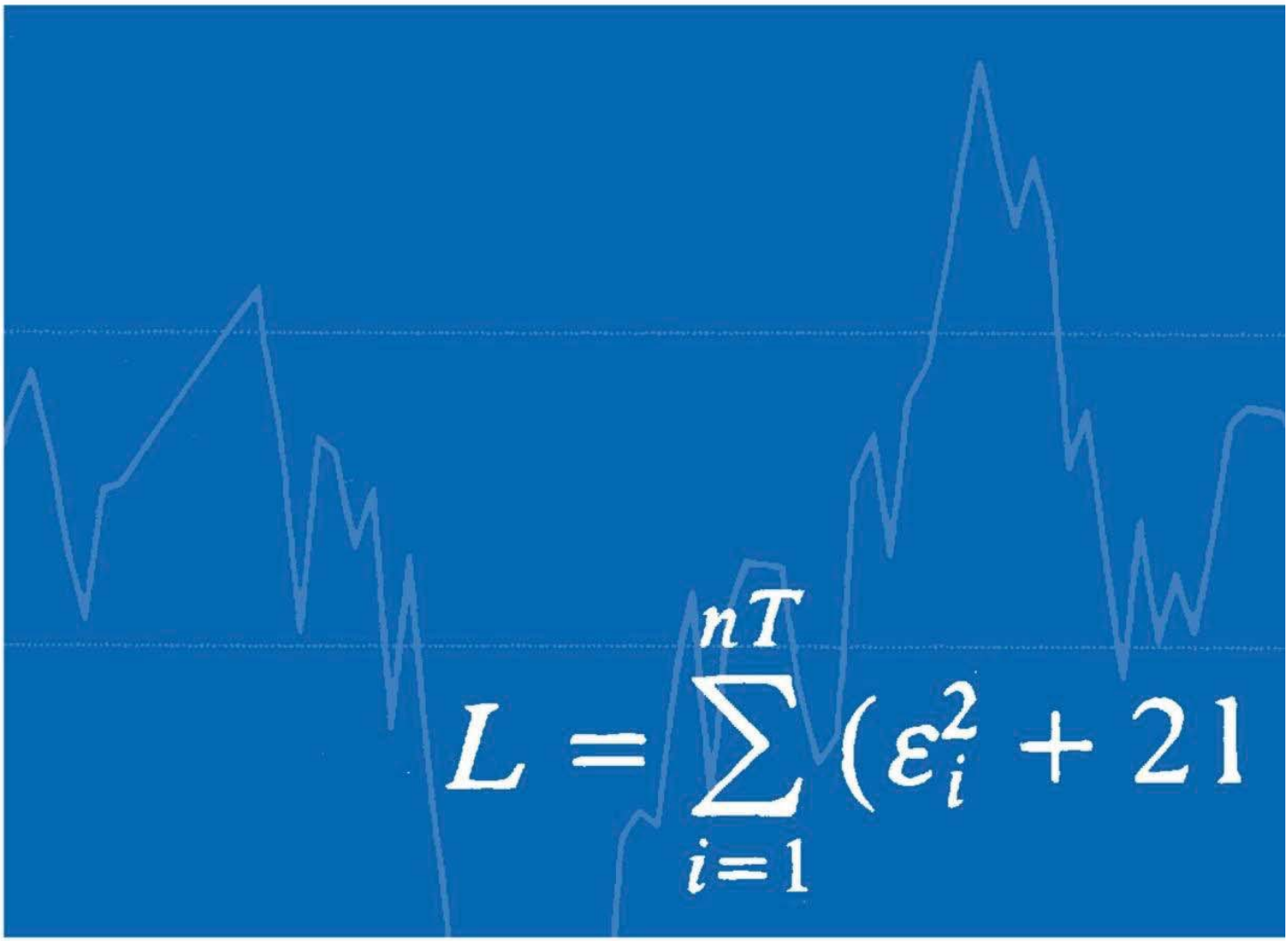
Evaluating Spatial Heterogeneity and Temporal Movements in Cross-sectional Dependence Structures

Spatial Transport and Environmental Economics Thesis



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Abstract

Cross-sectional non-stationarity and heterogeneity in spatial dependence has achieved quite some attention in literature. This paper proposes a framework for dynamic spatial time series modelling referred to as Time Dynamic Smooth Transition Spatial Autoregressive (TDST-SAR) models in which cross-sectional dependence is both time-varying, and allowed to differ over space. The specification builds on the well-known spatial autoregressive model and the smooth transition framework. The TDST-SAR nests the widely adopted SAR and spatial lag model. In addition, current work might lead to a generalization of the framework by extending spatial autoregressive models with autoregressive disturbances with similar dynamics. I establish the theoretical properties of the model and show that maximum likelihood estimation is consistent and asymptotically normal. Information optimality of the framework is also studied, and intuitive arguments for attractiveness over static models are provided within this context. Monte Carlo simulations show that patterns generated by the model are adequately filtered out in empirically relevant sample sizes. The framework is adopted empirically to explore heterogeneity in spatial dependence structures in data on Dutch household densities between 2005 and 2014. The estimations reveal that spatial externalities are high in cities and decay outwards. Furthermore, relaxing homogeneity constraints reveals that linkages with the presence of children in surround areas are highly heterogeneous. Local clustering of spatial autocorrelation remains however in the residuals. Identified clusters are in line with deprived neighbourhoods and are possibly due to omitted local policy variables.

Keywords:

Local non-stationarity, Spatial heterogeneity, Spatial autocorrelation, Spatial time series, Smooth transition, Residential density, Household density, Intensification, Expansion, Sprawl

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