**Low-rank Panel Quantile Regression: Estimation and Inference**

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**Abstract**

This paper studies panel data models with two-dimensional unobserved slope heterogeneity and interactive fixed effects. We propose a two-step approach to estimate the parameters in the model. In the first step, we obtain preliminary consistent estimators of the factors and factor loadings via a nuclear-norm-regularization (NNR). In the second step, we propose an iterative procedure to estimate the parameters of interest. We establish the asymptotic properties of the estimators in each stage. We apply the proposed model to estimate heterogeneous treatment effects at both individual and aggregate levels. Monte Carlo simulations show that the proposed estimators perform remarkably well in finite samples in comparison with some competitors such as the synthetic control ones. We apply our method to study the effect of economic liberalization on economic growth and find a positive and significant aggregate average treatment effect on the treated (ATT).