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The interplay of cultural intolerance and action-assortativity for the emergence of cooperation and homophily

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ABSTRACT

This paper investigates the emergence of cooperation in a heterogeneous population that is divided into two cultural groups. Agents are randomly matched in pairs to engage in a prisoner dilemma. The matching process is *assortative in actions*, that is, cooperators are more likely to be matched with cooperators, defectors are more likely to be matched with defectors. Agents exhibit a form of cultural intolerance: when two agents of different cultures are matched, they suffer a cost due to their cultural differences. We find that when cultural intolerance is sufficiently strong, homophily emerges together with perfect correlation between culture and behavior: all agents from one cultural group cooperate, while all agents from the other cultural group defect, and interactions among agents within the same cultural group are more frequent. The relation between cultural intolerance and societal welfare is non-monotonic. In particular, stronger cultural intolerance can increase cooperation when action-assortativity is weak, while it can increase defection when action-assortativity is strong. Moreover, everyone cooperating does not necessarily maximize total welfare unless cultural intolerance can be made sufficiently weak.

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1. Introduction

It is a matter of fact that societies, in almost every age and place, are comprised of groups which differ between each other on a cultural basis. Often these differences – think, for instance, of language and religion – entail a cost that individuals suffer when interactions occur between members of different groups. The literature studying under which conditions cooperation can emerge in societies has so far given little consideration to the role of costly interactions between different cultural groups.¹ This paper attempts to address this issue.

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¹ The importance of cultural factors for the evolution of cooperation has been studied, among others, by [Henrich and Boyd \(2001\)](#), [Boyd et al. \(2003\)](#), [Henrich \(2004\)](#), [Boyd and Richerson \(2009\)](#), and [Boyd et al. \(2011\)](#). None of these or similar studies, however, consider the cost of interactions due to cultural mismatch.

1.1. Modeling background

We consider a heterogeneous population of agents who are randomly matched in pairs to engage in a prisoner dilemma. Each agent carries one of two different cultural types and they are divided into two cultural groups correspondingly. Each cultural type is substantiated by a set of identity traits, like language and religion, which are essential to the identity of a culture (Akerlof and Kranton, 2000, 2005). At the same time, these traits originate a cost when members of different cultural groups interact with each other: think of communication costs due to different languages, or coordination costs due to differences in work times for religious habits (e.g., Muslims observe Ramadan, Jews rest on Saturday, Christians rest on Sunday). Such a cost can also be psychological.² The cost of cross-cultural interactions can be considered as a measure of *cultural intolerance*.

Besides their identity traits, agents also carry auxiliary traits that characterize their actions, i.e., cooperate or defect in the prisoner dilemma. These auxiliary traits may have a cultural nature as well, but they do not convey an identity and, hence, they do not trigger cultural intolerance.

The matching process is not uniformly random, but exhibits *action-assortativity*, which describes people's general tendency to interact with those who act like them more often than with those who behave differently.³ In our model, action-assortativity implies that cooperators are more likely to be matched with cooperators, defectors are more likely to be matched with defectors.

Action-assortativity can emerge as a result of repeated interactions in which agents can voluntarily form and break partnerships conditioned on their opponents' actions but not cultural types. Such a context is particular relevant in today's world where many countries enforce anti-discrimination laws to prohibit the offer of business/education/housing/employment opportunities based on culture, ethnicity, religion and race.^{4,5}

Action-assortativity can also be the outcome of a meritocratic institution, which targets to promote good behavior independent of participants' backgrounds. Meritocratic institutions have been adopted since early human civilizations. Selection of officials and councilmen (the Chinese civil service exam), access to education (school-admission systems), honorary circles, reward and promotion schemes within a firm can all be considered as meritocratic institutions.⁶

Changes in traits such as preferences, customs and faiths usually take place across generations over time, while actions evolve over a much shorter time horizon. Since the focus of this paper is on the evolution of cooperation but not on the evolution of culture, we focus on a time horizon in which agents' identity traits are fixed while their auxiliary traits evolve. At the end of the paper, we briefly discuss what is likely to happen in the longer time horizon in which identity traits also evolve.

1.2. Main contribution

The central question we investigate is whether cultural intolerance between groups is relevant for cooperation. At a first glance, one may think that cultural intolerance does not affect, *per se*, the relative advantage of cooperation over defection, and hence it cannot have any effect on the evolution of cooperation. If this is the case, cultural intolerance simply reduces individual payoffs depending on the frequency of type-mismatches (i.e., the frequency of matches between agents belonging to different cultural groups) due to the costs associated with cross-cultural interactions; therefore, interventions aimed at reducing such costs are clearly good for societal interests. However, it turns out that it is not necessarily the case if we allow for action-assortativity in the matching process.

We find that action-assortativity plays a unique role in the situation we consider: given action-assortativity, cooperation and defection can work as instruments to avoid type-mismatches, and costly cross-cultural interactions can be, to some extent, beneficial to a society. More specifically, we show that when cultural intolerance is sufficiently strong, *homophily* emerges together with perfect correlation between culture and behavior: all agents from one cultural group cooperate, while all agents from the other cultural group defect, and interactions among agents within the same cultural group are more frequent. We call such states *type-monomorphic*.⁷

² Starting with the seminal work of Becker (1957) on taste-based discrimination, numerous researches have found that mistrust, animosity and negative attitude across cultural groups have significant impact on trade and investment (Fisman et al., 2014; Guiso et al., 2009; Michaels and Zhi, 2010), on labor market outcomes (Bandiera et al., 2009; Becker, 1993; Bertrand and Mullainathan, 2004), on financial activities such as mergers and bank loans (Ahern et al., 2015; Giannetti and Yafeh, 2012).

³ In social psychology, social matching theory (Walster et al., 1966) argues that people tend to form successful partnerships with those who share similar levels of social desirability.

⁴ Intuitively, one may think that observability of identity traits would bias the matching process. However, given a context with anti-discrimination laws, the fact that identity traits are *more* easily observable actually makes them *less* exploitable as reasons for terminating partnerships.

⁵ Rivas (2013) provides a convincing mechanism that gives rise to action-assortativity. In his model, agents will tend to stay matched longer when the match provides a higher payoff with the result that, even if the match is initially random, cooperators will be more likely to interact with cooperators and defectors with defectors. When applied to our framework, such mechanism would lead also to type-assortativity, but only in the absence of anti-discrimination laws.

⁶ See the discussions in Nax et al. (2015, 2014).

⁷ The tendency to interact with people sharing the same cultural trait is often called homophily. The term homophily is typically used to indicate, rather than an underlying preference trait, the behavior that results from it. Homophily is commonly observed in human societies along many cultural or ethnic dimensions including gender, language, religion, dress and origin, and it has been intensively studied in sociology and economics (see, among others, Bramoullé et al., 2012; Currarini et al., 2009; 2010; 2016; McPherson et al., 2001; Ruef et al., 2003).

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