

# **Inequality and Conflict**\*

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Over the second half of the 20th century, the frequency of conflicts within national boundaries increased. One-third of all countries experienced civil conflict. There are two remarkable facts about social conflict that deserve attention: first, within-country conflicts account for an enormous share of deaths and hardship in the world today, and second, internal conflicts often appear to be ethnic in nature. Which factors influence social conflict? Do ethnic divisions predict conflict within countries? How do we conceptualize those divisions? If ethnic cleavages and conflicts are related, how do we interpret such a result? Is ethnicity instrumental achieving political power or economic gain? We provide indices of ethnic diversity in the society, fractionalization and ethnic polarization, and find significant relationships with respect to social conflict.

*Keywords:* inequality, conflict, ethnicity

*JEL Classifications:* C51, D31

## **Summary of the Lecture**

I will start by giving a sense of the quantitative importance and nature of social conflict. Indeed, a substantial number of civil wars appear to be ethnic –non economic– in nature. Then I will discuss the measurement of social or ethnic divisions in a society, introducing the notions of fractionalization and of polarization of a distribution. I'll then present our modeling of ethnic conflict, allowing for potential

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economic or political gains. Using an approximation of the equilibrium of this game-theoretic model we obtain a simple, intuitive equation that permits to bring theory to data. This allows us to assess the importance of the different determinants, as they result from our theoretical model. Our empirical results show that the hypothesis that ethnic conflict is driven by secular hatreds has to be discarded. Both economic and political gains are important determinants of civil wars and social conflict in general. Ethnic divisions play a role only when they are combined with potential gains. Furthermore, the evidence suggests that in case of conflict individuals display a significant concern by the wellbeing of their fellow group members.

## The Ubiquity of Internal Social Conflict

### Basic Facts

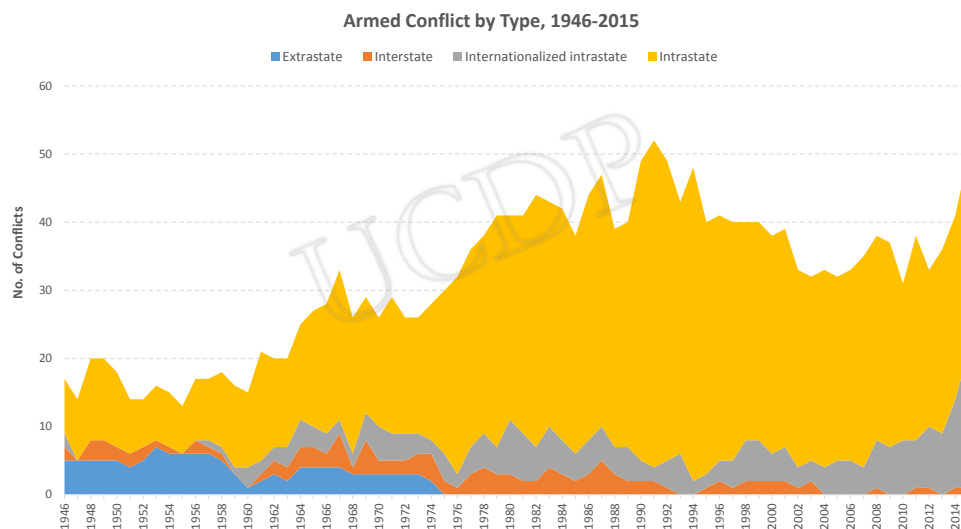
What do we mean by “social conflict” and how important is the topic? Some basic figures for the era after WWII give an immediate sense of the relevance of the topic. From 1945 to 2010, there have been 25 interstate wars with approximately 3 to 8 million casualties. In the same period, 240 civil wars took place in 73 states resulting in an approximate death toll of over 16 million, to which we should add 12 to 25 million civilian non-combatant casualties as estimated by the Political Instability Task Force.<sup>1</sup> In addition, we also have numerous cases of civil violence that, because they don't reach the threshold of 25 deaths in one year, are not recorded as violent conflict events. Besides the loss of human life, violent conflicts also have a negative impact on economic performance and, what is even worse, on the fragility of the state.

Figure ?? depicts the number of ongoing violent conflict events since 1946. Here we have the different conflicts classified by type: Extrastate (colonial wars), Interstate (between countries), Intrastate (domestic civil wars), and Internationalized Intrastate (civil wars with international intervention). In the first place, observe that the total number of ongoing conflicts has remained at the same level since the mid 70s. A second observation is that the end of the Cold War brought a momentary decline in the number of conflicts. But the number of conflicts is picking up again since the change of century. In the third place, it is remarkable that the increase in the number of conflict events since the early 70s have been almost entirely due to civil wars.

It is often believed that these conflicts predominantly occur in Africa or in some distant areas of the world. Figure ?? clearly shows that all the continents are prominently present. Most of the conflicts take place in Asia, followed by Africa and the Middle-East, but also in Europe and America. Violent social conflict is a

<sup>1</sup><http://globalpolicy.gmu.edu/pitf/pitfcode.htm>.

**Figure 1**  
Active conflicts by type, 1946-2016



Source: Uppsala Conflict Data Program (UCDP) updated 2017, Obtained from Melander E, Pettersson T, Themnér L. (2016).

universal problem.

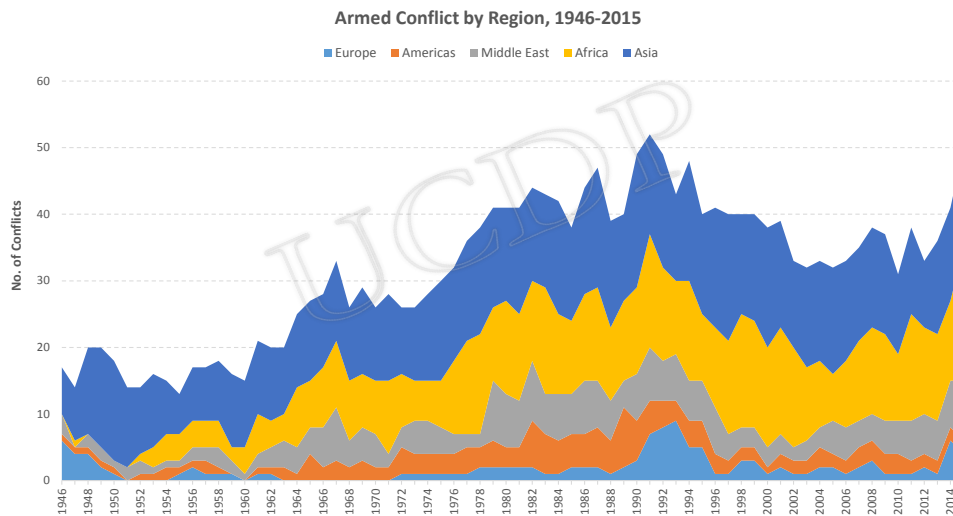
### Some Features of Violent Social Conflict

In this lecture I wish to focus on the fact that social conflicts often appear to be ethnic in nature. By this I mean that they appear to be informed by religion, nationalism, or other ethnic differences, rather than driven by economic class cleavages.

