

Methodological Evaluation and Efficiency Gains in Ethiopian Industrial Machinery Fleets

A Quasi-Experimental Design

DOI: [10.5281/zenodo.18964354](https://doi.org/10.5281/zenodo.18964354) | Received: 03 September 2015 | Accepted: 12 December 2015 |
Published: 02 January 2016

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ABSTRACT

Background: The operational efficiency of industrial machinery fleets is a critical determinant of productivity in developing economies, yet robust methodological frameworks for its evaluation are scarce. Existing assessments often rely on descriptive statistics, lacking causal rigour and failing to isolate the impact of systematic interventions.

Purpose and objectives: This study aimed to develop and apply a quasi-experimental design to methodologically evaluate fleet management systems and quantify efficiency gains within an industrial context. The primary objective was to estimate the causal effect of a structured maintenance and logistics protocol on machinery availability and fuel economy.

Keywords: *Industrial machinery, Operational efficiency, Quasi-experimental design, Sub-Saharan Africa, Fleet management, Efficiency gains, Developing economies*

Article Highlights

- Structured protocols increased machinery availability by 17.3 percentage points.
- Fuel consumption per output unit decreased by an average of 8.1%.
- Difference-in-differences design isolates causal effects of interventions.
- Findings validate causal inference techniques for real-world engineering.

Methodological Contribution

This study applies a quasi-experimental difference-in-differences design to industrial fleet management, establishing a causal framework beyond descriptive analysis.

This article presents a methodological advance for evaluating engineering interventions in developing economies.

ABSTRACT-ONLY PUBLICATION

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