Social networks and intergroup conflict

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"... both knowledge about and acquaintance with out-groups lessen hostility toward them."

Gordon W. Allport: The Nature of Prejudice (1954: 265)

CHAPTER 6

SUMMARY AND CONCLUSION

6.1 Summary of research questions and results

6.1.1 Research problem

Harmful conflict between groups is among the most costly enigma of mankind. The high complexity of intergroup conflict in our everyday life, however, makes the solution of this enigma a challenging task. Instead of dealing with all the complexities, by making simplifying assumptions and by relying on a sound theoretical basis, this study contributed to the investigation of certain factors that influence the likelihood of intergroup conflict. First of all, we emphasized that *intergroup conflicts arise as groups compete for the possession of scarce material or immaterial resources*. In pursuit of the underlying processes that drive competitions toward lethal consequences, we focused on effects of *structural and temporal embeddedness*. Particularly, we intended to determine some conditions under which *segregation* is associated with conflict and the causal mechanisms that are responsible for this effect. As most intergroup relations cannot be torn from their historical context, we also investigated how conflict changes over time and what are the endogenous determinants of positive and negative changes.

Such an investigation should not remain at the intergroup level, as groups are not unitary entities. They consist of consciously acting individuals, who make their decisions based on their own free will. For instance, citizens volunteer for military service in a war situation, soldiers volunteer to be sent to the front lines, front liners volunteer to be asked for special assignments (Coleman, 1990). Terrorists who commit suicide bombings not only risk their life, but they sacrifice it in the belief that it helps their groups to obtain a certain goal, such as independence. Individual participation in intergroup conflict is rarely so demanding, but it always involves a cost that members have to bear to help their group. Contributions of this sort are seemingly rather more senseless than valuable. The fundamental question this study has raised is *why are people willing to make such sacrifices, even though they are not required to do so and their behavior could lead to lethal consequences*. Forces and motives that facilitate individual participation are necessary to discover for the explanation of intergroup conflict.

In this study, we focused on factors that can be classified according to their origin in *intergroup competition*, in the *social network of group members*, or in the *time horizon of intergroup and interpersonal relations*. Intergroup competition and comparison motivates participation by *public good* rewards, such as territory, pride, or social identity that are distributed among the members of the winning side. Social relationships with relevant others constrain individual decisions by transmitting different forms of *social control* that can either enforce or reduce participation. The historical context is important as people behave according to certain *decision heuristics*. These heuristics are partly built on their *experience*, for instance, they learn from the

past or revenge previous outrages. Similarly, *expectations* about future encounters also influence individual actions strongly.

6.1.2 Structural embeddedness and intergroup conflict

The major theoretical goal of this study was to *construct a model of intergroup competition* that can help to understand the emergence of harmful conflicts that are the consequence of structural and temporal embeddedness. As a basis of model building, we departed from the *Intergroup Public Goods (IPG) game* model of competitive intergroup relations (Rapoport and Bornstein, 1987). The major potential of the IPG game model is that it coherently represents the dual interdependence structure of intergroup competitions; the negative interdependency between the groups on one hand and the free riding problem within the groups on the other hand. However, the IPG model in its original form could not cope with *effects of structural embeddedness*. Structural embeddedness affects individual decisions through different *social control mechanisms*. Social *selective incentives*, such as respect, are distributed as rewards for fellows who made sacrifices for the group and as punishments for those fellows who failed to take part in group efforts. *Behavioral confirmation* is received for an action that is identical to the behavior of fellow group members. *Traitor rewards* are sent to relevant members of the opposite group who refused to help their own group. As a substantial contribution of this study, we incorporated these forms of social control mechanisms into the IPG model of competitive intergroup relations.

As social control is transmitted through network relations, the *network structure of individual ties has an impact on the outcome of intergroup competition*. One of our main research questions targeted to determine the *structural conditions under which the likelihood of intergroup conflict is higher* and the conditions under which peaceful coexistence might be expected.

In the structurally embedded IPG game, under certain structural conditions strong social control might lead to an unusual social dilemma situation. In this social dilemma, everyone is better off by *contributing* for the group, but overall contribution would result in an outcome that for everyone is worse than peaceful coexistence. In this interdependence structure, unintended conflict is the aggregated consequence of intentional individual actions. The model predicts that such a social dilemma would occur where dense contacts within the groups are distribution channels for social selective incentives, rather than spreading routes of behavioral confirmation. An additional requirement for the emergence of suboptimal conflict situations is that interpersonal ties between members of the competing groups should be scarce or traitor rewards should be of little importance.

Our interest was not purely in determining the conditions under which overall conflict evolves as a social dilemma, but in general in showing the structural conditions that increase the likelihood of intergroup conflict. In particular, a main research

question concerned why and under what conditions *segregation* promotes intergroup conflict. For the investigation of this question we used simulations and experiments.

Simulations were applied in order to explore the general theoretical relationship between segregation and intergroup conflict and to derive hypotheses about the effect of structural embeddedness for the experimental investigation. In the simulations, the structurally embedded IPG game was played by agents arranged in simplified network structures. As a general result, we found that the effect segregation on the likelihood of intergroup conflict can be typically characterized by an S-shape function. This means that *segregation is likely to promote intergroup conflict*. However, depending on other parameter values, *in certain ranges of segregation, an additional change does not result in an increase in the likelihood of conflict*. These cases were labeled as *floor* and *ceiling* effects. Furthermore, we found *a stronger segregation effect where local selective incentives were relatively important when compared to behavioral confirmation from neighbors*.

Simulation results were reformulated as hypotheses for the *experiments*. Besides the theoretical developments, testing these hypotheses in experiments was another major scientific contribution of this study. For the implementation of structural conditions in laboratory, a *new experimental design* needed to be invented. In the experiments, subjects played the structurally embedded IPG game without communication in two teams consisting of five members. In order to test the presence of a segregation effect and the underlying social control mechanisms, seating patterns were varied and visibility conditions were manipulated. Four structural conditions were applied, one in which subjects were separated, one in which the two groups were arranged in a highly segregated pattern, one with medium, and one with low levels of segregation. The segregation effect on the likelihood of intergroup conflict was tested by comparing outcomes of the game under different seating patterns.

We predicted that social control would affect individual decisions also in an *internalized* form. For detecting internalized forms of social control, in one part of the experiment subjects established eye contact with their direct neighbors. In later parts of the experiment, also *direct forms of social control* were introduced as monetary rewards in order to test the relative impact of internalized and direct forms of social control on individual decisions.

Experimental results *partly confirmed the segregation hypothesis*. As predicted, intergroup conflict was least likely when members of the two teams were seated in a mixed pattern. However, conflict was not less likely in the medium segregation condition than in high segregation. This could partly be explained as a ceiling effect and partly as a consequence of high baseline contribution rates in the medium segregation setting.

In general, monetary social control strongly influenced individual decisions. We found strong evidence of internalized behavioral confirmation as subjects adjusted their decision towards the expected decision of their fellow neighbors even though there was only eye contact between them. There was also some support for the effect

of internalized selective incentives. These effects were not as strong as the influence of monetary social control, but internalized social control from fellow neighbors was still a major predictor of individual contribution propensities. Internalized traitor incentives were found only under certain conditions. Subjects felt a pressure to betray the interests of their group only when they were surrounded by members of the other group, who belonged to the opposite sex.