During most of the 20th century, class struggle, or more generally, economic inequality has been viewed as the main driver of social conflicts in industrial or semi-industrial societies, reflecting Marx's dominant influence in the social sciences. As commented by Sen (1973): "The relation between inequality and rebellion is indeed a close one." Hence, researchers would expect to find empirical evidence for the relationship between income inequality and the occurrence of social conflicts. However, this relationship has garnered no empirical endorsement.

Lichbach (1989) mentions forty three empirical papers on the inequality-conflict nexus and concludes that the overall evidence obtained by all these works is thoroughly mixed. Some studies support each possible relationship between inequality and conflict, and others show no relationship at all. Midlarsky (1988) remarks on the "fairly typical finding of a weak, barely significant relationship between inequality and political violence . . . rarely is there a robust relationship between the two variables."

**Figure 2**  
Active conflicts by region, 1946-2015



Source: UCDP (updated 2017), Obtained from Melander E, Pettersson T, Themnér L. (2016).

The relationship between inequality and class conflict appears to be non-monotonic at best. For instance Tocqueville [1856] observes that “the French found their condition the more insupportable in proportion to its improvement. (...) Revolutions are not always brought about by a gradual decline from bad to worse.” Long ago, Nagel [1974] found empirical evidence showing that social conflict is low both under complete equality and under extreme inequality. Similarly, Midlarski [1988] and Muller, Seligson and Fu [1989] observe that alternative notions such *patterned inequality* and *bifurcated inequality* appear to fit better the data.

Ethnic conflict seems far more prevalent than class conflict. Brubaker and Laitin (1998) examine the history of internal conflicts in the second half of the twentieth century and are led to remark on “the eclipse of the left-right ideological axis,” and the “marked ethnicization of violent challenger-incumbent contests.” Horowitz (1985), a monumental treatise on the subject of ethnic conflict, observes that “[the] Marxian concept of class as an inherited and determinative affiliation finds no support in [the] data. Marx’s conception applies with far less distortion to ethnic groups.” They suggest that political conflicts are rather based on ethnic identities that try to enhance political power.

If a class only consists of individuals with low income, they do not have the means to successfully challenge the rich class of society. However, if an economic conflict is disguised as an ethnic conflict, a broader group alongside the income range identifies themselves as one class. Ethnic differences clearly define your op-

ponent and eventually it is easier to gain political power. This leads to the hypothesis that ethnic differences are instrumentally used to obtain economic or political gains. I will refer to this point later again.

Looking at all these widespread natures of conflicts, a number of questions come to mind:

1. Do “ethnic divisions” predict conflict within countries? If we see countries with large ethnic diversity, are those countries more exposed to social conflict?
2. How do we conceptualize those divisions? What does ethnic division mean?
3. If it is indeed true that ethnic cleavages and conflicts are related, how do we interpret such a result?
4. Is ethnic conflict driven by “primordial”, ancestral ethnic hatreds?
5. Else, are they driven by “more rational” forms of antagonism, such as the instrumental use of ethnicity to achieve political power or economic gain?

#### **Overview of the existing literature**

First contributions to the quantitative study of the role of ethnicity in civil conflicts come from Collier (2001), Collier and Hoeffler (2004), Fearon and Laitin (2003), Miguel et al. (2004), Montalvo and Reynal-Querol (2005), all surveyed by Blattman and Miguel (2010).<sup>2</sup> These research papers suggest that ethnic differences are highly important in explaining social conflict. However, this assessment was not supported by the data; Fearon and Laitin (2003) and Montalvo and Reynal-Querol (2005).

Nonetheless, these authors raised several important questions:

1. What drives ethnic conflicts?
  - Greed: the main goal is to allocate rents after controlling the state and the natural resources.
  - Grievance: the main goal is the ethnic pride or revenge for ancestral grievances.
2. Why is ethnicity relevant?
  - Primordialist: Ethnicity plays a role because of ancestral hatred between ethnicities for many generations. This is also described by Huntington (1996)’s clash of civilizations and implied in many case studies.

<sup>2</sup> See Ray and Esteban [2017] for a recent survey on conflict and development.

- Instrumentalist: Ethnicity is used as a marker to achieve other goals, typically political or economic benefits. This goes in line with the aforementioned aspect.

In other words, if a group can be defined as primordialist, there are no material or political gains which drive the motivation for a potential conflict whereas an instrumentalist only acts if gains can be expected.

### Measuring Diversity

#### *The Fractionalization Index*

How can we measure ethnic diversity?. The most popular measure of ethnic diversity applied in the literature is the index of *fractionalization*, which is no other than the Hirschman-Herfindahl index:

$$F = \sum_i n_i(1 - n_i) = 1 - \sum_i n_i^2 \quad (1)$$

where  $n_i$  is the proportion of the population belonging to ethnic group  $i$ .

This index measures the probability that two randomly chosen individuals belong to different ethnic groups. The relationship between this probability and ethnic conflicts has been tested empirically, but did not reveal clear results. Moreover, Fearon and Laitin (2003) and Montalvo and Reynal Querol (2005) come to the conclusion that ethnic fractionalization is not statistically significant in explaining conflicts.

This comes with no surprise as the Hirschman-Herfindahl index does not represent ethnic structures which are crucial for defining the drivers of social conflicts. Social conflict requires society to be divided by one or more cleavages that define the contending groups. But if society is fractured in too many dimensions, it may become impossible to define a basic, effective social divide. In that respect, the index of fractionalization does not score well. From any given starting situation, the index increases as we split the existing groups into smaller and smaller subgroups. It attains its maximum when every individual is considered a differentiated ethnic group. But, it seems intuitively clear that in such an environment, there might be small inter-personal conflicts but there can hardly be a social split. Thus, the Hirschman-Herfindahl index is not a good indicator for potential conflict.

