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Qi Su* (qisu1991@gmail.com), University of Pennsylvania, Philadelphia, PA 19104, **Alex McAvoy**, 02138, and **Joshua B. Plotkin**, 19104. *Evolutionary dynamics in multilayer structured populations.*

In many real-world systems, individuals are often situated in multiple interaction scenarios, such as online chat and physical contact, interactions between relatives and between colleagues. The interacting results in different scenarios altogether decide one's ability to survive and compete. A natural question is: how does interaction in one scenario influence the dynamics in other situations? We consider a model of evolutionary game dynamics in multilayer structured populations, where the population structure is described by a multilayer network and each layer represents an interaction scenario. Individuals play games within each layer and accumulate payoffs from all layers. Within this model, we study the evolution of cooperation and derive an analytical condition to predict when selection favors cooperation replacing defection. We find that compared with a single-layer structured population, introducing the second layer can promote cooperation replacing defection. Even if selection opposes cooperation replacing defection in each individual layer, coupling them can promote the replacement in both layers. Our results suggest that the correlation of different interaction scenarios can promote the evolution of cooperation. (Received January 28, 2020)