To summarize, the new experimental design provided important insights for understanding structural effects and the influence of social control in intergroup situations. Particularly, results demonstrated how important *eye contact* between the subjects in the laboratory is in activating internalized mechanisms of social control.

What follows is a brief summary of our main *research questions* (**Q**), our derived hypotheses (**H**), and **experimental results** (**R**) about the effect of segregation on intergroup conflict.

Q *Why and under what conditions does segregation promote intergroup conflicts? In an experimental setting, is the likelihood of intergroup conflict higher when group members are arranged in a segregated pattern? Is there such an effect when individuals only have eye contact with each other?*

H The network structure affects the likelihood of conflict because it is the channel of social control mechanisms. In a segregated structure, the likelihood of intergroup conflict is usually higher because dense connections between group fellows allow for the spread of selective incentives that support mobilization. Moreover, scarce relations between members of the competing groups mitigate the distribution of suppressing motives. Because social control is often internalized, segregation increases the likelihood of intergroup conflict also where individuals only have eye contact with each other.

R **By comparing results from different structural configurations of the experiment, we found that intergroup conflict was least likely when members of the two teams were seated in a mixed pattern. However, conflict was not less likely in the medium segregation condition than in high segregation. This was also the case, when only minimal contact was introduced between neighboring subjects.**

Answering these questions required an explanation of individual behavior that is causing these macro consequences.

Q *Why and under which conditions do individuals participate in collective action that hurts the interest of another group and might result in mutually harmful consequences? What are the underlying mechanisms of network effects at the interpersonal level?*

How do different forms of social control, namely selective incentives, behavioral confirmation, and traitor rewards contribute to intergroup conflict and what is the impact of their relative size? Do these forms of social control affect individual decisions in a direct and in an internalized form in an experimental environment?

H Individuals might be mobilized to participate if direct and internalized forms of social control compensate for the cost of contribution. Social control implies a distribution of positive and negative incentives that constrain individual decisions, conditional on expectations and behavior of the individual and relevant others. Depending on the nature of social control and on the composition of the ego-network of the individual, social control can facilitate or suppress participation. As the web of interpersonal relations defines the social network, macro structural effects can be derived as a consequence of social control mechanisms.

Social selective incentives reward group fellows for participation. Traitor rewards are conveyed in interpersonal relations between members of the competing groups and inhibit participation. Consequently, these forms of social control are responsible for the segregation effect. Behavioral confirmation, however, has a double edge; it can contribute to the establishment of widespread activism as well as to the dissemination of peaceful behavior. The larger the size of normative pressure (selective incentives) compared to confirmation pressure, the stronger the effect of segregation on intergroup conflict.

R **Subjects in the experiment were strongly influenced by direct forms of social control. We found strong evidence of internalized behavioral confirmation and some evidence of internalized selective incentives. Internalized traitor incentives were found only under certain conditions. These social control effects were sufficient to cause a difference in the likelihood of conflict between structural conditions. The segregation effect was stronger when normative pressure was introduced in comparison to when confirmation rewards were present.**

Besides these main research questions, in the simulations we also investigated whether the effects and macro consequences of social control mechanisms are dependent on assumptions about *individual rationality* and access to information or not. We examined the effect of social control mechanisms and structural configurations on intergroup conflict under four behavioral models. These models differed in the assumptions regarding the level of calculating rationality of individual actors and regarding the amount of information individuals have access to. We were particularly interested in the effect of segregation on the likelihood of conflict under the different model specifications. Simulation results showed that under certain structural conditions, rational individuals with higher amount of information were more likely to be trapped in harmful conflict than less rational actors. Furthermore, rigid assumptions about

individual rationality slightly strengthened the effect of segregation on intergroup conflict.

We demonstrated that not only segregation, but also *other properties of the social network* are associated with the likelihood of intergroup conflict. For instance, minority hostages can suppress mobilization, bridging ties can play a brokerage in the spread of contribution, and loosely connected subgroups may either elicit or inhibit intergroup conflict depending on the behavioral assumptions.

6.1.3 Temporal embeddedness and intergroup conflict

Besides the structural embeddedness of behavior, *temporal embeddedness* plays also a crucial role in intergroup relations. The historical record of previous encounters and prospects of future relations have firm effects on present attitudes and actions in the intergroup context. Empirical examples of inflating clashes and durable conflicts between groups challenged us to explain the emergence of such scenarios. Fortunately, intergroup relations are more frequently peaceful than violent, which drove us towards the exploration of the conditions under which peaceful coexistence prevails.

Our explanation of the dynamics of intergroup relations concentrated on mechanisms at the individual level that aggregate to macro scenarios. Individual decisions are strongly affected by both experiences from the past and expectations about the future. With regard to the temporal embeddedness of action, in this study, we adopted a view of *bounded rationality*. We claimed that individuals do not recall all past events when making decisions and neither do they make extensive calculations about long-term consequences. Instead, they are guided by *simple behavioral heuristics*. With regard to the question, what are these guiding rules, based on recommendations of previous literature we formulated hypotheses about the existence of three mechanisms, namely criticalness, reinforcement learning, and reciprocity. *Criticalness* dictates contribution when the individual expects a single decision to change the outcome of the competition. *Reinforcement learning* prescribes sticking with a decision that gave rise to a satisfactory outcome. It calls for a change when the outcome was unsatisfactory. *Reciprocal mechanisms* evoke peaceful responses to observed peaceful behavior of others and evoke retaliations to previous contributions to conflict. Individuals might reciprocate the collective action of the other group, but also actions of relevant individuals. In this study, we have taken into consideration all these behavioral mechanisms. The main argument to present this approach was that behavioral strategies might differ between and also within actors.

An original aspect of this research was that it tested the influence of different behavioral heuristics on individual decisions simultaneously in the experimental laboratory. We could test the effect of temporal embeddedness as in parts of the experiment subjects played *repeated* IPG games. Unlike in the *single-shot games* where subjects did not receive any feedback on previous outcomes, in the repeated

games they received information about the outcome of the previous game and eventually about the decision of their neighbors. As structural conditions were introduced also in the repeated games, *interaction effects of structure and time* could be also tested.

Let us now provide a brief summary about the main *research questions* (**Q**) about the effect of temporal embeddedness and about the interactions of structure and time. We also summarize the hypotheses (**H**) that were formulated for these questions and the conclusions that were drawn from the experimental results (**R**).

Q *How do intergroup relations change over time? Are there typical scenarios, such as an endless regression of conflict or a spiral of peace? Do these scenarios differ according to structural conditions?*

H We predicted that some typical scenarios would occur, such as stable peace, durable conflict, a spiral of peace, and a spiral of conflict. Our forecast was that stable peace and a spiral of peace would be more likely in a mixed seating configuration and durable conflict and spiral of conflict would be more likely when segregation is high.

R **Results show that the scenarios of spiral of peace and stable peace occurred frequently when members of the two teams were seated in a mixed pattern. In sessions with high segregation, durable conflict emerged, but with changing fortune for the two groups and not gradually, as the spiral of conflict hypothesis had predicted. Contribution rates increased due to the introduction of social control between experimental parts.**

Q *What are the simple heuristics that guide individual choice and as a consequence, are responsible for the emergence of macro scenarios? Are criticalness, reinforcement and reciprocity important determinants of individual action in repeated intergroup relations?*

H Our hypothesis was that individual choice in the experiments would be guided by simple behavioral rules that are partly based on experience from previous encounters and partly based on expectations about future interactions. We predicted that the combination of criticalness, reinforcement learning, intergroup reciprocity, and local reciprocity mechanisms would influence actual individual decisions.

