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Cooperation, conformity, and the coevolutionary problem of trait associations

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Abstract

In large scale social systems, coordinated or cooperative outcomes become difficult because encounters between kin or repeated encounters between friends are infrequent. Even punishment of noncooperators does not entirely alleviate the dilemma. One important mechanism for achieving cooperative outcomes in such social systems is conformist bias where individuals copy the behavior performed by the majority of their group mates. Conformist bias enhances group competition by both stabilizing behaviors within groups and increasing variance between groups. Due to this group competition effect, conformist bias is thought to have been an important driver of human social complexity and cultural diversity. However, conformist bias only evolves indirectly through associations with other traits, and I show that such association are more difficult to obtain than previously expected. Specifically, I show that initial measures of population structure must be strong in order for a strong association between conformist bias and cooperative behaviors (cooperation and costly punishment) to evolve and for these traits to reach high frequencies. Additionally, the required initial level of association does not evolve de novo in simulations run over long timescales. This suggests that the coevolution of cooperative behaviors and conformist bias alone may not explain the high levels of cooperation within human groups, though conformist bias may still play an important role in combination with other social and demographic forces.

Keywords: social learning, punishment, metapopulation, F_{ST}, maximum entropy

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