

# COSTLY CONFLICT UNDER COMPLETE INFORMATION

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This paper studies costly conflict in a world of complete information, in which society can commit to divisible transfers among all potentially warring groups. The difficulty in preventing conflict arises from the possibility that there may be *several* conflictual divisions of society, each based on a different marker, such as class, geography, religion, or ethnicity. It is shown that this diversity of societal markers is particularly conducive to social instability when potential conflict is over private, divisible resources. In contrast, when conflict is over public goods, such diversity promotes social stability.

## 1. INTRODUCTION

There is a large literature on the initiation of costly conflict. All these models incorporate one essential feature of conflict: that it is fundamentally inefficient. Resources — both human and physical — are expended in order to meet some economic or political end. One might presume that the same ends could be foreseen and met through some other less costly device, such as negotiation. With rational agents, why do we observe conflict in the first place?

This sort of question is in the spirit of a political Coase theorem. Of course, intuition suggests that no such theorem is likely to hold in this setting, but *asking* the question in this way helps in classifying the different approaches to costly conflict that have been studied in the literature.

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First, there are issues of incomplete information. Fearon (1995), Esteban and Ray (2001), Baliga and Sjöström (2004), Bester and Warneryd (2006) and Sánchez-Pagés (2009) all write down models in which conflict is an equilibrium outcome even if it is costly (*ex post*). The simplest strategic setting in which this might occur is one in which both parties feel they have a better chance of getting the upper hand in a conflict, but several variations on this theme are possible.<sup>2</sup>

Second, there are issues of limited commitment. An allocation that Pareto-improves upon the conflict outcome will generally require transfers to implement, and there is no guarantee that those transfers will indeed be made once the occasion comes around to do so. The problem is particularly acute in intertemporal situations in which ongoing transfers are called for (Fearon (1995), Garfinkel and Skaperdas (2000), Powell (2004, 2009)). There may also be problems involved in committing *not* to attack once transfers have been made; see for instance, Slantchev (2003).

A third approach relies on the eminently sensible position that for some issues, compensating transfers are simply not available. What would be the compensating price that a fundamentalist Hindu might accept for the conversion of the Indian state to a Muslim *rashthra*? (Or vice versa?) There may be no such reasonable price that the opposing camp will be willing to pay. In that case conflict may be an equilibrium outcome (see, e.g., Kirshner (2000)).<sup>3</sup>

Finally, it may be that those who precipitate conflict do not fully internalize the costs of doing so (Jackson and Morelli (2007)). In particular, they may enjoy a disproportionate share of the potential benefits while incurring less than their

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<sup>2</sup>The classic paper by Myerson and Satterthwaite (1983), while having nothing to do with conflict, can be usefully modified to yield some of the insights.

<sup>3</sup>In this case, while conflict does not maximize the overall value of surplus, it will be *ex ante* Pareto-optimal within the class of feasible allocations.

fare share of the losses. This line may also be interpreted as a variation on the theme that appropriate compensating transfers are unavailable.<sup>4</sup>

The purpose of this short paper is to illustrate the possibility of conflict in a world in which complete information is available *and* society can commit to divisible transfers among all potentially warring groups. The difficulty in preventing conflict arises from the possibility that there may be *several* conflictual divisions of society, each based on a different marker, such as class, geography, religion, or ethnicity. Because conflict is inefficient, society can arrange — for every potential conflict — a set of transfers that Pareto-dominate the expected payoffs *under that conflict*. But it may be unable to find an arrangement that *simultaneously* prevents *all* such conflicts.

The paper considers two sorts of conflicts: one over private resources that can be divided up and shared (such as oil revenues), and the other over public goods (such as religious supremacy). A central goal is to show that these two sorts of potential conflicts have very different implications for political stability. Under the assumption that a variety of possible divisions are available, I show that the existence of private and divisible resources is likely to result in conflict. In contrast, if all resources are used for the production of public goods, a variety of potential divisions in society actually makes for stability. This is the crux of Propositions 1–3.