R **Results justify the use of a combination of different behavioral principles in the explanation of individual contribution propensities. The hypothesis about criticalness is confirmed, but with an adjustment for forward-looking bandwagon tendencies. We found surprisingly high willingness for contribution when subjects expected a victory for their group in the forthcoming game. Results show however that reinforcement learning does not**

work symmetrically, as we did not find evidence of reinforcement towards a contribution choice. Moreover, there is little support for the presence of intergroup reciprocity. Only a previous defeat elicited significant retaliations, but this might also be caused by simple hawkish attitudes. Local reciprocity was found conditional to personal characteristics of the subject and conditional to the gender and group affiliation of the neighbor.

6.2 Implications and societal relevance

In this section, we discuss some implications of this study for societal applications. Our model was built on the presumption that the origin of intergroup conflict is the *competition* between the groups for certain limited resources. If there is no competition, intergroup relations have a completely different nature. In most cases, the lack of negative interdependency is a guarantee for peaceful coexistence, even if there are dark memories of the past or there is a high level of segregation. In these situations, there could be other difficulties, such as coordination problems. For instance, using the same standards would be beneficial for interacting groups, but naturally enough, none of the groups are keen on changing its own established system. This research has not directly dealt with such situations, but it might have some valid implications also for these cases. The underlying mechanisms of social control and decision heuristics work in a similar way in these contexts, causing effects of structural and temporal embeddedness. For example, people experience strong confirmation pressure from relevant others to use identical standards, such as speaking the same language as they speak. Consequently, members of a minority, who are exposed to members of the majority group, are easily forced to adopt the standards of the other group. Furthermore, segregation of the social network directly leads to the same standards within the segments, such as to the evolution of dialects in remote parts of a language area.

A closer correspondence can be made between the results of this study and situations in which groups actually compete for a certain goal. However, *not all competitions are social dilemmas*, as mutual collective action does not always have suboptimal consequences. Intergroup rivalry might result in a draw that is not harmful for either side or the groups may reach a *compromise* and divide the public good. Furthermore, competitions might have a positive value for the larger community such as in the case of team sports or competition between R&D teams. In these cases, there is still a free riding problem within the groups, but mobilization has positive externalities for the other group. The community has an interest in enforcing participation. Therefore policy suggestions that follow from our analysis are the opposite to the case of harmful competition. In order to facilitate contribution, dense relations within the group and strong selective incentives are needed. Besides, ties between members of the rival groups should be minimized or should be kept at a neutral level.

These implications also hold for in-group *collective action problems*. The key mechanism to the solution of these social dilemmas is the distribution of strong selective incentives and their internalization. Our model predicts, similarly to Coleman (1990), that this works best in a dense network with transitive ties. On the other hand, strong confirmation pressure in a dense network might lead to widespread contribution as well as to overall defection. In this way, behavioral confirmation is double edged for cooperation, just as in the case of approval exchange (Flache, 1996).

There are possibly many more situations, to which the results of this study can be implied. However, the major goal of this research was to understand and explain the emergence of *mutually harmful intergroup conflict* situations and to show under which conditions these can be avoided. In this respect, our major contribution was to reveal mechanisms that explain how and why conflicts emerge as a result of structural and temporal embeddedness of individual actions.

In relation to *structural embeddedness*, our major conclusion was that *segregation* is likely to promote intergroup conflict. Starting from a certain structural configuration, an increase in the number of relations within the group or a decrease in the number of relations toward members of the other group will definitely not facilitate conflict resolution. For instance, this result supports policy arguments to encourage interethnic relations and decrease residential segregation in order to help the resolution of ethnic conflicts. However, as both theoretical and experimental results suggest, such a policy will not always be effective. Conflict can just as likely occur in middle ranges of clustering as it can in the completely segregated setup, due to weak traitor incentives and the strong influence of (internalized) fellow pressure. Furthermore, already a few zealots might be sufficient to initiate conflict even in a relatively mixed configuration. In these cases, especially if the costs of desegregation are high, it is better to seek institutional or external solutions for the management of damaging intergroup relations.

Desegregation policies also have to be aware of *other influential network properties*. As the examples of minority hostages and bridging ties show, it is often more efficient to place certain persons to the right position than to implement a costly wide-range desegregation policy. A presence of a small minority in an otherwise homogenous environment might be sufficient to excite sympathy for the rival group and to suppress activism. Bridging ties between isolated subgroups might play a crucial role in the dissemination of radical, but also of peaceful attitudes. We illustrated that one gatekeeper is usually not enough to play such a brokerage. Multiple bridging ties do this better, when supported by strong bridgeheads, that is by influential group members, who are in contact with the intermediary persons. To keep hawkish tendencies at a low level, the most efficient way is to close down the radical groups' bridging contacts to the outside world, and thus to isolate radicalism. With regard to the question of how can such structural strategies be implemented in practice, one can benefit from recommendations of applied social network analysis (e.g., Kratzer, 2001; Leenders, Kratzer, and van Engelen, 2002).

There will always be heroes who are prepared to die to advance the position of their group. In the experiments of this study, a significant portion of subjects sacrificed the received bonus, even when their decision remained anonymous and the effort was completely fruitless. We did not find any personality trait that would strongly correlate with such behavior, except prosocial orientation, to a certain extent. The interesting result that zealots often have prosocial attitudes implies that it is the individualistic "invisible hand" that would save intergroup relations from lethal rivalry.

Individualization is a remedy for conflict also in another sense. Apart from fanatics, most individuals are sensitive to social control effects. Experimental results show that social control from fellow group members even in an internalized form impacts upon individual action. As fellows are more likely to demand contribution, downgrading fellow contacts would further conflict resolution. In *isolation*, individuals build primarily on their egoistic incentives and do not make costly sacrifices for the group.

Minority hostages are also isolated from their fellows. Besides free riding incentives, an additional motivation for them to defect is traitor pressure from their neighbors. Minority groups do not have many choices, apart from assimilating into their environment. If they are too few, they cannot even hope to evoke tolerant attitudes from their neighbors.

As experimental results show, traitor incentives are only internalized and affect decisions when group affiliation is combined with visible characteristics, such as gender. In practice, social relations are much stronger than in the laboratory. We could therefore expect the transmission of immaterial traitor rewards between members of the different groups. This prescribes another route out of troubled intergroup relations, which is *globalization*. As relations across groups are propagated and network paths between individuals are shortened, exposure to other cultures increases and individuals are influenced by stronger traitor incentives that work against the emergence of intergroup conflict of a traditional kind.

In relation to *temporal embeddedness*, we concluded that intergroup competition that is repeated in a similar fashion often has similar outcomes because individual decisions are also relatively stable over time. On one hand, peaceful relations are likely to be preserved. On the other hand, conflict is also frequently a follow-up of previous conflict, although the winners of the competition might change. The pessimistic prediction that vengeance drives conflict toward ultimate escalation is not supported by our experimental data. Individuals were tempted again and again by the free rider benefits of peaceful behavior.