#### *Polarization and social antagonism*

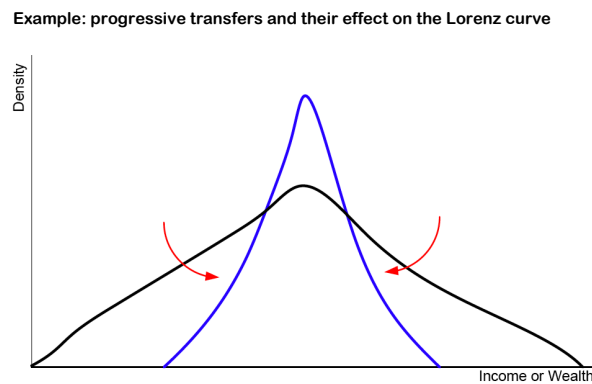
In contrast, the measures of *polarization* are designed to capture the split into a small number of large social groups, and thus seem more appropriate in order to

capture potential conflict.<sup>3</sup> The notion of the degree of polarization exhibited by a distribution is meaningful for all types of variables: wealth or income distribution, political position in the left-right spectrum, ethnicity, etc.

Let me start by discussing why the standard measures of inequality cannot do a good job as an indicator for social conflict. Consider the fundamental principle satisfied by all the basic inequality measures: the Dalton's principle of progressive transfers. This principle says that, if one unit of income is transferred from any individual to one poorer than her, inequality decreases. Furthermore, whenever it is possible to move from one distribution to a new one by means of progressive transfer, the Lorenz curve of the new distribution dominates the curve of the original distribution.

The following Figure depicts the effect of progressive transfers.

**Figure 3**  
**Example I: progressive transfers and their effect on the distribution of income**



Own graph

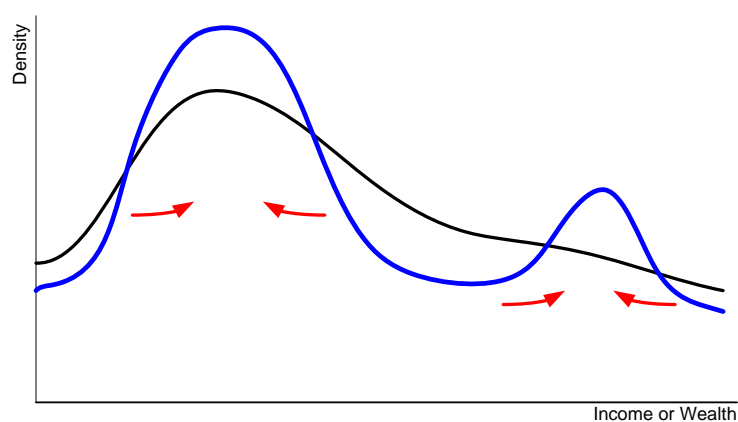
Figure 3 shows an example how a progressive transfer affects inequality. After transferring from the top to the lower end of the distribution, the blue function indi-

<sup>3</sup>The first published characterization of a measure of polarization is in Esteban and Ray (1994), where we also emphasize the link with social conflict. The conflict-polarization nexus has been examined in Esteban and Ray (1999). The measure of polarization for continuous distributions in Esteban and Ray (1991) and Duclos, Esteban and Ray (2004). Contemporary with our first contribution, Wolfson (1994) independently developed a measure of bi-polarization, based on the earlier work by Foster and Wolfson (1992, 2010).

icates a higher concentration. It is intuitive that the transfer implies more concentration in the middle of the distribution and less inequality. However, this perspective does not state anything about the potential of social conflicts.

I assume another scenario, where income is transferred from the top of the distribution to the upper middle class, forming a more homogeneous and larger rich class. We do that for the poor as well, transferring from the lower middle class to the very poor resulting in a more clearly defined poor group. This is depicted in the following Figure.

**Figure 4**  
**Example II: progressive transfers and their effect on the distribution of income**



Source: own graph

Figure 4 shows another distribution. Within the society, income is more equally distributed, but there is a large group of rich and of poor. The two types of progressive transfers suggested by figure 4 will lower all typical inequality measures. Nonetheless, this new society with two well defined groups can potentially be more conflictual than the initial one, even though there is less inequality. What happened is that groups are now economically well defined. Being “rich” or “poor” has become more visible and social groups have formed.

This is an example for income, but we can think as well of the same change of the distribution of political positions, left to right. Again, the degree of inequality in political positions would have decreased [from a “statistical” point of view], but the outcome can be more conflictual as a polarized society tends to display more conflict than one with wide-spread political preferences. In sum, less inequality indicated by standard indices does not necessarily imply that the probability of social conflict reduces as well.

Let me give a more specific content to the previous intuitive (and imprecise)



ideas, under the assumption that social antagonism between individuals and society is the main cause of social conflict. This was the main building block of the axiomatization of the notion of polarization in Esteban and Ray(1994).

As a first step, we need to define antagonism and polarization:

- Antagonism is the degree of opposition between a member of group  $i$  towards a member of group  $j$ . This can be captured by the joint effect of  $i$ 's group identity—which depends in our model on the the group size  $n_i$ , *i.e.*  $\Phi(n_i)$ —and the alienation, the distance of individual  $i$  from the members of the other group  $j$ , *i.e.*  $\Psi(d_{ij})$ .
- Polarization,  $P$ , is the sum of all inter-personal antagonisms which exist in a society. This leads to the following equation:

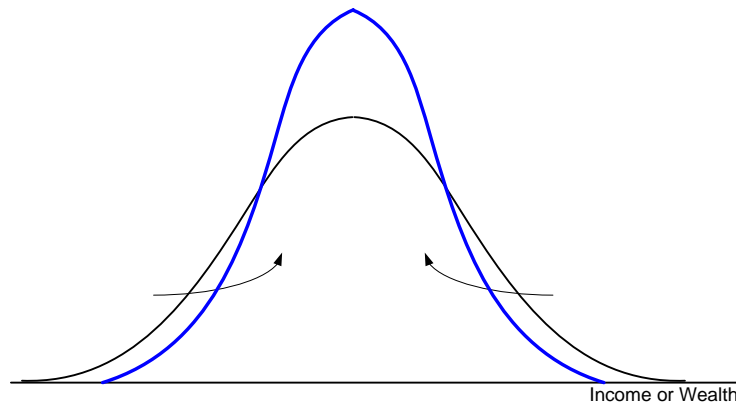
$$P = \sum_i n_i \sum_j n_j A[\Phi(n_i), \Psi(d_{ij})]. \quad (2)$$

This equation cannot be applied directly to data as the functions  $A[\Phi(n_i), \Psi(d_{ij})]$  are unknown. We focus on the case of continuous distributions. Duclos, Esteban and Ray (2004) propose three axioms that a measure of polarization should satisfy:

- Axiom 1: Suppose that the overall distribution is symmetric around the mean and it is unimodal. If the overall society is more concentrated by a compression towards the mean, the degree of polarization decreases.

