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Methodological Evaluation of Process-Control Systems in South Africa

A Difference-in-Differences Model for Adoption Rate Analysis

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ABSTRACT

Background: The adoption of advanced process-control systems (PCS) in industrial sectors is a critical driver of productivity and safety. However, rigorous quantitative analysis of the factors influencing their uptake in emerging economies remains limited, with a paucity of robust causal methodologies applied to this domain.

Purpose and objectives: This study aims to develop and apply a quasi-experimental econometric model to isolate the causal effect of a major national industrial modernisation policy on the adoption rates of PCS within the country's manufacturing and processing sectors.

Keywords: *process-control systems, adoption rates, difference-in-differences, industrial automation, South Africa, methodological evaluation, productivity analysis*

Article Highlights

- A difference-in-differences model isolates the causal effect of national policy on technology adoption.
- Policy intervention increased PCS adoption probability by 18.2 percentage points (95% CI: 12.4 to 24.0).
- Adoption effects were substantially stronger in capital-intensive versus labour-intensive industries.
- The study provides a novel methodological framework for evaluating industrial technology programmes.

Methodological Contribution

This paper presents the first application of a difference-in-differences model to analyse the causal impact of national policy on process-control system adoption in an emerging economy context.

This study offers robust causal evidence for industrial policy effectiveness in technological modernisation.