Political Autonomy and Independence: Theory and Experimental Evidence

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Abstract

We use a game-theoretical model and results from laboratory experiments to study the process by which subordinated regions of a country can obtain a more favorable political status. In our theoretical model a dominant and a dominated region first interact through a political process. This process involves two referenda, one at the level of the country as a whole and one at the level of the subordinated region. If the political process succeeds, then the new autonomy level is implemented. If this process fails then both regions engage in a costly political conflict in which both sides can spend resources to win the upper hand. We show that in the subgame-perfect equilibrium of our game the voting process leads to an intermediate arrangement acceptable for both parts so that the costly political struggle never occurs. In contrast, in our experiments we observe frequent fighting involving high material losses.

Keywords

Secession, collective action, independence movements, laboratory experiments, rent-seeking

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1. Introduction

Many countries consist of several parts or regions with populations that have different interests or identities. Often one of the parts of the country is politically dominant due to its size, historical circumstances or other reasons. In many of such cases there are conflicts - peaceful or violent - over parts of countries attempting to obtain more political autonomy or to secede and obtain independence. Different degrees of political autonomy including independence imply differences in the allocation of government spending, in tax arrangements, in the degree of self-government between the communities involved, as well as in the satisfaction that derives from more or less possibilities of cultural expression and recognition.

The process by which such regions obtain a different political status can be very violent. For instance, the civil war fought over a Kurdish state independent from Turkey has claimed about 30,000 lives, without any sign of success for the seceding party. Separatists in East Timor have been more successful, since the country gained fully recognized sovereignty in 2002. Independence came at a price, though, with a death toll of at least 100,000 in a 25-year civil war with Indonesia. Similarly, the independence of Kosovo in 2008 was a result from the Balkan wars in the 1990s. The latest new sovereign state, South Sudan, declared independence in July 2011, in the aftermath of one of the bloodiest conflicts in post-war history. More than two million people were killed in the Second Sudanese Civil War between 1983 and 2005. In other cases the record is less bleak. In the last three decades Catalonia has reclaimed considerable legislative powers from Spain in a purely political non-violent process. Similarly, the sovereignist movement of Québec peacefully achieved substantial concessions from Canada and in 1995 even forced a referendum on full sovereignty. The motion failed only by the narrowest of margins (49.4% versus 50.6%)

The question arises as to why different regions of countries are often not able to agree on an intermediate solution to the conflict, involving some degree of power sharing, while others are able to compromise without bloodshed. In many cases the struggle revolves around the extreme solutions; it is about whether the dominant region maintains complete control or whether independence – or a similar status - of the dominated region is attained. One possible explanation for this is that intermediate solutions are somehow not stable, because, due to the particular set of feasible distributions of resources, they are very unsatisfactory for the regions involved.

Another explanation is that intermediate solutions are in a material sense stable, but that non-material forces, which arise in the process of attempting to find an intermediate solution, prevent them from being reached. One possibility is that when different strongly cohesive communities are involved then conflict as such is positively valued. Another possibility is that the fact that the starting point is a status quo involving the preponderance of one of the regions makes it very hard for the citizens of the dominated region to accept the process.

In this paper we combine a theoretical model and the analysis of experimental data based on an implementation of the model to shed light on some of the issues just discussed. First, we present a simple theoretical model in which to study the purely material payoff-based determinants of whether intermediate solutions can be reached and, hence, costly conflict can be avoided. We model a society with a majority in the central state and a significant majority in one region, with antagonistic preferences over the level of autonomy. The majority region can offer concessions. The minority vote whether to accept the offer or open conflict. We show that there are conditions (a notion of concavity of the utilities) under which peaceful settlements are predicted, but under unfavorable conditions conflict is inevitable.

Our game theoretic model follows the long tradition of formal rationalist approaches to the analysis of conflict and settlement in political science. One of our earliest predecessors in this spirit is Wittmann (1979), who particularly looks at the conditions under which a war ends through negotiations.[1] Warring parties are seen as rational actors who weigh the value of winning the war against the costs of fighting and the probability of defeat. The war continues unless both parties can be made better off in a negotiated settlement. Wittmann (1979) finds some counterintuitive insights with his formal analysis: Reductions in hostilities during the war do not always make settlement more likely, or that impatient countries can be better off in a negotiation.

Blainey (1988) and Wagner (2000) argue that because most wars end with an agreement to stop it, the actual fighting should be seen as an integral part of the bargaining process[2]. Fearon (1995) emphasizes the role of information asymmetries: If all parties were always fully informed about relative strengths, preferences, and fighting costs, then most wars would be avoided because parties would prefer a settlement over a devastating conflict (Walter (2009) discusses information problems as factors explaining why civil wars start and how long they last). If the opponents are incompletely informed about the enemy's strength, then some might prefer war over an ill-informed settlement that could be unnecessarily generous to a weaker-than-expected enemy.

Information problems are not the only reason why peaceful settlements are not possible. There might be commitment problems (Powell (2006)), the unavailability of effective mediation or peacekeeping (Kydd (2010)), or simply the absence of a feasible compromise. The latter can occur if the stakes are indivisible or if the parties attach a very high symbolic value to their most preferred outcome. The present study looks at constellations in which the absence of a feasible compromise can be an issue.

[1] Some models capture a situation of interstate conflicts (e.g. Powell (1987), Wagner (1991)), others explicitly model intrastate civil conflict (e.g. Esteban and Ray (2011)). Some, like Wittmann's, can be interpreted in both ways.

[2] This adopts the notion of von Clausewitz (1832) who saw war as a mere continuation of politics by other means ("eine bloße Fortsetzung der Politik mit anderen Mitteln", First Book, Chapter 1). Gershenson and Grossman (2000) consider the case that conflict can go on forever, rather than just being a means to an end.

There is also an important theoretical literature in economics on the break-up of countries which models of the benefits and costs of unified and split-up countries and analyzes the comparative statics of the equilibrium outcomes with respect to various important factors. Two early contributions are Alesina and Spolaore (1997) and Bolton and Roland (1997). The first of these papers shows, among other results, that democratization leads to secessions and that the equilibrium number of countries is increasing in the degree of economic integration. Bolton and Roland (1997) find that when income distributions vary across regions and the efficiency gains from unification are small, separation occurs in equilibrium and that when all factors are perfectly mobile, all incentives for separation disappear. For a more recent survey of this literature see also Spolaore (2012).

Although our work builds on some of the formal models described above, it differs from all its predecessors in a variety of ways. First, in our model we explicitly include a democratic voting process in which the (preliminary) outcome is determined.[3] So our model does not necessarily imply a civil war context, we understand it just as well as a model for non-violent struggles for autonomy. Second, compared to the literature discussed in the previous paragraph we do not study the comparative statics of the break-up of countries, but focus on cases where (subgame-perfect) equilibrium prescribes an intermediate solution between secession and the status quo. Third, and this is the most fundamental innovation we contribute to this strand of literature, we use a laboratory experiment to test the behavioral implications of the model. Doing this, we radically depart from the strict rationalist framework. In the game theoretic models emotions, social norms and cultural contexts play a role only insofar they can be meaningfully incorporated in the actors' preferences.

With the experiment we can analyze these intangible factors more explicitly.[4] Though none of the conflict models mentioned has been tested experimentally, there is evidence that conflict influences people's social norms and attitudes. Whitt and Wilson (2007) use the dictator game paradigm[5] to study whether the experience of the Balkan war has affected the locals' fairness norms towards one another.[6] The results reveal good news and bad news. The bloody conflict has left fairness norms largely intact, but there is also a strong tendency to discriminate against members of other ethnic groups. This is important news and suggests that the behavioral analysis of conflict is a worthwhile agenda to pursue.

[3] Downs and Rocke (1994) propose a principal-agent model to analyse the interaction between the citizens (the principal) and the government (the agent) in decisions to go to war. See Baron and Ferejohn (1989) for a classic model of bargaining and voting, albeit outside the realm of conflict, and Großer and Schram (2010) for an example of an experiment on voting behavior.

[4] Morton and Williams (2008, 2010) document the important increase in experimentation in political science since the 1990s and discuss various methodological questions. See also Hibbing and Alford (2004), Smith (2006), and Wilson (2011).

[5] In the dictator game one player is asked to share a given amount of money with an anonymous partner. Social psychologists and behavioral economists frequently use this paradigm to gauge altruism and fairness attitudes.

[6] See Fowler and Kam (2007) for a related study comparing Republicans and Democrats in the US.

In our experiment we design a set of conditions very favorable to peaceful settlement. We choose parameters such that efficient and fair solutions are very salient. Nevertheless, we observe conflict that is not only frequent, but also far more intense than the rationalist analysis of the model would predict. We therefore conjecture that there are factors beyond pure materialism that should be taken into account in policies of conflict resolution.

Our experimental results complement the empirical literature on conflict. Though few studies look explicitly at independence struggles, some results are relevant to the questions we ask. Reynal-Querol (2002) finds that a fragmented society (one divided into many small ethnic groups) is less prone to civil war, while polarization (few equal-sized groups) makes conflict more likely. Hale (2000, 2004) uses the breakup of the Soviet Union as a natural experiment and finds that regions were the quicker to secede the richer they were and the more autonomy they already had within the Union. Walter (2006a, 2006b) analyses data from ethnic conflicts and finds that minorities tend to make decisions to secede strategically, contingent on the central government's past and expected future behavior. A challenge that naturally comes with the analysis of field data is the absence of a counterfactual. It is hard to identify the conflict that did not break out or the separatist movement that did not form, so that the analysis is restricted to those events that did happen. The laboratory provides one way to overcome this difficulty, since all parameters of the environment are under the experimenter's control. So it is possible to observe conflicts that could have broken out but did not.

The particular issues of secession and the fight for independence has, to our knowledge, not been previously studied experimentally. Even the more general experimental literature on political conflict is surprisingly sparse. Abbink (2011) provides a survey of the emerging experimental literature on various issues of conflict. A few experiments on political systems focus on the emergence of regimes in a model in which citizens can devote their efforts to production or appropriation (Durham, Hirshleifer, and Smith (1998), Duffy and Kim (2005)). Others (Abbink and Pezzini (2005), Cason and Mui (2005)) study revolts against a leader.

With the conflict model we use our study is also related to the literature on rent-seeking games in the experimental economics literature. (e.g. Millner and Pratt (1989, 1991), Davis and Reilly (1998), Potters, de Vries and van Winden (1998) Sheremeta and Zhang (2009), Sheremeta (2010), Abbink et al. (2010), Ahn et al. (2011)), which recently has experienced an important growth. The survey by Dechenaux, Kovenock and Sheremeta (2012) discusses this literature in great detail.

