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Communication with evidence in the lab ☆

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ABSTRACT

We study a class of sender–receiver disclosure games in the lab. Our experiment relies on a graphical representation of sender's incentives in these games, and permits partial disclosure. We use local and global properties of the incentive graph to explain behavior and performance of players across different games. Sender types whose interests are aligned with those of the receiver fully disclose, while other types use vague messages. Receivers take the evidence disclosed by senders into account, and perform better in games with an acyclic graph. Senders perform better in games with a cyclic graph. The data is largely consistent with a non-equilibrium model of strategic thinking based on the iterated elimination of obviously dominated strategies.

1. Introduction

In many economic interactions, agents provide hard evidence to influence the choice of others. Firms disclose product information to consumers. Policyholders provide medical check-ups to their insurers. At technology exhibitions, start-ups display their newest products to users and competitors. Job candidates make claims on CVs that employers can often cross-check on the Internet. In all these cases, the revealed information is verifiable and, yet, some of it can be voluntarily omitted, presented more or less advantageously or made imprecise. The objective of the informed party affects her incentive to shroud information, and the reading of disclosed information by the uninformed party. In this paper, we report the results of an experiment that investigates how agents disclose and interpret evidence depending on the strategic context. To do so, we use a collection of simple sender–receiver disclosure games that is rich enough to vary the strategic context, while permitting a tractable common analysis. In general disclosure games, the predictive power of perfect Bayesian equilibrium

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is plagued by multiplicity, and fully revealing equilibria, while focal when they exist, can also be sustained by multiple strategies, and sometimes fail empirically. We show that a non-equilibrium approach based on the iterated elimination of obviously dominated strategies (Li, 2017) generates meaningful restrictions on behavior that are well matched by the data, and can provide guidance for equilibrium selection.

The empirical and experimental disclosure literatures focus on situations where the sender has monotonic incentives: She prefers to appear as having a "higher" informational type (better quality, greater ability, etc). By contrast, the games in our experiment span various incentives for the sender. This is important because non-monotonic incentives are omnipresent in economic situations. Consider, for example, the following situation. Company A and company B compete in the cell phone market. Company B is also present on the tablet market, where A is a potential entrant. A has just held its board meeting and it is known that they have reached a decision about entering the tablet market. This decision is private information but generates evidence, such as a new product, that can be disclosed or hidden. If A has decided to enter, it would prefer B to believe that it has not, so B does not engage into preventive R&D on a new tablet. If A has decided not to enter, it would prefer B to believe it has, so B devotes resources to the tablet market rather than to the cell phone market. In this case, the incentives of company A are cyclic: when committed to enter, A wants to appear as not entering and vice versa. More generally, cyclic incentives are natural in strategic situations with a Colonel Blotto flavor.[1] When having committed resources to one front, a player prefers the opponent to think she will attack on the other fronts. Non-monotonic incentives also arise naturally in situations where the receiver does not know the direction of the sender's bias,[2] or where the sender is addressing a heterogeneous audience. Even in situations where the sender's bias is fixed and known, incentives to masquerade are not necessarily monotonic: The sender may want to appear as a slightly higher type but not as any higher type as in the Crawford and Sobel (1982) model. In the games we study, payoffs generate cyclic as well as acyclic but non-monotonic, and monotonic incentives.

Our experiment incorporates multiple games into a unified framework. These games are taken from a simple class of sender–receiver disclosure games in which the receiver essentially wants to identify the type of the sender, and the sender may have various incentives. We use a reduced representation of sender's incentives, taken from Hagenbach et al. (2014), as a graph whose nodes represent the different informational states (types) of the sender, and whose oriented arcs represent masquerading incentives. Thus, there is an arc from type t to type s if t wants to masquerade as s, that is, if the sender is better-off convincing the receiver that her information is s when it really is t. A sender type is categorized as *envious* if she has an incentive to masquerade as some other type, and *satisfied* otherwise. A satisfied sender's interests are aligned with the receiver's, whereas an envious sender's are not. We also distinguish between games with masquerading cycles, and those without cycles. Acyclic games have a fully revealing equilibrium (FRE), whereas cyclic games may or may not have one. In our experiment, the information of the sender is materialized by two colored cards that she observes, and can reveal as she sees fit. This simple design provides an original and natural way to allow for full disclosure (FD), partial disclosure (PD) and no disclosure (silence).

Our empirical analysis has two parts. In the first part, we document how players' performance and behavior depend on sender categories (envious or satisfied), the nature of received messages (FD, PD or silence) for receivers, and game categories (cyclic or acyclic). The main findings are as follows. First, receivers overwhelmingly take evidence into account both in beliefs and actions. That is, they report beliefs that do not put any weight on informational types that are ruled out by the evidence, and take actions that reflect consistent beliefs. Second, satisfied senders overwhelmingly fully disclose, whereas envious senders use vague messages (silence or PD). While intuitive, this result is not a necessary feature of perfect Bayesian equilibrium. Finally, while satisfied senders perform equally well in all games, envious senders tend to perform better, and receivers worse, in cyclic games.

In the second part, we confront several theoretical models of strategic behavior in our class of games with the data. The models we consider are perfect Bayesian equilibrium (PBE), fully revealing equilibria (FRE), and a new procedure of iterated elimination of obviously dominated strategies (IEODS) based on the notion of obvious dominance recently introduced in Li (2017). These concepts are defined, and their implications for our class of disclosure games derived in the theory section of this paper (Section 3). PBE is defined as usual in disclosure games. Its predictive power in our class of games is low as it induces few behavioral and payoff restrictions. Consequently, it is difficult to exclude as a model of players behavior even though we do find some discrepancies between beliefs reported by the subjects and empirical frequencies, and subjects do sometimes fail to optimize with respect to reported beliefs. FRE can only be applied to games for which it exists, but it induces significant restrictions on strategies, allowing us to develop multiple measures of FRE. We show that FRE matches more than 80 to 90% of the data according to these different measures in the case of simple acyclic games. In the case of more complicated acyclic games, the fit is good, but we document significant departures from FRE. For cyclic games that have a FRE, however, FRE only matches a small share of the data.

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[1] In Colonel Blotto games, two players simultaneously allocate their resources across battlefields. These games have been used to model research and development portfolio selection, political campaign resource allocation and auctions with simultaneous bidding.

[2] Consider a researcher advising a dean deciding between hiring an experimentalist or a theorist. The researcher knows which candidate is best but also has a hidden bias. His type set is $\{tT, tE, eT, eE\}$ where tE corresponds to a bias towards the theorist but information that the experimentalist is best. Then type eT would like to be perceived as eE or tE, whereas type is tE would like to be perceived as type tT or eT. This induces a cycle between types tE and eT.