for interior solution \( \sum_{i \in g} \left\{ w_i - f'(1 - p_g) / R \right\} > 0 \), both the numerator and the denominator in the previous expression are positive. Then it follows that \( \frac{\partial p_g}{\partial R} < 0 \quad \forall \ g \). Further, for every \( g \) there exists a positive constant \( K_g \) such that \( p_g > 0 \) if and only if \( R \leq K_g \).

Consider the function:
\[
\Pi = \frac{1}{R} \sum_g \sum_{i \in g} \text{Max} \left\{ 0, w_i - f^{-1} \left( \frac{1}{R} (1 - p_g) \right) \right\}
\]

At equilibrium, \( R \) must be such that \( \Pi = 1 \) with \( p_g \geq 0 \ \forall \ g \). Note that \( \Pi \) is strictly decreasing in \( R \), and tends to zero as \( R \) goes to infinity. On the other hand, when \( R \) goes to zero then, \( p_g > 0 \), and \( \Pi \) goes to infinity. It follows that there must be some \( R \) for which \( \Pi = 1 \). Further, it is unique.

**Proposition 2**

Assume that we are at equilibrium.

(a) Applying the implicit function theorem to equation 6 and keeping \( R \) constant we get

\[
\frac{\partial p_g}{\partial n_g} = -\frac{n_g R f''(\cdot)}{R^2 f''(\cdot) - n_g} > 0 \quad \text{Since} \quad \frac{\partial p_g}{\partial n_g} = \frac{\partial \Pi}{\partial n_g} |_{R} , \text{an increase in} \ p_g \text{makes} \ \Pi(\cdot) > 1.
\]

Thus to recover the equilibrium conditions \( R \) must increase whenever \( p_g \) and \( R \) are negatively related. It proves that the level of conflict increases as the group \( g \) average wealth increases. Now we concentrate on the final effect on \( p_g \). Until now the winning probabilities of the other groups \( (p_{-g}) \) have not changed and \( p_g \) has gone up. Since \( R \) increases in order to recover the equilibrium conditions, all the probabilities go down. Then, at the new equilibrium all the probabilities \( p_{-g}'s \) go down and the final \( p_g \) must be larger that the initial \( p_g \). It proves that the winning probabilities also increase with the average wealth.

(b) Same as before, keeping constant \( R \) (and \( \bar{w}_g \)) in equation 6 by the implicit function theorem we get

\[
\frac{\partial p_g}{\partial n_g} |_{R} = -\frac{f''(\cdot) R^2 p_g}{n_g \left[ f''(\cdot) R^2 - n_g \right]} > 0. \text{The final result follows similarly as above.}
\]

**Proposition 3**

See the proof in the text.

**Proposition 4**

Assume that we are at equilibrium. In order to prove this proposition we first claim that for a given \( R \): (i) If \( p_i < p_h \) then \( f''(\bar{w}_i - p_i R/n_i) > f''(\bar{w}_h - p_i R/n_h) \) \( > 1 \), and; (ii) if \( p_i \geq p_h \) then \( f''(\bar{w}_i - p_i R/n_i) \leq 1 \). Let us prove claim (i). When \( p_h > p_i \), equilibrium condition 6 implies \( f'(\bar{w}_h - p_i R/n_h) < f'(\bar{w}_i - p_i R/n_i) \). Given the characteristics of \( f(\cdot) \) we have.
that \( \frac{f''(\bar{w}_i - p_i R/n_i)}{f''(\bar{w}_h - p_h R/n_h)} > 1 \). The same steps can be used to prove claim (ii). Using these claims and previous results we have that:

(a) When either \( n_i = n_h \) or \( n_i < n_h \) it must be that \( p_i < p_h \). Then it follows that

\[
\frac{n_i}{n_h} \leq \frac{f''(\bar{w}_i - p_i R/n_i)}{f''(\bar{w}_h - p_h R/n_h)}
\]

and from proposition 3 the level of conflict increases.

(b) In this case both \( \frac{n_i}{n_h} \) and \( \frac{f''(\bar{w}_i - p_i R/n_i)}{f''(\bar{w}_h - p_h R/n_h)} \) are higher than one, so the effect on the level of conflict is ambiguous.