In the next section, we introduce the theoretical model and show under which conditions the subgame-perfect equilibrium of our game leads to an intermediate arrangement acceptable for both parties without any costly political conflict. In contrast, in the experiments based on the model, which we present thereafter, we observe a large amount of fighting involving high material losses, even in a case in which the possibilities for an arrangement without conflict are very salient. In our experimental environment intermediate solutions are feasible and stable, but often participants fail to reach them.

Our experimental design consists of two parts. In what we call the original set-up, we test the predictions of the theoretical model, using three treatments that we thought ex-ante differ in their likelihood for peaceful solutions. This experiment generated the strong overfighting mentioned above. We conjectured that the emotional attachment of our Catalan subjects to the independence issue might have triggered an impulse to excessive aggressiveness. In a second series of sessions, we use a subject pool that is unaffected by independence movements, and present the situation to subjects without context. Indeed conflict intensity is reduced, but conflict frequency remains unchanged.

2. The model

Before we introduce the details of the model we want to briefly discuss some of the essential features of the kind of context that we want to represent. We start by saying that we do not model an authoritarian situation in which a single individual or a small group dictates the political outcome. Rather, we focus on conflicts between different communities as such, which initially live together under certain rules that favor one of the communities. In such cases the process by which a change in the political arrangement is sought often has a democratic character, but suffers from the difficulty that the citizens of the dominant region inevitably are the majority in the political entity. Hence they can prevent the dominated region from obtaining a more satisfactory status. Given these circumstances, the citizens of dominated regions may consider the outcome of this particular democratic process unacceptable and may organize to reject it.

The next building block of our model that we want to highlight at this point is our representation of conflict. We represent conflict as an intense sort of rivalry, in the sense that only one of the sides involved can obtain its preferred status. Conflict involves potentially large losses. In the way we model things, the losses from conflict will be inefficiencies that need not occur. The study of how these inefficiencies arise and how they can be avoided is the main motivation for our work.

We now present the model in a general version, in section 2.2 we will introduce the specific parameter configurations that we use in our experiments. We start with agents and preferences. A state or country is divided into two exogenously given regions, A and B. In region A there are n_A type A citizens, region B is inhabited by n_B type B citizens. We assume $n_A > n_B$, type A citizens are the majority in the state.

In accordance with many real-life cases, the smaller region is the one striving for a more favorable institutional arrangement. Type A citizens prefer the status quo which can be interpreted as a centralized regime, while type B citizens prefer other possible institutional arrangements and their ideal state of the world is at the other extreme of the policy space, which we envision as being complete autonomy or independence. For simplicity, we assume

that all citizens within one region have identical preferences with respect to region B's autonomy.[7]

In between complete centralization and complete independence there are various levels of autonomy that region B can be granted. In this section we assume, to keep things neat, a continuous measure of possible regimes, ordered from 0 (complete centralization) to 1 (independence).[8] Different values on this line represent different combinations of self-determination rights. Along this line, type A individuals prefer a smaller value to a larger one, while type B individuals always prefer the larger one. Without loss of generality we normalize type A citizens' utility of full independence to zero, and denote their utility from full centralization as Δ_A.

The ordering follows the citizens' preferences, but there is no meaningful scale that can be given to the zero to one range. We therefore normalize the variable in a way that the type A individuals' utility is a linear function of the autonomy level x, i.e. $u_A(x) = -x\Delta_A$. The utility of a type B citizen, $u_A(x)$ is then an increasing function of the autonomy level, and implicitly a decreasing function of type A's utility.[9] We denote this function by f(x). Note that there is no a priori natural assumption to be made about the curvature of f. This is because f reflects the response of the Bs' preferences to changes in the autonomy levels, relative to the response of the As' preferences.[10] Figure 1 depicts an example constellation.

With this framework of preferences, we can now construct the strategic model, which is also illustrated in the timeline shown in figure 2. Our game consists of up to four stages. The four stages represent what we think are the crucial steps in the process by which a new institutional arrangement between the two regions is reached. Consider that at the outset of the game the state is organized in full centralization. This assumption is not crucial for the theoretical analysis of the game that we present below, but it corresponds to the frame that we present to subjects in the experiment. We consider that the initially dominant region A has the political initiative at the beginning of the process. Region B then reacts to A's initiative.

[7] It is possible to allow for some heterogeneity in the model without changing the main results. It is sufficient to require a majority of citizens in each region to have a certain type of preferences.

[8] Continuity is not crucial for the analysis. It will turn out that very similar results can be obtained if the function has kinks, jumps, or even a discrete domain.

[9] Monotonicity is not technically required, but is a sensible assumption. If there is a policy measure that makes both types of citizens better off, it should simply be implemented and is not part of the interregional conflict.

[10] We could have normalised the Bs' preferences as well, since our model does not require direct interpersonal comparison of preferences in any way. However, this would not have gained much in terms of simplicity. Further, there might be cases where such comparisons are meaningful (e.g. if the utilities represent money equivalents), such that we did not want to restrict our model unnecessarily.

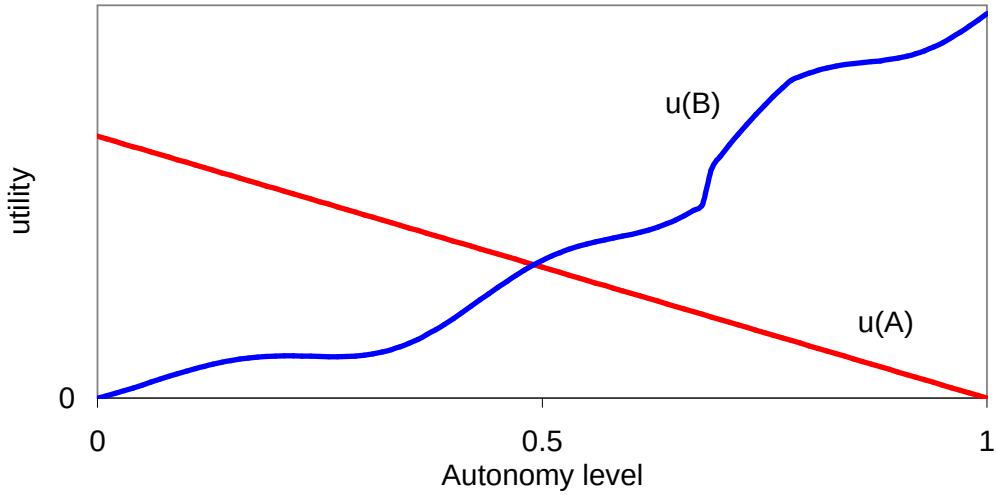

Figure 1. Utility functions for citizens of both types

To represent this, in the first stage it is one of the type A player who proposes a level of autonomy, x, between 0 and 1 inclusively, over which the citizenship as a whole – all As and all Bs – will decide by a majority vote. In our context, it is not important who makes the proposal for the As– since all have identical preferences equilibrium predictions are not affected. It could be a political leader or the delegates of the reigning party.[11] Type A players are in the majority with respect to the B types. Thus, if there is a proposal that is optimal for the type A players, it should be expected to always be made and always win the ballot. The voting behavior of the type B citizens will not matter in this case.

The second stage consists in the majority rule voting decision advanced above: all citizens, including both type A and type B, vote on this proposal versus the status quo of full centralization. The winning alternative becomes the starting point for the third stage of the game.

In the third stage type B citizens vote on whether or not they open a conflict for full independence. If a majority votes against the conflict then the interim status quo (the winner of the previous voting stage) is implemented. If a majority votes in favor of opening the conflict for independence, then the conflict – the fourth stage of the process - is fought out.

[11] Lacking a natural "leader" in the experimental context, we opted for having the proposer randomly selected among all A type players. This should be seen as a very simplified representation of a process in which the A type citizens have all the initiative. A more detailed modelling of the process by which the A players come up with a proposal could involve communication and deliberation between the As. The questions that arise is what proposals would emerge from such a process and how the B players would respond to a given proposal in comparison how they respond in our current design. It is not easy to speculate about the impact of such a change, but tt is possible that proposals coming out of such a deliberation process would be more acceptable to the B players.

The voting process in the third stage is meant to be a very stylized rendering of the political interaction that takes place between the citizens of the subordinate region.[12]

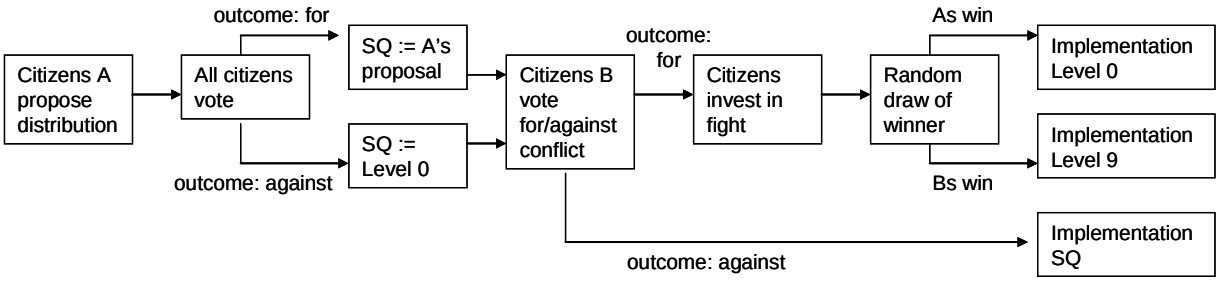

Figure 2. Timeline of the game

The winners of the conflict (either citizens A or B) get their most preferred state implemented, i.e. full centralization if the citizens A win, and complete independence if the citizens B are victorious. This reflects that after a conflict the winning side can impose its rule on the losers.

Who wins the conflict is determined using a binary lottery. Before the actual fight takes place, each citizen can contribute to its group's "war chest". This term is not to be taken literally. The fourth stage contest might represent a violent conflict, but it does not need to be that way. The contributions could as well stand for efforts made in political campaigns, like demonstrations, strikes, or propaganda. As mentioned earlier, our model is best suited to explain independence struggles in a civil society with sufficiently strong democratic institutions.[13]

A type B citizen contributes to the independence campaign of region B, and a type A citizen contributes to its region's movement to maintain complete centralization. After the contributions have been made, a binary lottery is played out. If the outcome is in region B's favor, then region B becomes an independent state. If region A wins the lottery, then the original status quo of full centralization is implemented.

