

# Estimation of stochastic frontier panel data models with spatial inefficiency\*

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## Abstract

This paper aims to contribute to the stochastic frontiers (SF) literature by studying a panel data model in which the unit specific inefficiencies are spatially correlated. In the last 10 years several authors have studied spatial SF models (Druska & Horrace, 2004; Glass et al., 2013, 2014, 2015). However, to the best of our knowledge, no study has investigated a spatial error SF model for panel data where the inefficiency is spatially autocorrelated, allowing for both local and global spatial spillovers. The proposed statistical model has simultaneously three important features: i) the *global* inefficiency of a unit depends on its *intrinsic* inefficiency and on the inefficiency of its neighbors (*indirect*); ii) the spatially autocorrelated and time varying inefficiency is disentangled from time invariant unobserved heterogeneity in a panel data model à la Greene (2005) and; iii) systematic differences in inefficiency can be explained using exogenous determinants. By assuming that the intrinsic inefficiency belongs to a one-sided and one-parameter family of distributions, we propose to estimate both the “true” fixed- and random-effects variants of the model using a straightforward Simulated Composite Likelihood (SCL) estimator. We investigate the finite sample behavior of the proposed estimator through a set of Monte Carlo experiments. Our results suggest that, regardless of the assumptions on the time invariant unobserved heterogeneity, the estimator is consistent, showing good finite sample properties, especially in small samples. An application to an aggregate production frontier for European countries illustrates the usefulness of the new approach.

**Keywords:** stochastic frontiers model; spatial inefficiency; panel data, fixed-effects model.

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