Suppose we observe distributions as in figure 5 (black). The new distribution, the blue one, is less polarized than the black one, because everybody shifts towards the center. In this case, inequality and polarization in society both decrease.

**Figure 5**  
**Polarization: Axiom 1**

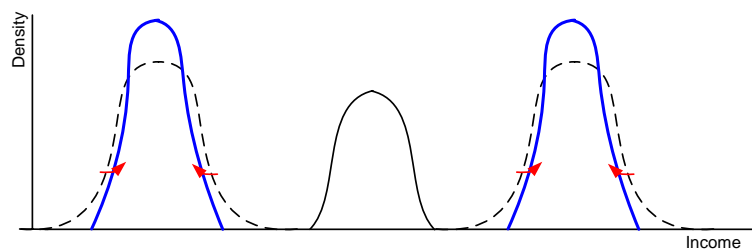


Source: Duclos, Esteban and Rey (2004), p. 7

- Axiom 2: Suppose that the overall distribution is symmetric with respect to the mean and consists of three bounded intervals with strictly positive probability: the center and the extremes. If the extremes of the distribution become more concentrated by a compression towards their local mean, the degree of polarization increases.

In figure 6, there are two extreme groups. A higher concentration within these groups, indicated by the blue distribution is likely to increase the degree of polarization as the groups become internally more cohesive and externally more differentiated.

**Figure 6**  
**Polarization: Axiom 2**



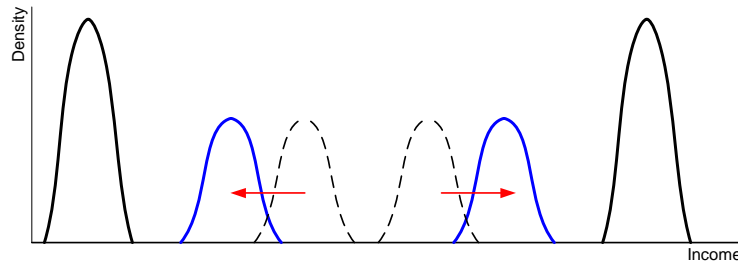
Source: Duclos, Esteban and Rey (2004), p. 8

- Axiom 3: We now have a symmetric distribution with the population con-

centrated on four non-overlapping bounded intervals. We can think of them as corresponding to poor, lower middle class, upper middle class and rich. If the two center distributions each one shifts towards the closest extreme group, polarization goes up.

In figure 7, the two center distributions move towards the extremes, indicated by the blue distribution. When measuring polarization, the index should increase.

**Figure 7**  
**Polarization: Axiom 3**



Source: Duclos, Esteban and Rey (2004), p. 9

Duclos, Esteban and Ray (2004) prove that a polarization index satisfies the three axioms and defines polarization as the “sum” of inter-personnel antagonisms, if and only if it can be written as

$$P = \int \int f(x)^{1+\alpha} f(y) |x - y| dx dy \text{ with } \alpha \in [0.25, 1] \quad (3)$$

Esteban and Ray (1994) derive the analog for discrete distributions:

$$P = \sum_i \sum_j n_i^{1+\alpha} n_j d_{ij} \quad (4)$$

where  $n_i$  is the relative population size of group  $i$  and  $d_{ij}$  is the alienation, distance between members of group  $i$  and of group  $j$ .

The parameter  $\alpha$  indicates the sensitivity towards polarization. In our conflict model and the subsequent empirical test we shall work with discrete distributions and will take  $\alpha = 1$ .<sup>4</sup> Therefore, our measure of polarization will be:

$$P = \sum_i \sum_j n_i^2 n_j d_{ij}.$$

<sup>4</sup>Montalvo and Reynal-Querol (2005) use an index of polarization in which all inter-group distances are  $d_{ij} = 1$ . This measure is  $RQ = \sum_i n_i^2 (1 - n_i)$ .

As an aside comment, we want to underline that when the sensitivity towards polarization disappears —and  $\alpha = 0$ — we obtain the Gini-Greenberg index of dispersion:

$$G = \sum_i \sum_j n_i n_j d_{ij}.$$

Here, the size of groups enter only as a frequency and not any longer as an indicator of group identification, as it is the case in the measure of polarization.

Our motivation for the interest of a measure of social division is that deeper divisions breed violent social conflict. We shall now develop a game-theoretic model of conflict and study how the equilibrium intensity of conflict depends on a series of determinants, including different measures of ethnic division.

### A Model of Ethnic Conflict

How does the degree of polarization relate to social conflict? In order to answer this question, we build a simple model of conflict (Esteban and Ray, 1999, 2011a, and Esteban, Mayoral and Ray 2012a, 2012b) that includes individual political preferences and motivations.

The core idea of the conflict model is as follows. In a society, there is a variety of opposing interests. Yet societies have built various political mechanisms designed to yield a collective decision. For instance, in a majoritarian democracy the minority accepts that the majority chooses the policies to implement. We say that we are in a situation of conflict when at least one of the social groups challenges the outcome of the status quo political mechanism.

Lacking a generally agreed mechanism for a collective decision, individuals see the outcome of this challenge as uncertain, probabilistic. And one's win probability can be increased by expending resources, time, or finances. In this situation, the strategies consist of the volume of resources expended as a best response to the resources expended by the other competing groups, all trying to modify the probability of victory. We make the standard assumption that the probability of success depends on the relative amount of resources, that each group is spending. Then, a Nash equilibrium is an array of expenditures by the different players such that all are best responses to each other.

I now introduce the precise conflict model we shall work with.