The probability with which the two groups win is determined by

[12] Again, this process is represented in a very stylized way. A more complete modelling would should probably involve some communication between B players before the voting process takes place. Perhaps this kind of communication would lead to more reflexion and lead to different voting outcomes.

[13] We therefore also abstract from other problems that might arise in violent secession conflicts. For example, leaders of the central state might face a credibility problem when they offer limited autonomy to the seceding region. Citizens in the subordinate region may not believe that promises will be kept. We do not model these credibility problems since they would not play a great role in a state with strong institutions, where arrangements can be implemented in laws or the constitution.

$$\text{prob(CEN)} = \frac{\sum_{i=1}^{n_A} a_i}{\sum_{i=1}^{n_A} a_i + \sum_{j=1}^{n_B} b_j}, \text{ and} \qquad \text{prob(IND)} = \frac{\sum_{j=1}^{n_B} b_j}{\sum_{i=1}^{n_A} a_i + \sum_{j=1}^{n_B} b_j}$$

where CEN denotes full centralization, IND stands for independence. The variables a_i and b_j denote the individual contributions of a type A or type B citizen, respectively.

The last stage subgame is a contest game, in which players compete for a prize by investing in campaigning. A contest success function based on the set of the players' (non-refundable) investments determines which contestant receives the prize. We use the lottery contest function proposed by the economist Gordon Tullock (1967, 1980), in which each contesting party has a probability of winning the prize equal to the proportion of its investment out of the total investment by all parties. This is, in our view, a very natural way of representing the kind of wasteful rivalry that we want to portray here and is commonly used in conflict models.[14] [15]

In our set-up players are groups whose voluntary contributions form the investment in rent-seeking. Contest games played between groups with the prize having a public good structure were theoretically first studied by Katz, Nitzan and Rosenberg (1991).[16] In our case the prize may differ for the two groups. For general surveys of the theoretical literature on conflict and contest games see Garfinkel and Skaperdas (2006) and Konrad (2007), respectively.

We end this section with a brief discussion of our simplified representation of the democratic process. It has two main parts: the referendum-like vote in the country as a whole (involving regions A and B) and the vote among the citizens of region B about whether to accept the outcome of the country-wide referendum. We think that both these parts are important. The country-wide referendum is crucial, since it embodies precisely the main problem that we want to address: the difficulties of changing the political status of a community that is a minority given the institutional status quo. The vote in the subordinated region B is also important for our modeling, because we also want to represent the political process in the subordinated region as a democratic one. The democratic legitimacy of this process is important since it may have an effect on the As' behavior in the first part of the political process, i.e. the proposals by the As as well as the As' vote in the country-wide referendum may be conditional on the fact that the subsequent decision in the B-region is the outcome of majority-voting.

[14] For a discussion of the pros and cons of different specific contest functions see Hirshleifer (1989, 1991) and).

[15] Abbink et al. (2010, 2012) present analyses of behavior in the group rent-seeking game in isolation, focusing on the effects of intra-group punishment.

[16] See also Nitzan (1991) for the analysis of different sharing rules within each group.

2.1. Game-theoretic analysis

We now turn our attention to the equilibrium analysis of our model. We study the symmetric subgame perfect equilibria of the game, assuming sincere voting at the voting stages (see the discussion at the end of this section).

At the final stage of the game, each citizen decides how much to contribute to his region's war chest. In our set-up each citizen makes this decision independently, without any possibility of coordinating with his fellow citizens. Conflicts between communities will certainly often be influenced by organized groups. However, we also think that in a democratic context there will be much scope for decentralized decision-making with the possibility of free-riding. Given that decisions are made by individual citizens it makes sense to consider that each person makes his/her choice in isolation and tries to maximize his/her individual payoff while taking the choices of all others as given. In the resulting equilibrium own-payoff maximizing individuals free-ride on the fighting efforts of their fellow citizens, with respect to the case where the members of each group decide jointly on what individual decisions should be.

For convenience we define the variable Δ_B which denotes the difference in a citizen B's payoff between the best (full independence) and the worst (full centralization) outcome. Recall that for the type A players this difference Δ_A is 1 due to the normalization of their utility, while for the type B players this difference is $\Delta_B = f(1) - f(0)$. We first look at a type A player's maximization problem. The citizen maximizes the expected payoff, which is determined by the stakes in the lottery and the probability of winning. Thus the player maximizes

$$\Pi_A = \Delta_A \frac{a_i + A_{-i}}{a_i + A_{-i} + B} - a_i$$

Where a_i denotes player i's contribution, A_{-i} the aggregate contribution of all other type A players, and B the aggregate contribution of all type B players. Note that player A's payoff in the case of not winning the lottery is normalized to 0.

After some rearrangements, the first order condition of the above maximization problem is

$$a_i = \sqrt{B\Delta_A} - A_{-i} - B \qquad (1)$$

Symmetry of all players of the same type[17] then requires that

$$A = n_A a_i = \sqrt{B\Delta_A} - B$$

A type B citizen's maximization problem is analogously

[17] Recall that symmetry is an assumption we make. It seems a natural equilibrium selection criterion for a game in which all players of a type are identical. There are asymmetric equilibria as well. In these equilibria the aggregate contribution of a group is the same as in the symmetric case, but the distribution across the group members can be different (see, e.g. Abbink et al. (2010)).

$$\Pi_B = \frac{b_i + B_{-i}}{b_i + A + B_{-i}} \pi_B^{IND} + \left(1 - \frac{b_i + B_{-i}}{b_i + A + B_{-i}}\right) \pi_B^{CEN} - b_i \quad \rightarrow \quad \max!$$

With $\pi_B^{IND} - \pi_B^{CEN} = \Delta_B$ and $B_{-1} = (n_B - 1)b_i$ – for symmetry – we obtain that

$$B = n_B b_i = \sqrt{A\Delta_B} - A$$

Substituting this into (1) yields after some rearrangements the type A player's contribution function

$$a_i = \frac{1}{n_A} \Delta_B \left(\frac{\Delta_A}{\Delta_A + \Delta_B} \right)^2 \qquad (1)$$

The contribution function for a type B player is completely analogous

$$b_i = \frac{1}{n_B} \Delta_A \left(\frac{\Delta_B}{\Delta_A + \Delta_B} \right)^2 \qquad (2)$$

Perhaps not surprisingly, these reaction functions have a similar structure to those for standard rent-seeking games. If $n_A = n_B = 1$ and $\Delta_A = \Delta_B$ then they are identical to each other. Note that rent dissipation decreases considerably as the groups become larger. Since Δ_j is the prize that *each* individual of group j receives when winning the lottery, the total amount won by the winning team is $n_j\Delta_j$. The sum of all group members' contributions, however, just adds up to a contribution equivalent to the individual player case.

From the point of view of social efficiency, this free-rider effect is a good thing, since it leads to less resources being wasted on unproductive conflict. If all players coordinated and acted as if they were maximizing the group's expected profit (thus acting as if $n_A = n_B = 1$ and the prizes were $n_A\Delta_A$ and $n_B\Delta_B$), total expenditures on conflict in the groups would be n_A and n_B times higher, which is undesirable for the society as a whole. Efficiency losses through conflict expenditure would be avoided altogether (and possibly efficiency gains realized), if conflict could be avoided in the collective bargaining and voting stages. We shall now derive conditions under which this can be achieved in equilibrium.

With the equilibrium contributions we can calculate the expected payoff of conflict for a citizen of each region. The probability of region A winning the contest is obtained by substituting the equilibrium contributions into the probability function, thus

$$prob(CEN) = \frac{\left(\frac{\Delta_B}{\Delta_A + \Delta_B}\right)^2}{\Delta_B \left(\frac{1}{\Delta_A + \Delta_B}\right)^2 + \left(\frac{\Delta_B}{\Delta_A + \Delta_B}\right)^2} = \frac{\Delta_A}{\Delta_A + \Delta_B}.$$

Since a citizen's contribution is lost in any case, a citizen A's expected payoff is

$$E_A(war) = \frac{\Delta_A^2}{\Delta_A + \Delta_B} - \frac{1}{n_A}\Delta_B\left(\frac{\Delta_A}{\Delta_A + \Delta_B}\right)^2$$

The expected payoff for a citizen B is calculated analogously. In any case a B citizen will get f(0), the payoff for the worst case of full centralization. The additional expected payoff from conflict is then the winning probability times the prize, thus

$$E_B(war) = f(0) + \frac{\Delta_B^2}{\Delta_A+\Delta_B} - \frac{1}{n_B}\Delta_A\left(\frac{\Delta_B}{\Delta_A+\Delta_B}\right)^2 \qquad (3)$$

From here the analysis of the voting stages is straightforward. If there is an autonomy level which generates a higher utility than the expected payoff of conflict for both A and B citizens, then there will be no conflict. It is always better for a citizen A to propose such a level than one that leads to conflict. All players A vote for it rather than remaining at full centralization in order to avoid conflict. Since the As form the majority, they will win the vote regardless of the voting behavior of the citizens B. The citizens B will vote against opening conflict, since their utility at that autonomy level is higher than their conflict payoff as well. If there is more than one autonomy level that has these properties, then the proposing citizen A will pick the one with lowest autonomy, since an A's utility decreases with the level of autonomy.

One of the questions that brought us here is under what conditions an appeasement level of autonomy exists. It is not difficult to see that this depends on the shape of the citizens B's utility function.

Proposition. If the citizens B's utility function f(x) is concave, then there will be no conflict in a subgame perfect equilibrium of the game.

Proof. It is sufficient to show that one autonomy level x exists which generates higher payoffs for both types of citizens than their respective expected payoff of conflict. Suppose $x = \frac{\Delta_B}{\Delta_A + \Delta_B}$. A citizen A's payoff at that autonomy level is $1 - x = \frac{\Delta_A}{\Delta_A + \Delta_B}$. This is higher than the conflict payoff of $\frac{\Delta_A}{\Delta_A + \Delta_B} - \frac{1}{n_A}\Delta_B\left(\frac{\Delta_A}{\Delta_A + \Delta_B}\right)^2$, since the citizen A does not pay contributions to the war chest. Concavity of citizen B's utility function implies that

$$f\left(\frac{\Delta_B}{\Delta_A + \Delta_B}\right) \geq f(0) + \left(\frac{\Delta_B}{\Delta_A + \Delta_B}\right)\Delta_B =$$

$$= f(0) + \frac{\Delta_B^2}{\Delta_A + \Delta_B} > f(0) + \frac{\Delta_B^2}{\Delta_A + \Delta_B} - \frac{1}{n_B}\left(\frac{\Delta_A}{\Delta_A + \Delta_B}\right) = E(\Pi_B)$$

Hence $f(x) > E(\Pi_B)$. ■

Concavity is thus a sufficient, though not necessary, condition for the existence of a peace equilibrium. An example of such a constellation is depicted in figure 3, where we use $E_i(war)$ to refer to expected payoff from conflict. The intersection of the citizens B's utility function

and the expected conflict payoff marks the left boundary of autonomy levels in which peace is at least as good as conflict. Autonomy levels to the left of that point would please the citizens A, but citizens B would prefer conflict. Levels to the right of the intersection of the citizens A's utility function and their conflict payoff would not be suggested by any player A, since they would leave the As worse off. All levels in between these boundaries improve the payoff for both types of citizens over their conflict level. Since the citizens A wish to maximize their payoff, they would propose the smallest autonomy level available that improves both types' payoffs, marked by the vertical line, labeled SPE for subgame-perfect equilibrium.

