

Methodological Evaluation and Risk Reduction in Senegalese Manufacturing Systems

A Difference-in-Differences Analysis

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ABSTRACT

Background: Manufacturing systems in developing economies face significant operational risks, yet rigorous methodological frameworks for evaluating systemic interventions are scarce. The Senegalese industrial sector, a key regional hub, lacks empirical studies quantifying the efficacy of engineering-led risk reduction programmes.

Purpose and objectives: This study aims to develop and apply a quasi-experimental econometric model to methodologically evaluate the causal impact of a structured engineering safety and maintenance protocol on operational risk within manufacturing plants.

Keywords: *Manufacturing systems, Operational risk, Difference-in-differences, Sub-Saharan Africa, Developing economies, Process evaluation*

Article Highlights

- Quasi-experimental design isolates causal impact of safety protocols.
- 18.5% average reduction in composite risk index for treated plants.
- Validated parallel trends assumption using pre-intervention data.
- Demonstrates value of econometric methods for engineering evaluation.

Core Methodology

Difference-in-differences model with panel data, cluster-robust standard errors, and validation of the parallel trends assumption.

This study offers a methodological framework for causal evaluation in engineering management contexts.

ABSTRACT-ONLY PUBLICATION

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