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Receiver's dilemma☆

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ABSTRACT

In a sender–receiver game, the sender's concern for his credibility as a source of truthful information will boost his incentive to report truthfully. However, because his preferences over the outcomes differ from the receivers', he still has an incentive to manipulate information in his favor. While the receivers comprehend this incentive, we nevertheless show that they do not ignore his message and play according to his preferences, which leads to his (not their) favorite outcome. This is the dilemma that the receivers are faced with. We identify a generic game that shows this receiver's dilemma.

1. Introduction

In a sender–receiver game between one sender and multiple receivers, suppose that the outcome of the game will be determined only by the actions of the receivers. Then, one may expect that the sender cannot influence the receivers to play in his favor unless his preferences are sufficiently similar to theirs, because otherwise the receivers can simply ignore the signal from the sender. We will show that this is not necessarily so if the sender has concern for his credibility as a source of truthful information.

Consider the following sender–receiver game between a sender, say, a labor union, and multiple receivers, say, regulatory policy committee members. There are two states: a Good state (*G*-state) in which the free-market equilibrium is efficient and no regulatory policy is required, and a Bad state (*B*-state) in which some imperfection inhibits efficiency and many regulatory policies are required. This setting of the good state and the bad state is adopted from Warren and Wilkening (2012).

The union observes the underlying state and sends the committee members one of two signals: a *G*-signal denoting that the *G*-state has occurred, and a *B*-signal denoting that the *B*-state has occurred. After observing this signal, but without information on the underlying state, the committee members make a joint decision on whether to prepare for the *G*-state by making no regulatory policy (*G*-decision) or to prepare for the *B*-state by making many regulatory policies (*B*-decision). As in Warren and Wilkening (2012), we assume that the committee members can learn the true state only when they make the *G*-decision.[1]

Regarding their preferences, the union prefers the *B*-decision to the *G*-decision regardless of the states, while the committee members prefer the *G*-decision when the *G*-state occurs and prefer the *B*-decision when the *B*-state occurs. Finally, we assume that the union has concern for its credibility as a source of truthful information. The union's credibility concern is exogenously given, and the game lasts only for one period.

In this game, the preferences of the union differ from those of the committee members. Hence, the union has an incentive to manipulate information in its favor. The credibility concern, however, boosts its incentive to report truthfully. As a consequence, the union will manipulate information if it can make them play the *B*-decision, and will report truthfully otherwise. We refer to this behavior as *contingent information manipulation*.

The result shows that because of its contingent information manipulation, the union can influence the committee members to play the *B*-decision. In this game, only the committee members make a decision. Moreover, they clearly comprehend the setting of the game. Hence, they know that the union can report untruthfully, and conclude that they will not benefit from its signal. Nevertheless, they still cannot ignore its signal, because of its contingent information manipulation, and play according to its, not their own, preferences. As a consequence, they cannot help choosing only the *B*-decision, which is the union's (not their) favorite. We refer to the situation that the committee members (or receivers in a broad sense) are faced with as a *receiver's dilemma*.

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[1] Warren and Wilkening (2012) say that "regulation in our model is a policy that pools or constrains different types into the same (second-best) action so that the state is unobservable." In our model, the *B*-decision is viewed as imposing the regulation defined in their model.

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Jung (2009a) shows that, if receivers' favorite outcome is risk-dominated by a sender's favorite[2] and if the sender has concern for his credibility and uses the media as a means of information transmission, then the receiver's dilemma occurs. Jung (2009b) shows that the receiver's dilemma can occur even when there is only one receiver.[3] However, Jung presents the results without a systematic explanation, and even the results require specific assumptions about the sender's preferences.

In this paper, therefore, we have three goals. The first goal is to propose a theory that captures the receiver's dilemma. We build the theory based on the sender's contingent information manipulation. The second goal is to identify a general class of games in which a sender shows the contingent information manipulation, which then results in the receiver's dilemma. We refer to such games as ε-uncertain games. The third goal is to apply the equilibrium selection power of the contingent information manipulation to games with multiple equilibria. We develop two approaches to pure-strategy equilibrium selection.

In the ε-uncertain game, one (main) event occurs at least with probability $1-\varepsilon$, and the other event occurs at most with probability ε. Hence, this game may be viewed as containing ε amount of uncertainty, which explains why this game is referred to as the ε-uncertain game.

The rest of the paper is organized as follows. Section 2 reviews some related literature. Section 3 presents a basic game to illustrate how the sender's contingent information manipulation selects equilibria and results in the receiver's dilemma. Section 4 extends the basic game and introduces the ε-uncertain game. Section 5 applies the equilibrium selection power of the contingent information manipulation, and develops two approaches to pure-strategy equilibrium selection. Finally, Section 6 concludes.