If the Bs' utility function is too convex, then an appeasement level of autonomy (and thus a peace equilibrium) does not exist. Strong convexity of B's utility function implies that to obtain sizeable increases in B's utility one has to lower A's considerably. In this case conflict is inevitable and one region will get its most preferred outcome. A constellation like this is illustrated in figure 4.[18]

It is worth stressing that the existence of a peaceful interior equilibrium depends on the shape of the utility functions relative to one another. It does not depend on the intensity of the emotions attached to national sovereignty. It is well possible that self-determination issues stir strong emotions among the citizens of a state (or have substantial economic consequences), but nevertheless a peaceful agreement granting limited autonomy can be reached. On the other hand, even if national identity issues are relatively low-key, conflict may arise if the relevant utility function is convex.

We conclude our theoretical analysis with some remarks on our equilibrium selection criterion. We only consider subgame perfect equilibria with sincere voting at the voting stages. This seems natural since no-one can gain by voting against an alternative that, if implemented, leads to a better outcome for one-self. There are other equilibria, though. Any voting pattern in which there is a clear majority for or against an alternative, such that no voter is pivotal, is an equilibrium outcome, regardless of the voters' preferences. In a single ballot, equilibria in which voters vote against their own preferences seem implausible because sincere voting is a weakly dominant strategy. However, embedded in a multi-stage bargaining game like ours, selection of non-sincere voting equilibria opens strategic possibilities. For example, the Bs could threaten to all vote for conflict if the As do not offer some higher level of autonomy. The As would then be better off if they offered at least that minimum level (as long as it is better for them than conflict). The resulting equilibrium would still be subgame perfect, since the voting stage has no subgames and subgame perfection does not select any further. The threat would be credible in the sense that no-one threatens to play a non-equilibrium strategy at any node. By threatening to select a non-sincere equilibrium at the conflict stage, the Bs could enforce a better offer from the As than under sincere voting.

[18] Kydd (2010, p. 105) discusses factors that might prevent the existence of an outcome that both parties prefer to war and refers to the possibility that the issue over which the parties are bargaining may not be smoothly divisible, so that deals that would be mutually acceptable are not possible and to players having extreme preferences that devalue compromise solutions in comparison with total victory.

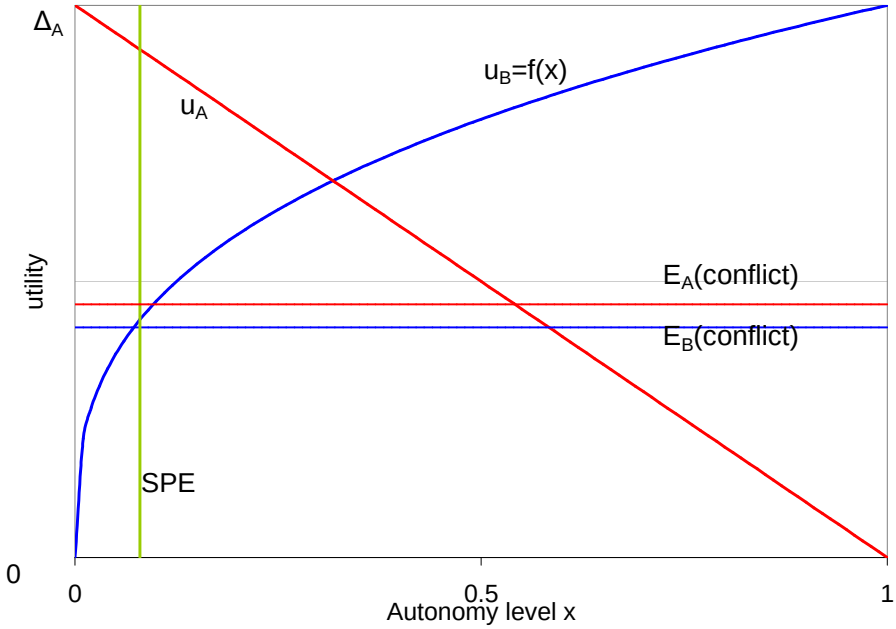

Figure 3. Concavity and peaceful subgame-perfect equilibrium

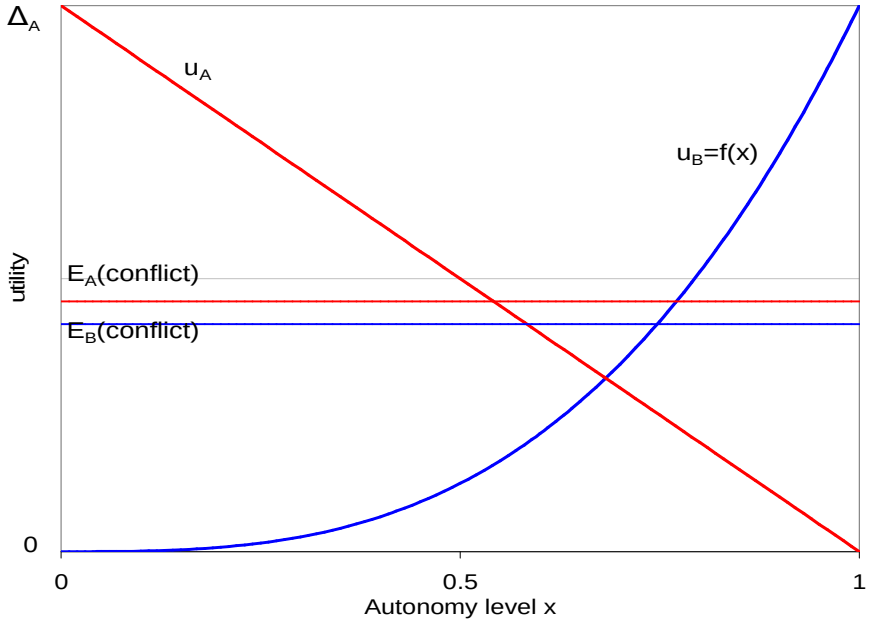

Figure 4. Convexity and the absence of a peaceful subgame-perfect equilibrium

While this seems an interesting possibility, we decided not to extend the analysis to such equilibria, for three reasons. First, they would still require the Bs to play a weakly dominated strategy when the vote on conflict is reached. This seems theoretically unappealing. Equilibria with non-sincere voting would not be trembling-hand perfect. As soon as there is the smallest probability that a player becomes the pivotal voter, sincere voting becomes the strictly better response. Second, without a reasonable selection criterion any outcome at any voting stage (and any combination of outcomes for any combination of first-stage outcomes) would be an

equilibrium outcome, which is not a useful prediction to test in experiments. This pertains to both finite and infinite repetitions of the game. Third, playing such sophisticated threat strategies would require an amount of group coordination that we think is implausible to expect from subjects in our context, especially since there are many such equilibria. In summary, we think that it makes more sense to interpret observed behavior in relation to the equilibrium with sincere voting than as the expression of some other equilibria, which are very difficult to coordinate on.

2.2. Experimental design and research questions

The analysis of the previous section is based on the assumption that people are only motivated by their own material payoffs. However, we know from many other experiments on interactive situations that relative material payoffs, efficiency considerations, emotional forces, issues of process satisfaction etc. may also come into play and have substantial influence on behavior. This is what we want to study with our experiment.

In all six treatments of the experiment there were six citizens of type A and three citizens of type B. We chose this configuration because we wanted to have a substantial majority of A type citizens, and also wanted to make sure that the number of Bs as well as the total number of citizens is odd, in order to ensure that in the voting stages ties were impossible. Space limitations did not allow us to use even larger numbers, given that we wanted to have at least two complete countries in parallel in every session for reasons of anonymity.

In the original set-up we studied three conditions. The treatment variable was the curvature of the payoff function for the citizens of region B. These three functions were derived from the function $\Pi_B = 270 + 1080x^{\beta}$, where $x \in [0;1]$ is the autonomy level. Note that the linear transformation of the payoff functions, which we applied to generate more convenient integer payoffs in the experimental set-up, does not alter the theoretical predictions in any way. Type A players' payoffs were also transformed as $\Pi_A = 1350 - 1080x$, for the same reason.

In one treatment, which we label "weakly concave" (WC hereafter) the value for β was set to 1.38. A second, so-called "medium concave" (MC) treatment, this value was set $\beta = 5.99$. Finally, we conducted a "strongly concave" (SC) treatment with $\beta = 18.65$. The parameter values were chosen such that there was one autonomy level in which payoffs for all citizens were equal. Figure 5 visualizes the payoff functions we used in the experimental sessions.[19]

We limited the number of feasible autonomy levels to a discrete grid of 10 equidistant levels, again to improve the presentation of the game to participants. As a result of these manipulations we obtain payoff tables as reproduced in table 1. In the three different treatments the column for the payoff of the As was used together with one of the three

[19] We do not study the case of convex preferences of the Bs. We conducted a pilot session using a moderately concave payoff function and no payoff-equalizing focal point. In this session, 39 out of 40 games ended in conflict. We figured that to give peace a chance, we would need to create a more favorable environment. For the first real session (MC treatment) we increased concavity and introduced payoff-equalizing outcomes.

columns corresponding to the payoffs of the Bs. These payoffs are rounded values as obtained from the above functions, with the following exception. In the MC and SC treatments, more than one high autonomy level would yield the maximum payoff of 1350. To prevent possible ambiguity resulting from this we slightly changed the payoffs in these cases. In table 1 the subgame perfect equilibrium predictions are shaded.[20] Lower autonomy levels than the equilibrium implies a prediction of conflict, since what the Bs obtain is lower than their conflict payoff.[21]