In general, our results suggest that effects of temporal embeddedness are not as strong as effects of the payoff structure and social control. Among temporal effects, the *shadow of the future* proved to be more influential than the shadow of the past as individuals were rather forward than backward-looking. We demonstrated that the

proper model of action should also consider influences of previous encounters. Experiments showed that subjects were reinforced to adopt peaceful behavior, but they were not likely to learn activism in the Pavlovian sense. In general, being aware of the implications of lessons learned in the past for one's future were developed over time and reinforcement was detected more often in later stages of the experiment. The *asymmetry of learning effects in favor of peaceful attitudes* gives hope for endogenous solutions of intergroup conflict. In principle, a deadlock of a clash can be broken by a critical mass of defecting initiatives: others will follow as they learn over time the benefits of peaceful coexistence. This process requires a lot of patience if people indeed need time to adopt reinforcement principles. In practice, this could be facilitated by making the negative consequences of the past transparent and by helping coordination between initiators of peace.

Another positive result of the experiments for conflict resolution is that subjects *did not retaliate* the collective action of the rival group except where they were provoked by other incentives. This suggests that vengeance can be avoided in the intergroup context. On the other hand, we found conditional support for the existence of local reciprocity. Under certain conditions subjects retaliated the previous contribution decisions of other subjects seated adjacent to them. This result implies that unlike in the intergroup context, revenge can be an important mechanism in interpersonal relations. Furthermore, a contagion of interpersonal retaliations might gradually lead to an outburst of intergroup conflict.

Still, such macro dynamics were not detected in the experiments. There was no indication that conflict would have been solved as individuals adopted reinforcement over time. Furthermore there was also no sign that local retaliations were leading to a spiral of conflict. These scenarios did not occur in the repeated games because of the presence of intervening effects, of which the most influential was the role of *expectations about the future*.

Subjects did evaluate possible outcomes of subsequent games, which is very much in line with the rational choice perspective on individual action. On the other hand, these evaluations were far from being sophisticated and perfect, which shows that individual rationality also in this aspect has strong limitations. Subjects helped their group only if they felt that a single contribution could change the outcome. This happened frequently as they largely overestimated the criticalness of their choice (for a similar result, see Kerr, 1989). Furthermore, if subjects expected a victory of their team, they did their best to take their shares not only from the rewards but also from the group efforts. However, they largely overestimated the chances of their group to win and the efforts made by their fellows (for a similar result, see Brewer, 1996a; 1999). All this resulted in a *blind optimism* about the future and their individual role. After all, this optimism explains hawkish tendencies in the experiment and much of why intergroup conflicts were observed so frequently.

This implies that a *cognitive approach* of conflict resolution might have an enormous power. Methods that can lower individual expectations and beliefs about

criticalness would contribute substantially to peace. In practice, this means that the media and for that matter anyone, who has control over the flow of information, carries a large responsibility with regard to the management of intergroup relations. Major channels of information could be used effectively to educate individuals about realistic thinking and the irrationality of radicalism. Manipulating individual concepts about the future in this positive sense would help the establishment of peace in the world. However, this is extremely difficult as the groups have a collective interest that is in contradiction with this end. They have an incentive to advertise criticalness principles, such as stating that "we need *you* to win". Besides, bandwagon effects explain why it is always in the interest of the most popular political party to publish survey results before the elections.

6.3 Limitations

In this section we critically discuss the limitations of this study and the problems we face in generalizing the results. Our conclusions have remained at a highly abstract level, as it was not our intention to provide precise policy instructions. We would need to be much more cautious with regard to relating the results to concrete cases of intergroup competitions. Empirical situations have special characteristics that should be taken into account in their analysis. Most limitations of this study concern such *complexities* that actually shape intergroup relations in practice. We intended to stay at a relatively abstract level in order to focus on fundamental processes of structural and temporal embeddedness. In this section, we summarize some points to which we need to add complexity to understand concrete cases of intergroup conflict better.

Some of the restrictions and assumptions we needed to make can quite easily be relaxed. Both in the simulations and in the experiments, we considered a specific *group size*. As we discussed, in small groups individual decisions are more likely decisive, therefore it is easier to establish collective action, even in the absence of social selective incentives (cf. Olson, 1965). In large groups, relative differences in group sizes are more important because of the disproportional effect of segregation. We also discussed the importance of minimal contributing sets (MCS). The higher the *thresholds* to establish collective action, the higher the chances for intergroup peace are. The *payoff structure* of the IPG game can easily be adjusted to model different empirical situations. For instance, the assumption of zero reward for peace can be relaxed.

Furthermore, similar assumptions on structural and temporal embeddedness can be applied to completely different interdependence structures, such as to *other team games*. For instance, there might be objections to the too *narrow concept of clash* in the IPG game. In case of civil war, urban gang fights, and other violent competitions, when the number of participants is not exactly equal in the groups, conflict outcomes are still lethal for both sides. A game that takes this into consideration is illustrated in

Figure 6.3.1. A significant change compared to the original IPG game is that overall clash is no longer a Nash-equilibrium. However, by comparing the structurally embedded version of this game to the structurally embedded IPG game, we would not detect significant differences. Both the conditions for contribution being a dominant strategy and the conditions for overall contribution being a suboptimal equilibrium are exactly the same as those presented in this study. Hence, our major conclusions might be also generalized for these situations.

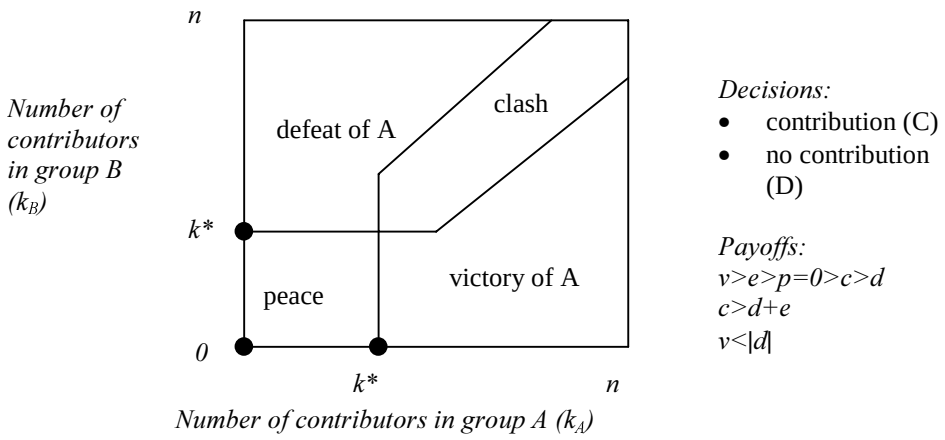

Figure 6.3.1 Graphical representation of a game with an extended concept of clash

Note: Nash equilibria are indicated by bullets.

It was necessary to decrease abstraction and consider some intervening variables already in the experiments in comparison to the simulation analysis. In the simulations, we assumed a linear *utility function* that was independent from the utility of others. Furthermore, we assumed that the set of players is *homogeneous* with regard to the applied behavioral rules. In the experiments, we found that utility functions are sensitive to attitudes towards risk and to rewards of others. Besides, experiments showed that subjects also differ in their strategic behavior. Subsequent simulations that are follow-up of this study could incorporate this and could introduce parameters about the distribution of social orientations, risk attitudes, and decision heuristics in the analysis. Advanced models might also incorporate further individual differences. An example is a distinction between forward-looking leaders and backward-looking followers or aggressive and peaceful types. Such differences might be caused by intrinsic values of fighting or differences in individual incentive structures. For instance, some people may have a stronger preference for the public good of victory, and in this privileged situation they would therefore be more inclined to make sacrifices for their group (cf. Olson, 1965).

Another major discrepancy between the simulations and the experiments is that we did not consider *repeated interactions* in the simulations. The theoretical analysis of iterated intergroup competitions would be a natural development of subsequent research that might build on the experiences of our experiments.

