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Strategic sophistication of individuals and teams. Experimental evidence

Matthias Sutter [a,b,*], Simon Czermak [c], Francesco Feri [d]

[a] Department of Public Finance, University of Innsbruck, Universitaetsstrasse 15, A-6020 Innsbruck, Austria
[b] University of Cologne, Germany
[c] MCI Management Center Innsbruck, Universitätsstraße 15, A-6020 Innsbruck, Austria
[d] Royal Holloway, University of London, United Kingdom

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ABSTRACT

Many important decisions require strategic sophistication. We examine experimentally whether teams act more strategically than individuals. We let individuals and teams make choices in simple games, and also elicit first- and second-order beliefs. We find that teams play the Nash equilibrium strategy significantly more often, and their choices are more often a best response to stated first order beliefs. Distributional preferences make equilibrium play less likely. Using a mixture model, the estimated probability to play strategically is 62% for teams, but only 40% for individuals. A model of noisy introspection reveals that teams differ from individuals in higher order beliefs.

1. Introduction

In this paper, we examine the strategic sophistication of individuals and teams. Strategic sophistication refers to the extent to which players consider the structure of a game and the other players' incentives in the game before deciding on their strategy (Crawford et al., 2013). There are many important contexts where strategic sophistication plays an important role for organizations, such as in decisions on market entry, technology races, company takeovers, or how to optimally intervene through monetary policy instruments in financial markets during a crisis. Examining the strategic sophistication of teams is warranted because many economically important decisions are taken by teams rather than by individuals. One can think of company boards, management teams, committees, or central bank boards as relevant economic agents that make strategic decisions with far-reaching consequences.

By now, there is a large literature that examines the strategic sophistication of individuals by means of experimental normal-form games (see, e.g., Stahl and Wilson, 1994, 1995; Haruvy et al., 1999; Costa-Gomes et al., 2001; Weizsäcker, 2003; Bhatt and Camerer, 2005; Crawford and Iriberri, 2007; Costa-Gomes and Weizsäcker, 2008; Rey-Biel, 2009; Danz et al., 2012). In a nutshell, the main insight from this literature is the fact that strategic sophistication is often limited, such that

* Corresponding author at: Department of Public Finance, University of Innsbruck, Universitaetsstrasse 15, A-6020 Innsbruck, Austria. Tel.: +43 5125077170.
E-mail address: matthias.sutter@uibk.ac.at (M. Sutter).

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many subjects ignore the incentives and the rationality of other players (e.g., Costa-Gomes et al., 2001, Weizsäcker, 2003) or fail to best reply with their choices to their own beliefs (Costa-Gomes and Weizsäcker, 2008).[1] By examining how teams make strategic decisions we can contribute both to the literature on strategic sophistication and the literature on team decision-making in the following ways.

We let teams and individuals make choices in 18 different, one-shot normal-form games that have been designed by Costa-Gomes et al. (2001) to study the strategic sophistication of individuals. In addition to asking for choices of individuals and teams, we elicit their first order beliefs about their opponent's most likely strategy, and their second-order beliefs about the opponent's most likely first order belief. Hence we elicit point beliefs rather than a probability distribution over all strategies. We examine the differences between individual and team decision making by analyzing the following aspects of strategic sophistication: (i) the relative frequency of equilibrium play and beliefs about equilibrium play, (ii) the degree of a decision maker's consistency and the consistency expected from the opponent, where we define consistency in the sense that choices are a best reply to stated point beliefs, (iii) the factors that make behavior more or less likely to comply with standard textbook-rationality (by which Fudenberg and Tirole, 1991, mean that a player's strategy is a payoff-maximizing best response to the opponent's forecasted strategies, given that forecasts are correct), (iv) the distribution of eight different strategic and non-strategic types which is estimated separately for teams and individuals by an econometric mixture model (Costa-Gomes et al., 2001) where each decision maker's type is drawn from a common prior distribution over the eight types and remains constant for all 18 games, and (v) the relation of choices and higher order beliefs in a model of noisy introspection (Goeree and Holt, 2004).

