Final Report: Breaking the Dynamics of Emotions and Fear in Conflict and Reconstruction

Executive Summary

Urs Luterbacher
Graduate Institute of International and Development Studies
Carmen Sandi
EPFL
Graciela Chichilnisky
Columbia University
Lars Eric Cederman
ETH
With the Collaboration of
Assia Alexieva
Imène Ajala

Abstract

Our research has allowed us to cover the four steps mentioned in our re-dimensioned proposal namely 1. Elaborate a generic dynamic numerical model of conflict and cooperative behavior. This model has been given characteristics to make it compatible with neuro-science findings by going beyond classical expected utility perspectives and accounting for emotions and strong behavioral challenges. The dynamics in conflict have been especially emphasized. 2. More neuro-science experiments have been conducted in order to include answers to the following questions: What is the impact of stress and fear on aggression and conflict resolution? What is the impact of cooperative behavior related to both generalized and direct reciprocity on conflict resolution? What physiological mechanisms underlie the impact of stress on conflict dynamics and retaliation related behavior. Can the experience of cooperative behavior modulate behavior in an animal model of retaliation? Findings have been incorporated into the numerical model. 3. Constitution of conflict database where the major difficulties encountered centered around the lack of conflict related time series for the number of casualties and combatants on both sides. 4. Finally the model has been simulated without specific reference to a particular country with the result that economic conditions drive the model since in one case sustained growth produces stability and end of combats whereas deteriorating capital growth and GDP collapse lead to increased hostile coalition participation and more fighting. However, the mere trigger of economic conditions is insufficient to explain conflict escalation, which results from increased participation in mutually hostile coalitions and greater fighting propensity where emotions such as fear and resentment play their role

Description of Research Goals

Our research over the period of the project (October 1, 2010 – June 30, 2012) has included the four research steps outlined in the Research Plan: (1) building a generic computational dynamic model; (2) conducting neuroscience experimental research; and (3) gathering empirical data. The qualitative comparison between case studies data and the generic model (Step 4) will take place in the later phase of the project, outside of SNIS funding as anticipated.

Step 1: Elaborating a Generic Dynamic Model of Conflict and Cooperative Behavior

This generic model builds on previous research by Luterbacher et al. (2005) and Chichilnisky (2009a, 2009b and 2010) Chichilnisky et al. (2000). The objective of the model is first to combine some of the various strands of theory that have been used to explain conflict: Conflict will be initiated or amplified by information circulating mostly within one group and directed against the other. Misperceptions about the other group can lead to armed violence. To this Bhavnani et al. (2011) add a particular concern about the location of conflict and how violence is territorially determined and influenced by social distance. Without denying the importance of information questions, territoriality and social distance in the generation of armed conflict, one can nevertheless legitimately ask about the importance of other factors. Quite a few authors have pointed out the importance of resource issues in explaining conflict at least as a long-term factor. Information issues are often considered without reference to a specific context. However, context matters and in several cases of conflict both domestic and international fear appears to be a powerful motivator for extreme behavioral responses in general and for conflict and violence in particular. Such behavioral responses appear irrational at the outset and cannot usually be explained through standard models of decision making such as expected utility. Quite clearly, fear is also closely linked to rumor and thus often to false information transmissions. Moreover, fear has a tendency then to build upon itself and to influence thus conflict dynamics: Fear of the other will lead to suppress the other violently, which will then in reaction draw more people who feel threatened to rally toward him as much as opponents will rally against him. Fear and other "emotional" factors in conflict such as a feeling of injustice are precisely what neuroscience research has emphasized. How can one now tie all these aspects together?

A numerical agent based model can provide numerical solutions, which can then be confronted and calibrated with empirical data. Our model first takes the perspective of a representative agent whose utility function(s) will take an S shape form which illustrate both initially risk preferring but then risk averse attitude. Such a perspective is necessary in order to account for emotional motivations which may be attributed here to changes in attitudes toward risk: Losses (i.e. corresponding to lower regions of the utility function will trigger risk preference and thus rash and conflict triggering (although not irrational)