There are also major limitations to the generalization of experimental results to empirical situations. Although intergroup competitions often have the same target over and over again, such as regaining control over a certain territory, *interdependencies are seldom repeated exactly in the same structure*. Additionally, history cannot repeat itself because structural contacts between individuals change. Neighbors move to another house, old friendships dissolve and new friendships develop, or member countries of rival alliance blocks change their dyadic relations. These changes might be partly the consequence of previous intergroup conflicts (for empirical evidence see Doherty, 1990; Liska and Bellair, 1995; Liska, Logan, and Bellair, 1998). Extreme examples of feedback effects of intergroup conflict on the community structure are the incidences of massive refugee flows. In most cases, feedback effects promote a segregation process in the community structure. A segregated network can remain a stable configuration, in which intergroup conflict is repeated. As segregation and conflict stabilize it is difficult to intervene and help the community shifting to peaceful equilibrium. Major research implications proceeding from these empirical processes would see the formation of a dynamic model that incorporates feedback effects of conflict on the residential structure.

Furthermore, in the long run, *group boundaries may also change*. Assimilation, for instance, can be considered as an optimal long-term strategy to avoid the emergence of harmful conflicts between groups.

A major concern for the validity of this study is the difficulty of the *measurement* of payoff parameters in empirical situations. Even the utility of material rewards of intergroup competition, such as territory, is difficult to determine. There are even more problems with conceptualizing the value of immaterial rewards, such as social identity, and also with providing meaningful parameter values for rewards of social control.

A possible objection to the behavioral assumptions of this study is that *social control might take quite different forms* in interpersonal relations than that which we have explicated. There are several regularities at the micro level that can be related to undesired macro consequences (cf. Coleman, 1990). For instance, not every acquaintance is a good one. There can be interpersonal feuds not only between fellows, but also between members of the competing groups. Intergroup conflict very often originates or results in negative interdependencies between individuals. Furthermore, some ties are stronger and transmit more efficient social control than others. There are also qualitative differences between different social contacts. Certain individual characteristics, such as gender, might imply that ties are very different in terms of content (e.g., Burt, 1998). As we hear about contemporary Romeos and Juliets, we know well how the meaningless fight between the modern counterparts of Capulets and Montagues lead to personal tragedies (cf. movies “Before the Rain” or “Torn Apart”). Moreover, social control can also be completely independent from the

intergroup context. Policies that aim to strengthen these forms of social control are ineffective for the improvement of intergroup relations.

Another possible objection to the behavioral assumptions of this study is that *social control is not always gratuitous to produce*. The establishment of effective sanctioning systems, such as norms, can also be characterized as a social dilemma, which includes a second order free rider problem (Heckathorn, 1989; 1993). Furthermore, sanctioning those who do not take part in the enforcement of sanctions includes higher order free rider problems (Kuran, 1995; Wintrobe, 1995: 59). An example of how such dilemmas can be solved by *hierarchies* is provided in Stalinist regimes, where top leaders executed the highest level officials who failed to punish those party members who did not enforce enough "contributive" behavior in the population.

The role of in-group hierarchies is another factor that was disregarded in this study. Formal hierarchical control is an effective way of solving social dilemmas, but it does not improve intergroup relations. On the other hand, internal hierarchies clarify responsibilities within the groups for certain actions. If the set of powerful actors is clearly defined, *negotiations* between the two sides are also easier. Agreements between leaders can bring settlements over highly segmented division lines. Furthermore, a *higher body* that controls, at least to a certain extent, actions of the groups, such as the teacher in the classroom or the United Nations in international conflicts, can impose on rival parties that they be committed to peaceful coexistence. This higher body can induce positive changes also indirectly by manipulating the structural conditions of the intergroup competition. For instance, national governments can implement and even enforce desegregation policies or can change the competitive character of intergroup relations, for example, by dividing the public good.

In general, *institutions* can play a crucial role in conflict resolution, even if they are not external supervising powers but established internally by opposite sides. Intense competition can sometimes be defused by institutional interventions of seemingly little importance (for instance, by a fixed negotiation schedule, a referee or a mediator). Similar help might come from the introduction of *new division lines*, from the intervention of *third parties* or from the *media*. These interventions might change the incentive structure, might manipulate the available information or create cognitive interdependencies. However, as Rubin (1980: 385) claims, this help is only conditional: "It appears that certain tried and true techniques of third-party intervention, such as the introduction of communication between the parties, the recommendation that the disputants consider multiple issues as a package, and the use of such issue identification procedures as role reversal, facilitate concession making and agreement only when conflict is relatively low in amount and intensity. When conflict is intense, these very techniques may prove ineffectual and may even exacerbate the conflict."

There are probably several more limitations and objections to this study that concern the complexity of empirical situations. Despite these reservations, our analysis was nevertheless able to demonstrate the effect of intergroup competition, structural and temporal embeddedness on the likelihood of group conflict. This may help conflict resolution in empirical situations that are along these lines.

6.4 Directions for future research

We hope that future studies of intergroup conflict and peace can benefit from the results of this research. In this section we provide some suggestions for subsequent investigation. *Analytical developments* might concern different types of equilibria in repeated games or the derivation of aggregated consequences of bounded rationality of players. *Ex-post simulations* in close relation with our experimental findings might be designed to model macro consequences of certain combinations of behavioral mechanisms given certain distributions of personal characteristics in a predetermined population. Further simulation developments might include computer tournaments, genetic algorithms, cellular automata, neural networks, and other *agent-based simulation* techniques for the analysis of repeated interactions and structural dynamics. *Future experiments* might be concentrated on the role of communication, on the process of identification with the group, on structural changes, or on the emergence of social control. *Field experiments, case studies,* and *survey research* might provide ways to test theoretical hypotheses empirically and might reveal further underlying mechanisms for the explanation of intergroup conflict.

This constitutes a wide range of possibilities. Section 6.4 is devoted to provide more concrete suggestions for some of the specific directions that were originally planned to be part of this study.

6.4.1 Analytical developments

As this research has demonstrated, social control can provide a structural solution to the collective action problem within groups. On the other hand, this solution might create a social dilemma in the intergroup context, especially in a segregated setting. Individual contribution can be the dominant choice for everyone. This choice would result in an aggregated outcome that is suboptimal compared to peace. Is there a way out of this social trap? How can the harmful outcome of overall conflict be avoided? Similar to Axelrod (1984), we can argue that *infinite repetitions* provide a resolution to conflict. However, the strategy that triggers collective action of the other group is *not* in equilibrium against itself in the structurally embedded IPG game. Hence, intergroup reciprocity has no theoretical support in this specific context.

A reciprocal strategy that offers a way out of the social dilemma is TIT FOR ONE TAT (TF1T). It defects in the first round and contributes only, if there was at least one contributor in the other group in the previous round. A homogenous population of the TF1T strategy is an equilibrium, if the shadow of the future is bright enough (the probability of continuation is high). The proof is similar to the derivation of the possibility of TFT| TFT equilibrium in the two-person Prisoner's Dilemma (PD) (Axelrod, 1984)[1].

6.4.2 Individuals with short-term memory: analysis of two-state Moore machines

Subsequent research that assumes intentional individual action should examine *what are the successful individual strategies in long-term intergroup competitions*. For the purpose of this theoretical inquiry, hardwired strategies should be targeted that have the same conditional rules throughout the repetitions.