There are a number of groups in conflict,  $i = 1, \dots, m$ , with population size of  $N_i$ . The total population is  $\sum_{i=1}^m N_i = N$ . We shall also use the relative size of each group  $n_i = \frac{N_i}{N}$ .

Let  $r_{ik}$  be the resources contributed by individual  $k$  belonging to group  $i$  to increase the win probability for the own group  $i$ . These resources will imply a loss

in her payoff of  $c(r)$ , a strictly convex function.<sup>5</sup>

Adding up all resources contributed in support of group  $i$  we have that  $R_i = \sum_{k \in i} r_{ik}$ . The total resources wasted by society are  $R = \sum_{i=1}^m R_i$ . We shall use  $R$  as an indicator for the intensity of conflict. Therefore, the probability of conquering power is  $p_i = \frac{R_i}{R}$ ,  $i = 1, \dots, m$ .

The winning group rules the government and decides on general policies and on the allocation of economic resources. The public resources are of two types. One type is the monetary transfers that can be allocated to the different segments of society. We denote by  $\mu$  the per capita budget in the hands of the government. We assume it be entirely transferred to the own groups  $i$  so that the economic transfer per individual member of group  $i$  is  $\frac{\mu}{n_i}$ . Note that  $\mu$  can simply be the extra allocation with which the winning group compensates their members, not necessarily the entire financial resources. This differential transfer can come from rents obtained from natural resources and materialize not only as monetary transfers, but also as reallocation of scarce land or the building of infrastructures in the own region. The magnitude of such appropriable surplus depends on the source of this revenue. When the surplus is essentially furnished by rents on natural resources it is more easily appropriable than when it has to be raised through increased taxation.

The second type of decision that the government makes concerns the provision of the public good this group likes most. As examples of such public goods we have in mind the use of the capacity of establishing the legislation preferred by the group in power, the enjoyment of ethnic or religious dominance [also hatred], the support of the own religion, imposing the own language and so on. This public good affects the entire population, even the individuals of the opposing groups. How an individual of group  $i$  values the dominance by group  $j$  depends on two different elements. In the first place, there is an "objective" cultural difference. For instance the two groups may speak different languages or have different norms of behavior. We shall denote by  $u_{ij}$  the "objective" payoff to  $i$  from having  $j$  in power and  $u_{ii} > u_{ij}$ . Then, the "objective" cultural distance between individuals  $i$  and  $j$  is  $d_{ij} = u_{ii} - u_{ij} > 0$ .

The second critical element of how important the "objective" cultural distance is to individuals of group  $i$  also depends on the level of tolerance or repression of the cultural differences displayed by  $j$  in power. We specifically assume that the objective differences are enhanced by a factor  $\pi$ , increasing in intolerance. We are expressing the payoff in terms of monetary value. Hence,  $\pi$  measures the current monetary value of an "objective" valuation  $u_{ij}$ . For instance, the cultural distance between Kurds and Turks in Turkey is exacerbated by the repressive policy of the government towards Kurdish culture and we expect the loss by the Kurds can be

<sup>5</sup>In Esteban and Ray (2008) and (2011b) we allow individuals to contribute time and/or money. This permits the analysis of the complementarity between activists and finances for an effective mobilization. We are not addressing this issue here.

seen as equivalent to a large income loss. But, similar cultural/linguistic differences are moderated by decentralization policies as in Belgium or Spain, for instance. Here we would expect the money equivalent of similar objective cultural distance be much less than in the Turkish case. Therefore, the valuation by individuals of group  $i$  of group  $j$  be in power, as far as the public good is concerned, is  $\pi u_{ij}$ .

Taking into account the public and private good benefits, an individual of group  $i$  has a payoff of  $\pi u_{ii} + \frac{\mu}{n_i}$ , if the own group wins the conflict and  $\pi u_{ij}$  if group  $j$  wins the conflict. Thus, the net expected payoff  $\vartheta_i(k)$  for an individual  $k$  as member of group  $i$  is

$$\vartheta_i(k) = \sum_{j=1}^m p_j \pi u_{ij} + p_i \frac{\mu}{n_i} - c(r_i(k)). \quad (5)$$

The first part of equation (5),  $\sum_{j=1}^m p_j \pi u_{ij}$  represents the expected payoff from the public good  $\pi u_{ij}$ . The probability that one group gains political control is captured by  $p_j$ . Summing up all possible events leads to the overall expected payoff from the public good. In addition, we assume possible private benefits  $\frac{\mu}{n_i}$ , which only occur when the group  $i$  wins the conflict. Thus, the private pay off per capita is multiplied with  $p_i$ . Finally, there are individual utility costs from the amount of resources  $r$ , invested in the conflict and that are lost irrespectively of the outcome of conflict.

We now extend the model to allow individuals to be (partially) altruistic. We shall assume that individuals care about their own direct, personal utility and also assign some weight  $\alpha$ , to the utility of the other fellow group members. This leads to the extended utility function:

$$\begin{aligned} V_{i(k)} &= \vartheta_i(k) + \alpha \sum_{\ell \neq k \in i} \vartheta_i(\ell) = (1 - \alpha) \vartheta_i(k) + \alpha \sum_{\ell \in i} \vartheta_i(\ell) \\ &= \left[ (1 - \alpha) + \alpha n_i \right] \left[ \sum_{j=1}^m p_j \pi u_{ij} + p_i \frac{\mu}{n_i} \right] - c(r_i(k)) - \alpha \sum_{\ell \neq k \in i} c(r_i(\ell)). \end{aligned} \quad (6)$$

The variable  $\alpha$  describes the degree of altruistic behavior. One extreme would be  $\alpha = 0$ , when individuals only care about their private payoff. The other extreme corresponds to  $\alpha = 1$ , when individuals only care about maximizing the aggregate utility of their fellow group members.

Individuals unilaterally choose  $r_i(k)$  without assuming any sort of direct group coordination in individual choices. Hence individuals are assumed to free-ride each other to some extent. Parameter  $\alpha$  measures the extent of the assumed free-riding: maximum when  $\alpha = 0$  and nil when  $\alpha = 1$ . We are agnostic on how important this altruism factor is. We shall let the data speak.

