

# **Innovation, Productivity, Growth, and Unemployment: A Panel Granger Causality Analysis**

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## **Abstract**

This research aims to analyze four interrelated phenomena—innovation, productivity, growth, and unemployment—by conducting a Granger causality test on EU-27 countries. The study's empirical analysis is novel in that it examines two types of innovation: output innovation, measured by patents, and input innovation, measured by expenditure on research and development. Additionally, the study examines labor and capital productivity, the latter of which is rarely analyzed in the literature. The causal paths tested in the research are as follows: input/output innovation  $\leftrightarrow$  labor/capital productivity  $\leftrightarrow$  growth  $\leftrightarrow$  unemployment. The time frame of the study is from 1995 to 2023. The Im-Pesaran-Shin unit root test was used to test the data stationarity. Lags for the Granger test were chosen based on the Schwarz criterion. The results of the research indicate bidirectional causality between labor productivity and growth, as well as between growth and unemployment. Additionally, the results show that growth Granger-causes capital productivity.

**Keywords:** capital productivity; EU-27; input innovation; labor productivity; output innovation