To impose a restriction on the number of possible strategies and to make the analysis more realistic, research interest could be limited to the analysis of strategies with short time memory. An example would be to consider strategies with only one round of memory. These behavioral rules are called *two-state Moore machines* (Linster, 1992; Bicchieri, 1997; Klos, 1997). A Moore machine is a deterministic automaton that provides conditional responses for all possible combinations of previous outcomes and decisions. Different Moore machines can represent permanent

[1] For the sake of simplicity, let us introduce the notations S_i for $f_i s$, T_i for $g_i t$, and B_i for $f_i b$. It is sufficient to show that the homogenous TF1T population cannot be invaded by ALL C nor by an alternation of D and C. For the first statement,

$$S_i + \frac{\delta(T_i + B_i + e + d) + \delta^2(S_i + B_i + v)}{1-\delta^2} \le \frac{T_i + B_i + e}{1-\delta} \qquad (6.4.1.1)$$

should hold for all i, where δ is the probability of continuation. This simplifies to

$$\delta d + \delta^2(B_i + v) \le T_i + B_i + e - S_i. \qquad (6.4.1.2)$$

A continuation probability $\delta>0$ exists, if $d+v \le T_i+e-S_i$ is met for everyone.

For the second statement (the homogenous TF1T population cannot be invaded by an alternation of D and C),

$$S_i + \delta(S_i + d) + \frac{\delta^2(S_i + B_i + c)}{1-\delta} \le \frac{T_i + B_i + e}{1-\delta} \qquad (6.4.1.3)$$

should hold for all i. This simplifies to

$$\delta d + \delta^2(B_i + S_i + c) \le T_i + B_i + e - S_i. \qquad (6.4.1.4)$$

A continuation probability $\delta>0$ exists, if $d+c \le T_i+e-2S_i$ is met for everyone.

trouble-makers, firm free riders, revenging individuals, and many other types. Examples of Moore machines are shown in Table 6.4.2.1. Cells show individual decisions in round *r* as functions of the outcome and decision in round *r-1*. These strategies use only restricted information from the previous round. They are conditional on the previous collective outcome and not on the exact number of contributors. There are two possible past decisions and if we assume information about the establishment of collective action, six possible outcome states (see Table 6.4.2.1). Every strategy is defined by its binary responses to these twelve different states. Therefore, strategies can be expressed as 12-bit strings or can be uniquely represented by the decimal number translations of these strings (these are shown as strategy codes in Table 6.4.2.1). Additionally, for each strategy, the very first choice also has to be defined. This could be a quite crucial determinant of fitness, as it is the case with a property of being *nice* in the two-person PD (Axelrod, 1984).

Table 6.4.2.1 Examples of two-state Moore machines

outcome in round r-1		*victory*				*peace*		*clash*		*defeat*			
collective action in round r-1		*yes*		*no*		*no*		*yes*		*yes*		*no*	
own decision in round r-1		C	D	C	D	C	D	C	D	C	D	C	D
Strategy	*code*												
ALL D	0	D	D	D	D	D	D	D	D	D	D	D	D
Change	1365	D	C	D	C	D	C	D	C	D	C	D	C
Likely Critical	2096	C	D	D	D	D	D	C	C	D	D	D	D
Win-Stay Loose-Change	2709	C	D	C	D	C	D	D	C	D	C	D	C
Intergroup TFT	3135	C	C	D	D	D	D	C	C	C	C	C	C
Intergroup GRIM	3775	C	C	C	D	C	D	C	C	C	C	C	C
TFT + Bandwagon	3903	C	C	C	C	D	D	C	C	C	C	C	C
ALL C	4095	C	C	C	C	C	C	C	C	C	C	C	C

Notes: Cells contain decisions in round *r*. C=contribution (binary value 1), D=defection (value 0).

Among the strategies that are displayed in Table 6.4.2.1, “Likely Critical” resembles the criticalness behavioral principle of the present study. However, the “Likely Critical” Moore machine is strictly backward-looking, unlike subjects, who base their decisions on expectations about the next outcome. “Intergroup TFT” resembles intergroup reciprocity and the strategy “Win-Stay Loose-Change” is the counterpart of reinforcement learning. The main difference is that in the experiments we did not consider deterministic strategies, and we formulated our hypotheses in probabilistic terms, since other factors also influence decisions.

Strategies that were shown in Table 6.4.2.1, do not use information about previous decisions of relevant others. However, one of the major conclusions of this study is that human action is strongly determined by social control from related group members. For instance, previous decisions of neighbors might influence the behavior

of individuals in the form of local reciprocity. In order to analyze what are the successful individual strategies *in different neighborhoods* in long-term intergroup competitions, we need to consider much more complex strategies that are also conditional on the behavior of relevant others.

The conceptualization of what is successful, however, is quite problematic. Strategies can have overwhelming success in certain neighborhoods and ignominious failure in others. Even in strategically equivalent network positions or at a fixed location different strategies may do best, depending on the distribution of strategies among others. Therefore, a study that aims to search for successful strategies has to make simplifying assumptions, for instance by considering simple network structures, such as a cellular world (cf. von Neumann, 1966; Nowak and May, 1992; Nowak and Vallacher, 1998; Hegselmann and Flache, 1998; Flache and Hegselmann, 1999a).

6.4.3 Computer tournaments and evolutionary selection of successful strategies

The study that examines Moore-machines and searches for successful individual strategies would need to specify the *population* of strategies that is analyzed, the *selection criteria*, and also the *algorithm* that is used to determine success.

To avoid the criticism that strategies are chosen in an ad hoc fashion for the analysis, strategies should be systematically selected or sampled (Binmore, 1998). For instance, similar to the two-person PD computer tournaments of Linster (1992), a careful design can encounter *all possible* Moore machines with one round of memory. On the other hand, for the illustration of certain tendencies, a *qualitative selection* also suffices, as in the computer tournament of Axelrod (1984) or in the case of strategy selection by Kollock (1993).

One possibility to determine the success of strategies is based on an evolutionary perspective (Maynard Smith and Price, 1973; Dawkins, 1976; Maynard Smith, 1982). *Ecological success* covers all phases of a strategy-life from birth to overwhelming dominance and it consists of three criteria: initial viability, robustness, and stability (Axelrod, 1984). *Initial viability* means that a strategy is successful as a mutant in a uniform population. The fabled TFT, for instance, individually is not viable in an ALL D population in the two-person iterated PD. *Robustness* means that a strategy does well in mixed environments. In the iterated PD computer tournaments of Axelrod (1984) TFT and slight modifications of TFT were the most robust strategies. If all possible two-state Moore machines participate, GRIM[2] is the most robust strategy (Linster, 1992). Finally, a strategy is *evolutionary stable*, if no other strategy can invade its uniform environment. In the iterated two-person PD, ALL D is always stable and TFT is evolutionary stable, if the discount parameter is sufficiently high (Friedman, 1971; Axelrod, 1984).

[2] GRIM is also known as FRIEDMAN (Axelrod, 1984). It contributes in the first round and never contributes again, once the other player has defected.

