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Structural breaks in panel data: COVID-19 pandemic in Russian regions

This paper discusses contemporary methods of testing for structural breaks in panel data. We discuss the approaches for single and multiple breaks testing in cross-sectionally correlated panels. For empirical application, we use weekly data for the COVID-19 pandemic in Russian regions. We identify several structural breaks over the period and add them to the econometric model. The results show a significant difference compared to the model that ignores structural breaks, underscoring the importance of accounting for these breaks when analyzing Russian regional data.

Keywords: structural breaks; models with changing regimes; Russian regions; panel data; COVID-19 pandemic.

JEL classification: C12; C22.

1. Introduction

Structural breaks take a central place in the modern applied econometrics and statistics. Their identification and dating play a key role in the analysis of the dynamics of socio-economic data, changes in financial markets and economic policy. In particular, institutional reforms and external events such as macroeconomic crises, changes in monetary and fiscal policies, technological advances, epidemics, changes in legislation, etc. lead to structural breaks. Ignoring such changes results in model misspecification, distorted understanding of economic mechanisms and misleading policy recommendations.

The advantage of panel data is the ability to simultaneously consider individual heterogeneity and the dynamics of the changes over time. However, due to the dual dimensionality the problem of structural breaks in panels becomes more complex and multifaceted. In contrast, most classical statistical methods developed for time series cannot be directly transferred to the panel context without significant modifications.

In panel models, the identification of structural breaks has particular importance due to the variation of data both over time and across the objects. For instance, during the crisis periods some regions or industries may respond more rapidly (or more significantly) to emerging changes, which leads to an earlier (or more significant) change in the dynamics of economic indicators. In addition, unobserved heterogeneity arising in panel data (e. g., interactive effects, latent factors) complicates

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