The Effects of Heterogeneous Development Density Regulations on Exurban Development: An Agent-Based Model of Developer and Homebuyer Decision-Making

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Abstract:
We explore the effects on settlement patterns and ecological quality of interacting scales of decision-making in a hypothetical exurban area. Land use policies applied by local governments interact with smaller scale decision-making processes of heterogeneous developers and residents. The resulting land use patterns will have impacts landscape effects, which will feed back into the micro-level process of development and settlement. We present an agent-based model (ABM) of land-use change to study how the combined effects of heterogeneous local zoning regulations that limit settlement density, and various distributions of individual preferences for location affect regional-scale exurban patterns. Heterogeneous homebuyer agents have preferences for neighborhood density, proximity to service centers, ecological and aesthetic quality, and lot type. Farmers and residential developers specialize in building particular lot types. They choose their location following a set of empirical rules based on landscape and infrastructure characteristics, and zoning restrictions on density. Homebuyers move into lots from which they derive the highest utility according to their preferences, which are affected by their demographic and socioeconomic characteristics. We examine the effects on landscape fragmentation and composition of particular planning approaches characteristic of Southeastern Michigan, in terms of land-use zoning policies that manipulate the maximum allowable residential density. The questions we ultimately seek to address relate to the ecological effects of alternative forms of exurban residential development, and the effects of neighboring local government jurisdictions competing to preserve their attractiveness to businesses, developers and residents.

Keywords:
land-use change, urban sprawl, scale interaction, zoning policy, spatial modeling