

Centre de Referència en Economia Analítica

Barcelona Economics Working Paper Series

Working Paper n° 253

A Model of Ethnic Conflict

Joan Esteban and Debraj Ray

September 2005

A Model of Ethnic Conflict

Joan Esteban

Instituto de Análisis Económico (CSIC)

Debraj Ray

New York University and Instituto de Análisis Económico (CSIC)

Barcelona Economics WP n° 253

September 2005

ABSTRACT

We present a model of conflict, in which discriminatory government policy or social intolerance is responsive to various forms of ethnic activism, including violence. It is this perceived responsiveness — captured by the probability that the government gives in and accepts a proposed change in ethnic policy — that induces individuals to mobilize in support for their cause. Yet, mobilization is costly and demonstrators have to be compensated accordingly. Individuals have to weigh their ethnic radicalism with their material well-being to determine the size of their money contribution to the cause. Our main results are: (i) a one-sided increase in radicalism or in population size increases conflict; (ii) a one-sided increase in income has ambiguous effects depending on the elasticity of contributions to income; (iii) an increase in within-group inequality increases conflict; and (iv) an increase in the correlation between ethnic radicalism and inequality also increases conflict.

We thank Tzachi Gilboa and Rohini Pande for useful comments. Ray acknowledges support from the National Science Foundation under grant number 0241070, and thanks the London School of Economics, STICERD in particular, for their warm hospitality during the preparation of this revision. Esteban is a member of Barcelona Economics and is grateful for support from the Generalitat de Catalunya and the CICYT (SEC-2003-1961). This research is part of the Polarization and Conflict research project CIT2-CT-2004-506084 funded by the European Commission-DG Research Sixth Framework Programme

1. INTRODUCTION

In this paper we set out an elementary game-theoretic model of conflict between groups based on individual behavior. We focus on the role of heterogeneity both between and within groups in explaining conflict. Individuals differ not only in the group they belong to — their “ethnicity” — but also in their wealth and in the radicalism of their commitment to the group’s cause. The within group heterogeneity in wealths and radicalism is the main novelty of this paper. Besides examining the more standard issue of whether higher heterogeneity across groups leads to higher conflict, we also study the role of within-group homogeneity. As is now well-known, both these features have been highlighted in recent literature on the conceptualization and measurement of polarization.¹

The model is extremely simple, and is to be regarded more than anything else as a tool to classify different factors in conflictual situations. But even in this stripped-down form the model yields some insights, arguing — for instance — that economic inequality *within* ethnic groups rather than *across* them is likely to be a potent force in determining the extent of ethnic violence. This sort of model may therefore be useful, because in spite of the continued attention to the issue of ethnic/religious conflict analysts appear quite far from a minimal agreement on its basic driving forces. In his comprehensive survey Horowitz (1998)² lists up to ten distinct explanations for social conflict, some substitutes for each other, some complementary. To each such family of explanations he produces countering facts. This variety of possible causal factors, while rich, can be at the same time confusing and not easily amenable to empirical falsification.

A first major concern in the analysis of religious/ethnic conflict is to account for the obvious passion and rage overwhelmingly present on either side of the ethnic divide. Writers such as Horowitz (1985, 1998) and Brewer (1979, 1991 and 1997) have argued that the success of the group has value *per se*, quite independently of the material benefits that the group members could derive from a victory over the opponent. Horowitz (1998) stresses the role of passion along with sheer material interest in explaining individual behavior in conflict. In the exercise that follows, we will let individuals be motivated by group success — conceived of here as the payoffs from an “ethnic public good” — and we permit these payoffs to vary across individuals as well the direct material components of their well-being. In this sense, we marry the rational choice tradition with a broadening of the notion of individual motivations, including non-material, group-defined rewards.

Concerning the role of material rewards, the explanations — and the corresponding supporting evidence — seem at least partially contradictory. This apparent contradiction might be produced by the fact that economic wealth plays a double role. On the one hand, such wealth determines the stakes in case a victory over the opponent comes with (possibly partial) expropriation of the opponent’s resources. From this angle, we should expect that the larger are wealth differences across groups the more likely it is that conflict will break out. This is the view held by Wintrobe (1995) who views inter-group envy as a major cause of conflict. In the same vein, Stewart (2002) identifies “horizontal inequality” across groups — the existence or the perception of an unjustly widening economic gap between them — as a major source of ethnic conflict.

Two considerations militate against this point of view. First, as Pande and Ray (2003) have argued, the assertion that inter-group inequality is conflictual depends crucially on the assumption that the economically *weaker* group is the instigator of conflict. If, on the other hand, the economically stronger group is the instigator, a *narrowing* of the economic gap may fuel resentment and therefore conflict. While we do not pursue this particular thread here, we follow a

¹See Esteban and Ray (1994) and Duclos, Esteban and Ray (2004) for the notion and measure of polarization and Esteban and Ray (1999) for the role of polarization among groups in conflict.

²See also his classic, Horowitz (1985).

complementary line of reasoning by emphasizing a second role played by wealth: that it determines the capacity to mobilize and possibly arm people. We will see that this notion of “wealth as capacity” — as opposed to the idea of “wealth as loot” — generates a more nuanced and qualified relationship between inequality and wealth (parallel to, but different from the route emphasized in Pande and Ray (2003)). Specifically, as a given group becomes wealthier (and depending on the way this increased wealth is distributed within the group) it might more easily be tempted to expend part of the additional resources into fighting the opponent party. While this outcome is independent of whether the group in question is economically weaker or stronger to start with, its effect on the opponent depends crucially on this feature. Specifically, we show in Proposition 2 that if the weaker group expends more resources, so will the stronger group, leading to an escalation of conflict. The opposite is true if the initial impetus comes from the stronger group: conflictual activity is deterred for the opponent. It is possible, then, that the closing of the wealth gap between two groups — rather than its widening — might ignite conflict instead.

This latter point seems compatible with the abundant evidence — see Melson and Wolpe (1970), Olzak and Nagel (1986) and Tellis, Szayna and Winnefeld (1998) — that economic modernization fuels rather than moderates ethnic conflict. The process of modernization might generate resources to fundamentalist segments (or cynical opportunists) which would then be channelled into financing (a thus far latent) conflict.³

Indeed, under the approach we take, a *balanced* growth of wealth within a group is less potent in generating conflict than a wealth increase that accrues to the *élite* in that group (see especially Propositions 3 and 5). Such disequalizing wealth changes, we argue, are more likely to trigger greater activism for the group in question. [As we’ve already said, whether this leads to escalation or deterrence depends on whether this group was economically weaker or stronger to start with.] Our approach is therefore in line with Bates (1999), who emphasizes within-group inequality as a potential source of increased conflict against the opposing ethnic group. The emergence of an economic and cultural *élite* appears as a critical factor in substantial escalations in many ethnic conflicts in Africa. They provide the leadership and the means that facilitate the escalation. Thus, accordingly with Bates’ arguments conflict will be higher the more uneven is the distribution of the benefits of modernization *within each rival group*. This view is also shared by Horowitz (1997, pp 439 and 457) who stresses the fact that the *élites* hold the same or even more hostile views. Having more resources does not necessarily make people more moderate.