(c) In this case \( n_i > \frac{f''(\bar{w}_i - p_i R/n_i)}{f''(\bar{w}_h - p_h R/n_h)} \) and so the level of conflict decreases.

**Between-Group Income Inequality Case**

Equation 3 defines the equilibrium conditions in this case. Assume that there is interior solution for everybody. Since at equilibrium \( \frac{I}{R} (1 - p_g) \) is the same for any pair of persons in the same group, say \( i \) and \( j \), from 3 it must be that:

\[
f'(w_i - r_i) = f'(w_j - r_j)
\]

Given the monotonicity of \( f(.) \), this equality holds if and only if:

\[
w_i - r_i = w_j - r_j \quad (1A)
\]

Equation 1A implies that at equilibrium the wealth net of conflict expenditure of all active individuals who belong to the same group must be equal to the same constant. It is possible to derive this constant in terms of the equilibrium variables \( R \) and \( p_g \). In order to do so take any group \( g \), fix any active individual in this group, say person \( i \), and use 1A to sum up the equilibrium contributions of the other active individuals in the group, then:

\[
\sum_{j \neq i} r_j = \sum_{j \neq i} [w_j - w_i + r_i] = \sum_{j \neq i} w_j - (n_g - 1)w_i + (n_g - 1)r_i \quad (2A)
\]

Reorganizing terms in 2A we can write down the total amount of resources spent in the conflict by the group \( g \) in terms on the personal contribution of any active member, say person \( i \), and her wealth:

\[
R_g = (W_g - n_g w_i) + n_g r_i \quad (3A)
\]

Notice that if \( w_i = \bar{w}_g \), this equation implies that \( R_g = n_g r_i \) \( \forall i \) and then equation 3a can be written as \( \frac{I}{R} (1 - p_g) = f'\left( \frac{\bar{w}_g - p_g R}{n_g} \right) \). We shall prove with equation 5A that
it is true not only for this case but in general for every \( w_i \). Combining equation 3A and 2 and solving for \( r_i \) we get:

\[
    r_i = \frac{p_g R - (W_g - n_g w_i)}{n_g} \tag{4A}
\]

Notice that the equilibrium contribution can also be written as \( r_i = \bar{r}_g + w_i - \bar{w}_g \), where \( \bar{r}_g = R_g / n_g \). Thus, richer people spend resources over the group’s average contribution.

Finally, using 4A we can rewrite 3a as follows:

\[
    \frac{1}{R} (1 - p_g) = f'(\frac{\bar{w}_g - p_g R}{n_g}) \tag{5A}
\]

which actually is similar to equation 6.

If there are inactive people in \( g \), equation 5A must be written as

\[
    \frac{1}{R} (1 - p_g) = f'(\frac{\bar{w}_g^A - p_g R}{n_g^A})
\]

where an \( A \) has been added as superscript in \( n_g \) and \( \bar{w}_g \) to denote the active number of people in a group and their average wealth. This is so because when adding contributions in 2A only active people matter. Notice that if it is the case, it cannot be done any comparative statistics whenever \( n_g^A \) and \( \bar{w}_g^A \) are endogenous.

**Proposition 5**

(a) Assume that \( R \) is the equilibrium level of conflict and \( W_s \) is such that 9 holds. Since

\[
    \left(1 - \frac{n_s}{n}\right) R > 0,
\]

it is easy to see that this condition implies \( \bar{w}_s > \bar{w}_b \), i.e. the necessary condition to get \( p_s > p_b \) is satisfied. Starting from 9 we have:

\[
    W_s - \frac{n_s}{n} W \geq \left(1 - \frac{n_s}{n}\right) R \quad \Rightarrow \quad W_s - \frac{n_s}{n} W > \left(p_s - \frac{n_s}{n}\right) R
\]

\[
    \Leftrightarrow \quad n W_s - n_s (W_s + W_b) > (n_s + n_b) p_s - n_s R
\]

\[
    \Leftrightarrow \quad (n - n_s) W_s - n_s W_b > (n_b p_s - n_s (1 - p_s)) R
\]

\[
    \Leftrightarrow \quad \frac{n_b W_s - n_s W_b}{n_s n_b} > \left(\frac{n_b p_s - n_s p_b}{n_s n_b}\right) R
\]
\[ \overline{w}_s - \overline{w}_b > \left( \frac{p_s}{n_s} - \frac{p_b}{n_b} \right) R \]
\[ \iff \overline{w}_s - \frac{p_s}{n_s} R > \overline{w}_b - \frac{p_b}{n_b} R \]
\[ \iff f'(\overline{w}_s - \frac{p_s}{n_s} R) < f'(\overline{w}_b - \frac{p_b}{n_b} R) \]
\[ \implies p_s > p_b \]

The last line comes from the equilibrium conditions (equation 6).