My arguments rely on the potential multiplicity of conflictual markers within any given society, a topic that has received some attention in recent work (Robinson (2001), Esteban and Ray (2008)). For instance, it may be that society can set up institutions that can adequately deal with the question of class conflict, only to be confronted by threats from a religious or geographical subgroup. In India

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<sup>4</sup>As in the previous case, conflict will generally be Pareto-optimal, if the leaders are included as a separate group of agents.

(an area that particularly interests me), several groups have challenged the center in conflictual situations: a casual list would include fundamentalists (both Hindus and Muslims), revolutionary groups based on class (such as the Naxalites), high-caste groups, the scheduled castes, geographical areas such as the North East States or the Punjab, agricultural labor, farmer groups, trade unions, industrial lobbies, and so on.

Now, it is entirely possible that these different markers all delineate essentially the same division of people: for instance, “poor” and “rich” might generate the same division as “North” and “South”. In that case my argument fails. In contrast, my argument is strongest when the different markers generate “orthogonal” divisions of society. Then a system of transfers set up to deal with one sort of division may be entirely useless when confronted with another.

This discussion suggests that one sort of transfer institution is already in place, and it is the sluggishness of its response to a different kind of threat that is responsible for conflict. While that may well be true, that is not the mechanism underlying my argument. The model I use has no such institution “already in place”. Rather, I argue that in some circumstances it may be logically impossible to design any one transfer institution that deals with all potential threats at the same time. This is an anti-Coaseian proposition, because it allows for an inefficient outcome even when there is complete information and perfect commitment.<sup>5</sup>

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<sup>5</sup>We are so used to thinking in Coaseian terms that this last assertion may come as somewhat of a surprise. Yet the Coaseian intuition often relies on there just being two “warring” parties, or at best some larger set of agents who cannot form subgroups, whereas in the present context all sorts of alliances can form. To someone familiar with the game-theoretic proposition that superadditive games may have an empty core, our approach is not at all unfamiliar. I should add, however, that the model I use does not generate a characteristic function, so that the classical results of cooperative game theory are inapplicable. Ray (2007) discusses newer developments in the theory of coalition formation that allow us to address situations that are more general than characteristic function. The present model represents a particular example of such a situation.

That said, the dynamic version of our model in which an institution designed for a particular purpose is already in place, only to be confronted by some new threat, may be a useful extension of the ideas presented here. Specifically, such an extension might explain why one salient division in society (such as class) may, over time, yield to a fresh salient division, such as ethnicity. This is because society becomes aware of the former division and might invest a lot to devise safeguards against it, only to be left vulnerable to an entirely new set of concerns. But this is the task of a future paper.

## 2. A MODEL OF POTENTIAL CONFLICT

**2.1. Peaceful Allocations.** Society is composed of a collection  $N$  of individuals of unit measure. Society has a total value  $v$ , which it can allocate among its members using transfers of money. This value may represent material or economic resources, or the value of ideological positions such as "a Hindu state". Just how this value is generated is indeed important to the results will be described in more detail below.

For now observe that (a) individuals are assumed to have linear utility in the transferable money, and (b)  $v$  represents the aggregate of "resources" that can be fully expropriated from all members of society. There may be other nonappropriable human or physical resources which we normalize to zero for everyone (by linearity, this normalization is unimportant).

An (peaceful) *allocation* is a real-valued (measurable) mapping  $x$  on  $N$  such that  $\int x(i) = v$ .

**2.2. Markers and Conflict.** A *marker* is a characteristic — such race, religion, ethnicity or class — which can be used to describe a subset of people. Thus we identify a marker with a coalition  $M \subseteq N$ .

A marker can precipitate conflict. I now describe conflict outcomes. For ease of exposition, I restrict myself to bilateral conflicts (see the remarks in Section 3.1). For any marker  $M$  of measure  $m$ , denote by  $\bar{M}$  its complement in  $N$ , with measure  $\bar{m} = 1 - m$ . Denote by  $\pi$  and  $\bar{\pi}$  the *per-capita* value of the prizes to  $M$  and  $\bar{M}$  respectively in the event of victory. Exactly how  $\pi$  and  $\bar{\pi}$  are related to each other (and to  $v$ ) will depend on the particular specification of the model; more on this below.