Disequalizing wealth changes are more dangerous precisely because they put resources in the hands of potential contributors, *while at the same time they do not increase the cost of mobilizing activists*. By increasing the opportunity cost of conflict all round, balanced wealth changes dampen this phenomenon. Thus our findings are perfectly consistent with the findings of Collier and Hoeffler (2002), Fearon and Laitin (2003), Miguel, Satyanath and Sergenti (2004) and others that overall income increases are negatively related to conflict.

It may be worth relating these observations to the general theme of this special issue of the *Journal of Conflict Resolution*, which is the relationship between polarization and conflict. In the setup explored by Esteban and Ray (1994), *population* similarities across two different groups are conflictual, while *income* similarities across the two groups are not. But the latter notion is based on a “class view” of polarization, in which the only dividing line between two groups is *economic* wealth. In the situation studied here, class is not the dividing line, it is ethnicity or religion. Wealth plays a role, but *not* in determining which groups are to be the warring parties.

³See Bourguignon (1998) for a careful quantitative analysis of the relationship between growth, inequality, and conflict.

In this case, as we have argued, wealth *similarities* may be conflictual rather than wealth differences. It should be noted that this does not contradict the earlier notion of polarization, which simply states that greater heterogeneity *in the variable that defines groups* is conflictual. For economic classes, wealth is the appropriate variable. For ethnic groups, it is not. Wealth differences across groups may therefore have very different implications in the two cases. One therefore needs prior knowledge on the role of a particular dimension in a conflict in order to be able to say whether increased “income polarization” will lead to higher conflict or not.⁴

On the subject of similarity of characteristics across groups, Proposition 2 has additional implications. While introduced above in our discussion of wealth changes, this proposition actually states that *any* source of increased activism for a particular group (not just changes in its wealth) causes escalation — a heightened reaction from the opponent — if the group is relatively weaker to start with, while it acts as a deterrent — lowers opponent activism — if the group is stronger to start with. The initial change could, of course, stem from changes in population or radicalism (or for that matter, wealth). This suggests more generally that polarization or the similarity of characteristics on either side (and not just the similarity of wealth) could be more conflictual. Montalvo and Reynal-Querol (2005) show, for example, that population polarization over ethnic and religious groups is an important predictor of civil war.⁵

To summarize, then, we construct a simple model of ethnic conflict in which individuals can contribute to an “ethnic cause”, the payoffs from which partially drive their behavior. In addition, individuals can directly participate as activists, but such participation needs to be compensated (this includes “self-compensation”, such as the willing bearing of opportunity costs). This model permits us to analyze different sorts of factors, which we’ve broadly classified into inter-group and intra-group differences. Among other things, we show that

An increase in activism by one contending group will create escalation or deterrence depending on whether that group was weaker or stronger to start with; this has implications for the relation between polarization and conflict;

Balanced increases in the wealth of one group might reduce its activism: the higher money contributions may be insufficient to cover the higher costs of mobilization; but

An increase in wealth *inequality* within one ethnic group may make inter-ethnic conflict more violent: mobilizing the poor is cheaper, and the rich have more resources to implement that mobilization.

2. THE MODEL

We will use the notation H and M to denote two ethnic affiliations, often referring to these as Hindu and Muslim respectively. [But the model that we lay down is more abstract and can be applied to other conflictual situations quite easily.] There are n^h and n^m people of each conviction, with $n^h + n^m = n$, the total population.

In this paper, we place attention on “religious policies”, to be thought of as actions or concessions (or social attitudes) that are effectively tilted towards one religious group or the other.

⁴This discussion leads to the all-important question of *saliency*, to the issue of just which cleavage — class or ethnicity — acquires center stage. Esteban and Ray (2005) address this question. A related paper is Robinson (2001), which presents a model in which conflict can take place either along class lines or along ethnic lines and shows that the latter will in general be more severe than the former. Of course, this does not address the question of saliency directly, choosing instead to compare two different forms of conflict.

⁵Lest this point be misunderstood, it is true that the more widely-used *fragmentation* index has no effect on the incidence of war; see e.g., Fearon and Laitin (2003). But unlike polarization, there is in any case no theory that suggests that fragmentation should affect conflict one way or the other. Moreover, polarization indices are entirely orthogonal to indices of fragmentation.

To be concrete, suppose that there is some “status quo” policy to begin with, against which an alternative proposal has been raised. For instance, fundamentalist Hindus might (and did) call for the razing of a mosque and the building of a temple on supposedly sacred ground. Or fundamentalist Muslims might (and did) decide to enforce problematic aspects of Muslim personal law, pertaining to divorce or marriage.

In each of these cases, the acceptance of the newly “proposed” situation marks a change in social attitudes, sometimes but not always mediated by state policy. Different people will, of course, feel differently about the change. Let us use the *individual-specific* variable x to capture the intensity of feelings regarding the proposed shift from the status quo. For the sake of concreteness, suppose that the proposed policy is favorable to the Hindu position, relative to the status quo. Consequently, in the Hindu camp, the variable x will stand for how strongly an individual feels about supporting the shift, while in the Muslim camp, x will stand for how strongly the individual feels about opposing it.⁶

The different groups will voice their support or dissent regarding the proposed shift in religious policy. Such activism may take the form of open debate or discussion, but more likely it will take the form of demonstrations, processions, and riots, and occasionally looting, rape and murder. “Activists” are needed to engage in these activities. Denote by A^i , $i = h, m$ the number of individuals of each creed involved in such “activism” and denote by p the probability that the proposed policy shift will indeed be successful. We assume that p depends on A^h and A^m in the following way:

$$(1) \quad p(A^h, A^m) = \frac{\psi(A^h)}{\psi(A^m) + \psi(A^h)},$$

with ψ strictly increasing and concave and $\psi(0) = 0$.

The individuals in our model vary in three ways. First, as already mentioned, they are H or M . Second, and also discussed, they can vary in their feelings about the proposed policy; this is captured by the variable x . Finally, individuals may also vary in the resources under their command; call this w . To fix ideas we shall think of w as the earning capacity of the individual. It will be used not only to proxy his wealth, but also as a measure of the opportunity cost incurred by that individual if he becomes an activist. So in summary, an individual is characterized by his religion, his religious attitudes and his resources. With religious affiliation given, we will refer to any combination of the remaining two characteristics as a “type”. Use $z = (x, w)$, $i = h, m$, to denote a type. There are $n^i(z)$ individuals of each type for each group i .

We assume that each individual makes a decision about how much resources (personal or financial or both) to contribute to activism. To solve this problem we need to convert units of money to units of activism. We take up this issue in some detail below; for now, simply assume that each unit of activism needs to be financed by an amount s^i . This amount can vary across the two groups. Then a typical H -individual of type z will seek to choose r to maximize

$$(2) \quad px + u(w - r)$$

where p is given by (1), A_h can be affected by the contribution r , and $u(w - r)$ is the utility of consumption when contributing to the religious cause an amount r by an individual with resources w . [An analogous expression with $1 - p$ in place of p is maximized by the M -individuals.]

