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Public announcements and coordination in dynamic global games: Experimental evidence☆

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ABSTRACT

This paper uses a two-stage variant of a dynamic global game often used to model speculative attacks to study experimentally whether and when the introduction of an announcement by an uninformed outsider facilitates coordination. Consistent with previous findings, when multiplicity is theoretically possible, the announcement serves as a coordination device and significantly affects the probability of a successful speculative attack. On the other hand, importantly, when the model predicts a unique equilibrium in the same environment, I find that the announcement has no effect on behavior. Beliefs about others' actions appear to play a crucial role in the differential effect of the announcement on attacking behavior under different information conditions.

1. Introduction

The outcomes of interactions between economic agents often depend on their ability to coordinate on a course of action. Examples range from micro-level situations, such as deciding on the timing of commercial breaks by contemporary music radio stations (Sweeting, 2006), to macroeconomic events, such as speculative attacks on a currency (Obstfeld, 1996). Miscoordination in such settings is a distinct possibility, since individual agents must rely on unverifiable subjective beliefs about the actions of others.[1]

The theoretical literature proposes the use of focal points and framing as a way to resolve the indeterminacy that often results in miscoordination. In a series of informal experiments, Schelling (1960) asked two strangers, unable to communicate, to meet somewhere in New York City without having already set a location or time for the meeting. Grand Central Station at noon was chosen by the majority of subjects and could be considered the focal point in the experiment. Focal points of this sort relate abstract strategies that are available to the players to the context of the game, providing the players with extra information about which equilibrium might be chosen by others (Bacharach and Stahl, 2000; Casajus, 2000; Hargreaves Heap and Rojo Arjona, 2014).[2]

In pure coordination games with complete information that produce multiplicity of equilibria (like the one studied by Shelling), focal points do not always have to convey information to facilitate coordination. Previous experimental literature has found that even a completely uninformative public announcement can help agents settle on an equilibrium while preserving the game in its original state (Cooper et al., 1992; Duffy and Fisher, 2005; Fehr and Heinemann, 2012; Arifovic and Jiang, 2014). Because previous experimental literature had focused on pure coordination games, where

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[1] Coordination failures have been documented in numerous laboratory experiments (see, for example, Cooper et al. (1990), and Van Huyck and Battalio (1990)).

[2] Focal points in the presence of multiple equilibria have been shown to aid coordination in numerous experiments (see, for example, Murnighan and Roth (1987), in bargaining games; Ochs (1990), in pure coordination games where the focal point is the symmetric mixed strategy Nash equilibrium; Mehta and Starmer (1994), in pure coordination games where the focal point is a Nash equilibrium, and players use the labeling of strategies to identify focal points; Bosch-Domènech and Vriend (2008), in pure coordination games where the focal point is *not* a Nash equilibrium.) Informative coordination devices in global coordination games a la (Morris and Shin, 1998) that serve as focal points have been explored in an experimental study by Cornand (2006).

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the theory predicts multiplicity of equilibria under all conditions, the mechanisms behind the role of these types of announcements in coordination remains unclear. One possibility is that subjects were rational in using the announcement as a coordination device only in the presence of multiple equilibria – a " coordination device effect." Another possibility is that subjects followed the announcement for reasons such as social pressure, myopia, or bounded rationality, regardless of whether or not following it was theoretically optimal – a "pure announcement effect." Previous literature on anchoring suggests that such a "pure announcement effect" exists in other settings. For example, Caroll et al. (2009) and Choi and Laibson (2011) find evidence that different default options for 401(k) plan enrollment significantly influence participation rates, even in situations when rationality implies a certain dominant strategy.[3]

In addition to capturing the real-world features of speculative attacks, a dynamic global coordination game model with incomplete information developed by Angeletos and Hellwig (2007, hereafter AHP) provides a unique platform for disentangling these two mechanisms.[4] While pure coordination games always predict multiplicity and static global coordination games of Carlsson and van Damme (1993a); 1993b) and Morris and Shin (1998) predict a unique equilibrium, the AHP model predicts either a unique equilibrium or multiple equilibria, depending on the availability of information in an otherwise identical environment. Experimentally, the basic predictions of the AHP model have been tested by Shurchkov (2013) to find support for dynamic learning and the importance of beliefs about others' actions in coordination.[5] The issues of multiplicity detection and the role of uninformative announcements in equilibrium selection, on the other hand, have heretofore been unexplored.