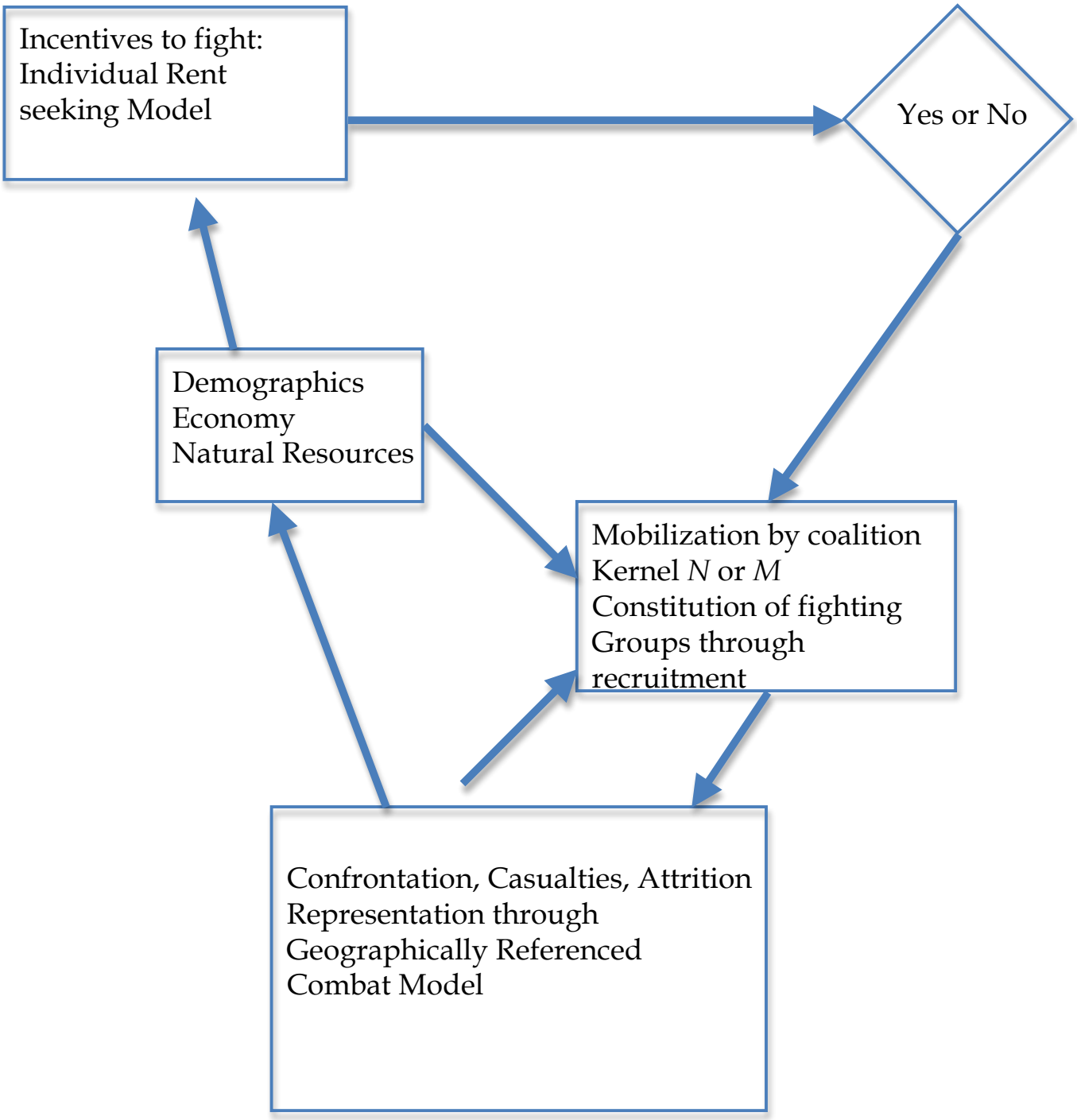
behavior[1]. We are thus starting with an approach that explains first a representative agent's economic choices in terms of allocating his producing/expending activities between collective and private goods and then the choice he has between producing and joining fighting forces in an unstable country or to what extent such an agent is willing to join aggressive actions by a political grouping (which might be a country). This perspective can help understand under which conditions the emergence of a society with competing warlords (as it sometimes occurs in developing countries) is more or less likely than the building of a politically stable and economically developed society or the development of hostilities between different groups. We want to find the level of producing/fighting, which maximizes the utility of a representative agent.