We assume fairly standard things about the utility function: that it is increasing and strictly concave in consumption—and hence convex in r —and that individuals cannot contribute more

⁶This is a bleak view indeed. Many tolerant Hindus might deplore the proposed shift as well. The model is easily amended to take this into account.

than their earning capacity. Notice that the concavity of u implies that increased wealth reduces the marginal utility cost of contributions.⁷

The maximization problem in (2) is straightforward. Each H -individual of type $z = (w, x)$ takes as given the contributions of everyone else in society and selects his own contribution r . If we denote by A_-^h the aggregate contributions by the rest of the H -individuals, then r is chosen to maximize

$$p\left(A_-^h + \frac{r}{s^h}, A^m\right)x + u(w - r),$$

It follows that the H -individual's "best response" r is uniquely described by the first order condition

$$(3) \quad p_1\left(A^h, A^m\right) \frac{x}{s^h} \leq u'(w - r), \text{ with equality if } r > 0,$$

where A^h is just the sum of A_-^h and r/s^h .

For an M -individual of type (x, w) , the conditions are entirely analogous:

$$(4) \quad -p_2\left(A^h, A^m\right) \frac{x}{s^m} \leq u'(w - r), \text{ with equality if } r > 0.$$

So far the present model is not too different from a standard model of lobbying. There are two variations though, with a third — the most important — to be introduced presently. First, we allow for heterogeneity in individual attitudes towards religious policy, something that will permit us to remark later on the correlation between wealth and extremist attitudes. Second, each *individual* makes his choice of contributions; the choice is not dictated by a group decision. On this matter, we are agnostic regarding the alternatives of group-based versus individual-based contributions.⁸

The third and most important way in which we depart from the standard literature is by endogenizing the costs of activism, s^h and s^m . It is hardly a novel observation⁹ that social and political activity, especially of the potentially violent kind that we have in mind, is costly. Individuals who earn a lot of money with their labor time are generally not out on the streets; they would rather contribute monetarily to an extremist cause than participate in it physically. On the other hand, individuals who are poor can be easily "bought" and compensated for their violent activity. The compensation can include meals, money, and promises of reciprocal favors or job opportunities. The term s^i generally includes these compensations.

The easiest way to model the effects of economic circumstances on this sort of activity is to suppose that all those whose earning capacities are low enough join up, though they cannot switch religious alliances in the process. Thus a person with religious affiliation i can only be compensated by s^i should he decide to take to the streets, and he must join the i -activists. We've already used w as a proxy for overall earnings capacity; we now use precisely this variable to determine a cutoff: all i -types with $w \leq s^i$ become activists.

Notice that this does not imply that every individual with $w < s$ must become a full-time activist. There are generally limits on the extent of this sort of activity. Presumably — and even in Gujarat — an individual cannot participate in a religious riot 365 days per year, but the point is that he should be ready to do so if called upon to instigate or assist in one. Thus we suppose throughout that the decision to participate or not in activism represents a small fraction of working time, so that for all practical purposes an individual's earnings capacity is not endogenously altered thereby.

⁷Formally, we assume that u is a smooth function with $u'(w - r) > 0$, $u'(w - r) \rightarrow \infty$ as $r \rightarrow w$, and $u''(w - r) < 0$.

⁸Esteban and Ray (1999) employ a group-based approach, and Esteban and Ray (2001) address the Pareto-Olson group size paradox by taking an individual-based approach.

⁹See, e.g., Becker (1968).

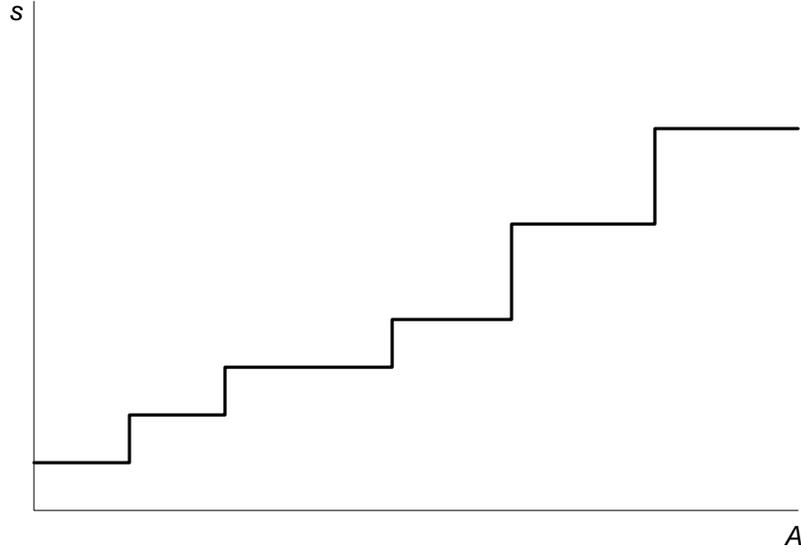


FIGURE 1. THE SUPPLY OF ACTIVISTS

In particular, this allows us to treat an individual's (gross) contributions r as a decision that isn't intertwined with his activism. Of course, his *net* contributions may well be: part of his r may be imputed payments to himself (if he is also an activist at the same time).

The endogeneity of s means that over and above best "responses" at the individual level, which are defined by (3) and (4), there is an implicit aggregation at the level of each group. This gives rise to the notion of an *equilibrium response* for each group, which we now proceed to discuss.

Fix a group i , with compensation s for its activists. Notice that all types in that group with $w \leq s$ will be willing to join the ranks of the activists. For every s the number of available activists will be

$$(5) \quad A^i(s) = \sum_{w \leq s} n^i(x, w).$$

This is an increasing step function. Figure 1 plots its inverse, by showing the compensation rate(s) s that will elicit various quantities of activism A . Of course, this inverse correspondence $s^i(A)$ is also an increasing step function; we've filled in the jumps in the obvious way by including all compensation rates between the extremes at each jump. These jumps will be small if the gaps between wage rates of neighboring types are small.

3. EQUILIBRIUM

Consider group H , and fix some level of activism A^m for group M . The pair (A^h, s^h) is an *equilibrium response* to A^m (by individuals in H) if there is a profile of individual contributions $\{r^h(z)\}$ such that

- (i) For each $z = (w, x)$, $r = r^h(z)$ satisfies (3),
- (ii) $\sum_z r^h(z) n^h(z) = s^h A^h$, and

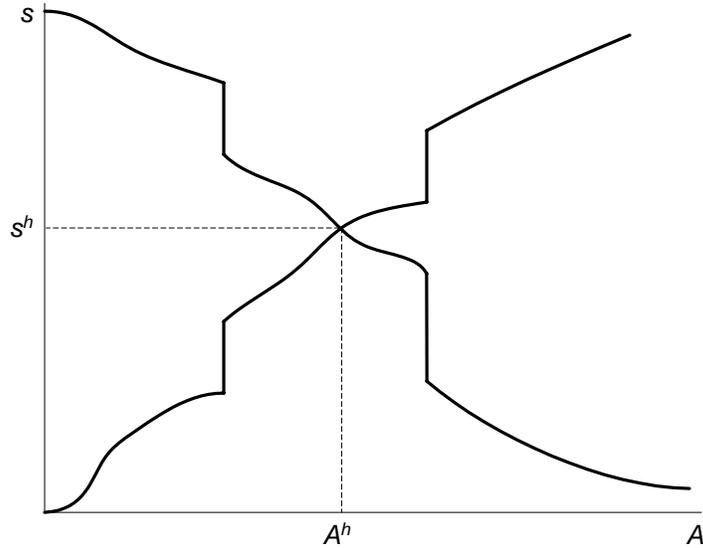


FIGURE 2. EQUILIBRIUM RESPONSES

(iii) $s^h \in s^h(A^h)$.

