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Social dilemmas between individuals and groups

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The article is dedicated to Gary Bornstein, who lost the battle during the revision of the manuscript

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ABSTRACT

Three computer-controlled experiments were conducted to study interactions between individuals and non-cooperative groups in prototypical social-dilemma games. The asymmetric competition between an individual and a group was compared with symmetric control conditions where both competitors were either individuals or groups. All games were played repeatedly with the same players interacting for 120 rounds. The results show that the outcome of the conflict depends both on the type of competing players and on the structure of the competition. Generally, individuals do better than non-cooperative groups, regardless of the type of conflict, and more often than not it is better to have a non-cooperative group rather than an individual as an opponent. The relative advantage is a result of individuals generally cooperating better with other individuals (as compared to cooperation between two groups), and that in mixed competitions the individual takes advantage of the group's difficulties in mobilizing collective-action, and dominates it.

Introduction

Conflicts between superstores (such as WalMart) and small, 'mom and pop', businesses are often discussed by political and social activists in the US. While we do not intend to analyze the advantages and disadvantages of big corporations to society within this manuscript, such conflicts provide an excellent example of an asymmetric conflict between an individual competitor and an unorganized, non-cooperative group. To illustrate this point, focus on the lobbying efforts made in this market. While all small corporations have a joint incentive to allocate their resources to prevent opening of new Walmart stores in their towns, each of the small businesses prefers to free ride on efforts made by other small businesses and refrain from expending its own resources. Another example is the difficulty small businesses may have in coordinating their advertisement efforts ("shop locally") to counter the effective strategies of the big corporations ("always low prices"). As a result, coordination problems and free riding can easily lead to big corporations dominating the market.

This paper investigates bilateral conflicts between a group and an individual. Additional real-life examples of such asymmetric conflicts are abundant. A strike of an unorganized group of workers against an individual employer, a confrontation between street mob and a police officer, and a popular revolution against a dictator are only some of the examples that come to mind. These conflicts raise interesting and important questions: How does the asymmetry between the conflicting sides affects the course and outcome of the interaction? Which side, if any, has an advantage? How does this depend on the strategic structure of the conflict?

Social conflicts are often complex and multi-dimensional and therefore hard to study. There are at least two approaches to deal with this complexity. One can study real conflicts in the field, using either case studies or archival data of historical conflicts. We choose an alternative, complementary approach. Following the long tradition of social dilemmas research (e.g., Dawes, 1980; Dawes & Messick, 2000; Kollock, 1998; Weber, Kopelman, & Messick, 2004), we model conflicts as simplified, stylized interactive decision tasks (or games, as game theorists refer to them). While this requires abstracting away from many aspects of reality, a simple, well-defined game provides an opportunity to focus on selected properties of reality and systematically manipulate them in a controlled environment (see also Devetag and Warglien (2008) for an experimental analysis demonstrating the difficulties in constructing representations of complex conflicts).

While asymmetrical social dilemmas has been investigated frequently, those asymmetries typically focus on resources or endowments (De Cremer, & van Dijk, 2009; van Dijk & Wilke, 1995, 2000;

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Wit, Wilke, & Oppewal, 1992), rewards (Wade-Benzoni, Tenbrunsel, & Bazerman, 1996) group size (Rapoport & Bornstein, 1989), or interests (Stouten, De Cremer, & van Dijk, 2009) and not on the type of competitor, as is the focus of our investigation. Therefore, there is no consensus in the literature on the right way to model a conflict between an individual and a group.

Choosing the right game entails careful consideration. Modeling conflicts between a group and an individual as a two-person interaction is obviously inadequate as it ignores the asymmetry between the conflicting sides: one side consists of a number of individuals each deciding on their own action, whereas the other side decides single-handedly on all of her actions. Despite this insight, groups (states, companies, families) are often modeled as individual agents, ignoring the possibility of an intragroup conflict of interests.

If one assumes, for simplicity, as we do in this paper, that the two sides have equal resources at their disposal, it still matters that one side is a group while the other is an individual.

Groups face internal problems that individual players are spared. One such potential problem is *free-riding*. The benefits associated with winning an external conflict (e.g., wage increase, political freedom) are typically public goods which are equally available to all group members, regardless of whether (or how much) they contributed to the collective group effort. When contribution is costly (in terms of time, money, effort or risk) rational group members have an incentive to take a free ride on the contribution of others. Consequently, the group may lose the competition and the public good will not be provided. A second problem is that of *coordination*. Coordination is a concern whenever a number of individuals have to actuate a joint strategy under conditions of imperfect information. Clearly, coordination is harder to achieve the larger the group is (e.g., Bornstein, Budescu, Kugler, & Selten, 2008; Hamburger, Guyer, & Fox, 1975; Marwell & Schmitt, 1972; Oye, 1986; van Huyck, Battalio, & Beil, 1990).