Conflict involves — on each side — the expending of individual efforts or resources  $r$ . The utility cost of that expenditure is given by

$$c(r) = (1/\alpha)r^\alpha$$

for some  $\alpha > 1$ . It is assumed that each group has circumvented the free rider problem,<sup>6</sup> and that a group leader extracts these resources from everyone to maximize total group payoff. Because the cost of effort provision is strictly convex, the group leader will ask for equal effort from each individual.

To map efforts into win probabilities, I adopt the simplest approach by using contest success functions (Skaperdas (1996)), so the probability that one side — say  $M$  — will win is given by

$$p = \frac{mr}{R},$$

where  $r$  is contribution per person in  $M$ , and  $R = mr + \bar{m}\bar{r}$  is the total of all contributions made in society. Therefore, once it precipitates conflict, marker  $M$  seeks to maximize its per-capita payoff

$$\pi \frac{mr}{R} - c(r)$$

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<sup>6</sup>What is needed is not a full circumvention of the free-rider problem but some partial resolution of it (see Esteban and Ray (2009) for a formalization of this remark).

and a similar problem is faced by the complement  $\bar{M}$ . A conflict equilibrium is just a Nash equilibrium of this game. Our extremely simple structure guarantees that equilibria are fully described by the first-order conditions

$$(1) \quad \pi m \bar{m} = R^2 \frac{r^{\alpha-1}}{\bar{r}}$$

for marker  $M$ , and by

$$(2) \quad \bar{\pi} m \bar{m} = R^2 \frac{\bar{r}^{\alpha-1}}{r}$$

for the complementary group  $\bar{M}$ . Conditions (1) and (2) yield a very simple expression for the relative efficacy of marker  $M$  in summoning individual resources:

$$(3) \quad \frac{r}{\bar{r}} = \left( \frac{\pi}{\bar{\pi}} \right)^{1/\alpha} \equiv \gamma.$$

We can use these conditions to describe the conflict payoff of each group. For group  $M$ , first rewrite (1) to observe that

$$r^\alpha = \pi p \bar{p},$$

so that the expected payoff from conflict is given by

$$(4) \quad v(M) \equiv \pi p - c(r) = \pi p - (1/\alpha)\pi p \bar{p} = \pi[kp + (1-k)p^2],$$

where  $k \equiv (\alpha - 1)/\alpha$ , which lies in  $(0, 1)$ . Finally, note that

$$(5) \quad p = \frac{mr}{mr + (1-m)\bar{r}} = \frac{m\gamma}{m\gamma + (1-m)},$$

where  $\gamma$  is defined in (3). Together, (3), (4) and (5) describe a closed-form solution to marker  $M$ 's group payoff in conflict equilibrium.

We now go into more detail by describing the structure of societal budget  $v$  and relating this to the payoff  $\pi$  in conflict equilibrium. Once we do this, the Pareto-inefficiency of conflict equilibrium will stand out very clearly.

We carry out the exercise for two leading cases: one in which the overall budget is a private good which is simply looted, and the other in which the budget must be used to provide public goods.

**2.3. Private Goods.** First suppose that the entire prize is a private good: just money. Say  $1 - \beta$  of it is destroyed, where  $\beta \in (0, 1]$ . Then  $\beta v$  represents the resources at stake, so that in any conflict induced by a marker  $M$ ,

$$\pi = \beta v / m \text{ and } \bar{\pi} = \beta v / (1 - m).$$

Using this information in (3), we see that

$$\gamma = \left( \frac{1 - m}{m} \right)^{1/\alpha},$$

so that (using (5)),

$$(6) \quad p = \frac{m^k}{m^k + (1 - m)^k},$$

where  $k = (\alpha - 1) / \alpha$ .