The first condition requires that every individual choose a best response, and the second guarantees that these responses generate the equilibrium quantity of activism. The third condition ensures that at the going compensation rate the equilibrium amount of activists will be supplied.

An *equilibrium* is a collection (A^h, s^h, A^m, s^m) such that (A^h, s^h) is an equilibrium response to A^m , and (A^m, s^m) is an equilibrium response to A^h .

The following background result sets the stage for the rest of the paper.

PROPOSITION 1. *There exists a unique equilibrium.*

We are going to go over the proof of existence, not for the sake of technicalities but because the argument reveals a lot about the shape of the equilibrium response functions and therefore about the observations that follow subsequently.

We start by showing that there is a unique equilibrium best response. So in the discussion that initially follows, A^m is simply given.

To begin with, construct a “demand curve” for activists by finding the choice of “desired” A^h for each s^h . Consult (3). Fix values of s^h and A^h on the left-hand side of (3). This yields a value for individual contributions for each type z ; call it $r(z, s^h, A^h, A^m)$. It is the value of r that solves (3). Add this up over all types z to obtain an aggregate value of “desired contributions”: call it $C(s^h, A^h, A^m)$. Notice that C is strictly decreasing in A^h as long as it is positive, so there is a unique value of A^h (for each s^h) such that $C(s^h, A^h, A^m) = s^h A^h$. We have found a point on the “demand curve”.

Now raise s^h . Because C is declining in s^h , the new value of “desired” A^h — the new value that equates $C(s^h, A^h, A^m)$ and $s^h A^h$ — must be strictly lower, as long as it is positive to start with.

Figure 2 superimposes this demand curve on the earlier supply curve for activists, given by Figure 1. There is a unique intersection of the two curves, and this determines the equilibrium response (A^h, s^h) to A^m .

By exactly the same argument, for every A^h there is a unique equilibrium response (A^m, s^m) . We now proceed to describing the overall equilibrium. This analysis depends on the following useful fact:

OBSERVATION 1. *If the equilibrium response A^h is positive, it increases with A^m as long as A^h exceeds A^m , and declines as A^m increases whenever the opposite inequality holds.¹⁰*

Proving this observation is a simple exercise. By virtue of (3), all we need to do is study whether C increases or decreases with A^m . For instance, if C increases in A^m , then by the earlier argument, A^h increases.¹¹ Using a standard complementarity argument, it is easy to see that C increases with A^m if the derivative $p_1(A^h, A^m)$ increases with A^m , and decreases otherwise. Recalling (1), we see that

$$p_1(A^h, A^m) = \frac{\psi(A^m)\psi'(A^h)}{[\psi(A^m) + \psi(A^h)]^2},$$

so that

$$\frac{\partial p_1(A^h, A^m)}{\partial A^m} = \frac{\psi'(A^m)\psi'(A^h)}{[\psi(A^m) + \psi(A^h)]^3}[\psi(A^h) - \psi(A^m)],$$

so that the derivative increases or decreases with A^m depending on whether A^h is larger or smaller than A^m .

Observation 1 tightly pins down the shape of the equilibrium response function. Either it stays flat at 0 throughout — the uninteresting case — or it is “hump-shaped”, initially rising with the response exceeding the “provocation” that caused it, flattening out at the 45° line, and declining thereafter with responses falling short of provocations.¹²

Both response curves — one for H and one for M — are depicted in Figure 3.¹³ It follows immediately that the two curves intersect and that the intersection can only be unique.

The hump-shaped profile of the equilibrium response functions is exactly what one would expect. When a given group is faced with increasing opposition it will initially respond with increased activism of its own. However, the limitation of one’s own resources (economic and human) will eventually lead to a decrease in activism as a response to a further increase in the opposition.

4. DETERMINANTS OF EQUILIBRIUM CONFLICT

The equilibrium level of conflict is determined by the intersection of the equilibrium response functions of the two groups. These functions depend on the individual characteristics of the

¹⁰The zones of increase and decrease will be punctuated by flats corresponding to the jump segments in s ; these flats will be small if the wage rate differential across neighboring types are small. In any case, these have no effect on the results.

¹¹It will stay constant with the entire increase transferred to s^h in case we are at a jump segment; see previous footnote.

¹²There must come a point at which A^h equals A^m , for our assumptions on cost function assures us that equilibrium responses must be bounded.

¹³The depiction of these curves neglects — without any substantive loss — the small flats that correspond to jump points in the s -function for activists.

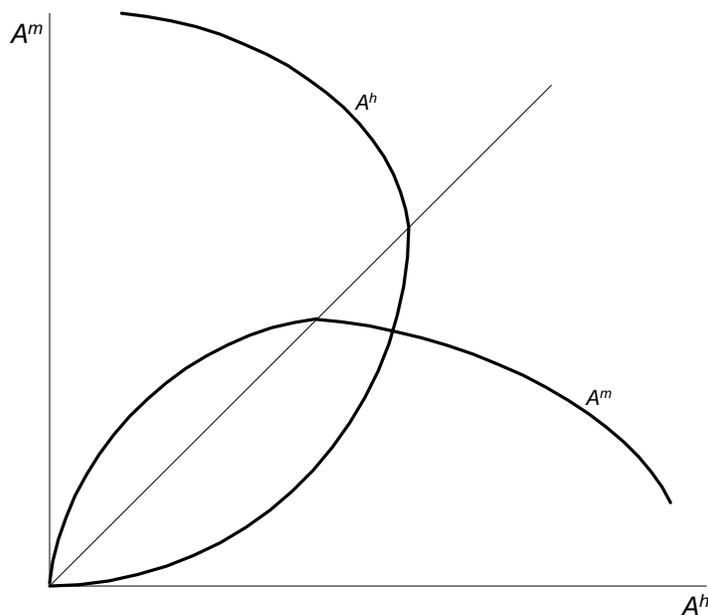


FIGURE 3. THE SHAPE OF EQUILIBRIUM RESPONSES

group members. In what follows, we are interested in two sorts of changes. We distinguish between changes *across* groups — captured by uniform changes in the characteristics of all members of one group — and changes *within* groups — captured by changes of the distribution of group characteristics while preserving the aggregate values for that group.