(b) Assume that \( R \) is the equilibrium level of conflict, and that \( W_s \) is such that 10 holds (then \( \overline{w}_s > \overline{w}_b \)) but \( p_s > p_b \). Then from the equilibrium conditions (equation 6) it follows that 
\[ f'(\overline{w}_s - \frac{p_s}{n_s} R) < f'(\overline{w}_b - \frac{p_b}{n_b} R) \]. From the proof of part a, this inequality implies that \( W_s - \frac{n_s}{n} W > \left( p_s - \frac{n_s}{n} \right) R \), which is a contradiction since by assumption \( p_s > 1/2 \).

Generalization of proposition 5 for \( G>2 \)

We concentrate again on groups \( s \) and \( b \), where similar as before \( n_s < n_b \). Call \( \Pi^- = \Pi - p_s - p_b \). The following claim generalizes previous findings.

Proposition 6 (\( G>2 \)): Assume that \( G>2 \), \( R \) is the equilibrium level of conflict, and both \( s \) and \( b \) are active groups.

a) The smaller group (\( s \)) will be more successful than the larger group (\( b \)) if:
\[ W_s - \frac{n_s}{n_s + n_b} (W_s + W_b) \geq \left( 1 - \frac{n_s}{n_s + n_b} (1 - \Pi^-) \right) R \quad (6A) \]
Or in terms of average wealth:
\[ \overline{w}_s - \overline{w}_b \geq \left( \frac{1}{n_s} - \frac{1}{n_b} \Pi^- \right) R \]

b) Even though \( \overline{w}_s > \overline{w}_b \), the smaller group (\( s \)) will be less successful than the larger group (\( b \)) if:
\[0 < W - \frac{n_s}{n}(W_s + W_b) \leq \left( \frac{1}{2} - \frac{n_s}{n_s + n_b} \right) (1 - \Pi^-) R \]  

(7A)

**Proof:** Similar to the proof of proposition 6.

**Optimal Contributions with mix public-private prize**

Each individual \(i\) who belongs to group \(g\) maximizes:

\[
\max_{n_i} EU_i = \frac{R^g}{R} z_g + f(c_i)
\]

Assuming interior solution for everybody the first order condition can be written as:

\[
\frac{I}{R} (1 - p_g) z_g = f'(c_i)
\]

(8A)

Following the same steps and arguments used in the pure public prize case, from 8A we can redefine the equilibrium in terms of \(p\) and \(R\), and prove that the equilibrium vector \((p, R)\) always exists and is unique. Moreover, following the same steps used to obtain equation 5A we get that at equilibrium for each group \(g\) it must hold:

\[
\frac{I}{R} (1 - p_g) z_g = f'(\overline{z}_g - \frac{p_g R}{n_g})
\]

(12)

This system of \(G\) equations plus the conditions \(\Pi = \sum_p p_g = 1\), and \(p_g \geq 0\) \(\forall g\), complete the equilibrium description.

**Proposition 6**

Assume that we are at equilibrium.

(a) Applying the implicit function theorem to equation 12 and keeping \(R\) constant we get

\[
\frac{\partial p_g}{\partial \overline{z}_g} = \frac{n_g R f'(c)}{R^2 f''(c) - n_g z_g} > 0.
\]

From the same arguments given in proposition 2(a) \(R\) must increase to recover the equilibrium and \(p_g\) increases.