Notice from (6) that smaller groups are disadvantaged in conflict in the sense that they have a lower probability of winning; after all  $p$  is increasing in  $m$  and  $p(1/2) = 1/2$ . Nevertheless,

**Observation 1.** *Assume that the budget is private, and that under peace, society divides its overall budget equally among everyone. Then there exists  $m^* \in (0, 1/2)$  such that a marker with  $m < m^*$  will wish to engage in conflict.*



To see this, note that equal division (in peacetime) assures a marker a per-capita payoff of  $v$ , and if we combine this with expected per-capita payoff under conflict as given by (4) (with  $\pi = \beta v/m$ ), we see that a marker  $M$  will induce conflict provided that

$$(7) \quad \beta[kp(m) + (1 - k)p(m)^2] > m,$$

where  $p(m)$  is given by (6).

The function  $p$  has a “reverse-logistic” shape. It starts above the  $45^0$  line and at the point  $n = 1/2$  crosses it and dips below. The derivatives at the two ends are infinite.<sup>7</sup> With this in mind, observe that the left-hand side of (7) starts out (for small values of  $m$ ) higher than the right-hand side and ends up lower (for values of  $m$  close to 1). Indeed, we can strengthen this assertion and show that

$$\beta[kp(m) + (1 - k)p(m)^2] < m,$$

for any  $m \geq 1/2$ , so that conflict can never be preferable for any weak majority marker.<sup>8</sup>

It remains finally to show that there is a unique intersection (crossing from above to below) in the interior of  $m$ . This is done by showing that the derivative of  $\beta[kp(m) + (1 - k)p(m)^2]$  is strictly smaller than 1 at any intersection, so that there can be only one intersection; I omit the details. The proof of the observation is now complete.

Observation 1 shows that — under equal division of a private societal surplus in peacetime — conflict is preferable for small minorities. At the same time, there

<sup>7</sup>To check these claims, note that  $\frac{m^k}{m^k + (1-m)^k} \geq n$  if and only if  $m \leq 1/2$  (simply cross-multiply and verify this), and that  $p'(m) = \frac{km^{k-1}(1-m)^{k-1}}{[m^k + (1-m)^k]^2}$ , which is infinite both at  $n = 0$  and  $n = 1$ .

<sup>8</sup>Suppose this is false for some  $1 > m \geq 1/2$ . By the properties of  $p$  already established, we know that  $m \geq 1/2$  implies  $m \geq p(m)$ , so that  $km + (1 - k)m^2 \geq m$ , but this can never happen when  $m < 1$ , a contradiction.

is no reason to only consider equal division: after all, we are precisely interested in the case in which a Coaseian bargain can be struck through the use of suitable transfers. And for any fixed marker  $M$ , such a transfer is, indeed, available. This is because the sum of the two expected conflict payoffs is given by

$$\begin{aligned} mv(M) + (1 - m)v(\bar{M}) &= m\pi[kp + (1 - k)p^2] + (1 - m)\bar{\pi}[k\bar{p} + (1 - k)\bar{p}^2] \\ &= \beta v[kp + (1 - k)p^2 + k\bar{p} + (1 - k)\bar{p}^2] \\ &< v[p + \bar{p}] = v. \end{aligned}$$

Yet the key qualification in the argument above is that it holds for any *given* marker. The question is whether there is one allocation that *simultaneously* avoids conflict from *all* markers. If the variety of potential threats is large relative to the degree of inefficiency, the answer could be in the negative.

To formalize the idea of a “variety of threats”, say that a finite collection  $\mathcal{C}$  of markers is *balanced* if there is a set of weights in  $[0, 1]$ ,  $\{\lambda(M)\}_{M \in \mathcal{C}}$ , such that

$$\sum_{M \in \mathcal{C}, i \in M} \lambda(M) = 1 \text{ for every } i \text{ in society}$$

**Proposition 1.** *Assume that the prize is a private good. Suppose that there exists a balanced collection  $\mathcal{C}$  of markers, each with  $m < m^*$ , where  $m^*$  is given by Observation 1.*