## Equilibrium

Given the extended payoff function each individual  $k$  of each of the groups  $i$  chooses the optimal contribution of resources to conflict. The aggregate of these contributions determines the win probability of each group and hence the expected marginal gain from the contributed resources. Since these gains are conditional to the choices made by all other players, each chosen  $r_i(k)$  is the best response to the contribution of the others. A Nash equilibrium of this game is a stationary array of contributions in which no player finds it optimal to deviate from her contribution.

Before we derive the first-order condition for a utility maximizing choice, we transform equation (6), rewriting the expected payoffs in terms of losses relative to the payoff they obtain in case of victory. The individual total loss in the private and public payoff in the case of victory of group  $j$  is

$$\Delta_{ij} \equiv \pi d_{ij} + \frac{\mu}{n_i}, \text{ for all } j \neq i \text{ and } \Delta_{ii} = 0.$$

Thus, the expected direct individual payoff of equation (5) can be rewritten as

$$\vartheta_i(k) = u_{ii} + \frac{\mu}{n_i} - \pi \sum_{j=1}^m p_j \Delta_{ij} - c(r_i(k)).$$

Finally, the modified extended utility function is

$$V_{i(k)} = \left[ (1 - \alpha) + \alpha n_i \right] \left[ u_{ii} + \frac{\mu}{n_i} - \pi \sum_{j=1}^m p_j \Delta_{ij} \right] - c(r_i(k)) - \alpha \sum_{\ell \neq k \in i} c(r_i(\ell)).$$

This payoff is concave in  $r_i(k)$  and hence the optimal choice is characterized by the first order condition. Differentiating with respect to  $r_i(k)$  and multiplying by  $r_i(k)$  throughout, we obtain

$$c'(r_i(k)) r_i(k) = \pi \left[ (1 - \alpha) + \alpha n_i \right] p_i \sum_{j=1}^m p_j \Delta_{ij}. \quad (7)$$

This first order condition implicitly characterizes the optimal  $r_i(k)$ , conditional on the choices of individuals in the other groups  $j \neq i$  and of the own group,  $j \neq k \in i$ . In an equilibrium condition (7) has to be satisfied by every individual. We add up this condition over the entire population and assume that, at equilibrium,  $p_i \approx n_i$  for all  $i$ . Writing  $\lambda = \frac{\pi}{\pi + \mu}$ , and opening up  $\Delta_{ij}$ , we obtain that in equilibrium the following condition has to be satisfied:<sup>6</sup>

<sup>6</sup>This approximation result is proven in Esteban and Ray (2011a).

$$\frac{c'(\rho)\rho}{\pi + \mu} \approx \alpha [\lambda P + (1 - \lambda)F] + (1 - \alpha)\lambda \frac{G}{N} + \frac{\text{Constant}}{N}, \quad (8)$$

where  $\rho$  is the average, per capita, expenditure in conflict resources and  $P, F$  and  $G$  are as defined above.

Let us interpret expression (8). The numerator of the left hand side is the value of the per capita resources expended in conflict using the marginal rate of substitution of conflict resources to income as the “shadow price”, evaluated at the average per capita expenditure. The denominator is the per capita money value of the private and public goods payoff. Hence, the ratio is an indicator of the intensity of conflict relative to what is at stake.

The right-hand side is a linear function of the indices of polarization, fractionalization and Gini [divided by the total population] measuring the level of ethnic division. Notice that we have *derived* from the equilibrium condition that the intensity of conflict is linear in three dispersion indices. Furthermore, observe that each index is interacted with coefficients that the model helps us to interpret.

Suppose first that  $\lambda = 0$ , so that the payoff is exclusively monetary. In this case, the only thing that matters is whether the group wins, and cashes in the prize, or not, and some other group does. If one’s group is not the winner, it is irrelevant who won and the inter-group cultural distances. Notice in (8) that in this case, the only relevant index is  $F$ , which uses the size of the groups but not the inter-group distances. At the other end, when  $\lambda = 1$  the prize is purely public and hence all individuals will be concerned about which group is the winner. In that case,  $P$  and  $G$  count in determining the level of conflict, as the two depend on the inter-group distances.

These indices are also multiplied by  $\alpha$ , and  $(1 - \alpha)$ . When individuals are fully egotistic and have  $\alpha = 0$ , only the  $G$  index counts. This is consistent with the fact that  $G$  is linear in the population weights. When individuals have maximum care about the fate of their group and  $\alpha = 1$  only  $P$  and  $F$  are relevant. Both are non-linear in the group sizes and hence capture whether society is composed of a few large groups or many and small, as this is critical for group behavior in conflict.

Finally, I would like to underline that the equilibrium approximation condition (8) tells us how the independent variables of the privateness/publicness of the prize and of the degree of group commitment interact with the three indices of ethnic diversity. We shall use this fact in our empirical analysis.

### **Ethnic Conflict: an Empirical Analysis**

In this part of my talk I will summarize the results of the empirical analysis of our model in Esteban, Mayoral, and Ray (2012a,b). The equation to estimate is



$$\text{conflict intensity} = b_1\alpha(1 - \lambda)F + b_2\alpha\lambda P + b_3X + \text{error}. \quad (9)$$

Equation 9 is directly derived from equation (8). For the sake of brevity I have excluded  $\frac{G}{N}$ , as we did in Esteban, Mayoral and Ray (2012b).

The *dependent variable* is conflict intensity,  $X$  refers to a set of controls, and the key *independent variables* are the importance of material and moral payoffs, *i.e.*  $\lambda$ , the degree of social polarization (and hence inter-group distances  $d_{ij}$ ),  $P$ , the level of fractionalization  $F$ , and the sense of group commitment,  $\alpha$ . The controls we shall use are : *population size* [POP]; *gross domestic product per capita* [GDPPC]; *natural resources* [NR], measured by the presence of oil or diamonds; the percentage of *mountainous terrain* [MOUNT]; *non-contiguity* [NCONT], countries separated from the land area; extent of *democracy* [DEMOC]; the *degree of power* [PUB] afforded to those who run the country, which is a proxy for the size of the public prize (more on this below); *time dummies* to capture possible global trends; and *regional dummies* to capture patterns affecting entire world regions. Finally, because current conflict is deeply affected by past conflict, we use *lagged conflict* as an additional control.

We study 138 countries over the time span of 1960 to 2008, with periods divided in five-year intervals. This yields a total of about 1,125 observations.