Computer tournaments can be used to investigate the robustness of different strategies (cf. Axelrod, 1984). Evolutionary algorithms can test also other criteria of ecological success employing the principle of "survival of the fittest". *Learning* and spread of successful heuristics can either happen *globally* in the entire population as the best performing strategies reproduce (Axelrod, 1984; 1997a) or can take place *locally* as individuals adopt better codes of behavior from neighbors (Ellison, 1993; Chwe, 2000). If strategies are also contingent on previous actions of neighbors, the amount of possible codes is extremely large, even if only two-state Moore machines are considered. *Genetic algorithms* are able to cope with such a variety as they introduce mutation and crossover to the reproduction process (Holland 1975; Holland and Miller, 1991; Macy, 1996; Klos, 1997). Hence there is no need to encounter all possibilities; simulations take care of the selection of successful behavioral traits.

6.4.4 Fully connected networks

In this study, we assumed that all interpersonal relations are equally important. However, the impact of good friends and acquaintances on individual behavior might be radically different. An advanced model design might take into account that the size of social control effects is dependent on the strength of the tie between given individuals. A further complication is that individual relations might be asymmetrical. The subjective strength of a tie could be different for the connected persons. Subjective values, ranging from zero (no contact, indifference) to maximum influence (dictatorship), determine the weights of social control effects.

The consideration of relational strength adds substantial complexity to the model and calls for efficient computational methods. *Agent-based simulation* techniques could be used for this purpose. Agent-based simulations assume that individuals have intentions and make choices that affect other agents (Macy, 2002). With their help, emergent macro phenomena can be "grown" from simple rules of micro behavior (Epstein and Axtell, 1996). For the study of structural embeddedness of intergroup dynamics, neural network models might provide a powerful example of agent-based techniques (Bainbridge, 1995; Macy, 1996; Nowak and Vallacher, 1998). *Attractor neural networks* that create a compelling analogy of mechanisms in the brain and in society would particularly fit the purpose of the study of social network dynamics (Minsky, 1985; Kitts, Macy, and Flache, 1999). In attractor neural networks, nodes are agents and ties between nodes have weights corresponding to the strength of the relationship. Agents adjust these weights over time due to their network strategy. Meanwhile, they receive from and impose social control on others proportional to the strength of the tie. These relational strategies combined with the decisions of whether to participate in intergroup conflict could be the basic decision elements in an agent-based simulation model of a subsequent research program.

6.4.5 Structural dynamics

In repeated interactions, intergroup conflict or peace has a feedback effect on the network structure. People might reconsider, who are their real friends, depending on their previous actions. As a consequence of intergroup conflict and of dyadic social control, some ties might become stronger and other ties might dissolve almost entirely.

In order to increase future satisfaction, individuals have an interest in strengthening their ties with those who rewarded them in previous rounds with either selective incentives or with behavioral confirmation. All this is at the expense of less profitable relations. This kind of *structural learning* (cf. Kitts, Macy, and Flache 1999) is an optimal network strategy in the short run. However, it does not provide a way out of ongoing intergroup conflict. After clashes, structural learning provides a directive to decrease the strength of ties with members of the other group and to increase the strength of ties within the group. This leads to higher segregation and durable intergroup conflict, which Newcomb (1947) called *autistic hostility*. It could happen that the suboptimality of overall participation disappears and group members enjoy continuous conflict, since they are compensated by selective incentives and behavioral confirmation. But this is definitely not a desirable resolution for the social dilemma. Individual structural strategies that show the way out of harmful clashes should be of a different kind.

6.5 Walking out of social traps

It is certainly challenging to find ways out of the spiral of ongoing conflict and segregation without an inclusion of third parties or institutions. In this section, we discuss some intuitively appealing *endogenous solutions* of *reciprocity*, *tolerance*, *raising new issues*, *assimilation*, *exit*, and *positive discrimination* of members of the opposite group. Subsequent research in the directions we considered in Section 6.4 might provide theoretical support for these solutions. Moreover, we would like to demonstrate that suggested solutions can be explicitly linked to empirical situations and provide ways out of the social trap of harmful intergroup relations.

6.5.1 The emergence and collapse of live-and-let-live systems

In this section, we consider an endogenous solution of intergroup conflict by *reciprocity*. At the same time, we also illustrate how this research and its proceedings might help to explain intergroup conflicts better than previous studies.

In his highly influential work, Axelrod (1984) argues that the relevance and success of TFT in the repeated PD can help to explain the emergence of the live-and-let-live system in the trench warfare of World War I. There is no doubt that mutual

restraint became possible in the antagonistic fight because of the static nature and infiniteness of the opposition. However, the two-person PD model of trench warfare is too simple to represent the interdependencies on the battlefield. First of all, opponents cannot be considered as unitary players. Soldiers as individual actors start socializing with soldiers from the other side and they are the ones, who apply the live-and-let-die principle otherwise. It is completely their decision to shoot accurately or not, although there is extremely high pressure from their commanders to comply with group efforts. On the other hand, besides the effort of pulling the trigger, they face a much higher cost of breaking the strong moral rule of "not to kill". Because of these concerns, trench warfare is better described as a team game, in which individual actions aggregate to the collective performance of the armies. As the competition at the national level can indeed be described as a two-person PD, for the two levels of interdependencies the IPG game provides an accurate representation.

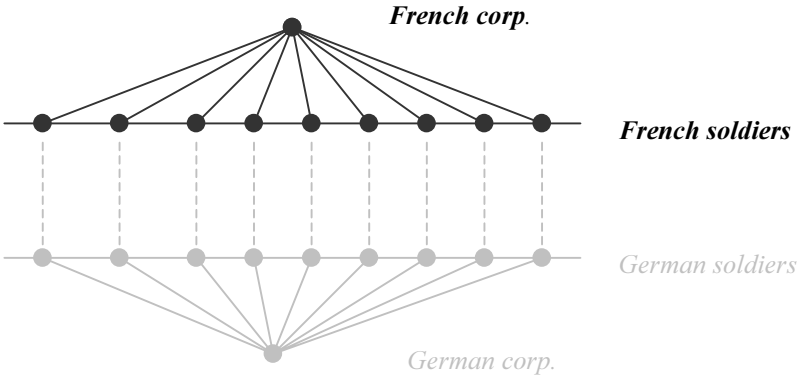

Figure 6.5.1.1 Application of the structurally embedded IPG game to trench warfare in World War I

Social control effects entering the model as soldiers have an influence on the actions of comrades and on warriors on the opposite side. These include behavioral confirmation as well as social selective incentives between fellows and traitor rewards towards people on the other side. Furthermore, in the form of orders, rewards, and punishments, officers distribute strong selective incentives between their troops. Social control effects are transmitted along the spatial arrangement of soldiers on the front line that is more or less stable over time (see Figure 6.5.1.1 for a rough illustration).

To get a closer impression of the social dilemma of trench warfare, consider a numerical example. Let us fix the private shares of the public rewards from the intergroup competition to $p=0$; $v=2$; $d= -5$; and $c= -4$. Let us assume a benefit for not shooting that contains the value of a bullet, a spared effort, and moral satisfaction of being $e=1$. Additionally, side payments of social control are in effect. The supervising officer enforces compliance strongly by $s=4$. Behavioral confirmation from each neighboring comrade is set to $b=0.5$. Furthermore, assume that traitor rewards that

concern sympathy to humans on the other side are negligible ($t=0.01$). In the structurally embedded IPG game of this payoff structure, shooting is a dominant strategy of all soldiers. Independently of what others do, individuals are always better off by fighting. Rationality dictates the application of the live-and-let-die principle for everyone. The aggregated consequence of overall participation in the bloodshed is dominant strategy equilibrium. However, in this outcome everyone is rewarded less (1) than in overall peace (2.01), which shows the social dilemma character of trench warfare.