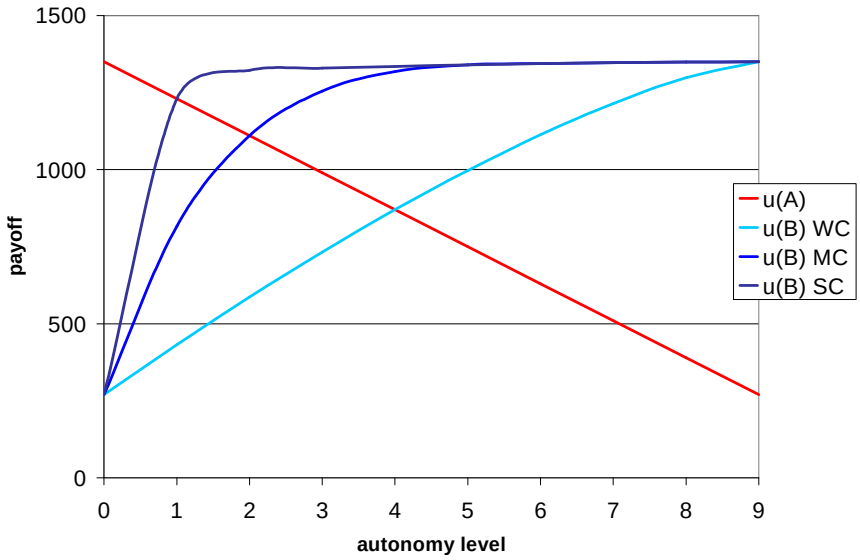

Figure 5. Payoff functions in the experiment

2.3. The conduct of the original set-up sessions

The experimental sessions for the original set-up were all conducted at the *Universitat Autònoma de Barcelona* (UAB), Spain. The experiment was computerized, with software developed using the *RatImage* programming package (Abbink and Sadrieh (1995)).[22] Subjects were recruited with posters placed all over the university campus. Each subject was allowed to participate in only one session, and no subject had participated in experiments similar to the present one. The subjects were undergraduate students from a wide range of disciplines, with slightly more women than men. The participants in the experiment were mostly Catalan and Spanish students. We chose this location for the original set-up of our experiment because

[20] Apart from the subgame-perfect equilibrium some other distributions of the ones shown in table 1 are worth highlighting. The egalitarian distribution is for WC at an autonomy level of 4, for MC at a level of 2 and for SC at a level of 1, which coincides with the subgame-perfect equilibrium. The utilitarian distributions are for WC at 0, for MC at 2 and for SC at 1.

[21] It is possible that the "symbolic" values of the alternatives could have an effect on behaviour. All three SPE are at relatively modest levels of autonomy (3 for WC and 1 for MC and SC) that are close to the status quo of 0. If the SPE were at levels such as 6 or 7 (holding payoffs constant) they might be perceived as more favorable by the members of group B. However, the analysis of the voting behavior (see next section) reveals that subjects respond strongly to payoffs, making this explanation unlikely.

[22] The appendix contains a copy of the instructions for the original set-up.

these subjects are precisely immersed in a conflict – albeit a peaceful one – of the type that we want to study. Thus the participants could be seen as more representative of the real-life agents than participants in a country without interregional dispute. The agents in the model represent voters who have pronounced political opinions, but are not necessarily themselves politicians or professionals in policy-oriented areas. So students, who are well-educated potential opinion leaders, seemed the most appropriate subject pool for our study. Later we also ran sessions at the University of Amsterdam, the Netherlands to control for the influence of the subject pool. We present the design and the results from these sessions in section 4.

Table 1. The payoffs in the three treatments of the experiment

Autonomy level	Each A receives	Each B receives		
		WC	MC	SC
0	1350	270	270	270
1	1230	432	817	1230
2	1110	587	1110	1322
3	990	733	1255	1329
4	870	870	1318	1335
5	750	997	1340	1340
6	630	1113	1344	1344
7	510	1214	1347	1347
8	390	1298	1349	1349
9	270	1350	1350	1350

In all sessions two experimental countries were run in parallel. There was no migration between these countries and subjects interacted in fixed groups of 9 subjects. Subjects were not told who of the other participants were in the same group, but they knew that the composition of the groups did not change. The subjects were seated distantly from one another in order to ensure that they could not influence each other's behavior other than via their decisions in the game.

Each session began with one of the experimenters reading aloud the written instructions (reproduced in appendix 1). In the original set-up the language used in the instructions was always naturalistic, i.e. we did not disguise the situation by using abstract terms only. Players were labeled "citizens" living in two "regions" of a "country", and they decided on "levels of autonomy" and "opening a conflict" (translations from Spanish). We did, however, avoid very loaded terms like *independence*, *violence* or *war*. Compared with a neutral framing this choice of language has the advantage that the parallelism between experiment and real-life environment is improved if the language in the experiment echoes the one used in real life. We later also ran sessions with abstract framing, in order to isolate possible emotional influences triggered by wording. These sessions are reported in section 4.

After all questions were answered, the computer program started play. In each round every citizen A proposed an autonomy level first; one of them was then randomly selected. In this way we could generate a richer data set for citizen A proposals. All citizens were then

informed about the selected proposal and asked to vote on it. Like in most real-world ballots, players were informed about the distribution of votes, separately for the two regions, but not on individual voting behavior. Then the type B citizens voted on whether or not to open the conflict for full autonomy. Again, the distribution of votes was transmitted to all citizens. If a conflict was opened, then all players were asked for their contributions, after which the total contributions in each region was made public. The lottery was then played out, visualized by a wheel of fortune on the computer screens.

In line with the tradition from many experimental games, participants interacted in fixed groups for 20 rounds. A strangers design, where groups are reshuffled in each round, would be closer to the theoretical predictions, which pertain to the one-shot game. However, it would be at odds with the framework of an independence struggle between countries that do not move around all the time. Further, there are practical limitations. With our nine-player game a strangers matching would require huge participant numbers to be implemented, and destroy the statistical independence of the observations from the different groups (countries).

We conducted four experimental sessions (a session refers to a particular time period in the lab) with each of the three treatments (i.e. each of the three payoff functions introduced above). In each session two separate groups of nine subjects, each corresponding to a "country" played in parallel. Since there is no interaction between the participants of the different countries, each country can be considered a statistically independent observation. Thus we gathered eight independent observations per treatment.

3. Results for the original set-up

The main focus of our experiment is on the likelihood of conflict and its resolution under the different sets of induced preferences. Therefore, we jump in our results presentation to the last stage of the game and first look at the frequency of an outbreak of conflict. Figure 6 shows the relative frequency of conflict in the three treatments over the twenty rounds of the experiment, aggregated over all sessions in each treatment.[23] Recall that concavity of preferences in all treatments implies that – if subjects are guided by these preferences - there should be no conflict at all according to the subgame-perfect equilibrium prediction.

Observe that in all three treatments the proportion of rounds in which no peaceful solution could be achieved is substantial. Even in the strongly concave condition more than one third (37.5%) of all rounds ended in conflict. This is surprising given that the autonomy level of 1 in this treatment is vastly more efficient than conflict. Recall that at this level each citizen gains a sure payoff of 1230, which is only slightly less than the winning party's per-capita payoff of 1350 (while the losers get a mere 270 each). In addition, citizens lose their contributions to the war chest in conflict. While in the SC treatment the frequency of conflict

[23] In figure 7 we include both conflicts that emerge after an equilibrium or an even more favorable proposal and those that emerge after an out of equilibrium proposal.

diminishes over the course of the experiment, no such trend can be observed in the MC and the WC treatment. Rather, conflict frequencies stay high at slightly less than one half even in later rounds. Recall that in these treatments there exist peaceful solutions, autonomy levels 2 and 1 respectively, that provide high (1110 and 1230 talers, respectively) and equal payoffs to all citizens.

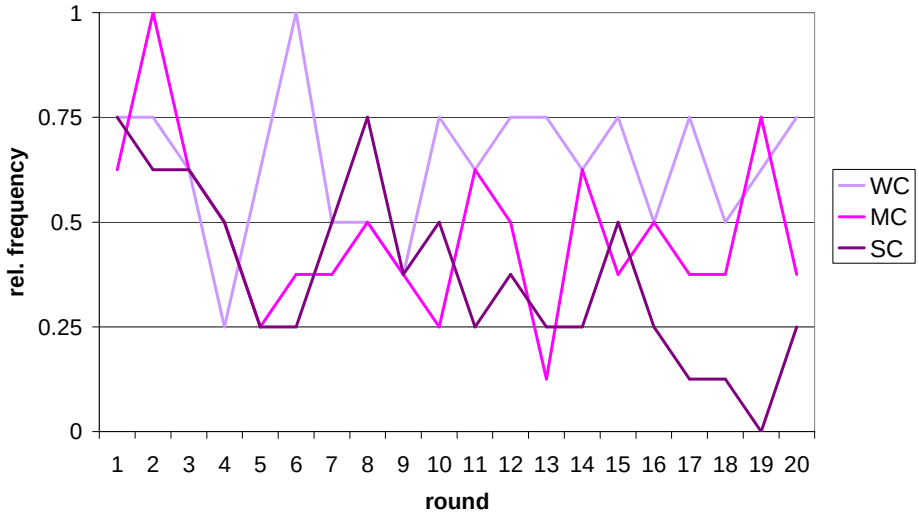

Figure 6. Conflict frequency

Over-fighting is strongly pronounced in all three treatments of the experiment, but we can establish a relationship between concavity and the likelihood of conflict. The respective conflict frequencies are 63.8%, 47.5% and 37.5% in the WC, MC, and SC treatment. Thus there is a tendency that a higher degree of concavity leads to a lower incidence of conflict. However, this effect is statistically significant only for the comparison between the WC and the SC treatment ($\alpha = 0.01$ one-sided, Fisher's two-sample randomization test). The other two pair-wise comparisons (WC vs. MC and MC vs. SC) are not significant.

Result 1. *In all three treatments the B citizens often vote for conflict even if they had previously accepted the proposal for a new status. Instead of the absence of conflict predicted in the subgame equilibrium we observe conflict frequencies of 63.8% for SC, 47.5% for MC and 37.5% for WC.*

The core of our interest is in the existence of peaceful solutions to inter-regional conflicts of the ethno-political type. In that respect result 1 can be seen as the bottom line. However, once a conflict has erupted there is still a question of how strong or intense the conflict will be in terms of the contributions to the war chests. Figure 7 shows the average total group contributions, conditional on there being a conflict, over the twenty rounds of the experiment.[24] The subgame equilibrium prediction for the conflict games considered in

[24] For the SC treatment there was never conflict in round 19, in round 20 there were conflicts and the average contributions were 1756 for the A citizens and 1009.5 for the B citizens.

isolation is a total contribution of 270 for both the group of A citizens and the one of the B citizens, with individual contributions of 45 for each A and 90 for each B citizen.

