

A Comparative Difference-in-Differences Analysis of Industrial Machinery Fleet Reliability in Ethiopia, 2000–2026

Meklit Assefa^{1,2}, Tewodros Getachew^{1,3}, Saron Tadesse^{3,4}

Hawassa University | Gondar University | Department of Civil Engineering, Debre Markos University |
Department of Civil Engineering, Hawassa University

Correspondence: massefa@hotmail.com

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ABSTRACT

Background: Industrial machinery fleet reliability is a critical determinant of productivity and economic growth in developing economies. In the context of Ethiopia, systematic, longitudinal evaluations of reliability interventions for such fleets are scarce, limiting evidence-based asset management.

Purpose and objectives: This study aims to methodologically evaluate the application of a difference-in-differences (DiD) model for quantifying the causal impact of a national preventive maintenance programme on the operational reliability of industrial machinery fleets. It compares outcomes between treated and control fleets over an extended period.

Keywords: *Difference-in-differences, Industrial machinery reliability, Fleet management, Sub-Saharan Africa, Longitudinal analysis, Maintenance engineering, Developing economies*

Article Highlights

- DiD analysis reveals a 17.3 percentage point increase in fleet reliability from the national programme.
- Parallel trends assumption validated, strengthening causal interpretation of the results.
- Study provides a methodological framework for evaluating engineering interventions in observational data.
- Findings support the structured rollout of preventive maintenance protocols in industrial sectors.

Methodological Core

The analysis employs a difference-in-differences model with cluster-robust standard errors on panel data from cement and textile machinery fleets to isolate the causal effect of a preventive maintenance programme.

This article presents a quasi-experimental evaluation of an industrial policy intervention.

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