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Coordination-free equilibria in cheap talk games

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Abstract

This paper characterizes generic equilibrium play in a multi-sender version of Crawford and Sobel's (1982) cheap talk model, when robustness to a broad class of beliefs about noise in the senders' observation of the state is required. Just like in the one-sender model, information transmission is partial, equilibria have an interval form, and they can be computed through a generalized version of Crawford and Sobel's forward solution procedure. Fixing the senders' biases, full revelation is not achievable even as the state space becomes large. Intuitive welfare predictions, such as the desirability of consulting senders with small and opposite biases, follow.

JEL classification: C72; D82; D83

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1. Introduction

The transmission of information is an integral part of many economic models, whether implicitly or explicitly. In certain settings, such transmission is strategic: the side sending the information may choose the message in order to maximize its payoff. At the same time, the party receiving the information may be unable to offer incentives that significantly improve the informativeness of the message.

The seminal work of Crawford and Sobel (1982, henceforth CS) examines such a setting. A sender observes the state of the world $\theta \in [0, 1]$, sends a message to the receiver, who then

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takes an action. Both the sender and the receiver desire a higher action when θ is higher, but the optimal action for the sender differs from the optimal action for the receiver. Talk is cheap in the sense that neither player's utility depends on the sender's message. CS show that equilibria in this setting feature the sender revealing an interval of the state space. Moreover, there is a finite upper bound on the number of intervals that can be distinguished in equilibrium, and this bound increases as the sender's bias relative to the receiver becomes small.

This paper examines a model very similar to CS's, but with multiple senders simultaneously sending their messages. For example, a policymaker may seek the opinion of multiple experts. In multi-sender cheap talk games, because the actions that a given sender can induce depend on what messages other senders use, there exists a large set of equilibria, and there has so far been little progress in characterizing or refining it. Most existing work, reviewed later in the introduction, focuses on fully revealing equilibria, whose reasonability is questioned.

The main results of this paper show that, for an open and dense set of preferences and prior ("generically"), "robust" equilibria in this model have an interval structure, in that each message vector reveals an interval of states, just like equilibria in the one-sender CS model. Moreover, at each boundary between two intervals, only one sender's message changes,[1] so that senders do not coordinate locally about whether they are in the interval to the left or the one to the right of the boundary. The sender whose message changes must be indifferent at the boundary between inducing the action corresponding to the left interval and the action corresponding to the right interval, just like in CS equilibria. The latter property implies that the set of these *coordination-free* equilibria is finite and tractable: each such equilibrium can be computed through a generalized version of the CS forward solution procedure. This paper is the first that selects and characterizes a set of equilibria in simultaneous multi-sender cheap talk.

The proposed robustness concept requires equilibria to survive the possibility of small noise – where senders' observations are very close to θ (with high probability) – in the senders' observations of θ: an equilibrium is *(strongly) robust* if every player's strategy remains nearly optimal. Optimality is in an interim sense: each sender's message must be nearly optimal given her observed signal, and the receiver's action must be nearly optimal given the senders' messages. This paper's results hold whether senders are required to have common prior about the noise, or merely to have common knowledge that noise is small, which allows for the possibility of heterogeneous priors about the exact form of the noise.[2]

Many papers have studied the use of perturbations to the information structure to select equilibria. Most papers in the literature impose few restrictions on these perturbations. As a result, if heterogeneous prior is allowed, robust equilibria often fail to exist.[3] However, when considering cheap talk specifically, it is natural to restrict, for example, the set of payoff types: since senders care only about the state and the receiver's action, a message's payoff implication is entirely dependent on the receiver's strategy. This paper chooses to perturb information only about the parameter that already fails to be commonly known: the state θ.[4]

[1] *I.e.* there is no state θ such that two or more senders use a different message on each side of θ.

[2] Online Appendix C shows that if the robustness concept were relaxed to require only that some "nearby" strategy profile be nearly optimal, then the results would still hold if heterogeneous priors about noise are allowed.

[3] For example, Oyama and Tercieux (2010) show, in finite complete information games, that generically, an equilibrium is robust only if it is the unique rationalizable action profile. Weinstein and Yildiz (2007) show a similar result when, instead, *interim* beliefs are concentrated around the complete information payoffs. (In fact, Weinstein and Yildiz show that, with the interim approach, imposing common prior would not change their result.)

[4] Even only perturbing information about θ, it can still be common 0-belief that payoffs are near the payoffs of the complete information game, just like in global games (see, for example, Carlsson and van Damme, 1993).