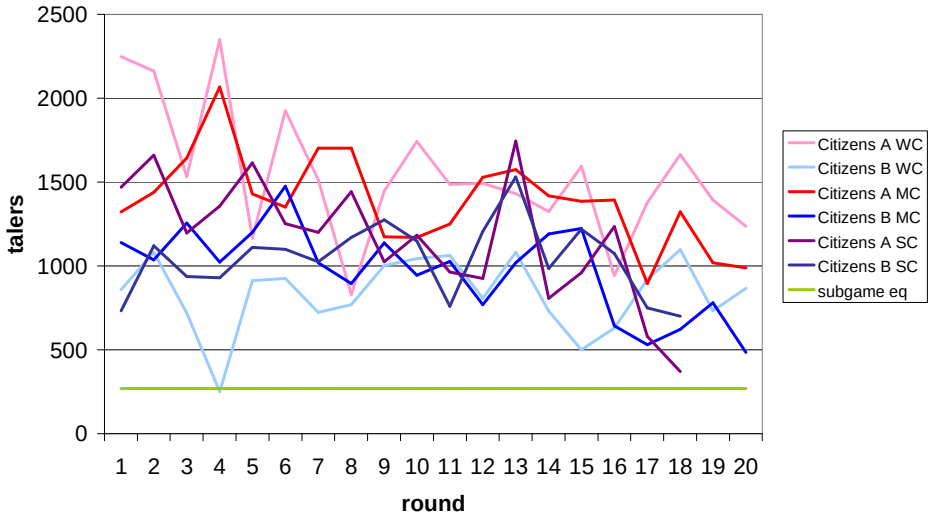

Figure 7. Average aggregate contribution to conflict

One can see that the tendency towards over-fighting manifests itself further in the massive contribution levels once a conflict has been opened. In fact the average contribution we observe in the experiment is 4.4 times higher than in the subgame equilibrium, with an average total contribution of 1376.3 for the A and 949.4 for the B citizens. Thus, not only is there far more conflict than predicted, but if there is conflict it is also far more intense.[25]

Significant treatment differences cannot be observed with respect to the contributions. However, once a conflict breaks out the subgame is identical in the three treatments, thus the absence of such effects might not be surprising.

Result 2. *In all three treatments we observe strong over-fighting with respect to the equilibrium level of the conflict stage as such.*

It is interesting that the aggregate investments are not far from a hypothetical benchmark in which each group acts as one player, playing as if they were in an equilibrium maximizing the group's aggregate payoff. In this case the (pseudo-)equilibrium contributions from equations

[25] Most experimental studies on rent-seeking games with individual players show that investment in conflict is larger than in equilibrium. Millner and Pratt (1989, 1991), Davis and Reilly (1998), Potters et al. (1998), Anderson and Stafford (2003), Schmitt et al. (2004a) and Öncüler and Croson (2005) find over-investment, while Shogren and Baik (1991) find investment at equilibrium levels and Schmidt et al. (2004b) and Shupp (2004) find over-investment. There are fewer studies comparing groups with individuals. Abbink et al. (2010) and Ahn et al. (2011) compare,with slightly different set-ups, individual with uncoordinated group behavior and find that groups over-contribute with respect to the equilibrium. Sheremeta and Zhang (2010) study an environment in which single bid is submitted by a group of two subjects after they exchange free-form text messages in a chat window for one minute and find that under these circumstances investments decrease..

(1) and (2) would be computed by setting $n_A=n_B=1$, and the prizes as the sum of all individual prizes, hence $\Delta_A=6(1350-270)=6480$ and $\Delta_B=3(1350-270)=3240$. The resulting group contributions in this pseudo-equilibrium are 1440 for the As and 720 for the Bs, not far off the observed averages of 1376.3 and 949.4, respectively. Once the conflict stage is reached groups seem to play remarkably similar to what they would play if the group members acted as one and the free-rider problem did not exist.

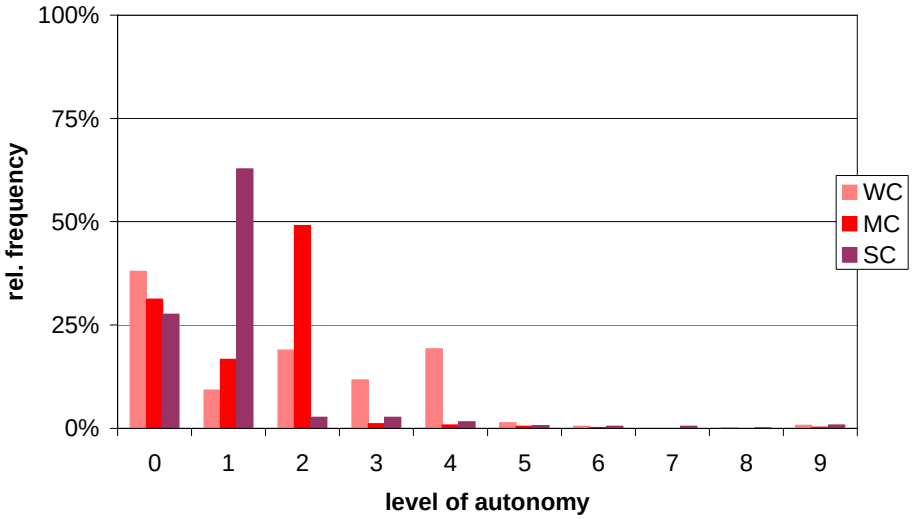

Figure 8. Distribution of citizens A's proposals

Note that this finding does not explain the excessive frequency of fighting we observe. Since contribution levels are much higher than under the prediction for individual rationality, conflict is even more costly, hence groups should be even more eager to avoid it. As a general rule, the citizens B would be willing to accept even lower levels of autonomy to escape conflict. In our setting, the expected per-capita payoff from conflict drops to 390 tokens for the Bs in the pseudo-equilibrium[26], hence any autonomy level of at least level 1 would be preferable over conflict for the Bs (see table 1). If anything, scope for peaceful agreements should be wider than under individual rationality, yet we observe very high conflict frequencies. We shall now look into the political process to shed light on the reasons for the high incidence of conflict.

3.1. Causes of over-fighting

The massive over-fighting we observe in both frequency and intensity is especially surprising given that we designed the experiment purposefully to give peace its best shot. Recall that in all treatments there is an attractive payoff-equalizing proposal. Equal payoffs are known to be very salient focal points from a plethora of bargaining experiments. So the question is why

[26] Insert $n_A=n_B=1$, f(0)=3*270 (the loser's payoff), $\Delta_A=6*1080=6480$, $\Delta_B=3*1080=3240$ into equation 3 and divide the final result by the true $n_B=3$ to obtain the per-capita expected payoff of war in the pseudo-equilibrium.

participants fail so frequently to agree on them. Do the As offer too little or the Bs demand too much? We look into the offers the As make and the voting behavior of the Bs to find out.

We start with the distribution of the proposals made by the As in the first stage, which are shown in figure 8. This includes all proposals made by the A citizens and not only those randomly selected to actually be presented to the B citizens. Recall that the payoff equalizing autonomy level is 4 in WC, 2 in MC, and 1 in SC, and the subgame-perfect equilibrium autonomy level is 3 for WC and 1 for both MC and SC.

Figure 8 shows that in the WC treatment more than 80 per cent of all proposals fall short of the payoff equalizing autonomy level. In the other treatments payoff equalization is the modal proposal, but the distribution is clearly skewed towards offers less favorable to the Bs. Overall, type A citizens frequently fail to make proposals acceptable to the B citizens. About one third of the proposals involve an autonomy level of zero, which means the citizen A refuses to offer any level of autonomy and therefore near-certainly opts for conflict.

Result 3. *The A citizens frequently propose to the B citizens autonomy that are disadvantageous to the B citizens.*

Table 2 shows that the As' frequent failure to make payoff-equalizing proposals is indeed the key to explaining the high conflict frequency. The table shows how often a certain proposal ended in conflict. Payoff-equalizing offers rarely lead to conflict, in all treatments this fraction is no more than one in eight. Lower offers, as we have observed them frequently, typically end in conflict because the Bs reject them, higher offers typically do not pass the first voting stage because the fellow As are not satisfied.

Table 2. Conflict frequency conditional on selected proposal

	WC			MC			SC		
Prop	#peace	#war	% war	#peace	#war	% war	#peace	#war	% war
0	1	67	98.5%	0	41	100.0%	4	33	89.2%
1	1	5	83.3%	14	16	53.3%	79	9	10.2%
2	9	15	62.5%	61	2	3.2%	3	2	40.0%
3	9	8	47.1%	2	1	33.3%	4	1	20.0%
4	21	3	12.5%	1	1	50.0%	1	1	50.0%
5	0	1	100.0%	1	0	0.0%	0	0	--
6	0	0	--	0	0	--	2	0	0.0%
7	0	0	--	0	0	--	1	0	0.0%
8	0	0	--	0	0	--	0	0	--
9	0	0	--	0	0	--	0	0	--

Result 4. *Payoff equalizing proposals rarely end in conflict. Lower or higher offers often are rejected by one of the groups.*

Since the citizens B open conflict so frequently and conflict is so intense, we may conjecture that they leave a lot of money on the table when they reject the As' proposal and open conflict. However, the proposals they receive from the citizens A are often poor. As seen in

table 2 the As frequently refuse to offer any improvement over the Bs worst outcome of full centralization, which can make even intense fighting preferable to the Bs. To assess Bs' gains and losses from conflict one needs to compare their payoffs from conflict to the payoff the Bs would have obtained if they had accepted the As' offer. Figure 9 shows the distribution of the Bs' expected gains from conflict for the three different payoff distributions, where the expectation is computed for the actual conflict expenditures in each instance. The thick red dots show the average over all cases. One can see a rather large dispersion in expected gains for all three cases. There are some very costly fighting decisions, but also many in which fighting was actually more profitable than accepting a poor offer. On average there is only a rather small expected loss, for all three payoff distributions.