(b) Keeping constant \(R\) (and \(\overline{z}_g\)) in equation 12 by the implicit function theorem we get

\[
\frac{\partial p_g}{\partial n_g} = -\frac{R}{n_g} \left( (1 - p_g) (1 - \lambda) M/R + f''(c) R p_g \right) / \left( n_g z_g - f''(c) R^2 \right).
\]

Since \(f''(c) < 0\), then the sign of this derivative depends on the sign of the term in parenthesis in the numerator. Thus, \(\partial p_g / \partial n_g > 0\) if and only if:
\[
\frac{1}{R} (1 - p_g) \lambda (1 - \lambda) M < -f''(.) R p_g
\]

\[
\Leftrightarrow \frac{1}{R} (1 - p_g) z_g (1 - \theta_g) < -f''(.) \frac{R p_g}{n_g}
\]

\[
\Leftrightarrow f'(1 - \theta_g) < -f''(.) R p_g
\]

\[
\Leftrightarrow (1 - \theta_g) < \eta_g
\]

Since \( \eta_g > 0 \) and \( \theta_g \in [0,1] \), the corollary follows immediately.

**Proposition 7**

Consider again two groups \( h \) and \( l \) with \( \bar{w}_h > \bar{w}_l \). We can apply the same strategy using in section 3 to study any between-group progressive transfer. Using equation 7 and replacing the respective derivative or each group (see proposition 7a) we get that a progressive transfer of income generates a decrease in the level of conflict if

\[
\frac{n_l z_l}{n_h z_h} > \frac{f''(\bar{w}_l - p_l R/n_l)}{f''(\bar{w}_h - p_h R/n_h)}
\]

When this inequality is reversed, the transfer generates an increase in the level of conflict. The difference with the condition in proposition 3 is that the right-hand term includes the ratio \( z_l/z_h \). Notice that since the term \( n_g z_g \) is strictly increasing in \( n_g \), then \( n_l z_l/n_h z_h > 1 \) whenever \( n_l > n_h \).

First consider the case where \( \eta_g(.) > (1 - \theta_g) \), i.e. that in which the winning probability is strictly increasing in the group-size. In this case there are the same possibilities studied in propositions 4 and 5. Following the same arguments used to proof that propositions we can get the same results. The only difference has to do with the line of reasoning in proposition 5b. In this new condition the ambiguity arise because of the ratio \( f''(c_l)/f''(c_h) \) can be higher, equal, or smaller than 1. This proofs part (a) of the proposition.

Now consider the case where \( \eta_g(.) < (1 - \theta_g) \), i.e. that in which the winning probability strictly decreases in group-size. When this happens there are three alternatives: (1) \( n_l < n_h \) and \( p_l < p_h \); (2) \( n_l < n_h \) and \( p_l > p_h \); and (3) \( n_l > n_h \) and \( p_l < p_h \). Notice that from the results in proposition 7(b) the possibility \( n_l > n_h \) and \( p_l > p_h \) never happens. Applying the same arguments used to proof propositions 4 and 5, under the alternative 1 it follows that \( n_l z_l/n_h z_h < 1 \), and \( f''(c_l)/f''(c_h) > 1 \), thus result in proposition 8(b-i) immediately arise. Under alternatives 2 and 3, it is not possible to infer whether the ratio \( f''(c_l)/f''(c_h) \) is above or below the unit. This is so because of we do not know if \( z_l(1 - p_l) \) is higher, equal, or smaller than \( z_l(1 - p_l) \). Thus, in these cases the result of a between-group progressive transfer is ambiguous.
Table 1
Basic Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. Obs.</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>State per capita campaign spending in House Race, cycle 1995/96 ($)</td>
<td>40</td>
<td>1,77</td>
<td>0,41</td>
<td>0,72</td>
<td>2,66</td>
</tr>
<tr>
<td>State population 1996 (thousands).</td>
<td>40</td>
<td>6.271</td>
<td>5.878</td>
<td>1.120</td>
<td>31.230</td>
</tr>
<tr>
<td>State per capita personal income 1996 ($)</td>
<td>40</td>
<td>22.727</td>
<td>3.327</td>
<td>17.171</td>
<td>32.135</td>
</tr>
<tr>
<td>State per capita government spending 1996 ($)</td>
<td>40</td>
<td>3.078</td>
<td>535</td>
<td>2.318</td>
<td>4.514</td>
</tr>
<tr>
<td>Within state std. deviation of log of MSA per capita income 1996.</td>
<td>40</td>
<td>0,14</td>
<td>0,05</td>
<td>0,08</td>
<td>0,28</td>
</tr>
<tr>
<td>Number of campaigns</td>
<td>40</td>
<td>34</td>
<td>32</td>
<td>6</td>
<td>182</td>
</tr>
<tr>
<td>Within-state Correlation: MSA population and personal per capita income</td>
<td>40</td>
<td>0,66</td>
<td>0,36</td>
<td>-1,00</td>
<td>1,00</td>
</tr>
<tr>
<td>Average of population ratios between richer and poorer cities</td>
<td>40</td>
<td>7,26</td>
<td>4,93</td>
<td>0,26</td>
<td>18,84</td>
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<tr>
<td>Percentage of population ratios between richer and poorer cities that are equal or higher than 1</td>
<td>40</td>
<td>0,75</td>
<td>0,18</td>
<td>0,00</td>
<td>1,00</td>
</tr>
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</table>