Due to the static nature of opposition, the interdependency is repeated in the same structure. As Section 6.4.1 shows, if the likelihood of continuation is large enough ($\delta \geq 0.657$), the strategy TF1T ensures a possibility of an endogenous solution for the conflict. The emergence of the live-and-let-live system can be explained by the overall adoption of this rule. On the other hand, the easy collapse of this system is the consequence of the extreme vulnerability of this equilibrium to a single trembling hand (cf. Selten, 1975).

6.5.2 Glory for tolerance

Another internal solution has its roots in the *contact hypothesis* of Allport (1954). Facilitating contact formation and interaction between members of the rival groups might contribute to the dissemination of traitor incentives and consequently to the resolution of intergroup conflict. However, it is more difficult to find a rationale for actors to behave tolerantly and form such contacts voluntarily, especially during ongoing conflict. Unlike structural learning (cf. Section 6.4.5), *tolerance* is a farsighted network strategy that is based on short-term sacrifices in order to gain long-term benefits of intergroup peace. Subsequent research might examine under which conditions, if at all, strategic formation of intergroup ties would bring individual benefits in the long run. Another question concerns whether or not tolerant network strategies can invade a segregated population that is full of prejudice, and whether or not tolerant societies can be in evolutionary stable equilibrium.

This investigation might take place by using attractor neural networks (cf. Section 6.4.4). In this perspective, the strategy “tolerance” gives new weights to the strength of ties in favor of intergroup contacts. The success of the strategy might depend on the likelihood of continuation and on how quickly individuals can change their ego-networks. A key to success might be in the moderateness of the strategy. An exaggerated application of tolerance would simply lead to treachery and not to conflict resolution. Important fellow ties should not be sacrificed, as they are the sources of propagating peaceful behavior. Furthermore, the network location of tolerant actors might also be of crucial importance. For instance, individuals with high centrality in their group can provide sufficient confirmation pressure towards several fellows, but they are also at risk of being turned back easily.

6.5.3 Raising new issues: crosscutting cleavages and consociational democracies

The idea that crosscutting social circles promote good intergroup relations dates back to Simmel (1955[1908]). This theorem was elaborated further in several respects (LeVine and Campbell, 1972; Deschamps and Doise, 1978; Blau and Schwartz, 1984; Brewer and Miller, 1984; Flap, 1988). In empirical research, the hypothesis was tested, for instance, by using data on intermarriage (Blau and Schwartz, 1984). In political science, crosscutting dimensions have been recognized to overcome deeply rooted cleavages in Western democracies (cf. Lipset and Rokkan, 1967). However, there is also contradicting evidence, which shows that crosscutting social circles do not necessarily influence behavior, for instance, voting (Nieuwbeerta and Flap, 2000).

A subsequent study could analyze the effects of introducing a new issue that causes a similar negative interdependency as the old issue of intergroup competition, but along another division line. In the case of crosscutting cleavages, the dimensions would be clearly distinct. A further specification could concern the salience of actors for old and new issues, as is the case in collective decision making models (e.g., Bueno de Mesquita and Stokman, 1994). Conflict on the old issue might end, if the new issue is salient enough for actors in key structural positions to build intergroup ties. On the other hand, conflict might evolve on the new issue, if the old division becomes unimportant for most individuals and the population becomes segregated along the new division line. Even worse, raising a new issue might lead to conflict on both dimensions, even when cleavages are crosscutting. For instance, hooligans at one time may fight as football supporters and other times they may be side by side as left or right wing extremists.

Peaceful resolutions might emerge on both issues, for instance, if key actors in the rival groups develop a high salience for the new issue, on which they agree. In this case, the majority of the population does not necessarily have to be interested in the new issue nor should they decrease their negative sentiments towards members of the other group. It is sufficient if they remain interested in and influenced by the key actors in their group. The popularity of influential actors ensures that conflict is suppressed on the old dimension. This is probably why peaceful coexistence can be maintained in consociational democracies (cf. Lijphart, 1969; 1977). For instance, in Belgium, as long as the Flemish and the Walloon intellectual, political and economic elite remains united on major policy issues, there is a chance that ethnic relations can be rendered harmonious.

6.5.4 Assimilation and exit

As Simmel (1955[1908]) claimed, a natural end to conflict is the disappearance of its object. This refers to the case where a limited resource for which groups compete, cannot be attained anymore. Another quick way of conflict resolution is when one of

the contestants disappears. This occurs where one group *dies out* completely, it *assimilates* to the other group, or *quits* the interdependence. Unfortunately, there are several empirical examples, in which participants of conflict aim at the complete *annihilation* of the other side. Ethnic cleansing and genocide are the most horrible ways of getting rid of the rivalry. *Assimilation* means giving up the original group membership. It might be a beneficial strategy, especially if traitor pressure puts a heavy burden on the individual who is surrounded by members of the other group. The possibility of changing sides under such conditions might be incorporated into an agent-based simulation design. Sometimes it is possible to avoid taking part in the competition or to *exit* the intergroup contest (cf. Hirschman, 1970). The exit option has already been incorporated into agent-based simulations for the two-person PD. Results show that enlarging the set of alternatives by the possibility of not playing might help the evolution of cooperation and morality (Schüssler, 1989; Vanberg and Congleton, 1992; Macy and Skvoretz, 1998). Individual exit does not obviously have such desirable consequences in the structurally embedded IPG game, as gatekeepers with extensive contacts to members of both groups would be especially keen on refusing to play.

6.5.5 Discriminative sanctioning

Another strategy that advocates conflict resolution and might be of central interest in subsequent research is *positive discrimination.* As we discussed in Section 6.3, the production of social control often involves costs. Consequently, individuals have limitations on how much social control they impose on each other (cf. Kuran, 1995). Costs require them to decide whom to sanction negatively or positively (cf. Flache 1996; Fehr and Schmidt 1999). This means relaxing the assumption that social control towards in-group and out-group members is distributed automatically and infinitely. In this perspective, a multitude of possible strategies can be constructed that are based on different distribution policies of sanctioning resources. Positive discrimination, as one of these, implies more likely imposing positive sanctions on out-group members and negative sanctions on group fellows. Similar to tolerance (cf. Section 6.5.2), it is difficult to find an individual rationale for the application of such a strategy. A significant proportion of individuals may follow it if a backup group specializes in higher order sanctioning and provides selective incentives for positive discriminators or punishments for negative discriminators. A further support could come from the inclusion of both forward-looking and backward-looking agents in the population. Far sighted individuals might teach reinforcement learners to adopt peaceful behavior by using discriminative sanctioning. Exact conditions for the emergence of equilibria, in which individuals in sufficient number apply positive discrimination to protect intergroup peace, can be highlighted by agent-based simulation.

6.5.6 Epilogue

In this chapter, we summarized and concluded our study on competitive intergroup relations. An overview of the main results was provided and some strengths and weaknesses of the analysis were discussed. We also supported further investigations with some suggestions. We concentrated mainly on recommendations for simulation research, but we strongly believe that analytical model developments, laboratory experiments, survey research, field and case studies might also reveal further underlying mechanisms and enrich the explanation of intergroup conflict substantially.

After all, this study should be considered as a modest contribution to the search for a solution for the costly enigma of intergroup conflict. Hopefully, this search will provide the opportunity to challenge the heavy pessimism delivered from the time of the Bosnian war, in yet another graffiti message in the heart of Budapest stating “Szarajövõ” (the future is crap).