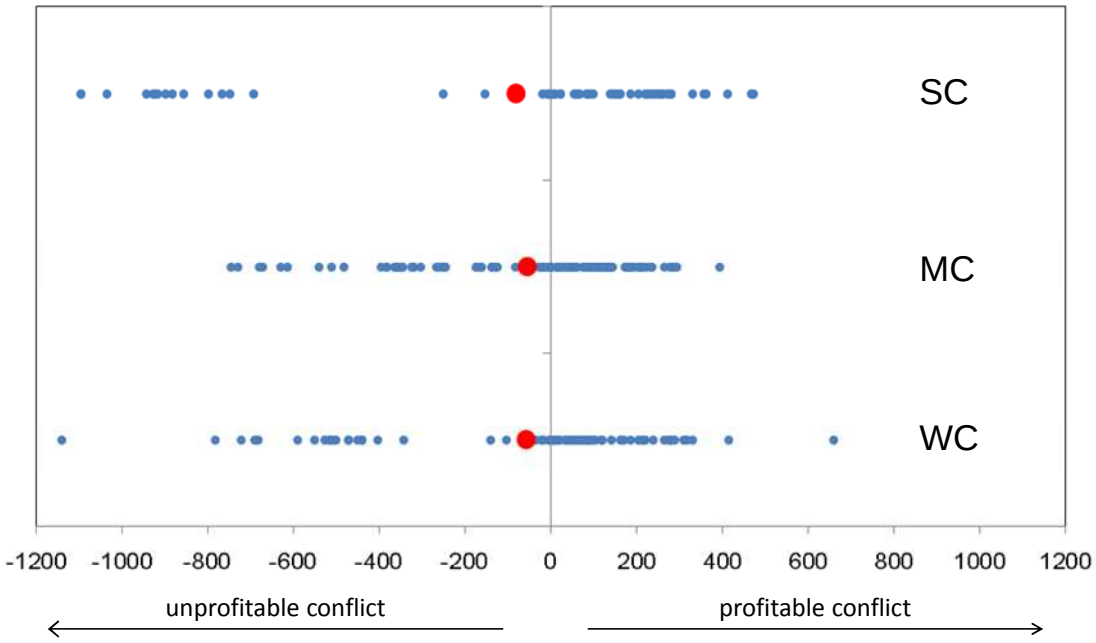

Figure 9: Expected gains from conflict for B citizens

Result 5. *We observe both large positive and large negative expected gains. On average the Bs' make a small expected loss by choosing conflict.*

4. Additional sessions with a new subject pool and new instructions

The previous analysis suggests an explanation for why there is a high frequency of conflict despite the concave payoff functions that guarantee the existence of Pareto superior peaceful solutions. Aspiration levels of some citizens A and the citizens B appear to be incompatible. Citizens B are not satisfied with less than equity and opt for conflict even if accepting lower proposals would still be materially better than conflict. This explanation still leaves us with

the puzzle of why fighting is also much too intense, as compared to the equilibrium level of the conflict game as such.

One natural conjecture is that this is due to the particular subject pool and to the use of naturalistic language in the instructions. Many Catalans have strong feelings about issues of national identity and self-determination. Given the naturalistic instructions, an unsatisfactory interaction process leading to a conflict situation may - in such a subject pool – trigger an intense emotional response which leads to the very high investment levels we observe. However, it is also possible that the game as such, involving group competition, leads to strong fighting regardless of the framing and the subject pool. Framing effects have been found to be important in a variety of areas of social and political life, as discussed by Chong and Druckman (2007).

To study these possibilities we varied the instructions and the subject pool. We ran additional sessions for three new treatments. First, we conducted additional sessions in Barcelona using the same game as in our original MC treatment, but with instructions worded in abstract language. These can be found in appendix B. As can be seen all loaded terms like "country", "region", "autonomy level", "conflict" etc. have been replaced by neutral abstract expressions. Without these linguistic hints the game is harder to identify as a model of an independence struggle, thus we may expect that the emotional response would be weaker, leading to lower contributions.

Second, we conducted sessions with both loaded and neutral instructions at the University of Amsterdam, the Netherlands. There is no independence conflict that concerns the Netherlands at the moment, so one would expect that people have less strong feelings about such issues.[27] If there is a framing effect of loaded instructions, one would expect it to be weaker in Amsterdam than in Barcelona.

The Barcelona subjects came from the general student population of the UAB, the Amsterdam subjects came from the general student population of the University of Amsterdam. We gathered some demographic information and found the subject pools to be similar. Questionnaires that we handed out at the end of the sessions (after play was completed to rule out possible contamination of the results), revealed that in both pools the modal age was 19, economics students formed the largest group, an overwhelming majority were born in the local country and native speakers of a local language.[28] Atheists formed the largest "religious" denomination, followed by Christians. Minor differences were that the majority in Barcelona were women, in Amsterdam men. However, this difference was small. We also asked the

[27] Suriname, a former Dutch colony, won independence in 1975. The students in our subject pool are thus too young to remember, and there is little reverberation of the event in the Dutch political debate today. The status of the remaining overseas territories (Aruba and Netherlands Antilles) is a very low-key issue, certainly not comparable with the situation in Spain.

[28] The University of Amsterdam has a very international student population. To make sure that mainly Dutch students took part in the experiment, the e-mail invitations to the experiment were sent out in Dutch, though the language of the instructions was English, the language of instruction for most students in Amsterdam.

subjects in Barcelona a question on their national identity. They were requested to indicate whether they saw themselves as "only Spanish", "more Spanish than Catalan", "equally Spanish and Catalan", "more Catalan than Spanish", or "only Catalan". The modal answer was "more Catalan than Spanish", followed by "equally Spanish and Catalan", with few responses at the extreme ends.[29]

As before, we conducted four experimental sessions with each of the three new treatments and gathered eight statistically independent observations per treatment.

We start with the comparisons of conflict frequency across treatments. Figure 9 shows the average percentage of conflict in the six treatments of the experiment. Inspection of the figure suggests that the differences between subject pools and framing conditions are not large. Of the pairwise comparisons for the four treatments with the MC payoff function, only the difference between BCN-loaded and AMS-loaded is significant, but observe that the lower of these conflict frequencies reaches the considerable level of 29%. Between the Barcelona sessions the framing effect is small and insignificant, between the Amsterdam treatment the effect is even (but not significantly) in the opposite direction.

How can we rationalize the perhaps unexpected pattern of differences shown in figure 10? One possible interpretation is that conflict stems from incompatibilities between the two groups' aspiration levels.

Result 6. *The framing of the instructions and the subject pool have only minor effects on conflict frequency.*

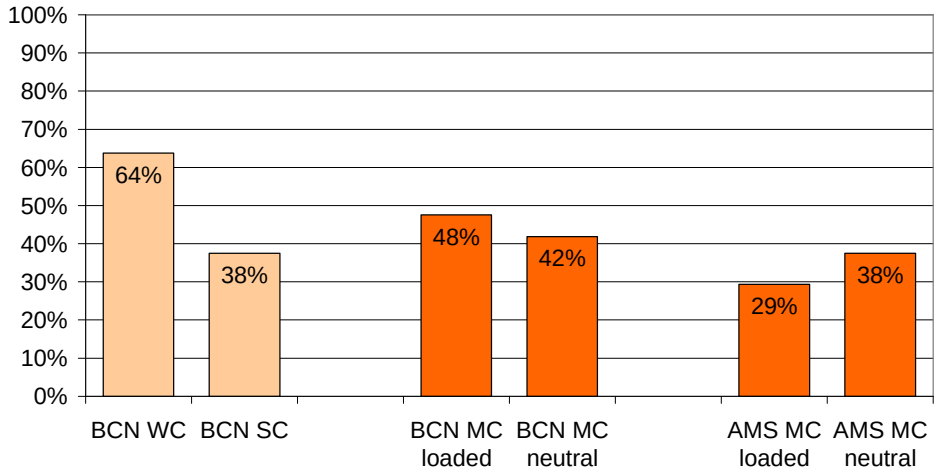

Figure 10. Conflict frequency

Given the rather similar conflict frequencies across the new treatments, we now move to the comparisons of conflict intensity. Figure 11 shows average total conflict investment levels in the six treatments of the experiment. Now we find clearer differences that go in the

[29] The distribution in our sample is only slightly more skewed towards a more Catalan identity than in the general population. The question we asked is regularly used in opinion polls.

hypothesized directions. There is a strong framing effect among the Catalan subjects. Contributions drop by 26.9 per cent. The difference is significant at p=0.032 (one-sided), according to Fisher's two-sample randomization test applied to average investment levels in each country. Further, the framing effect is much weaker in the Amsterdam sessions, whose subjects should generally be less emotionally involved in the matter. The difference we observe is not statistically significant.

The figure also shows that contributions in Amsterdam are lower than those in Barcelona. Direct comparisons across subject pools are notoriously difficult, since despite our best efforts it can never be ruled out that there are some idiosyncratic subject pool characteristics that remain uncontrolled for. Nevertheless, the tendency is clearly in the predicted direction. Further, the subject pool difference is highly significant with loaded instructions (p=0.004), but not significant in the treatment with neutral instructions (p=0.125).

Result 7. *Neutral framing of the instructions significantly reduces contributions in the Barcelona subject pool, while Amsterdam students show a much weaker response to framing.*

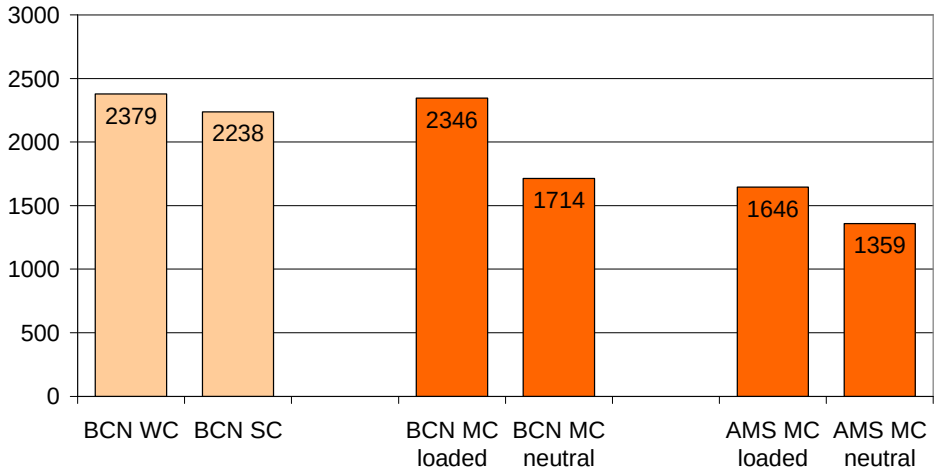

Figure 11. Total conflict investment

We have shown that subject pools and framing conditions have a minor effect on conflict frequency and an important effect on conflict intensity. However, despite the strong framing effect in Barcelona and the difference between the subject pools, the emotional response triggered by involvement and loaded instructions cannot explain all of the above-equilibrium contributions. Even in the least susceptible treatment, with neutral instructions and Amsterdam students, contributions are still 2.5 times higher than in the subgame-perfect equilibrium. Thus, a substantial part of the over-fighting must be induced by the group dynamics the contest as such may generate.