4.1. Equilibrium Activism. We begin with a general observation about comparative statics. Suppose that there is a change in parameters that pushes one side into supplying more activists. [For instance, the distribution of x for each wealth level could move rightwards in the sense of first-order stochastic dominance, for one of the groups.] In general, this will affect the equilibrium supply of activists for *both* sides. It turns out that the sign of the cross-group effect tells us something about the relative strength of the group that experienced the original change.

PROPOSITION 2. *Suppose that a change occurs in the parameters for a particular group, thereby shifting their equilibrium response function outwards: they are now more “aggressive” in supplying activists. Then*

- (i) *If the change in parameters has taken place for the group that had a smaller number of activists to start with, then the equilibrium A^h and A^m both move in the same direction; while*
- (ii) *If the change in parameters has taken place for the side that had the larger number of activists to start with, then the equilibrium A^h and A^m move in opposite directions.*

This result follows immediately from the properties of the equilibrium response functions described earlier.¹⁴ Indeed, Figure 4 contains a self-contained diagrammatic exposition of the proof.

¹⁴This neglects the case in which there are small flats in the response function arising from gaps between the wages of neighboring types. Such flats might create no change in cross-group activism if the parametric changes are very small, but in any case does not reverse the sign of the correlation. So we do not emphasize this point in the main text.

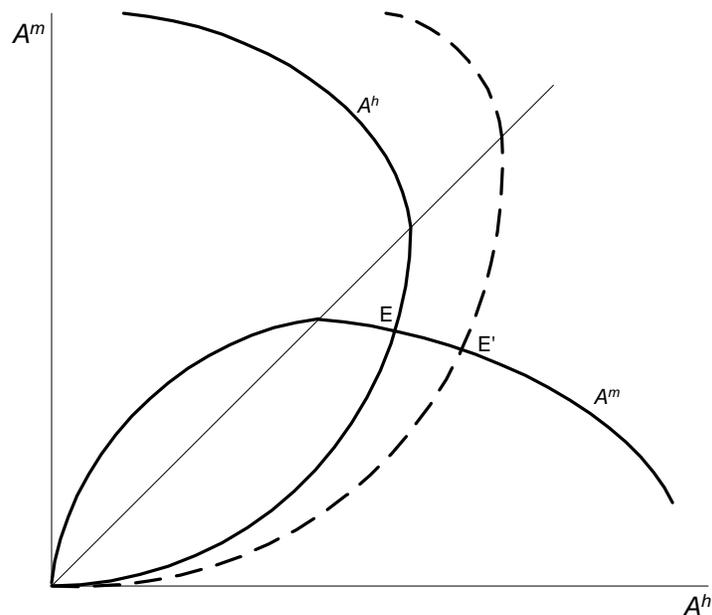


FIGURE 4. JOINT MOVEMENTS IN ACTIVISM

Thus if a group that has been so far moderate (mobilizing fewer people in equilibrium) becomes more aggressive, this has the primary effect of precipitating an escalation of conflict with *both* groups contributing more activists. However, if the increase of aggressiveness leads this group to become the more radical (in the sense of mobilizing the larger number of activists) any further increase in aggressiveness will have the opposite effect on the other group. The more moderate group will respond to the increase of activists by the aggressive group with a cut in the number of their own activists. An increase in radicalism does not necessarily translate into an escalation of conflict.

Propositions such as this have potentially interesting implications. By studying the changing patterns of conflict in societies we may be able to deduce the identity of an instigating party. To be sure, such an assertion needs to be treated with due care. The model studied here neglects psychological reactions to aggression, which may have the effect of altering the very parameters that defines a party's equilibrium response function. It remains to be seen whether this sort of analysis can be usefully extended to more general and realistic situations.

There are also implications for the effects of group polarization on conflictual outcomes. Each group has a distribution of possible characteristics: wealth, population and radicalism among them. It is, of course, hard to say *ex ante* which bundle of characteristics is inherently the more conflictual. One convenient shorthand is given by the nature of the equilibrium itself: the "less conflictual" group is the one that contributes, for one reason or another, the fewer activists in equilibrium. The proposition then states that an "aggressive change" in the characteristics of that group provokes an aggressive response in its opponent. In this sense, a polarizing change provokes a more aggressive stance in the opponent.

The proposition states that the same is also true if the group that is more conflictual to start with experiences a change that makes it less aggressive. That, too, provokes an aggressive response from the opponent.

So far, we have been describing the two contrasting situations in terms of the generated *patterns* of activism. One might ask if implications can be drawn for the overall *level* of conflict. The problem, of course, is that the “overall level” of conflict is hard to define. Consider a situation in which the less conflictual group increases its aggression. As discussed already, this provokes an aggressive reaction and “overall conflict” defined in any reasonable way must rise. This process continues until the two equilibrium response functions cross exactly at the 45⁰ line. Now further changes will produce opposite reactions, and an overall conclusion becomes more problematic. If conflict is defined by the *sum* of A^h and A^m , then it could continue to increase even in the deterrence phase.¹⁵ It is unclear, however, whether the sum is a more meaningful measure than some strictly quasiconcave transform of the two activism levels. For instance, consider the case in which the number of militants by one side is so large that the other side is practically devoid of activists of its own. There may be lots of mobilized militants but little street fighting.

The ultimate expression of a quasiconcave transformation is, of course, the Leontief specification: overall conflict is related to the *minimum* of the two activism levels. In this case, overall conflict will be maximal precisely when the two groups are equally aggressive. More generally, one would expect that conflict — appropriately defined — would be maximal at some intermediate group configuration, in which one side is distinctly dominant, but not overwhelmingly so.

4.2. Between-Group Heterogeneity. Consider three possible types of parametric changes that can modify the heterogeneity between the two groups while preserving within-group heterogeneity: in radicalism, population, and wealth. By and large, the results are not surprising.

Let us start with the case in which radicalism increases across the board for a group. From the first order condition (3) it is immediate that each individual of each type will increase her contribution to conflict. Since for every degree of activism by the opponent the radicalized group will contribute more resources and hence more activists, it follows that activism by that group will increase, both as an equilibrium response and in equilibrium itself.

The case of an increase in population is even simpler. Each individual optimal contribution will remain the same. The increase in the number of contributors will permit this group to mobilize a larger number of activists.

The one change that does merit additional discussion is the case of a uniform increase in wealth for a group, and by extension, the case of changing inter-group inequality. To study this, suppose that all wealths or earning capacities within a group are multiplied by the same proportionality factor. There are two effects. First, religious intolerance or radicalism becomes an easier game to play: the marginal cost of contributions to the cause goes down. Fixing for the moment the degree of activism by the opposing group, this change will increase the demand for activists within the group in question, for any given compensation rate. At the same time, there is a fall in the number of activists available at the old compensation rates: if earning capacities are higher, then so must be the monetary compensation for activism. Ideally, the wealthy in such groups would love to have continuing access to a low-wealth source of labor. While this desire may be more easily fulfilled when within-group *inequality* is altered (see below), a proportional increase in group wealth does not permit this luxury. Hence, the supply curve of activists will be shifted upwards.

