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Spatial Heterogeneity and Asymmetries in Spatial Autoregressive Structures: Similarities and Important Differences

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Abstract

In this paper, via a simulated dynamic spatial panel model, observational similarities and important differences between spatial heterogeneity and asymmetric spatial autoregressive structures are investigated. The former suggests a shift in level in the spatial landscape, while the latter suggests asymmetries in the way spatial units interact with each other. It can be shown that spatial landscapes generated from asymmetric spatial autoregressive structures and those generated from spatial heterogeneity are difficult to distinguish without performing formal statistical tests on one against the other. Mistaking asymmetric spatial structures for spatial heterogeneity creates significant biases in model estimates as well as resulting in inferior in-sample fits. Through decomposition of the dynamic spatial panel model, the source of the biases can be explained. Out-of-sample forecasting accuracy is also adversely affected. It will be argued that this issue deserves considerable attention, as it affects our fundamental understanding of a spatial process. For instance, in a study of diffusion of diseases, one that is distributed heterogeneously due to geographically unique conditions in each locale might suggest the need for location-specific treatments of the population. On the other hand, a disease that is distributed heterogeneously due to direction-specific spatial interactions might suggest the need for targeting the specific channels through which it spreads.