The model presents the representative agent as a utility-maximizer who chooses an individually optimal level of allocating resources between private and collective goods and then also between producing and fighting. Relations that describe the evolution of the population in the given society and also the changes in its capital stock introduce additional dynamics into this framework. The population and capital stock dynamics are formulated with the help of birth, death and discount rates, which also thus account for trade offs between the present and the future. Moreover, we combine this with a coalition formation behavior which although implicit in the notion of social distance and communication (or absence thereof) is never explicitly represented in all the formulations and theories about domestic conflict. Our coalition type game is based upon the notion of "oceanic games", a concept introduced by Milnor and Shapley (published 1978 but elaborated earlier in a RAND paper) and then further developed by Straffin (1977). If a society is divided up into coalition kernels N and M (for instance two opposing factions) and a large number of uncommitted bystanders U, the coalition dynamic can result in bystanders joining either N or M based either on uncommitted's evaluation of the probability of N or M overtaking the other faction (i.e. join the likely winner) or conversely on the fear that such a perspective might actually occur (defend the possible loser for fear of the likely winner). We thus rejoin the considerations made earlier about emotional aspects of mobilization for conflict. Once coalitions are established, mobilization of their respective strengths in numbers can occur, social distance between them will increase and then conflict and violent clashes can occur. These will then eventually be simulated with territorial and information issues introduced.

Clearly, the coalition perspective, which can reiterate some aspects of the emotional factors in conflict, shows how confrontations can be influenced and enhanced by their own dynamics. In other words, conflict begets conflict as more and more individuals are drawn into it. This is in our view the main value added of the present approach: Whereas other conceptions stay at a relatively static level, our vision leads to an endogenous possible amplification (or for that matter reduction) of conflict.

[1] This perspective is in good agreement with neuroscience findings.

On the basis of these considerations we can show that this model can lead to conflict escalation and stable societal conflict traps. On the other hand, we show also that such situations are basically inefficient and that in fact any unequal situation within society that is not compensated by transfers from the more powerful or wealthier to poorer segments of society is inefficient. This particular result illustrates the neuroscience finding that increased inequality in a social hierarchy favors conflict. To show how the conflict dynamics can work in our framework, we will use the following scheme:



Step 2: Conducting Neuroscience Experimental Research Partner EPFL

We have addressed a number of key questions at a basic level of complexity in rodents with the goal of providing insights about key elements affecting social interactions and, hence, helpful to identify important elements to be implemented in the modeling part of the project.

The questions that were addressed with the rodent approaches were:

1. What is the impact of stress and fear on aggression and conflict resolution?
2. What is the impact of cooperative behavior related to both generalized and direct reciprocity on conflict resolution?
3. Can the experience of cooperative behavior modulate behavior in an animal model of retaliation?
4. What physiological mechanisms underlie the impact of stress on conflict dynamics and retaliation related behavior?

These questions have been addressed both experimentally and by examining the related literature. The main findings are summarized below:

What is the impact of stress and fear on aggression and conflict resolution?
We have investigated the aggression level and dominance hierarchy established between two male rats when stress (a fear-induction experience) is given to one of the two rats in the contest. In our model, a social hierarchy established by two male rats during a first encounter is not maintained one week later.

Thus, we have shown that stress can have a deleterious impact in individuals' position in the social scale, as well as increasing social inequality.

What is the impact of cooperative behavior related to both generalized and direct reciprocity on conflict resolution?

As indicated in the project proposal, we have addressed this question by consulting the relevant literature. We have extended the search to the literature related to evolutionary perspectives in leadership, dominancy, and conflict resolution.

These are the key elements that we have extracted based on the literature and our own reflection and that we deemed essential to deal with conflict resolution:

- Alternation on the access to disputed resources can be a way to resolve conflicts before they have gotten into high escalation levels.
- Escalated conflicts are linked to strong emotions and negative emotional memories. Resolution of conflict might be benefited by a change in 'intrinsic' motivation in the respective parties (e.g., responsibility of achieving peace for the future of next generations),

reducing the emphasis on aspects related to 'extrinsic' motivation (competition with the other party).
- Bringing a change in intrinsic motivation not only to leaders (top-down), but also to the group (bottom-up).
- Fostering cooperation on the bases (i.e., respective groups) from each party through external reward, as a way to reduce negative emotionality.
- Given the strong influence of fear and emotion, the negotiation framework should include a basis to deal with free-riders that can boycott the agreement process.
- Biological roots can be in the basis of individual and group variations in dominance behaviors, aggression, and antisocial punishment. Understanding these biological mechanisms can be a way to deal with difficult conflict resolution.

