

## Evolutionary dynamics of neighborhood economic status in cities

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We extend our variant[1] of the Schelling model[2] incorporating an agent wealth gain function to study the long term evolution of the economic status of neighborhoods in cities. We find that the long term patterns of neighborhood relative economic status (RES) simulated by this model reasonably replicate the empirically observed patterns from American cities[3]. Specifically, we find that larger fractions of rich and poor neighborhoods tend to, on average, retain status for longer than lower- and upper-middle income neighborhoods. The use of a Potential function that measures the relative wealth of neighborhoods as the basis for agent wealth gain and agent movement appears critical to explaining these emergent patterns of neighborhood RES. This also suggests that the empirically observed RES patterns could indeed be universal and that we would expect to see these patterns repeated for cities around the world. We also find that the sharp transformation from a segregated to de-segregated state we observed in the earlier model still obtains in the current model as well.

We have here extended our variant of the Schelling model to study the long term behavior of economic status of neighborhoods in cities. We add a simple wealth increment function and find that the model reasonably replicates the empirically observed patterns of neighborhood economic status over long periods of time. Very rich and very poor neighborhoods tend to retain status more often than middle income neighborhoods. The use by agents of simple heuristics, such as the Potential function, to compare the wealth of their neighborhoods relative to the wealth of the city in deciding if they want to move neighborhoods or stay back appears significant in driving the dynamics that yield the observed patterns of neighborhood economic status. We also find that our previous result on the sharp transformation from a segregated to a de-segregated state upon the realization of disallowed moves (moves in contravention of the threshold condition) still holds in the modified model. The Schelling model therefore offers an excellent basis to study not only segregation but also the long term evolution of neighborhood economic status in cities.

[1] A. Sahasranaman, H.J. Jensen, PLoS ONE **11**, e0166960 (2016).

[2] T.C. Schelling, J. Math. Sociol. **1**, 143 (1971).

[3] S.S. Rosenthal, J. Urban Econ. **63**, 816 (2008).