The first question is how to measure *conflict intensity*. We use two indicators coming from two different datasets:

- Intensity as *death toll* based on the data furnished by the Peace Research Institute in Oslo (PRIO), *prio-c*.<sup>7</sup>

The PRIO dataset provides the number of estimated casualties in armed conflict between a rebel group and the state. The level of intensity can be (0, 1, 2) in each of the 5 year intervals. The level is 0, peace, if the country has experienced less than 25 fatalities in any one year within the five years interval, equal to 1 if it has experienced a low-intensity conflict corresponding to 25 to 1,000 battle related deaths, or equal to 2 if the country has been in a high-level conflict with more than 1,000 casualties.

- Intensity as *social unrest*: we use the *Index of Social Conflict* (ISC) as computed by the Cross-National Time-Series Data Archiv, *isc*.<sup>8</sup>

The ISC provides an annual measure of several manifestations of social unrest with no threshold dividing “peace” from “war”. The index ISC is formed by taking a weighted average over eight different manifestations of internal

<sup>7</sup><https://www.prio.org/Data/Armed-Conflict/UCDP-PRIO/>

<sup>8</sup> <http://www.cntsdata.com>

conflict, such as politically motivated assassinations, riots, political prisoners, guerrilla warfare, general strikes, etc.

Notice that the two indices measure different levels of conflict intensities. The PRIO index is strongly associated with violent armed conflict and it is not sensitive to less than 25 deaths. The ISC index instead is highly sensitive to lower and yet significant levels of social unrest. For instance, a sequence of political assassinations would be recorded as peace by the PRIO indicator as long as there are less than 25 victims.

We also need to compute the degrees of fractionalization and polarization,  $F$  and  $P$ . Both measures need the *population size of each ethnic group* in each country. Our basic source of information on group sizes is Fearon (2003), who provides standardized data of ethnic structures across countries. In addition, as a robustness test, we also use the size of linguistic groups provided by Ethnologue<sup>9</sup>, which is a data base of all languages spoken sorted per country and by the number of individuals as native speakers.

The latter dataset is also helpful for measuring *cultural distances*  $d_{ij}$ . To this effect, following Desmet, Ortuño-Ortín, and Wacziarg (2012), we compute the number of steps back in the language tree since the languages of two different ethnic groups,  $i$  and  $j$ , did split apart. The assumption is that the longer ago the language has divided; the more likely it is that their cultures have developed differently from each other. An advantage of this proxy is that we can neglect the endogeneity problem, as the language split occurred far in past and hence it is most likely to be exogenous to current conflict.

We obtain the *group concern*  $\alpha$  from the World Value Surveys.<sup>10</sup> We compute an index of group commitment for each country from the answers to questions regarding adherence to social norms, identification with the local community, the importance of helping others, etc. This index is country specific and we assume it to be part of the national culture and hence common to all ethnic groups.

Next we obtain an index for the *relative publicness of the payoffs*,  $\lambda$ , which is given by

$$\Lambda \equiv (\gamma \text{ PUB} * \text{GDPPC}) / (\gamma \text{ PUB} * \text{GDPPC} + \text{OILRSVPC}). \quad (10)$$

Observe first that we have to express the public payoff in money equivalent terms in order to make sense of the addition of private and public payoffs in the denominator. To this effect we have used the GDP per capita to scale our index of the economic equivalent importance of the public good payoff.

As a proxy for the private payoff, defined as  $\mu$  in the model, we take the value of oil reserves per-capita as an indicator of the size of the appropriable rents

<sup>9</sup><https://www.ethnologue.com>

<sup>10</sup><http://www.worldvaluessurvey.org/wvs.jsp>

*OILRSVPC*. The public payoff  $\pi$ , defined in equation (10) as *PUB*, wants to capture the current importance of the ancestral cultural distances  $d_{ij}$ . Our argument is that the cultural distances become the more salient the tougher is the repression by the government of their manifestations. Hence, we proxy  $\pi$  by the degree of power afforded to those who run the country, making that “more democratic” implies “less power”. Our index *PUB* incorporates four proxies:

1. Lack of executive constraints
2. Level of autocracy
3. Degree to which political rights are flouted
4. Extent of suppression of civil liberties

Further, we use time-invariant dummies of these variables based on averages over the sample, since short-run changes are likely to be correlated with the incidence of conflict. As I have already mentioned, we also multiply the *PUB* indicator by per-capita GDP, *GDPPC*, to convert the estimate into monetary equivalents. The “conversion factor”  $\gamma$  makes the privateness and publicness variables comparable in the ratio  $\Lambda$ . In the empirical analyses, we set  $\gamma = 1$ , but the results are robust to the choice of the parameter.

Table 1 provides the results of the estimations performed in three steps [see below].<sup>11</sup> The *P*-values are in parenthesis and we follow the standard convention of using three, two or one star to denote that the degree of significance is below 1%, 5%, and 10%, respectively.

Altogether, we have six regressions, summarized in Table 1. Three regressions, in columns (1), (3), and (5) use the PRIO-C death toll as dependent variable and columns (2), (4), and (6) use the Index of Social Conflict (ISC). Columns (1) and (2) introduce the indices of fractionalization and polarization alone. Columns (3) and (4) extend the model with  $\lambda P$  and  $(1 - \lambda)F$ , interacting the *F* and *P* indices with the index of publicness/privateness, as derived from the model. Finally columns (5) and (6) use the full implications of the model and include the index of group concern  $\alpha$ .

The results we obtain are as follows. In the first specification, (1) and (2), we find that for both definitions of conflict intensity, the coefficient of *P* is highly significant and the coefficient *F* is significant at the ten percent significance level for both datasets.

When we include the interaction with the indicator of publicness in columns (3) and (4) we find that for both specifications of the dependent variable the two interacted indices of ethnic division are significant. Notice that, we also include the

<sup>11</sup>Extracted from Esteban, Mayoral, and Ray (2012b)

$P$  and  $F$  indices in order to verify whether the significance of the interacted terms was simply driven by the significance of the indices. Our results show that neither  $P$  nor  $F$  are significant by themselves. This result also tells us something important: ethnic divisions are significant only in as much as they are associated with private or public good gains. Basic hatred doesn't seem to play any role.

