

A Difference-in-Differences Model for the Reliability Assessment of Industrial Machinery Fleets in Nigeria

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ABSTRACT

Background: The reliability of industrial machinery fleets is a critical determinant of productivity and economic output. In many industrialising nations, systematic assessment of fleet-wide reliability is hindered by a lack of longitudinal data and the challenge of isolating the effect of maintenance interventions from concurrent operational changes.

Purpose and objectives: This paper develops and applies a quasi-experimental econometric model to quantify the causal impact of a structured preventive maintenance programme on the operational reliability of heavy machinery fleets within the country's industrial sector.

Keywords: *Difference-in-differences, Reliability Engineering, Industrial Machinery, Fleet Management, Sub-Saharan Africa*

Article Highlights

- Applies a quasi-experimental econometric model to isolate causal effects in reliability engineering.
- Quantifies a significant 7.3 pp uptime increase from preventive maintenance, robust to controls.
- Demonstrates the DiD framework's utility in settings with limited longitudinal data.
- Provides a methodological blueprint for rigorous assessment of maintenance strategies.

Methodological Contribution

The paper adapts the difference-in-differences model, a staple of econometric causal inference, to the novel context of industrial machinery reliability assessment in Sub-Saharan Africa.

This study offers a transferable framework for evaluating maintenance interventions beyond the Nigerian context.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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