*Then there is no peaceful allocation for society that is immune to conflict.*

To establish this, suppose that the conditions in the proposition are met, but that there is indeed a peaceful allocation  $\mathbf{x}$ . For every marker  $M \in \mathcal{C}$ , we have

$$(8) \quad \int_{i \in M} x(i) \geq \beta v[kp(m) + (1 - k)p(m)^2] > vm.$$

Pick a collection of balancing weights  $\{\lambda(M)\}_{M \in \mathcal{C}}$ . Multiplying each side of (8) by  $\lambda(M)$ , and adding over all markers in  $\mathcal{C}$ , we see that

$$\sum_{M \in \mathcal{C}, i \in M} \lambda(M) \int_{i \in M} x(i) > \sum_{M \in \mathcal{C}, i \in M} v m \lambda(M).$$

Because  $\{\lambda(M)\}_{M \in \mathcal{C}}$  are balanced, this implies

$$\int_{i \in N} x(i) > v,$$

a contradiction.

Balancedness of the collection of markers means that it is hard to “buy off” small groups of individuals who are central to all potential conflicts. Indeed, balancedness assures us that there is no such “central collection”. For instance, the configuration in the following corollary satisfies balancedness.

**Corollary 1.** *Suppose that society can be partitioned into markers of size  $m < m^*$ . Then there is no peaceful allocation for society that is immune to conflict.*

The proof of this is immediate once we recognize that a partition of a society into markers is indeed a balanced collection of markers.<sup>9</sup>

Sharper results are surely available if we factor in the extra surplus to small groups. For instance, suppose that the cost function is quadratic (so that  $\alpha = 2$ ). It is then easy to verify that  $m^* = 1/4$ . With groups of size 10%, enough to have six such pairwise disjoint groups to make conflict inevitable.

I stress that the mere existence of a balanced collection of threats is generally not enough to precipitate conflict. It is enough *in the case of private resources*. Let us understand why. With private goods, the intensity of conflict precipitated by small groups is high, because the per-capita payoff (if they do win) is large. To be sure, this does not overturn the fact they have a lower probability of winning

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<sup>9</sup>Use as balancing weights  $\lambda(M) = 1$  for every marker in the collection.

than big groups do:  $p(m)$  continues to be increasing in  $m$ . But the important point is that the *ratio* of the win probability divided by group size is very high. That fact is reflected in the reverse-logistic shape of the win probability, derived in the proof of Observation 1. This is why they pose a serious threat to peace.

The next section paints a different picture when the prize is public.

**2.4. Public Goods.** Now suppose that the societal budget can only be used to produce public goods. Specifically, suppose that there is a single unit of resources which can be used to produce one of several marker-specific public goods, one for each marker. I take the production function to be as simple as possible: one unit of the budget produces one unit of any of the public goods.

Assume that each person derives utility  $\Psi$  per unit from a marker-specific public good, when that marker pertains to her, and 0 otherwise. Then the problem of efficient social allocation is extremely simple: choose any marker  $M$  with the maximal membership:  $m^* \equiv m \geq m'$  for all markers  $M'$ . Devote the budget entirely to the production of that good. Compensate all other individuals with suitably chosen transfers.

Of course, this will not be possible in many cases. Professed ethnic supremacy, such as the adoption of a Hindu state, may not be capable of compensation (to non-Hindus) at *any* price. While we do not deny the importance of such nontransferabilities in the creation of conflict, our goal here is simply to examine the Coaseian argument when transfers are indeed possible.

In summary, then, societal worth  $v$  equals  $\Psi m^*$ , which is also its per-capita worth.