In this paper, I conduct a laboratory experiment that combines the framework of a dynamic global game with a completely uninformative announcement to attack or not to attack the status quo. Each session contains 16 participants who interact over multiple rounds. Each round is characterized by a new random draw of a parameter that captures the state of the economic fundamentals. In each round, each of the 15 participants receives an individual private signal about the state of the fundamentals, while one randomly chosen participant does not receive such a signal. Instead, this uninformed participant serves as an " announcer" who chooses an announcement that implies an "attack" on the status quo or an announcement that implies "no attack." Depending on treatment, the remaining 15 subjects receive the announcement in the first stage (AHP predicts a unique equilibrium), in the second stage with no additional private information (AHP predicts a unique equilibrium), or in the second stage with additional private information (AHP predicts multiple equilibria). Under the "coordination device effect," the announcement should affect behavior only in the latter treatment, while under the "pure announcement effect," the announcement may affect behavior in all three treatments.

The experimental results provide support for the " coordination device effect." In the first stage of the dynamic game, I do not find evidence that an " attack" announcement leads to more attacking behavior than a "do not attack" announcement. Decomposing the analysis by round reveals that attackers exhibit some learning. In particular, an "attack" announcement significantly increases the probability of attacking in the first stages of the first five rounds of the experiment. However, in later rounds, this announcement ceases to be significant. On the other hand, announcers do not appear to learn from past outcomes. Thus, the multi-round design of the experiment does not invalidate the assumption that the announcement is "uninformed."

The two-stage dynamic setting allows me to observe how the interaction between the uninformative announcement and new information affects subjects' ability to coordinate. In theory, the arrival of new private information makes a new attack possible in the second stage, although not attacking remains as an equilibrium strategy as well. Here I observe a strong differential effect of the announcement on equilibrium outcome selection: subjects who receive the "attack" announcement and a new private signal are significantly (over 7 times) more likely to attack than the subjects who receive the opposite announcement. I confirm this result using individual-level analysis which allows me to condition on the private signal and therefore on the draw of the fundamental. This finding is consistent with the existence of multiple equilibria in this environment, in which case even such a weak coordination device as a completely uninformative announcement can aid individuals in coordinating on a particular course of action. I confirm that the effect of the announcement in the presence of multiple equilibria affects behavior through its impact on the agents' expectations about the actions of others, which is consistent with the AHP model.

In order to further distinguish between a "pure announcement effect" and the " coordination device effect," I then examine a control treatment in which the subjects do not receive new private information in the second stage. Here, the model predicts a unique equilibrium and therefore eliminates the purpose of a coordination device. Although the effect depends, in part, on the private signal, I show that, on average, the announcement does not play a significant role in subjects' decisions in this treatment.

This paper contributes to the theoretical and experimental literature on coordination games.[6] Recent experimental work has focused on the applications of coordination games to bank runs (see Dufwenberg, 2012 and Kiss and Rodriguez-Lara, 2015 for comprehensive reviews of this literature). These papers provide important conclusions about bank runs in environments described by static global coordination games or by sequential games that do not incorporate the effects of the arrival of new private information over time.

This paper is related to a rich experimental literature on the effects of "cheap talk" communication on the emergence of so-called "sunspot equilibria" in pure coordination games.[7] My study differs from these papers in a number of ways. First, the announcements here are not "cheap talk," because the choice of announcement affects the announcer's payoff. Second, to my knowledge, my experiment is the first to gauge the effects of such announcements in a global games framework. Lastly, this paper is the first to explore the interaction between private information and communication by uninformed outsiders in a dynamic environment. This framework presents a novel opportunity to set up treatments that

[3] In general, decisions under uncertainty can be influenced by numerical anchors even when those are explicitly randomized (Tversky and Kahneman, 1974).

[4] The global game framework has been applied to several macroeconomic phenomena: see (Goldstein and Pauzner, 2004) and Rochet and Vives (2004) for bank runs; Morris and Shin (2004) for debt crises; Atkeson (2000) for riots; Chamley (1999) for regime switches; and Edmond (2008) for political change.

[5] Static global game models have been tested experimentally by Heinemann and Nagel (2004); hereafter, HNO.

[6] For coordination games with common knowledge, see for example (Cooper et al., 1990; 1992) and Van Huyck and Battalio (1990) in a static environment and Cheung and Friedman (2009) and Brunnermeier and Morgan (2010) in a dynamic environment. For global coordination games with incomplete information, see for example (Heinemann and Nagel, 2004) in a static environment and Shurchkov (2013) in a dynamic environment. Duffy and Ochs (2012) compare dynamic global games equilibrium predictions to the corresponding static global games predictions.

[7] Crawford (1998) surveys seminal experimental studies on communication via cheap talk. Arifovic and Jiang (2014) explore the effect of sunspots in the context of a static coordination game with complete information and show that subjects tend to follow sunspots when there is great strategic uncertainty.