It is immediate that the response of societal conflict to *inter*-group changes in wealth inequality (that are evenly divided within groups) may be complex. The new intersection of the two

¹⁵It can be checked that this assertion is always true when $p(A^h, A^m)$ takes the special form $A^h/(A^h + A^m)$.

curves can produce either a higher or a lower number of activists as an equilibrium best response. In particular, it is quite possible that increased inter-group inequality can bring down equilibrium conflict.

In order to examine this in more detail, observe that if all incomes of one group have been multiplied by a factor of λ so will the aggregate cost curve. Hence, we have to check whether the supply of funds will also result multiplied by the same factor. Let us go back to (3) where the utility maximizing contribution is implicitly characterized and define

$$(6) \quad \varphi(\lambda) = p_1(A^h, A^m) \frac{x}{\lambda s^h} - u'(\lambda(w-r)).$$

This is the marginal utility of type z when incomes and reservation prices for mobilization have both been multiplied by λ (for given A^h and A^m). Clearly, $\varphi(1) = 0$ for all individuals for whom the non-negativity constraint on r is not binding. The sign of the change of φ as λ increases will tell us if λr — the amount needed to exactly pay for the higher compensation rate — exceeds or falls below the utility maximizing best reply. Differentiating with respect to λ , evaluating the result at $\lambda = 1$ and using (3) we see that for all contributing individuals

$$\begin{aligned} \varphi'(1) &= -p_1(A^h, A^m) \frac{x}{s^h} - (w-r) u''(w-r) = \\ &= -u'(w-r) - (w-r) u''(w-r) = \\ &= -u'(w-r) \left[1 + \frac{(w-r) u''(w-r)}{u'(w-r)} \right] = \\ &= -u'(w-r)(1-\eta), \end{aligned}$$

where η is the elasticity of the marginal utility of consumption. Therefore, the sign of $\varphi'(1)$ depends on the elasticity of the marginal utility being smaller or greater than unity.

In particular, if η lies between 0 and 1,¹⁶ $\varphi'(1) < 0$, which implies that the contributions do *not* rise enough to compensate for the higher payment that must now be made to activists. We can deduce that a scaling of wealth by a common factor λ to each member of one group will reduce the group's aggressiveness by shifting their aggregate response function down if $\eta < 1$. We reach the opposite conclusion when the elasticity of the marginal utility η is larger than unity.

In Esteban and Ray (2005), we explore these ideas in more detail in our study of the salience of class versus ethnic conflict.

We bring these results together in the following Proposition.

PROPOSITION 3. *Suppose that a change occurs in the parameters relevant to one single side. Then*

- (i) *an increase in population or a uniform increase in radicalism results in an increase in activism; while*
- (ii) *a uniform increase in wealth has ambiguous results on activism, depending on the elasticity of the marginal utility of consumption. When $\eta < 1$ ($\eta > 1$) a scaling of w will unambiguously reduce (increase) the group's activism.*

4.3. Within-Group Heterogeneity. The discussion above suggests that the distribution of economic resources *within* a group might have a more powerful effect on activism than a uniform change in the relevant parameters for one group. If this were the case, this would imply that intra-group dispersion might play a more important role in conflict than average levels.

¹⁶Consider the family of utility functions

$$u(y) = \frac{1}{1-\eta} y^{1-\eta}.$$

This family of utility functions is increasing and concave for all $\eta \geq 0$ and its marginal utility has a constant elasticity of η . Notice that $\lim_{\eta \uparrow 1} u(y) = \ln y$. Hence, $\eta < 1$ means that u is assumed to be "less concave" than $\ln y$.

We start by performing the two exercises separately: the effects of a change in inequality in the distribution of x within a group and of the change in the distribution of w . This allows us to compare the role of within-group heterogeneity in radicalism versus higher heterogeneity in wealth. We end this subsection by examining the effect of changes that increase the correlation between religious extremism and wealth and hence make the two characteristics more aligned with each other.

4.3.1. *Within-Group Radicalism.* We shall examine here the effects of a change in the distribution of radicalism within one group without perturbing the correlation between radicalism and wealth. To this effect at every wealth level w we shall redistribute population over x generating a Lorenz-worsening change in the distribution of radicalism. Religious attitudes will become more disperse *at each wealth level x .*

Making radicalism more dissimilar across the population of a given group decreases its internal cohesion. However, this decreased cohesion has the effect of increasing the extremism of the most radical part of the population — and decreasing the radicalism of those who already were more lukewarm. We want to examine which of these two forces will prevail. Will more religious heterogeneity decrease or increase group aggressiveness?

In order to examine this question we start by recalling that the group equilibrium best response is determined by the intersection of the aggregate cost of mobilizing a number A^h of activists with the funds individuals will willingly supply when A^h activists are being mobilized in response to the A^m activists mobilized by opposing group. The aggregate cost of mobilization is not altered by the change in radicalism. Hence we just have to focus on how the supply of funds will be modified as the distribution of radical feelings becomes more dispersed.

The aggregate demand for activists at any compensation rate is the sum of the individual decisions to contribute money to finance activists. We have already seen in Proposition 3 that an increase in radicalism leads to higher individual contributions. Therefore, we will have to balance the decreased contributions by the moderates who are now even less committed and the additional contributions coming from the most radical who have become more radicalized. This depends on how the marginal rate of substitution between consumption and religious attitudes varies as radicalism increases. When the marginal utility of consumption is convex, the fall in contributions by the more moderate (now even more so) will exceed the increase in contributions by the more radical (who have become more radicalized). Hence aggregate contributions will come down and with it the mobilizing capacity of the group.

Indeed, it is well known that a Lorenz-worsening in the spread of x over the population will produce an decrease (increase) in the aggregate contribution $\sum \lim_z r^h(z)n^h(z)$ if r is a concave (convex) function of x . Condition (3) implicitly defines r as a function of x . The assumed concavity of u with respect to consumption guarantees that r is increasing in x . It can be easily seen that the condition for the concavity (convexity) of r with respect to x is that the marginal cost $u'(\cdot)$ is a convex (concave) function of consumption.

PROPOSITION 4. *For a given group, suppose that for each level of w , the distribution of radicalism becomes more disperse in the sense of Lorenz-worsening. Then the group will display less activism if the marginal utility of consumption is convex, and more activism if the marginal utility of consumption is concave.*

When will the marginal utility function be convex? Notice we have assumed that $u'(\cdot)$ becomes unboundedly large as consumption goes to zero. By itself, this implies that marginal utility cannot be concave on its entire support. For utility functions with a third derivative that does not change sign, this has to be positive. This is the case for the constant-elasticity utility functions in the family $u(y) = \frac{1}{1-\eta}y^{1-\eta}$, $\eta > 0$.