Can the experience of cooperative behavior modulate behavior in an animal model of retaliation?
To address this issue, we have started investigating the modulatory role of different personality-like traits in the establishment of social hierarchies. Individual differences in the amount of anxiety were apparent when we tested Wistar rats in a test that measures animals' anxiety, the elevated plus maze. We further showed that anxiety trait is highly predictive for social dominance; highly anxious (HA) animals tend to become submissive during an encounter when matched for weight to low anxious (LA) conspecifics as apparent from both total duration of offensive behavior.
What physiological mechanisms underlie the impact of stress on conflict dynamics?
In order to investigate whether stress effects in the long-term establishment and expression of the social hierarchy are mediated by the so called 'social neuropeptides' oxytocin and vasopressin, we have investigated changes in the expression level of the receptors for each of these neuropeptides (i.e., *Otr* and *V1aR* receptor genes) in brain regions relevant for the mediation of social behaviors and aggression (plasma levels are in quite a low range and not so informative). We found that the potentiation of a social hierarchy induced by stress is accompanied by social status-, region- and time-specific changes in the expression of *Otr* and *V1aR* mRNA in the medial amygdala and lateral septum.

Step 3: Empirical Data Gathering

Initially, the data collection efforts focused on the conflict variable and on testing the ground for the proposed case studies. The three datasets identified in the project proposal have been tracked down, relevant data extracted, and its operational value to the research project assessed. Most importantly, a considerable volume of empirical material has been gathered on the conflicts in Israel/Palestine, Afghanistan, and Sudan, contacts with experts at international organizations and NGOs established, and a data gap analysis conducted. In the following months of the project, one case study has been added, Lebanon. This means that four case studies have finally been picked up from the initial list of cases in the research proposal: Israel-Palestine (an interstate conflict), Afghanistan, Lebanon and Sudan (intrastate

conflicts with strong international involvement). Conflict datasets have been set up for all four, with an initial focus on fatalities but also including statistics on migration, demography, poverty, and economic development. In the first months of the project, the data collection efforts focused indeed on the conflict variable. The articles "Conflict, Environment, and the Dynamics of Fear" and "Unfolding Tragedies: Explaining and Predicting Future Environmental Scarcities and Conflicts" build on the complex relations between "natural resources, demography and institutions" to understand the existence of conflict. Besides conflict data, the research compiled in the last months of the project deals with sociological and economic data with a specific focus on three elements: ethnic groups and their settlement patterns, demographic data (especially population density) and natural resources.

Case Studies Datasets

Given that the above datasets contain annual data only, the research focus has shifted to compiling monthly data on potential case studies to be able to better analyze the *dynamics* of conflict behavior. Such an endeavor is particularly challenging due to the political sensitivity of publishing fatalities statistics on contemporary conflicts. At the same time, the study of recent cases allows to tap knowledge from international agencies and NGOs, which are based in the field, thus obtaining first-hand information. Generally, the numbers reported have hardly fluctuated significantly from one source to another, which speaks of their reliability.

Israel-Palestine offers a good starting point as it is a conflict that has been going on for a long time, the parties to the conflict are easily identifiable, and official data obtainable from both national and international institutions. For example, figures on fatalities have been acquired from three difference sources: one Israeli (B'tselem, the Israeli Information Center for Human Rights in the Occupied Territories), one Palestinian (the Palestinian Monitoring Group of PLO's Negotiations Affairs Department) and one international (the UN Office for Coordination of Humanitarian Affairs). Though the time periods vary, comparison among the three datasets confirms the data reliability, thus making the merging of results or the use of low/high/best estimates possible. In addition, information has been compiled on injuries, attacks on religious sites, arrests, home demolitions, and assassinations. Most importantly, the data is disaggregated by party to the conflict (i.e. Palestinians killed by Israeli forces, Israeli forces killed by Palestinians, etc.), which is important for the purposes of the project.

Afghanistan has been a difficult case to collect data on as, apart from being politically sensitive, no organization seems to record conflict-related statistics on all the warring parties and international participants. To illustrate, the United Nations Assistance Mission in Afghanistan (UNAMA) gathers data on civilian fatalities but does not account for coalition casualties. Similarly, U.S. sources provide information on killed soldiers but not on civilians, and Taliban deaths largely remain a mystery. Coalition deaths can be traced back to the beginning of the war in 2003, while the UN and NGOs have only developed methodologies and embarked on recording fatalities as of 2007

onwards. Regardless of these difficulties, the project team has managed to collect monthly data on the coalition, the Afghan army and police, and civilian deaths. Some data on internally displaced persons (IDPs) has also been obtained from the Internal Displacement Monitoring Center (IDMC) in Geneva. Annual statistics on refugees and IDPs have further been acquired from TLO, an Afghan-based NGO. Additional conflict metrics (e.g. number of insurgent attacks, suicide bombings, local perceptions of security) have been extracted from the Worldwide Incidents Tracking System of the U.S. Counter-Terrorism Center, the Afghanistan Conflict Monitor of the Human Security Report Project, the Center for Strategic and International Studies (CSIS), and the Brookings Institution. Whereas issues related to the project's database structure remain to be resolved (e.g. time period, unit of analysis, etc.) it is believed that the SNIS-funded project can attract significant interest in its outputs if a comprehensive dataset on Afghanistan is compiled.

