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Partner-specific behavior in social networks: Coordination among actors with heterogeneous preferences

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ABSTRACT

Conventions guide our daily behavior. If everyone agrees on what the best convention is, coordination is easy. We study coordination games in which individuals have conflicting preferences. Theoretical arguments and experimental tests on conventions in networks start too much from the assumption that actors need to behave the same in their interactions with different others. We propose the actors' ability to vary behavior when interacting with different partners (partner-specific behavior) as a mechanism facilitating coordination in situations where actors have different preferences. Results show that whether partner-specific behavior is disadvantageous or advantageous for coordination depends on the distribution of preferences in the network. Moreover, subjects seem unable to foresee when partner-specific behavior is disadvantageous, since they invest in partner-specific behavior also when this does not pay off.

1. Introduction

People are often in situations in which they benefit from adjusting their behavior to the behavior of others in their social environment. Examples include driving on the same side of the road as other drivers, setting the time for a meeting, and talking in the same language as the person we are talking to (Bojanowski and Buskens, 2011; Harsanyi and Selten, 1988; Schelling, 1960). In these situations, individuals try to anticipate what others will do to determine their own behavior (Lewis, 1969). In other words, individuals aim at *coordinating* their decisions in order to achieve a commonly desired outcome (Blume, 1993). These coordination problems are often resolved by *conventions* guiding our behavior.

The emergence of conventions is often related to the existence of social norms: a pattern of behavior that is customary, expected, and self-enforcing (Ullmann-Margalit, 1977; Young, 1998). In the Netherlands, we speak Dutch by convention. But what happens in groups in which the convention is not so obvious and different individuals prefer different conventions? This paper is concerned with situations in which coordination is not straightforward. It studies how actors handle coordination problems if the actors in a social network have different preferences.

The following example will be used as the illustrative example: a group of employees has to work in pairs to create a product. The product depends on software components the employees develop in pairs. Within these pairs it is costly if the employees do not use the same operating system (say, *Windows* or *Mac*). We assume, for the sake of illustration, that the chosen operating system is not crucial for integrating the software components developed by different pairs to compose the final group product. All employees have to decide individually whether to use the *Windows* or *Mac* operating system. Assume that some employees prefer to use *Windows*, while others prefer *Mac*. Notwithstanding this *heterogeneity in preferences* between the employees, all pairs of employees are more productive when they create the program on the same operating system, due to the advantages of integrating their efforts (coordination), instead of each working on their own preferred operating system (miscoordination). However, an employee who decides to design the software component on the operating system preferred by the other employee, but not by himself has lower benefits from the coordination, since that employee has to invest in working with the non-preferred operating system.

In the example above, coordination is straightforward between two employees who prefer the same operating system. Coordination is more difficult between two employees who differ in their preferences as it introduces uncertainty as to which employee should deviate from his or her preference in order to coordinate. The situation becomes even more complicated when employees do not develop components with only one colleague at a time, but are involved in a network and are working with multiple colleagues simultaneously. In these situations the structure of the network matters (e.g. Choi and Lee, 2014; Goyal, 2007). If an employee mostly works with colleagues with a different preference, it might

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be better for this employee to adjust his or her behavior in order to gain more benefits from the relationship with colleagues. However, deciding who should deviate from their preference is more difficult when the preferences are equally distributed within the network and actors have about equal numbers of neighbors with one or the other preference. This might lead to opposing groups with coordination within the groups, but miscoordination in interactions between members of different groups (Hernández et al., 2013).

This coordination problem causing segregation is expected to be especially prevalent if employees have to choose the same operating system in collaborations with all their colleagues, but might be less problematic if employees can differentiate the operating system they use in interaction with different colleagues. We introduce such an ability to differentiate behavior, i.e., *partner-specific* behavior, as a possible mechanism that might overcome the coordination problem when actors prefer different conventions. In doing so, we extend existing models that have mostly assumed that employees have to choose the same operating system in all their dyadic collaborations.

We propose that the ability to behave partner-specifically might simplify the coordination problem for employees working with colleagues who have different preferences. However, it also introduces more uncertainty. When two employees are able to work with both operating systems, they might have difficulties agreeing on a specific one. This problem would not arise when both have a preference for the same operating system or are bound to an operating system due to other partners. Thus, choosing behavior that suits your specific partner might increase coordination problems if employees have different preferences and everyone is able to differentiate behavior between different partners. In such situations, the distribution of preferences within the network might be important in determining when the ability to behave partner-specifically facilitates coordination.