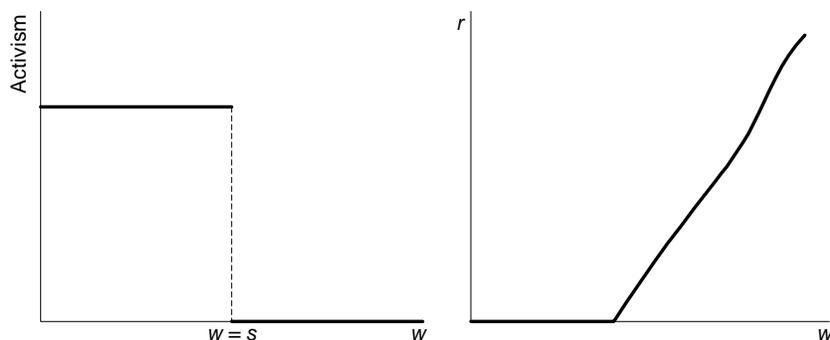


FIGURE 5. ACTIVISM AND CONTRIBUTION DECISIONS

Turning the proposition around, we see that greater cohesion in group radicalism increases group aggression if the marginal utility of consumption is convex. We have seen that this is indeed the case for the standard assumption that the utility of consumption is concave and of constant elasticity.

4.3.2. *Within-Group Inequality in Wealth.* Let us now examine the effect of increased within-group inequality in wealth. The simplest change in within-group inequality that does not perturb the correlation between resources and religious extremism is one that generates a Lorenz-change in wealth for every level of radicalism x , while leaving the population distribution of x completely unaffected. In what follows, we consider the implications of a deterioration in wealth distribution that has exactly this form.

To study the effects of this change, it will be useful to recall both the activism and resource contribution decisions made by various individuals. Figure 5 summarizes these. In our model, the activism decision is essentially mercenary (up to an inability to switch religious sides), and so is very simple. Each individual below the equilibrium compensation threshold supplies “one unit” of activism, and everyone above supplies none (panel A of Figure 5). The resource contributions r will depend on both radicalism x and wealth w ; panel B draws r as a function of w for some given level of x . For individuals with low wealth, r is set at zero; for them, (3) holds with an inequality. Thereafter r becomes positive and continues to rise as wealth increases.

Depending on how the distributional change affects earning capacities to the left and right of the activism threshold, there are — in principle — a number of cases to study. We illustrate by considering what we consider to be the most reasonable situation: that the worsening of inequality permits no one below the activism threshold to gain in wealth. Typically, this threshold would be quite low, and only the poor would participate. It is formally possible, but very unlikely, that a Lorenz-worsening of the overall distribution would actually permit such individuals to gain in wealth.

PROPOSITION 5. *For a given group, suppose that for each level of radicalism, wealth inequality worsens in the sense of Lorenz-deterioration, and that no activist in the going equilibrium gains wealth. Then, evaluated at the going equilibrium, the equilibrium response of the group must rise, so that in the new equilibrium there will be greater activism for the group.*

Thus, while inequality *across* groups may have ambiguous effects on conflictual tendencies, the verdict on inequality *within* groups is more clearcut. Inequality tends to heighten conflict for two reasons. First, heightened inequality will generally increase the supply of individuals

with low opportunity costs of activism, and in this way the supply of activists. Second and more importantly, it shifts wealth from those who contribute little or no resources to conflict and concentrates that money in the hands of those who are in a better position to make such contributions. The formal counterpart of this intuitive argument comes from taking another look at the second panel of Figure 5. If money is transferred from those who contribute no resources at all to those who do, contributions surely rise. However, it is also possible that transfers take place among those who are already contributors. In that case the net result will depend on the curvature of this “contribution function”. Because this cost function for contributions comes from some utility function for private consumption, it is easy to check that this positive stretch of the contribution function is *linear*. Therefore regressive transfers in this zone have no effect, unless it lands the losers in the zero-contributions segment, in which case the net effect on overall contributions will continue to be positive.¹⁷

4.3.3. *Correlating Wealth and Radicalism.* Our last exercise studies the effect of an increased correlation between radicalism and wealth.

A specific way to do this by leaving all marginal distributions unchanged is simply by changing moderates to radicals at high wealth levels and vice versa for lower wealth levels. More formally, fix a wealth pair (w_1, w_2) with $w_1 < w_2$ and a pair of radicalism levels (x_1, x_2) with $x_1 < x_2$ and construct a new distribution \hat{n}^h over types as follows:

$$(7) \quad \begin{aligned} \hat{n}^h(x_1, w_1) &= n^h(x_1, w_1) + \epsilon, & \hat{n}^h(x_2, w_2) &= n^h(x_2, w_2) + \epsilon, \\ \hat{n}^h(x_1, w_2) &= n^h(x_1, w_2) - \epsilon, & \hat{n}^h(x_2, w_1) &= n^h(x_2, w_1) - \epsilon, \text{ and} \\ \hat{n}^h(x, w) &= n^h(x, w) \text{ otherwise.} \end{aligned}$$

It should be clear from this construction that a change of this sort will positively affect overall contributions if higher wealth increases the marginal propensity to contribute from radicalism. If the lower wealth in question has zero contributions anyway, then this condition will hold automatically and the increased correlation between radicalism and wealth must increase the tendency for this group to engage in conflict.

The issue of an increased correlation of wealth and radicalism is of interest in several conflictual situations. Perhaps the most obvious instance, and one that has received the greatest amount of international attention, is the presence of large amounts of wealth behind terrorist activities linked to Al-Qaeda and similar fundamentalist groups. But there are several other examples, and they span different religious beliefs, not just Islam. In the example of Hindu fundamentalism that we have referred to in this paper, there is rising awareness of the role that rich Hindu expatriates play in the funding of organizations that explicitly lay down *Hindutva* goals.

5. CONCLUSIONS

We present a model of religious/ethnic conflict, in which discriminatory government policy or social intolerance is responsive to various forms of ethnic activism, including violence. It is this perceived responsiveness — captured by the probability that the government gives in and accepts a proposed change in ethnic policy — that induces individuals to mobilize in support for their cause. Yet, mobilization is costly and demonstrators have to be compensated accordingly.

¹⁷This discussion shows that if — in a more general model — contributions are strictly concave in income in the positive segment, a regressive transfer *could* bring down aggregate contributions, which works against our result. But it would not be sufficient. There is still the zone of zero contributions, which works in favor of the proposition, as well as the possible impact on the supply of activists, discussed in the main text.

An implication of our model is that the standard connections between the intensity of conflict on the one hand and inequality or polarization across or within groups on the other might be too simplistic. The interaction between the different relevant factors presents nuances that simple empirical tests would fail to capture. A sizeable literature is concerned about whether a particular change in the distribution of income, radicalism or population will precipitate or not an escalation of conflict. The empirical findings are far from clear. Our paper suggests that the lack of clarity may arise from at least three different sources.

First, given any changes in the relevant parameters, whether or not conflict escalates on both sides depends critically on whether the group experiencing the change is the less conflictual of the two to start with. Therefore, we should not expect significant empirical results unless this factor is explicitly controlled for. Indeed, we have attempted to argue that evidence of escalation or deterrence can tell us something about the identity of the party that experiences the initial change.

Second, in a multidimensional world we have to start by identifying the particular dimension that is key to each particular conflict. Specifically, even though wealth always plays an important role in conflict, it *does* matter whether a specific conflict is fundamentally played out along class or ethnic lines. In particular, while a reduction of within-group inequality in wealth might increase group cohesion in class conflict, it might actually weaken aggressive impulses in ethnic conflict. It follows that we cannot have the same kind of relation between inequality (or income-based polarization) and conflict *for all types of conflicts*.