If a marker  $M$  precipitates and wins a conflict, the use of the grabbed budget is obvious: all of it will go to producing the public good for that marker. It follows that the per-capita worth of a marker (conditional on winning) is  $\pi = \beta\Psi$ , where

(just as before)  $\beta \in (0, 1]$  is the fraction of resources left intact after conflict. If, on the other hand, the complement  $\bar{M}$  wins the conflict, it will generally face a problem of allocation just as society as a whole did. This problem is solved in the same way:  $\bar{M}$  will produce the public good corresponding to any marker of maximal size within it. If  $\mu$  is the largest fraction of  $\bar{M}$  that is occupied by a single marker, the per-capita worth of a marker (conditional on winning) must be  $\bar{\pi} = \beta\mu\Psi$ . It follows that

$$(9) \quad \frac{r}{\bar{r}} = \gamma = \mu^{-1/\alpha},$$

while (as before) the win probability for marker  $M$  is given by

$$(10) \quad p = \frac{m\gamma}{m\gamma + (1 - m)}.$$

Overall expected payoffs per-capita to  $M$  are, therefore, given by

$$(11) \quad \beta\Psi \left[ k \frac{m\gamma}{m\gamma + (1 - m)} + (1 - k) \left( \frac{m\gamma}{m\gamma + (1 - m)} \right)^2 \right],$$

where  $k = (\alpha - 1)/\alpha$ .

Note that unlike the case of private goods (Observation 1), conflict is now more likely to be precipitated by a *large* rather than a *small* marker. If we use the same scenario of equal division as a benchmark, conflict will occur whenever

$$(12) \quad \beta\Psi \left[ k \frac{m\gamma}{m\gamma + (1 - m)} + (1 - k) \left( \frac{m\gamma}{m\gamma + (1 - m)} \right)^2 \right] > m^*\Psi.$$

Because the left-hand side of (12) is increasing in  $m$ , this inequality will hold (if it holds at all) for large values of  $m$ . (To be sure, we are controlling for the value of  $\mu$  in this argument.) I note in passing that this contrast might form the basis of an interesting empirical proposition regarding which groups initiate conflict, and the nature of the prize that the conflict is over. But this is not the main theme of the current exercise, to which I now return.

**Proposition 2.** *Assume that the prize is a public good. Suppose that the complement of every marker is also a marker.*

*Then there exists a peaceful allocation for society that is immune to conflict.*

To prove this proposition, observe that if  $\bar{M}$  is also a marker, then  $\mu = 1$  and so  $\gamma = 1$ . Therefore the expected per-capita payoff under conflict to marker  $M$  is given by

$$\beta\Psi \left[ k \frac{m}{m + (1 - m)} + (1 - k) \left( \frac{m}{m + (1 - m)} \right)^2 \right] < \Psi m \leq \Psi m^*.$$

It follows that the equal division of payoffs for society cannot be challenged by any marker.

Proposition 2 stands in striking contrast to Proposition 1. Let us understand why. As we have already discussed following Proposition 1, small groups exhibit a high win probability (relative to their group size) when the prize at stake is private and divisible. This effect is missing in the public goods case. The easiest way to see this is to recall (9) and (10), which together describe winning probabilities when the prize is public. This function is now of the order of group size, and the only advantage to the marker  $M$  stems from the possibility that its complement is “fragmented” by virtue of not being a marker in its own right. (In that case,  $\mu < 1$  and  $r/\bar{r} = \gamma > 1$ .)

If that fragmentation does not occur (and Proposition 2 assumes that it doesn't), then  $\gamma = 1$  and the win probability becomes exactly  $m$ , the size of the marker. In addition, there is the cost of conflict. Apart from the possibility that  $\beta < 1$  (though we don't need this to make the point), the cost of expended resources tells us that the expected payoff is  $\Psi$  weighted by a convex combination of the win probability and its square (see (11)). This last combination is bounded above by the win probability itself, which is just  $m$ , and we are done.

Our last proposition is simply a joint corollary of Propositions 1 and 2, and drives home the stark difference between the two cases:

**Proposition 3.** *Suppose that every subset of individuals can be a marker.*

*Then, if the prize is private, there is no peaceful allocation for society that is immune to conflict. If the prize is public, there is always such an allocation.*

The proposition is proved by simply noting that the conditions of Propositions 1 and 2 are both satisfied.

