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Endogenous coordination and discoordination games: Multiculturalism and assimilation

John P. Conley [a], William S. Neilson [b,*]

[a] Department of Economics, Vanderbilt University, Nashville, TN 37235, United States
[b] Department of Economics, University of Tennessee, Knoxville, TN 37996-0550, United States

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ABSTRACT

We argue that many strategic interactions are chosen by, rather than imposed upon, agents. The endogeneity of the implicit game substantially alters the incentive structure faced by agents. If agents can refuse to play a game and instead seek a different partner, then it becomes in their interest to be the sort of player with whom a high quality partner will agree to play. Formally, we explore games which are endogenous in the sense that players first choose to learn a specific set of strategies to play with future partners, and then enter a matching process to find a suitable partner. We find that in coordination games, the only equilibria involve all agents learning the exact same single strategy and playing this with the first partner they meet. Applying this to culture and language, our results imply that if there are benefits from interacting with similar agents then there is a strong bias towards assimilation and the emergence of a single culture (that is, all agents use the endogenous game structure to learn or adopt only a single common culture or language). This result can be overturned, however, by such factors as heritage, cultural affinities, caste, and government policies. Finally, we show that if agents benefit from interacting with agents dissimilar from themselves (we call this a "discoordination game"), not only will different cultures coexist, but also there must necessarily arise a class of "cultural market makers" who specialize in bridging the cultural divide.

1. Introduction

In a typical coordination game, two players must simultaneously choose from identical action sets without prior communication. If the players happen to choose the same action, they both get large payoffs. If they choose different actions, they both get low payoffs. Coordination games have multiple equilibria, and as such, are useful in exploring equilibrium selection issues. Since all of these equilibria require identical behavior by all agents, this, in turn, informs questions about how seemly arbitrary social norms are established and persist. Equilibrium selection is commonly approached through experiments to study how actual subjects solve the problem, or through evolutionary games to study how a population evolves through time to arrive at one of the potential equilibria.

In this paper, we take a step back. We ask if the structure of the games used in these experimental and evolutionary treatments of coordination games agrees with the institutions agents experience in the real world. We use a new approach called "endogenous games" first developed in Conley and Neilson (2008) and explore the implications for equilibrium

* Corresponding author. Tel.: +1 8659741691
E-mail addresses: j.p.conley@vanderbilt.edu (J.P. Conley), wneilson@utk.edu (W.S. Neilson).

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outcomes, and especially the possibility that multiple social norms might be able to coexist in an integrated society instead of one culture always assimilating into the other.

In a typical evolutionary approach, members of a large population are randomly matched to play the coordination game.[1] Each member has exactly one action available which may or may not be a best response to the action played by the partner with whom he is matched. Agents who are fortunate enough to match with a similar partner gain higher payoffs than those who do not, and types with higher expected payoffs gain larger population shares in the next period. The evolutionary equilibrium is the long-run, steady-state distribution of types that emerges from this process.

Much of the interest in the various evolutionary approaches to coordination and other games arises from the specific mechanisms that match partners and how those mechanisms mimic real world societies.[2] Note that a maintained assumption in all of these matching protocols is that they are "forced" in that two randomly-matched agents must play the game against each other once the pairing occurs. None of the protocols allows agents to choose their own partners. We argue that this is very much at variance with many real world situations and that individuals often choose the set of agents with whom they interact. For example deciding to work with someone, joining a church or social organization or choosing to marry someone is typically a voluntary, strategic decision that logically precedes playing the resulting game between the agents in the group that eventually coalesces from this process. Bargaining games as discussed in Rubinstein and Wolinsky (1985) are an example of this type of interaction that has been well studied in the literature.

Since agents would have to be aware that groups form endogenously, we would expect that they would respond to implicit incentives that result. More specifically, since agents want to match with a partner who is "good" in the sense that the payoff received from playing the game together are high. However, good partners are in demand and can accept or reject an offered pairing. Thus, agents who know they will play an endogenously formed game have an incentive to make themselves attractive to good partners. Suppose, for example, I am seeking a business partner. In the abstract, I could choose to work honestly or try to cheat my partner as much as possible. Both are strategies that are physically available to all agents. However, if I could somehow exclude "cheat my partner" from my personal set of available strategies, then I could attract a similar partner in the choosing phase. Since two honest partners make more profit than two cheating partners, all would benefit from this exclusion. Thus, in a formal sense, we suggest that agents consider the whole set of strategies available to them in the game, but then learn to employ only a subset of these with a view to attracting a better partner.

In the real world, agents limit their strategy spaces and signal potential partners of these limits in a variety of ways.[3] The most obvious is learning. Many types of strategies are unavailable to agents unless they have taken the time to learn them. One cannot speak French without learning it at some point. One cannot follow Japanese cultural norms without being immersed in Japanese culture for some time. It is difficult to embezzle without first gaining a knowledge of accounting, and it is difficult to cheat on one's wife without knowing how to charm women. Alternatively, it may be that agents have ethical codes that prevent them from employing certain strategies, and these ethical codes can be signaled through a religious affiliation or lifestyle. When an agent can credibly signal the boundaries of his strategy set, he is more likely to match with other agents who have the same boundaries.[4]

In this paper, we look at the coordination game in a new way that allows for these two types of endogenous choices on the part of participants. Specifically, in period 0 (which we refer to as the *pregame*) agents choose a subset of all physically available actions as the only ones that they wish to have available to use when they eventually are matched with a partner. We refer to the subset of the action space chosen by an agent as his *list*.[5] In period 1, agents are randomly matched with a potential partner. Members of matched pairs do not know the full set of lists chosen by the population, but they do observe each others' lists and so decide on the basis of those observations whether to play or pass. If they both elect to play, they choose actions from their respective lists, collect their payoffs, and leave the game.[6] They are then replaced in the population by players of the same "type," that is, with the same list (which is similar to the evolutionary approach). If, on the other hand, at least one member of the matched pair elects to pass, they both pay a waiting cost and are randomly rematched in the

[1] See, for example, the pioneering papers of Kandori et al. (1993) and Young (1993).

[2] See, for example, Ellison (1993) and Morris (2000). Sugden (1995), Oechssler (1997), Ely (2002), and Bhaskar and Vega-Redondo (2004) show how manipulating the matching protocol can lead to the coexistence of different norms or conventions.

[3] Spier (1992) takes a traditional signaling approach in a matching market. In her model agents have two types, good and bad, and in the separating equilibrium good types select less-complete contracts than good types in order to signal their types to their partners. For example, if marriage partners come in stable and unstable types, the stable types would not ask for a prenuptial agreement in order to signal their stability, while an unstable type would ask for such an agreement. In Spier's approach the agents signal their types by taking specific actions. In contrast, in our approach agents restrict their action spaces to signal their resulting types.

[4] These limited strategy sets may also be considered internal moral constraints as described by Stringham (2011).

[5] Calabuig and Olcina (2009) also allow for a kind of "type" choice in the coordination game. In their model agents live for two overlapping generations, and parents choose what preferences to teach to their children.

[6] Ghosh and Ray (1996) and Rob and Yang (2010) consider the opposite type of player choice, where players are first matched randomly but can choose to terminate relationships. In their papers the presence of myopic agents allows others to enforce cooperation through the threat of termination. Too few myopic agents causes this equilibrium to break down, similar to low unemployment rates causing efficiency wage equilibria to break down. Watson (1999) also allows players to exit relationships endogenously, and his model focuses on how players learn about each other over time. Our approach differs from theirs in that we allow agents to choose to interact in the first place, and agents play only once so there is no termination.