Finally, our model shows that even in the case of an ethnic conflict, wealth plays a dual role. On the one hand, wealthier individuals may be predisposed to contribute more money to the cause. However, wealthier individuals are harder to mobilize. The net balance between the two opposing effects in the event of an overall increase in wealth critically depends on the *distribution* of wealth gains and not just the average gains.¹⁸

These last two points are related to a literature on modernization and conflict. There is evidence — Melson and Wolpe (1970), Olzak and Nagel (1986) and Tellis, Szayna and Winnefeld (1998) — that the process of modernization might ignite rather than moderate conflict. Our model allows to examine the implications of a general increase in wealth. In particular, we argue that the *distribution* of the benefits of this process of modernization turns out to be critical to the direction of the change in conflict.

The distributional issues have two facets: across groups and within groups. Wintrobe (1995), Robinson (2001) and Stewart (2002) put the emphasis on across-group inequality as a major explanatory factor for an escalation in ethnic conflict. Yet, as suggested by our analysis, a very uneven distribution of the benefits across groups, but very egalitarian within the beneficiary group, might have a limited effect on conflict. The additional resources might fail to mobilize a larger number of activists because their individual opportunity cost will be higher too.

On the other hand, Horowitz (1997) and Bates (1999), argue that increased within-group inequality has to have a major role in igniting conflict. Our results are aligned with Horowitz and Bates in that an increase in within group inequality will give more resources to the contributors without increasing (and perhaps even decreasing) the cost of mobilizing people. It follows that in these circumstances conflict will go up.

Finally, our model underlines a neglected factor: the correlation between religious passion and wealth. Higher correlation precipitates more conflict. It seems interesting to investigate whether the data confirm this prediction.

Our model can be improved in many directions. In the first place, we need an explanation for the origin of the very alternatives that are put forward to the population. Why might an ethnic

¹⁸In addition, it depends on the exact form of individual preferences, a point that we also note in the paper.

goal come to the forefront, rather than the more “classical” class objective of seizing economic power? Or is it economics all along, except that in some cases economic goals are better served using noneconomic cleavages such as ethnicity? This is the all-important question of group *salience*.

A second — and in our view important — line of progress is to endogenize individual attitudes, possibly in a dynamic model. One of the effects of proposals that we may judge as “extreme” today is that, by the mere fact of having been put forward, they become more acceptable tomorrow. It might well be that a moderate or a radical attitude is not absolute, but relative to what is being on the table today. This process might generate dynamics interesting to investigate. Finally, the gain from conflict should be made to include economic benefits as well as psychological ethnic pay-offs. Higher economic resources provide more means to confront the others, but it also provides a more attractive bounty to the other party in case of victory.

REFERENCES

- BATES, R.H. (1999), “Ethnicity, Capital Formation, and Conflict” *CID wp no. 27, Harvard University*.
- BECKER, G. (1968), “Crime and Punishment: An Economic Approach,” *Journal of Political Economy* 76, 169–217.
- BOURGUIGNON, F. (1979), “Distribution, Redistribution and Development: where do we stand?” *Desarrollo y Sociedad* 41, 23-52.
- BREWER, M.B. (1979), “In-Group Bias in the Minimal Intergroup Situation: A Cognitive-Motivational Analysis” *Psychological Bulletin* 86, 307-324.
- BREWER, M.B. (1991), “The Social Self: On Being the Same and Different at the Same Time” *Personality and Social Psychology Bulletin* 17, 475-482.
- BREWER, M.B. (1997), “The Social Psychology of Intergroup Relations: Can Research Inform Practice?” *Journal of Social Issues* 53, 197-211.
- CASELLI, F. AND W.B. COLEMAN (2002), “On the Theory of Ethnic Conflict” *mimeo*.
- COLLIER, P. AND A. HOEFFLER (1998), “On Economic Causes of Civil War” *Oxford Economics Papers* 50, 563-573.
- DUCLOS, J.-Y., J. ESTEBAN, AND D. RAY (2004), “Polarization: Concepts, Measurement, Estimation” *Econometrica* 72, 1737–1772.
- ESTEBAN, J. AND D. RAY (1994), “On the Measurement of Polarization” *Econometrica* 62, 819-852.
- ESTEBAN, J. AND D. RAY (1999), “Conflict and Distribution” *Journal of Economic Theory* 87, 379-415.
- ESTEBAN, J. AND D. RAY (2001), “Free Riding and the Group Size Paradox” *American Political Science Review* 95, 663-672.
- ESTEBAN, J. AND D. RAY (2005), “Salience: Ethnicity versus Class” *presented at Polarization and Conflict, Konstanz, June 2005*.
- FEARON, J. AND D. LAITIN (2003), “Ethnicity, Insurgency, and Civil War,” *American Political Science Review* 97, 75–90.
- HOROWITZ, D.L. (1985), *Ethnic Groups in Conflict*, Berkeley, University of California Press.
- HOROWITZ, D.L. (1997), “Self-Determination: Politics, Philosophy, and Law” *NOMOS* 39, 421-463.
- HOROWITZ, D.L. (1998), “Structure and Strategy in Ethnic Conflict” *ABCDE World Bank, Washington D.C.*

- MELSON, R. AND H. WOLPE (1970), "Modernization and Politics of Communalism" *American Political Science Review* 64, 1112-1130.
- MIGUEL, E., SATYANATH, S. AND E. SERGENTI (2004), "Economic Shocks and Civil Conflict: An Instrumental Variables Approach," *Journal of Political Economy* 112, 725-753.
- MONTALVO, J. G. AND M. REYNAL-QUEROL (2005), "Ethnic Polarization, Potential conflict and Civil War," *American Economic Review* 95, 796-816.
- OLZAK, S. AND J. NAGEL (1986), "Introduction" in S. Olzak and J. Nagel, *Competitive Ethnic Relations*, New York, Academic Press.
- PANDE, R. AND D. RAY (2003), "Preliminary Notes on Inequality and Conflict," mimeo.
- ROBINSON, J. (2001), "Social Identity, Inequality and Conflict" *Economics of Governance* 2, 85-99.
- SAMBANIS, N. (2001), "Do Ethnic and Non-Ethnic Civil Wars Have the Same Causes? A Theoretical and Empirical Enquiry (Part 1)" *Journal of Conflict Resolution* 45, 259-282.
- SKAPERDAS, S. (1996), "Contest Success Functions," *Economic Theory* 7, 283-290.
- STEWART, F. (2002), "Horizontal Inequalities: A Neglected Dimension of Development"wp UNU World Institute for Development Economics Research.
- TELLIS, A.J., T.S. SZAYNA, AND J. A. WINNEFELD. (1998), *Anticipating Ethnic Conflict*, Santa Monica, RAND Corporation.
- WINTROBE, R. (1995), "Some Economics of Ethnic Capital Formation and Conflict" in A. Breton et al. (eds) *Nationalism and Rationality*, Cambridge, UK, Cambridge University Press, 43-70.