Since we view coordination and free riding as crucial aspects of the conflict we are modeling, we also cannot draw on the extensive literature on the inter-individual inter-group discontinuity effect, that compares individual behavior to behavior of *unitary groups* (Bornstein, Kugler, & Ziegelmeyer, 2004; Bornstein & Yaniv, 1998; Cooper & Kagel, 2005; Cox & Hayne, 2006; Insko & Schopler, 1987; Insko et al., 1988; Kocher & Sutter, 2007; Kugler, Kocher, Sutter, & Bornstein, 2007; Morgan & Tindale, 2002; Schopler & Insko, 1992; Schopler, Insko, Graetz, Drigotas, & Smith, 1991; Wildschut, Insko, & Pinter, 2007; Wildschut, Pinter, Vevea, Schopler, & Insko, 2003; Wolf, Insko, Kirchner, & Wildschut, 2008; and many others, see Kugler, Kausel, and Kocher (2012) for a recent review). Unitary groups, which are at the focus of the discontinuity effect, are groups who have to make a *joint* decision (often through a process of discussion, but sometimes through voting or another mechanism), and its members receive identical payoffs (from a game-theoretical point of view this group is essentially only *one* player). Therefore, there are no conflicts of interests regarding payoffs within the group and no coordination problems in the standard sense: the group members do not need to coordinate their individual actions (there are, however, differences between such a group and an individual player from the psychological perspective: group members can differ in their understanding of the game, risk attitude, other regarding preferences, beliefs regarding the choices of other groups or individuals etc.). Unitary groups make different choices than individual players. Often, such groups are more competitive (or greedy), more fearful (or worried that they will be exploited by other groups) and more rational in the strict, selfish sense (Kugler, Kausel, et al., 2012). They are also better at understanding the game, analyzing the consequences, and make fewer mistakes. The non-cooperative groups in this investigation are different. Each group member gets to choose an action independently (the "group action", to the extent that such an action can be defined, is an aggregate of the individual choices), often without the ability to communicate or make binding agreements with other group members. The payoff structure creates inherent conflicts of interest within (as well as between) groups – hence our emphasis on free riding within groups. But even if groups could agree on the right course of action for the whole group, coordination issues would remain. Since all group members need to act independently, actuating a 'group strategy' is not trivial even if conflicts of interest can be resolved.

Going back to the issue of selecting the appropriate model for an asymmetric conflict, traditional *n*-person social dilemmas are also not satisfactory. In *n*-person public goods games (in particular the *n*-person Prisoner's Dilemma and Chicken games) the provision function which specifies the relation between the level of contribution and the benefits provided is determined by Nature (personified by the experimenter). In the present investigation the group's provision level is determined by a game of strategy against the individual player. The public good to be provided depends not only on the group's collective action, but also on the action taken by its individual opponent.

It is clear from the discussion above that to study competitions between a group and a strategic opponent (as opposed to Nature) the intra-group problem of collective action and the external conflict with the opponent must be considered simultaneously. We incorporate these two levels of conflict by employing a class of games called *team games*. Team games (Palfrey & Rosenthal, 1983) were originally formulated to model symmetrical conflicts between two non-cooperative groups (see also Bornstein, 2003, 2007; Kugler, Rapoport, & Pazy, 2010; Kugler & Szidarovszky, 2009; Rapoport & Almadoss, 1999), but, as will be shown below, they can be easily adapted to model the asymmetric competition which is in the focus of this investigation.

In its original formulation (Palfrey & Rosenthal, 1983) a team game involves a competition between two groups A and B with nA and nB members, respectively. Each member of group A (B) receives an endowment of eA (eB) and has to decide between keeping the money and contributing it towards her group's benefit. Contributions are forfeited. The group with more contributions wins the competition and each of its members receives a bonus of r ($r > e$). The members of the group that loses the competition receive no bonus. In case of a tie (i.e., an equal number of contributors in both groups), each member of both groups is paid a bonus of s.

The focus of this study is an asymmetric game with $nA = 3$ and $nB = 1$. This asymmetrical condition is compared with two symmetric control conditions, one in which $nA = nB = 3$ and another where $nA = nB = 1$. In all three conditions the two sides are a priori symmetric in power, in the sense that they are both endowed the same initial resources[1].

Prototypical team games

The effect of the asymmetry between the conflicting sides on the outcome of the competition is likely to also depend on the strategic structure of the conflict. We therefore study three prototypical *step-level* (winner-takes-all) team games. In step-level competitions the side whose total contribution *exceeds* that of the other side wins and receives the reward (Taylor & Ward, 1982). Each member of the winning side receives a payoff of r units ($e < r$), regardless of whether (or how much) she contributed to the collective effort. The members of the losing side receive no reward.

[1] This is obviously a simplifying assumption. In real conflicts initial resources vary in both directions, so the individual can have more or less resources than the group. We leave the important extension of this study to asymmetric resources for future work.