Finally, in columns (5) and (6) we have the results when the specification reflects the full implications of the model and also includes the interaction with  $\alpha$  in the definition of the independent variables. When conflict intensity is measured by the PRIO index we find that polarization interacted with publicness and group commitment is the only independent variable still significant, although at the 10% level. The two non-interacted indices continue to be non-significant. However, the model performs much better for conflict of lower intensity and captured by the ISC. The two interacted terms are in this case highly significant. This result seems to suggest that group solidarity plays more of a role for low level conflict activities such as strikes or demonstrations than when having to decide whether to join an armed rebel force.

## Conclusion

In this lecture, I have summarized my work with Debraj Ray and Laura Mayoral on ethnicity and social conflict.

We have started by providing some descriptive evidence on the importance of social conflict and civil wars and on how they appear to be ethnically driven. In order to study the nexus between ethnic divisions and social conflict we have discussed the most appropriate measure of ethnic division. We have argued that the group sizes and the "cultural" distance between them were both important ingredients of ethnic divisions. Together with the *fractionalization index*, which depends on population sizes only, we have presented how a *measure of polarization* can intuitively be derived from a set of three axioms.

In an attempt to make theory inform the subsequent empirical analysis, we have developed a basic game-theoretic model of conflict between groups and have computed the equilibrium conditions. Appealing to an approximation result we obtained in Esteban and Ray (2011a), the equilibrium conflict intensity can be approximated by a linear function of the indices of fractionalization, Gini and polarization. Note that the role of these indices of ethnic division in explaining social conflict intensity has been derived from the equilibrium conditions, not assumed. Furthermore, we obtained that these indices are weighted by the indices of concern for their own group and by the importance of the public good payoff relative to the total monetary value of the payoffs at stake.

This derived relationship between the dependent variable and the independent variables has guided our empirical exercise. We have decomposed our estimates

**Table 1**  
**Ethnicity and Conflict**

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	PRIO-C	ISC	PRIO-C	ISC	PRIO-C	ISC
$P$	*** 5.16 (0.001)	*** 19.50 (0.002)	- 1.48 (0.606)	-16.33 (0.227)	- 1.47 (0.701)	-23.80 (0.212)
$F$	* 0.93 (0.070)	* 3.56 (0.061)	0.76 (0.196)	0.31 (0.878)	0.87 (0.403)	- 0.16 (0.710)
$P\lambda$			*** 11.174 (0.003)	*** 61.89 (0.001)		
$F(1 - \lambda)$			* 1.19 (0.097)	*** 10.40 (0.000)		
$P\lambda\alpha$					* 12.65 (0.087)	*** 90.32 (0.010)
$F(1 - \lambda)\alpha$					2.54 (0.164)	** 13.15 (0.018)
GDPPC	** - 0.34 (0.047)	*** - 2.26 (0.004)	* - 0.36 (0.080)	*** - 3.02 (0.001)	- 0.25 (0.375)	*** - 3.68 (0.007)
POP	*** 0.24 (0.000)	*** 1.14 (0.000)	*** 0.21 (0.001)	*** 1.30 (0.000)	* 0.09 (0.166)	** 1.29 (0.013)
NR	- 0.27 (0.178)	- 0.53 (0.497)	- 0.00 (0.570)	0.00 (0.432)	** 0.00 (0.011)	* 0.00 (0.090)
MOUNT	0.00 (0.537)	0.02 (0.186)	0.00 (0.362)	* 0.03 (0.061)	* 0.01 (0.060)	** 0.05 (0.020)
NCONT	*** 1.06 (0.001)	*** 4.55 (0.001)	** 0.77 (0.026)	*** 4.28 (0.001)	*** 1.37 (0.004)	*** 5.89 (0.000)
POLITICS	0.18 (0.498)	0.29 (0.789)	- 0.00 (0.328)	** - 0.00 (0.026)	0.00 (0.886)	- 0.00 (0.374)
LAG	*** 1.99 (0.000)	*** 0.46 (0.000)	*** 1.94 (0.000)	*** 0.44 (0.000)	*** 1.84 (0.000)	*** 0.40 (0.000)
CONST	-	0.90 (0.915)	-	9.19 (0.398)	-	15.40 (0.328)
(Pseudo)-R <sup>2</sup>	0.35	0.43	0.36	0.44	0.40	0.43
Obs.	1125	1111	1104	1090	447	443
Count.	138	138	138	138	53	53

All specifications employ region and time dummies, not shown explicitly.  $p$ -values are reported in brackets. Robust standard errors adjusted for clustering have been employed to compute  $z$ -statistics. Columns [1], [3] and [5] are estimated by maximum likelihood in an ordered logit specification, and columns [2], [4] and [6] by OLS.

- $P$ : degree of polarization
- $F$ : degree of fractionalization
- $\lambda$ : index for realive publicness of the payoffs
- GDPPC: log of gross domestic product per-capita
- POP: log of population
- NR: dummy for oil and/or diamonds in columns [1] and [2] and oil reserves per-capita and oilrsvpc for columns [3]–[6]
- MOUNT: percentage of mountainous territory
- NCONT: non-contiguous territory, s. text
- POLITICS: is democ in columns [1] and [2] and the index  $PUB$  times  $gdppc$  (i.e. the numerator of  $\lambda$ ) for the remaining columns
- LAG: lagged conflict in previous five-year interval

into three steps getting closer and closer to the structural relationship derived from the equilibrium conditions. First, we have simply regressed the ethnic division indices, then the indices interacted with the degree of public/privateness of the prize, and finally, these terms interacted with the degree of social concern displayed in every country of the sample.

Our empirical exercise suggests a number of interesting implications. In the first place, that both fractionalization and polarization are significant when interacted with the corresponding index of publicness, but not if we add the indices by themselves. Hence, we learn that ethnic divisions are relevant only when combined with gains, either public, private or both. In fact, since the two interacted indices are significant, we can infer that both types of gains, public (like pride) and private (like rents) are effective drivers of social conflict. There is no dilemma between "greed" and "greavance", to use Collier's terms.

The empirical results also reveal that the level of concern for the group is relevant in order to explain lower intensity conflict activities, such as demonstrations, strikes and the like. But it is much less relevant when it comes to highly violent forms of activism.

Let me close my lecture by underlining that the fact that we have focused on ethnic divisions in order to explain social conflict does not exclude the potential role of economic class differences. My hope is that following similar steps as we have taken here might help to obtain neater results on the link between class differences and social conflict. We have to go beyond simply including an income inequality index in the regression. We have to start with a careful model that could guide us to identify critical interactions that have not been included in previous empirical analyses.

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