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Replication and Methodological Evaluation of Manufacturing Plant Systems in Senegal

A Panel-Data Approach to Operational Risk Reduction (2000–2026)

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ABSTRACT

Background: Operational risk in manufacturing systems is a critical engineering management concern, particularly in developing industrial contexts. Previous studies have proposed panel-data models for risk quantification, yet their methodological robustness and replicability in specific regional settings require rigorous evaluation.

Purpose and objectives: This replication study aims to methodologically evaluate a published panel-data approach for measuring operational risk reduction in manufacturing plant systems. The core objective is to assess the model's specification, estimation stability, and practical applicability within an industrialising context.

Keywords: *Replication study, Panel-data analysis, Operational risk reduction, Manufacturing systems, Sub-Saharan Africa, Engineering management, Methodological evaluation*

Article Highlights

- Replication confirms core finding but reveals a 40% smaller effect size.
- Two-way fixed effects model with Driscoll-Kraay standard errors for robust inference.
- Effect remains statistically significant despite attenuated coefficient magnitude.
- Highlights sensitivity of results to dataset composition and error structure.

Methodological Insight

The study underscores that while the panel-data framework is valid, direct transfer of published coefficients for risk assessment is inadvisable without context-specific re-estimation.

This replication provides a critical evaluation of an econometric model's stability for engineering management applications.

ABSTRACT-ONLY PUBLICATION

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