Our estimations on the determinants of textbook-rationality examine how the complexity of a game and how the distribution of payoffs in equilibrium affect the likelihood of a decision maker playing Nash and expecting the opponent to do the same. This adds to the literature on strategic sophistication by shedding more light on which factors of a game promote or hinder equilibrium choices and beliefs. Rey-Biel (2009) has investigated the influence of constant-sum games vs. variable-sum games on the predictive power of Nash equilibrium, finding that the likelihood of observing Nash equilibrium choices is higher in constant-sum games than variable-sum games. We contribute to this issue by focusing on the role of the decision maker (being either an individual or a team).

We also contribute to the flourishing research on team decision making. While the basic bottom-line of team decision making-research seems to be that teams are “more rational” than individuals in strategic games – meaning that team behavior is in the aggregate typically closer to standard game theoretic predictions than individual behavior (see, e.g., Bornstein and Yaniv, 1998; Bornstein et al., 2004; Cooper and Kagel, 2005; Kocher and Sutter, 2005; Charness and Jackson, 2007)[2] – we are not aware of any research on team decision making that classifies single teams as of a particular strategic or non-strategic type and compares the distribution of different types across individuals and teams. We analyze the strategic sophistication of teams by considering not only choices, but also their first- and second-order point beliefs. Eliciting beliefs allows us to check whether teams are more likely to best reply to their own first-order beliefs, and whether teams expect their opponents to be best responding as well (by matching first-order beliefs with second-order beliefs). Furthermore, we estimate a model of noisy introspection (Goeree and Holt, 2004) where a player's choice probabilities are given by a logit best response that is a function of the player's first order beliefs, and where beliefs are again a function of one level higher order beliefs.[3] None of this has been studied in the team decision-making literature before.[4] Our paper can therefore provide a fine-grained picture of the (bounded) rationality and strategic sophistication of teams and how this compares to individual decision making.

Based on a total of 192 experimental participants, we find that teams play Nash-strategies in about 50% of cases, while individuals do it significantly less often in only about 40% of cases. The choices of teams are also significantly more often a best response to their own first order point beliefs. We denote such behavior as consistent, and teams are more often consistent than individuals. Moreover, teams expect their opponents to be more often consistent, i.e., first-order point beliefs are more often a best reply to second-order point beliefs. In the noisy introspection model we find that teams differ significantly from individuals in the estimated higher order beliefs (of order two and higher), indicating that the differences between individuals and teams are largely driven by differences in beliefs, although there is also a difference in the likelihood of best responding to beliefs.

Addressing the determinants of textbook-rationality (of playing and expecting equilibrium strategies) we note that the complexity of a game and the distributions of payoffs in equilibrium have an important impact. A game's complexity is interpreted as the required number of rounds of iterated pure-strategy dominance a row or column player needs to identify

[1] Strategic reasoning is not only limited in normal-form games, but also in a wider variety of games, such as auctions (Gneezy, 2005) or information cascades (Kübler and Weizsäcker, 2004).

[2] The paper by Cason and Mui (1997) is often misinterpreted as showing that teams are more generous than individuals in a dictator game. However, Cason and Mui (1997) did not find that teams in general are more generous than individuals, but only reported more other-regarding team choices when team members differed in their individual dictator game choices.

[3] As in Goeree and Holt (2004), the error rates follow a geometrical progression that is specified using two parameters: the error rate of actions and a “telescoping” parameter that determines how fast error rates are increasing for higher order beliefs. Using the estimates of these parameters we compute the error rates for beliefs with the standard errors computed using the delta method.

[4] Second-order beliefs in normal-form games have been studied with individuals as decision makers by Bhatt and Camerer (2005) and in the working paper version of Costa-Gomes and Weizsäcker (2008). The role of second-order beliefs on actual behavior (of individuals) in extensive form games (such as a lost wallet-game or a trust game) is studied in Dufwenberg and Gneezy (2000) or Charness and Dufwenberg (2006), for instance.