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Methodological Evaluation of Industrial Machinery Fleets

A Difference-in-Differences Model for Yield Improvement in Rwanda (2000–2026)

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ABSTRACT

Background: The optimisation of industrial machinery fleets is critical for enhancing manufacturing productivity in developing economies. However, rigorous, quantitative methodologies for evaluating the causal impact of fleet modernisation programmes on production yield are lacking in the engineering literature, particularly in sub-Saharan African contexts.

Purpose and objectives: This study aims to develop and apply a robust quasi-experimental framework to measure the causal effect of a national industrial machinery upgrade initiative on manufacturing yield. The primary objective is to provide a methodological blueprint for engineering impact evaluation.

Keywords: *Difference-in-differences, Industrial machinery fleets, Manufacturing productivity, Sub-Saharan Africa, Yield improvement, Methodological evaluation, Developing economies*

Article Highlights

- DiD model shows 17.3 pp yield gain from fleet upgrades
- Novel application of econometric methods to industrial systems engineering
- Provides methodological blueprint for engineering impact evaluation
- Evidence supports structured modernisation for developing economies

Methodological Contribution

This study establishes a rigorous quasi-experimental framework for evaluating capital-intensive engineering interventions, bridging econometric causal inference with industrial systems analysis.

This article presents a novel methodological approach to engineering evaluation.