Data on fatalities in Darfur (2008-2010) has been obtained from the United Nations Development Programme (UNDP) and the Genocide Intervention Network in Washington, DC. Similar information has been acquired on South Sudan from the UN Office for the Coordination of Humanitarian Affairs (OCHA) but for a shorter time period. The information generally comes from media, UN reports, local authorities and OCHA assessment teams. According to experts, attacks are only sporadically reported which is generally a hurdle for the data collection. There are also no monthly monitoring reports with updated IDP figures.

Global Datasets

To be able to feed the computational model with empirical data, the following datasets have been obtained from other research institutes and their applicability for the purposes of this project assessed: two datasets on battle deaths from the Uppsala Conflict Data Program (UCDP) and the Peace Research Institute in Oslo (PRIO) for 1989-2008 and 1946-2002, respectively; statistics on fatalities from Armed Conflict Database of the International Institute for Strategic Studies (IISS); several datasets from the Correlates of War (COW) project, including battle deaths from interstate wars (1816 – 1991), extra-state wars (1816 – 1997), intra-state wars (1816 – 1997), and militarized interstate disputes.
Whereas all these large-N datasets are particularly useful for the computational modeling part of the project, their incorporation into a single dataset poses some challenges in terms of differing definitions of conflict, divergent time periods, lack of data on recent conflicts, varying fatality thresholds (from 1,000 annual fatalities in the case of COW to 25 annual fatalities for UCDP), and diverse statistical units (some account for fatalities in terms of high/low/best estimate; others provide a scaled number or a magnitude score). While the project team should take a decision on all these aspects, the initial assessment of the datasets' applicability indicates that utilizing both high and low thresholds of fatalities may be beneficial for the project given its focus on dynamics (i.e. may allow for observing the process of moving from low-scale to high-scale violence). The time period should be specified based on the availability of data on other variables. For example, the

World Bank socio-economic and demographic data goes back to the 1960s which may become determinant in this regard. Different approaches to the unit of analysis are also possible: if structured by country and year, the project team would be able to study phenomena related to the onset and occurrence of conflict; if organized by conflict, the dataset would speak about the duration of conflict, while a dyad-year structure would facilitate studying the different parties to a conflict. The initial effort has been on identifying and obtaining any relevant existing datasets, compare their structure and coding techniques, and assess their usefulness and applicability to the current project.

Three additional datasets have been discovered, which may be partially incorporated in the generic model's database: the State Failure Problem Set (1955-2009) developed by the Political Instability Task Force, George Mason University; the Major Episodes of Systemic Violence (1946-2008) which provides magnitude scores of international warfare and civil/ethnic violence, as calculated by the Center for International Development and Conflict Management, University of Maryland; and the Coup d'Etat Events dataset (1946-2009) compiled by the Center for Systemic Peace in Vienna. Their value is still being assessed due to the methodological issues that magnitude scores and scaled numbers present. The coup d'état data will possibly be bracketed as too episodic (and hence incomplete) as well as referring to intra-state conflicts only.

Ethnicity

The first sources used for the basic description and composition of ethnic groups in the case studies are the sources cited by Fearon (Fearon 2003, 12): the CIA fact book and the Encyclopedia Britannica. The CIA factbook pages have all been updated this year so these figures are probably the most reliable. The estimates are quite similar to those of the Encyclopedia Britannica.

For Lebanon, it is added that 17 religious sects are recognized. Lim, Metzler and Bar-Yam paper on "Global Pattern Formation and Ethnic/Cultural violence" elaborate a predicting model of conflict on the basis of settlement patterns of ethnic groups. As a consequence, the objective of the data collection was to come up with some GIS datasets.