Part of the explanation for this overfighting might lie in the creation of group identities through the experimental setup. It is known in social psychology that group identities can be

created in the laboratory by some pre-play activity. This is called the minimum group paradigm (Tajfel (1960)). Such artificial group identities can influence attitudes towards in-group altruism and out-group hostility even when the groups are completely meaningless (Harris et al (2011)). In our experiment we also create groups, especially in the sessions with naturalistic language (though we do not have any pre-play bonding activities). However, our groups are not entirely artificial, since the groups are characterized by a well-defined material group interest from our payoff structure.

5. Summary and Conclusions

We study an experimental game capturing essential features of a dependent region's fight for more political autonomy in a democratic context. For the concave preferences we study, theory prescribes a "peace equilibrium" with an intermediate degree of political autonomy and no conflict.

In our original set-up with a Barcelona subject pool and moderately loaded instructions, we observe that conflict not only happens frequently, but it also much more intense than it should be. We can attribute the frequent occurrence of conflict to a failure of the dominant region's citizens to make acceptable proposals, where acceptability is defined as equity across groups. The excess intensity is due to a combination of responses triggered by the political context and group dynamics inherent to the context. In an emotionally discharged setting, using neutral wording and/or an uninvolved subject pool, conflict intensity drops considerably. It remains, however, still substantially above equilibrium levels.

The interaction between the two groups, set in an emotionally loaded context, leads to the emergence of some kind of group cohesion, which in turn leads to unacceptable offers. This triggers unreasonable investment levels in the inter-group conflict. Our results are an instance of how political, psychological and economic factors can interact: a biased – albeit democratic - political process can trigger emotional forces which lead to an important destruction of material resources. Conducting the experiment in what can be seen as an emotionally loaded context leads to an increase in conflict intensity.

In relation to the interpretation of actual ethno-political conflicts outside the laboratory the results are not encouraging. We observe very unreasonable behavior in the very moderately emotional climate of the lab. The emotional forces that lead to the behavior we observe can be conjectured to be much more intense in natural environments involving communities that have been in conflict for generations.

We close with some speculative remarks intended to inspire further research. The question arises as to how, in the light of our results, costly conflict could be reduced. According to the notion put forward by Fearon (1995) that the problem of ethnic violence is connected to the absence of a third party that can guarantee agreements, one possible way to reduce conflict would be mediation by a neutral third party. Part of the problem with our environment is that

the A citizens have the initiative in proposing an outcome. This seems to make them somehow aggressive in their demands. At the same time the B citizens respond aggressively to the As proposals, as if they felt hurt in their pride due to the fact that they are assigned a more passive role. If a proposal for a reasonable arrangement were made by an independent mediator much of the aggressiveness displayed by both sides might disappear. Indeed, mediation is very frequently observed in situation of conflicts between communities, as in the former Yugoslavia.

Another way to improve relations between the two communities could be a change in the rules of the game to a situation with more symmetric roles for the As and the Bs. Perhaps if the initial proposals were launched by a small subset of As and Bs, a balanced expert commission of some sort, acceptance of equilibrium proposals might increase.

Our results show that concavity of relative preferences between the two groups does matter, albeit only moderately. In the experiment, of course, these preferences were induced by payoff tables. External validation of our results would require extensive survey studies to assess the preference profile in different countries in which autonomy struggles prevail. Such studies would systematically assess how different bundles of policy measures can be ordered to preference profiles as we use in our model. It would then be possible to evaluate the concavity of relative preferences between the median voters in the regions. In a cross-cultural survey our results could be empirically validated and potentially guide policy-makers in their effort to find peaceful solutions to the respective countries' problems.

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Appendix A. Naturalistic Instructions

General information

We thank you for coming to the experiment. The purpose of this session is to study how people make decisions in a particular situation. During the session it is not permitted to talk or communicate with the other participants. If you have a question, please raise your hand and one of us will come to your desk to answer it. During the session you will earn money. At the end of the session the amount you will have earned during the experiment will be paid to you in cash. Payments are confidential, we will not inform any of the other participants of the amount you have earned.

During the experiment you will be in a group with eight other participants. You will be grouped with the same participants throughout the experiment. You will not be informed of the identity of the persons you are grouped with. Six of the persons in your group will be in subgroup A and three in subgroup B throughout the experiment.

The experiment consists of 20 separate rounds.

Decision stages of each round

In each round participants will make decisions in three stages.

Stage 1

All participants live together in a country, with the As living in region A and the Bs in region B. Stage 1 of every round starts with original status quo payoffs of x for each of the participants in region A and of y for each of the participants in region B. These original status quo payoffs will be the same in all rounds. It is possible that there will be a referendum among all the members of a group about whether to replace the original status quo by another level of autonomy implying a different payoff combination. The table below shows the different possible autonomy level with corresponding payoff combinations.

	Payoff combinations of the different autonomy levels [see main text]									
Autonomy level	Original status quo	1	2	3	4	5	6	7	8	Full autonomy
Every A gets										
Every B gets										

Before the referendum can take place each of the As will propose simultaneously which autonomy level (original status quo, I, II,…, full autonomy) they want to replace the original status quo with. The proposal of one of the As will be chosen at random. If the randomly chosen proposal is the original status quo itself, then the original status quo remains, no referendum takes place and the round moves directly to stage 2. If the randomly chosen proposal is not the status quo then all the As and Bs will be called to vote in favour of the

new proposal or the original status quo. Whichever of the two possibilities obtains more votes wins and becomes the new status quo. Then the round moves to stage 2.

Stage 2

In this stage there will be a referendum among only the Bs to decide whether they accept what now is the status quo. If the majority of the Bs says yes the round ends and the As and Bs in the group earn the payoff corresponding to the new status quo. If the majority says no, then a conflict arises and the round moves to stage 3.

Stage 3

In this stage each of the participants in a group can campaign by investing money either in a "original status quo account" or in a "full autonomy" account. All participants make this decision simultaneously. Once all have made their decision the computer will randomly determine whether the payoff combination of the original status quo or the payoff combination of full autonomy will be implemented. The probability that the original status quo will be selected is:

(Money in the original status quo account)/(Money in the original status quo account + Money in the full autonomy account),

and the probability that full autonomy is selected is:

(Money in the original full autonomy account)/(Money in the original status quo account + Money in the full autonomy account).

Note that the two probabilities sum to one, i.e. one of the two payoffs, the original status quo or full autonomy, will be selected with certainty. Note also that the more money in one of the accounts relative to the other, the more likely that the first account will be selected.

Once the final payoff combination has been selected the round ends. After that the next round will start, until a total of 20 rounds.

Earnings

At the beginning of the experiment each of you will receive 1000 talers credited to your account. After each round, your round earnings are credited to your account. At any moment during the experiment you will be able to check the money in your account on the screen.

At the end of the experiment the talers will be converted to euros at the exchange rate of 1.50 euros for each 1000 talers.

Appendix B. Neutral Instructions

General information

We thank you for coming to the experiment. The purpose of this session is to study how people make decisions in a particular situation. During the session it is not permitted to talk or communicate with the other participants. If you have a question, please raise your hand and one of us will come to your desk to answer it. During the session you will earn money. At the end of the session the amount you will have earned during the experiment will be paid to you in cash. Payments are confidential, we will not inform any of the other participants of the amount you have earned.

During the experiment you will be in a group with eight other participants. You will be grouped with the same participants throughout the experiment. You will not be informed of the identity of the persons you are grouped with. Six of the persons in your group will be in subgroup A and three in subgroup B throughout the experiment.

The experiment consists of 20 separate rounds.

Decision stages of each round

In each round participants will make decisions in three stages.

Stage 1

All participants are together in a group, with the As in subgroup A and the Bs in subgroup B. Stage 1 of every round starts with initial payoffs of x for each of the participants in subgroup A and of y for each of the participants in subroup B. These initial payoffs will be the same in all rounds. It is possible that there will be a vote among all the members of a group about whether to replace the initial payoff distribution by a different payoff combination. The table below shows the different possible payoff combinations.

	Payoff combinations									
Name of payoff distribution	Initial payoff distribution	1	2	3	4	5	6	7	8	9
Every A gets										
Every B gets										

Before the vote can take place each of the As will propose simultaneously which payoff distribution (initial payoff distribution, 1, 2,…, 9) they want to replace the initial payoff distribution with. The proposal of one of the As will be chosen at random. If the randomly chosen proposal is the initial payoff distribution itself, then the initial payoff distribution remains, no vote takes place and the round moves directly to stage 2. If the randomly chosen proposal is not the initial payoff distribution then all the As and Bs will be called to vote in

favour of the new proposal or the initial payoff distribution. Whichever of the two possibilities obtains more votes wins and becomes the newly proposed initial payoff distribution. Then the round moves to stage 2.

Stage 2

In this stage there will be a vote among only the Bs to decide whether they accept what now is the newly proposed payoff distribution. If the majority of the Bs says yes the round ends and the As and Bs in the group earn the payoff corresponding to the newly proposed payoff distribution. If the majority says no, then a conflict arises and the round moves to stage 3.

Stage 3

In this stage each of the participants in a group can invest money either in a "initial payoff distribution account" or in a "payoff distribution number 9" account. All participants make this decision simultaneously. Once all have made their decision the computer will randomly determine whether the payoff combination of the initial payoff distribution or the payoff combination number 9 will be implemented. The probability that the initial payoff distribution will be selected is:

(Money in the initial payoff distribution account)/(Money in the initial payoff distribution account + Money in the payoff distribution number 9 account),

and the probability that payoff distribution number 9 is selected is:

(Money in the payoff distribution number 9 account)/(Money in the initial payoff distribution account + Money in the payoff distribution number 9 account).

Note that the two probabilities sum to one, i.e. one of the two payoffs, the initial payoff distribution or the payoff distribution number 9, will be selected with certainty. Note also that the more money in one of the accounts relative to the other, the more likely that the first account will be selected.

Once the final payoff combination has been selected the round ends. After that the next round will start, until a total of 20 rounds.

Earnings

At the beginning of the experiment each of you will receive 1000 talers credited to your account. After each round, your round earnings are credited to your account. At any moment during the experiment you will be able to check the money in your account on the screen.

At the end of the experiment the talers will be converted to euros at the exchange rate of 1.50 euros for each 1000 talers.