### 3. CONCLUDING REMARKS

I have deliberately chosen the starkest route to describing a complete-information theory of conflict, one that captures in a very simple way the essential difference between public and private budgets. There is no claim here that private goods conflicts must *always* break out, and that a public goods scenario must *always* be peaceful. But there is a clear sense in which the allocation of private, divisible resources is inherently prone to conflict. That sense relies fundamentally on the Pareto-Olson thesis that small groups are highly motivated in conflict — and therefore effective relative to their size. This effectiveness, in turn, threatens the stability of a peaceful society in the large. In contrast, there is no such *additional* effectiveness (over and above size) when large groups threaten conflict, which is the case when the budget is public. That makes for a more stable peace.

While the discussion above summarizes the central insight of the model, there are several extensions that might lead to fresh insights.

**3.1. Farsighted Stability.** Aumann and Myerson (1988), Chwe (1994), Bloch (1996), Ray and Vohra (1997, 1999) and Acemoglu *et al.* (2009) all formulate theories of coalitional stability when chains of deviations and counterdeviations might occur.<sup>10</sup> These ideas might be profitably applied to a theory of conflict.

Briefly, when a market precipitates conflict, the complementary group may itself find it profitable to disintegrate further into a collection of smaller coalitions, and a multilateral contest might ensue. If a marker consisting of farsighted individuals can predict this possibility, it will take it into account. There are several ways to solve for the equilibrium outcomes of such games.<sup>11</sup> It remains to be seen whether this modification fundamentally alters the results we obtain. I conjecture that it does not.

**3.2. Hybrid Models.** I have assumed that the budget to be seized is either private and divisible, or can only be spent on public goods. That assumption is made so that we can isolate the varying effects of privateness and publicness, but taken literally it is clearly unrealistic. The group that seizes the budget (or society as a whole for that matter) will optimally allocate resources among private and public goods, and the optimal allocation will generally depend on group size. This creates a hybrid model with potentially new avenues of exploration.

**3.3. Dynamics.** An issue that is entirely neglected in these notes is the question of marker cohesion. It is simply assumed that a marker can form and extract the necessary efforts from its members to achieve group ends. We do not have a good theory of how certain classifications (religious, geographic, or ethnic)

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<sup>10</sup>There is a large literature on the subject and the few references here do not do justice to it. See Ray (2007) for a recent overview.

<sup>11</sup>See, for instance, Bloch (1996) and Ray and Vohra (1997, 1999). For a literature on conflict along these lines (but without an explicit study of whether transfers can avoid conflicts) see, e.g., Esteban and Sákovicz (2004) and Bloch, Sánchez-Pagés and Soubeyran (2006).



might “gradually” acquire salience. A dynamic version of this model would have a particular peaceful allocation already in place, perhaps designed to ward off a pre-existing threat of conflict. For concreteness suppose that that preexisting threat is class conflict. Then society might develop institutions — progressive taxation, land reform, public provision of education or health care — that address that threat along class lines. Yet that very allocation may then spur the formation of a marker that’s orthogonal to the class marker, as members of that group realize that from the point of view of this new classification, there may be something to be gained from conflict. For example, religious divisions might acquire salience. Now existing institutions will have to be remolded, and perhaps new institutions formed, to deal with this new threat. In a world governed by Proposition 1, this two-step between marker formation and institutional adaptation could last for a very long time, as each allocation or institutional arrangement will be ultimately challenged. More significantly, even a potentially peaceful world governed by Proposition 2 could be so challenged: after all, there is no guarantee that the institutional response to the original threat (of class conflict) would be the one that fortuitously accommodates religious or geographical threats as well. This dynamic of sluggish institutional adaptation to similarly slow marker formation may be at the heart of many conflictual societies, and it will be worth studying in future research.

**3.4. Identity.** Sen (2006) has argued that multiple identities make for a more durable peace in a society, because they permit the same individual with a variety of perspectives. The analysis in this paper fully concurs with Sen’s idea when public goods (such as ideologies) are at stake. However, when multiple identities can be exploited to seize privately divisible resources, this paper shows that peaceful outcomes might be harder to come by.

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