

## Accepted Manuscript

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PII: S0304-4076(14)00180-8

DOI: <http://dx.doi.org/10.1016/j.jeconom.2014.08.004>

Reference: ECONOM 3963

To appear in: *Journal of Econometrics*

Received date: 1 October 2012

Revised date: 27 June 2014

Accepted date: 1 August 2014



Please cite this article as: Castagnetti, C., Rossi, E., Trapani, L., Inference on factor structures in heterogeneous panels. *Journal of Econometrics* (2014), <http://dx.doi.org/10.1016/j.jeconom.2014.08.004>

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# Inference on Factor Structures in Heterogeneous Panels

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June 23, 2014

## Abstract

This paper develops an estimation and testing framework for a stationary large panel model with observable regressors and unobservable common factors. We allow for slope heterogeneity and for correlation between the common factors and the regressors. We propose a two stage estimation procedure for the unobservable common factors and their loadings, based on Common Correlated Effects estimator and the Principal Component estimator. We also develop two tests for the null of no factor structure: one for the null that loadings are cross sectionally homogeneous, and one for the null that common factors are homogeneous over time. Our tests are based on using extremes of the estimated loadings and common factors. The test statistics have an asymptotic Gumbel distribution under the null, and have power versus alternatives where only one loading or common factor differs from the others. Monte Carlo evidence shows that the tests have the correct size and good power.

**JEL codes:** C12, C33.

**Keywords:** Large Panels, CCE Estimator, Principal Component Estimator, Testing for Factor Structure, Extreme Value Distribution.

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