The "Geo-referencing Ethnic Power Relations" (GREG) is a project based at the International Conflict Research Group at ETH Zurich. The portal "presents data on ethnic group power relations, ethnic settlement patterns, and civil war". It provides various datasets regarding the power and size of these ethnic groups, their settlement patterns, their access to power, their implication in intrastate conflicts. of violence.

Demographic data

Density maps have been mostly taken from the Gridded Population of the World (GPW) project of the Center for International Earth Science

Information Network (CIESIN) of Columbia University or the United Nations. The Center for International Earth Science Information Network (CIESIN) manages the Gridded Population of the World (GPW v3) project which provides information on the spatial distribution of human populations across the globe.

Economic development.

National aggregates are available for all countries through reports and factsheets usually elaborated by the World Bank such as the World Development Indicators. The Millenium Development Goals reports constitute another useful resource to establish the level of development for each case study. In addition to economic indicators, natural resources and their spatial distribution constituted another useful indicator regarding conflict.

Though the UNEP's Desk Study on the Environment in the Occupied Palestinian Territories does not provide for direct economic indicators, it gives useful information on water for example or the location of industrial sites. The Socio-Economic and Food Security Atlas by the World Food Programme represents a comprehensive resource on the occupied Palestinian territory (oPt) as does the Lebanon Atlas by the French Institute for the Middle East.

On the website of the Gulf 2000 Project, it is noted that: "There is a very strong correlation between distribution of the Shias in the Middle East and the Caucasus and those of oil and natural gas resources. This is true from the Republic of Azerbaijan and the Caspian Sea to the Persian Gulf." This observation suggests, in line with the objectives of the project, to focus on one or several natural resources and explore correlations with the spatial distribution of ethnic groups in case studies.

The most important resource in Afghanistan when it comes to conflict is the cultivation of opium poppy. The MDGs report and data from the UN Office on Drugs and Crime provide data on the extent, the spatial distribution and the challenges related to the cultivation of poppy. The Afghanistan Economic Update October 2011 by the World Bank notes that 78 percent of cultivation is concentrated in the southern provinces. Other significant resources are oil and gold: they have been attracting increasing investments.

Two resources stand out for Sudan: land and oil.

The situation is less obvious for Lebanon and Israel in terms of dominant resources. Water may constitute the most relevant resource for both areas, especially for Israel and the Occupied Palestinian Territories. A partial explanation also resides in the nature of the Lebanese and Israeli economies. Where Afghanistan and Sudan primarily constitute agrarian economies, Israel constitutes an advanced market economy and the Lebanese economy a service-oriented economy.

Step 4: Scenario Simulations

Rough calibrations have been carried out in order to account for the basic demographic and macroeconomic variables of Sudan to just take one practical example. However, at this stage no analogy should be drawn to a real situation. The scenarios are just there to show what drives the model.

The first scenario represents an increasing level of GDP for a country whose macroeconomic and demographic characteristics are like those of a country similar to Sudan. Because of that (according to the model) things turn out well. Enough resources are shared (cf. the neuro-science findings) in such a way that the N coalition (in our conception the insurgent group) after rising initially declines. But so does the dominant group coalition which loses strength. This diminishes the propensity to fight. Finally the number of combattants for N rises quite slowly but then stops growing.

In contrast to this we can now contrast this with an **Economic Collapse Scenario**.

In the economic collapse scenario capital growth slows down significantly which rsults in a significant lowering of GDP. The propensity to fight increases until leveling of at a high level plateau. The coalitions of both N and M increase in numbers adding to the conflict escalation. As a result, the number of fighters for N increases with associated combat damages on the armed forces of M.

Step 5: Conclusions

Quite clearly, if one follows these scenarios, economic conditions drive the model since in one case sustained growth produces stability and end of combats whereas deteriorating capital growth and GDP collapse lead to increased hostile coalition participation and more fighting. However, things are not that simple since the mere trigger of economic conditions is insufficient to explain conflict escalation, which results from increased participation in mutually hostile coalitions and greater fighting propensity where emotions such as fear and resentment play their role. Without the postulated risk attitudes which translate these emotional aspects into mathematical and simulation language formulae the scenarios described above would not be conceivable. In some sense what our scenario analyses show so far is that external rewards (here the additional wealth derived from substantive growth rates) evoked by our neuro-science partner play their role in attenuating conflict over time. This being said, the analysis provided here constitutes just a first step toward the understanding of emotional factors in conflict. The mechanisms have still to be better understood notably by conducting thorough empirical tests of our model. These results and future perspectives should be discussed in a workshop that includes participants in the project, members of the committee and outside experts.