This tension leads to the following research questions: *Does being able to differentiate behavior towards different partners facilitate coordination in social networks when actors have heterogeneous preferences regarding the different conventions?* And, assuming that flexibility might be beneficial under some conditions: *Under which conditions do individuals want to choose their behavior partner-specifically?*

One reason that most research so far has neglected this partner-specific behavior is probably, that most applications try to explain emergence of a norm at the group level, while there was less emphasis at dyadic coordination. By relaxing this rather specific assumption on coordination in networks, we broaden the applicability of game-theoretic models to a wider set of coordination problems. In our example, some firms might supply their employees with two computers enabling them to choose their operating system depending on their collaboration, while other firms enforce that each individual employee can only use one operating system, e.g., by providing them with only one computer. Because we often find ourselves in situations where we have the opportunity to choose the behavioral option that suits our specific partner best, it is important to understand the implications of this assumption better (cf. Tsvetkova and Buskens, 2013). Examples include switching languages depending on your conversation partner and choosing a different clothing style when going out with a different person. A second reason that others avoided modeling differentiating behavior in a network context is that if actors can solve the coordination problem within the dyad, the network context might be less relevant to understand behavior in the dyads. We show explicitly that also under our assumption the broader network context is still relevant.

By proposing partner-specific behavior as a possible mechanism that can help overcome coordination problems, we compliment previous *experimental* research assuming actors have to choose the same strategy for all their interaction partners (e.g. Berninghaus et al., 2002; Buskens et al., 2008; Goyal, 2007; Goyal and Vega-Redondo, 2005; van Huyck et al., 1990; Jackson and Watts, 2002). While most of experimental research has been on settings in which the preferred convention is the same for everyone, the most relevant experiments for us are those where this is not the case. Previous experimental research has shown that coordination is increasingly difficult when the degree of heterogeneity in preferences within the network increases. For example, Hernández et al. (2013) show that networks consisting of actors with conflicting preferences segregate into two components, each consisting of actors choosing the behavior they prefer. Helbing et al. (2014) found that there is more coordination in coordination games in which actors' preferences coincide rather than if preference differ between actors. Additionally, research has shown that in games with network formation interactions with actors who have different preferences are mostly avoided (Ellwardt et al., 2016). Neary (2012) shows that when given the opportunity, individuals will change their preference to match the preferences of the majority to reach coordination as coordination is more difficult when individuals have different preferences. The overall message of these studies seems to be that coordination is more difficult when actors have heterogeneous preferences. However, all these studies still assume that actors have to choose the same behavior for all their partners. This limits the applicability of these models and possibly overestimates how difficult it is to coordinate in heterogeneous populations. To our knowledge, there is no experimental research that examines what the consequences are of relaxing this assumption. Tsvetkova and Buskens (2013) are amongst the first to allow for partner-specific behavior, but do not elaborate on its consequences regarding coordination. Our work complements this literature by proposing the ability of actors to behave partner-specifically as a possible solution to overcome the coordination problem.

Although this paper focuses strongly on emergence of conventions modelled in a strategic manner using coordination problems, the substantive problem addressed also relates to understanding, e.g., social influence processes in networks (e.g. Marsden and Friedkin, 1993) and the spread of innovations and social norms in networks (Centola and Macy, 2007), which are often not theorized using arguments involving strategic interdependence. We will say a bit more on such wider implications in the conclusion and discussion section of the paper.

The remainder of this paper is organized as follows. Section 2 introduces the coordination game and deduces hypotheses. In the first part of section 3, we describe the experiment used to test the predictions. In the second part, we elaborate on the operationalizations and present the analytical strategy. In section 4, we present the results. Section 5 concludes and provides directions for future research.

2. Formal model and analytical solutions

2.1. The game

Actors are connected through a network and play coordination games (Ellison, 1993) with their neighbors in the network. Actors may or may not behave partner-specifically and actors' preferences for outcomes in the game may differ.

Fig. 1 represents a coordination game in which two actors can choose between using a *Windows* or *Mac* operating system and both actors are so-called *Windows-lovers*. Both actors prefer coordination over miscoordination ($a_i > b_i$, $d_i > c_i$, $i = 1, 2$). Furthermore, actors prefer coordination on the equilibrium (*Windows, Windows*)

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