
The methodological individualism of individual-based modeling in ecology

James Justus*¹

¹Florida State University (FSU) – Tallahassee, FL 32306, United States

Abstract

Cross-pollination between biological and economic theorizing has a long and fruitful history. Evolutionary economics and evolutionary game theory are prominent examples, and recent philosophical work has targeted the same confluences. But evolution is only one indispensable part of biology. Ecology is clearly another, yet cross-fertilization of ecological and economic theorizing remains largely unexplored. In particular, connections between methodological individualism (MI) and individual-based models (IBMs) in ecology are underappreciated. MI is a multifaceted set of principles, but a common denominator is privileging the individual-level in explanations of higher-level social phenomena. IBMs embody this perspective in ecological science. Just as actions of individual (putatively rational) agents constitute the preferred level of analysis according to MI in economics, individual organisms function similarly in IBMs. Evaluating the analogy is one task of this paper. Interestingly, recent work establishing links between rational choice theory and evolutionary theory suggests the ecological analogy is also apt. Another task is showing that arguments about MI in social science reveal insights about how IBMs in ecology should be understood. For example, the explanatory priority on the individual MI requires does not require ontological reductionism of population-level properties to the individual-level. Different methods for scaling actions of individual agents to higher-level social patterns also indicate how relationships between rational choice and evolutionary theory might be scaled to the ecology of biological populations and communities.

*Speaker