2. Related literature

The present paper is closely related to a strand of literature on information traps, such as McLennan (1984), Laslier et al. (2003), Berentsen et al. (2008), and Warren and Wilkening (2012). This strand of literature considers the situations in which agents, when choosing their actions, do not know underlying states (or true parameter values), but they may learn them from their experience if they play certain actions. The literature then shows that it is possible that the agents may optimally play uninformative actions (from which they cannot learn the true states), and fall into an information trap. As a consequence, they may stick to inefficient actions, resulting in so-called political inertia.[4]

We adopt the setting related to the information structure from this literature, and combine it with a sender–receiver game. We then show a result similar to those in the literature, that is, receivers fall into an information trap and play only outcomes which are Pareto inferior from their viewpoint. An important contrast is that in the literature, no agent intends to give birth to the inefficient results, but those results can accidentally occur, while in the present paper, the sender, who indeed has no control over the outcomes since his job is simply sending signals, gives birth to the result.

Loury (1994), Morris (2001), and Ely and Välimäki (2003) all show that the credibility concern of a sender can reduce the total welfare of the players in an information transmission situation. They assumed that there are two kinds of senders: good senders, whose preferences are the same as receivers', and bad senders, whose preferences are different from theirs. Each sender will have a better outcome if receivers believe he is good. Hence, the sender has an incentive not to make an impression that he is bad, and avoids sending signals that are typically sent by bad senders. As a result, even a good sender conveys no information, and the sender's credibility concern, consequently, makes every player worse off. In contrast, we assume that the sender is always bad (according to their definition because his preferences differ from the receivers') and cannot give a better impression to the receivers. He has concern for his credibility instead. His concern to report truthful information ironically makes him succeed in manipulating information. As a result, he becomes better off while the receivers become worse off.

The ε-uncertain game is a generic game that can show the receiver's dilemma. It differs from cheap talk games, such as Crawford and Sobel (1982), Farrell and Rabin (1996), Aumann and Hart (2003), and Goltsman et al. (2007). In cheap talk games, talk is irrelevant to a sender's payoff. Hence, the sender can babble and a receiver can ignore his talk. As a result, the receiver can choose her action regardless of the sender's preference. In the ε-uncertain game, however, signals are relevant to the sender's payoff. Hence, the sender never babbles and the receivers cannot ignore his signal. As a result, they cannot choose their actions regardless of the sender's preference.

Rubinstein (1989), Carlsson and van Damme (1993), and Morris and Shin (1998) all show how introducing a small possibility of uncertainty about either the payoffs or the fundamental payoff structure (called the "fundamentals") into a coordination game can eliminate all the equilibria except one.[5] In addition, Van Damme (1989) shows that when a game has multiple equilibria, if one introduces some dominated option into the game, then the modified game may have a unique equilibrium. Their underlying principle of the uniqueness results differs from ours. In their models, the uncertainty or the dominated option triggers the process of iterative elimination of dominated strategies, which then results in a unique equilibrium.[6] In contrast, the uncertainty in the ε-uncertain game does not trigger such a process, but gives rise to asymmetric information between the sender and the receivers. Hence, by strategically manipulating information, the sender can achieve his unique favorite outcome.

Finally, the contingent information manipulation is attributed mostly to the assumption that a sender has concern for his credibility as a source of truthful information. Most assumptions that can incentivize a sender to report truthfully, however, can play the same role as this assumption, and can induce this sender's behavior. Accordingly, our study is applicable to various sender–receiver games in which a sender has an incentive to report truthfully.

[2] To be specific, Jung (2009a) builds on the arms-race game by Baliga and Sjöström (2004), which is a version of the stag-hunt game. In the arms-race game, players each have two actions, and the not-building-weapon action, which leads to the receivers' favorite outcome, is risk-dominated by the building-weapon action, which leads to the sender's favorite outcome.

[3] The receiver's dilemma can occur only when there are multiple players who can directly affect the outcome. In Jung (2009b), the sender not only sends a signal but also takes an action that, together with the receiver's action, determines the outcome. Hence, both the sender and the receiver can directly affect the outcome.

[4] According to Zantvoort (2016), political inertia is defined as the failure of institutes (or agents) to respond adequately to social, technological, and environmental change.

[5] See also Harsanyi (1973), Selten (1975), and Kajii and Morris (1997).

[6] Van Damme (1989), for example, considers the battle of sexes (BS). In BS, there are two players, each with two strategies, say, S and W. Into this BS, Van Damme introduces a dominated option, such as burning his or her own money. In this modified BS, only one player, say, player 1, has this option, and can exercise it before the two players play BS. The other player, say, player 2, can observe whether or not player 1 exercises it. In the original BS (without the option), no player has a dominated strategy. But, in the modified BS (with the option), player 1 has a dominated strategy, which is exercising the option (burning money) and choosing W. Once this strategy is excluded from consideration, player 2 will have two dominated strategies. Again, once these two strategies are excluded from consideration, player 1 will have another dominated strategy. As a consequence, in this process of iterative elimination of dominated strategies, only one strategy profile survives.