MSA: Metropolitan statistic area
Table 2
U.S. State Campaign Spending in House Race
(Cycles 1991/92 to 1995/96)

Dep. Var.: Log of state per capita spending in House race.
(OLS estimation)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between-group income inequality (BGII) (a)</td>
<td>-2.53</td>
<td>-2.26</td>
<td>-2.75</td>
<td>-2.64</td>
<td>-1.94</td>
<td></td>
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<tr>
<td>BGII * Dummy Corr(population,income) (b)</td>
<td></td>
<td>-0.54</td>
<td>(0.68)</td>
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<td></td>
<td></td>
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<tr>
<td>BGII * Corr(population,income)</td>
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<td>0.53</td>
<td>(0.66)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BGII * Dummy proportion of population ratios &gt;1 (c)</td>
<td></td>
<td></td>
<td></td>
<td>0.27</td>
<td>(1.00)</td>
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<tr>
<td>BGII * Log(average of population ratios) (d)</td>
<td></td>
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<td>(0.43)</td>
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<tr>
<td>Log of per capita personal income</td>
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<td></td>
<td>(0.40)<strong>(0.34)</strong>(0.34)<strong>(0.34)</strong>(0.36)<strong>(0.38)</strong></td>
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<tr>
<td>Log of per capita government spending</td>
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<td>-0.13</td>
<td>-0.16</td>
<td>-0.18</td>
<td>-0.16</td>
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<tr>
<td></td>
<td>(0.32)</td>
<td>(0.27)</td>
<td>(0.29)</td>
<td>(0.28)</td>
<td>(0.30)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>Log of population</td>
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<td>-0.32</td>
<td>-0.31</td>
<td>-0.28</td>
<td>-0.25</td>
</tr>
<tr>
<td></td>
<td>(0.07)<strong>(0.09)</strong>(0.09)<strong>(0.10)</strong>(0.10)<strong>(0.11)</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Number of campaigns in race</td>
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<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
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<tr>
<td></td>
<td>(0.001)<strong>(0.002)</strong>(0.002)<strong>(0.002)</strong>(0.002)<strong>(0.002)</strong></td>
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<tr>
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<td>-3.56</td>
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<tr>
<td></td>
<td>(2.48)</td>
<td>(2.25)</td>
<td>(2.16)</td>
<td>(2.27)</td>
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<td>(2.95)</td>
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<tr>
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<td>0.34</td>
<td>0.34</td>
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<tr>
<td>No. Obs.</td>
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<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

Standard deviations are robustly estimated. *** = Significant at the .01 level; ** = .05 level; and * = .1 level. (a) Between-group income inequality: Corresponds to the within state standard deviation of log of MSA per capita personal income; (b) Dummy Corr(population,income): 1 if the MSA correlation between population and per capita income is smaller than 0.23; (c) Dummy proportion of population ratios >1: 1 if the percentage of population ratios between richer and poorer cities higher that one is smaller than 50%; (d) Log(Average of population ratios): Correspond to the log of the average of population ratios between richer and poorer cities. The population ratios between richer and poorer cities correspond to all the possible population ratios between pair of MSA that have in the numerator the population of a richer city and in the denominator the population of a poorer one.
REFERENCES


