Methodological Evaluation and Panel-Data Estimation for Yield Improvement in Ugandan Industrial Machinery Fleets

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ABSTRACT

Background: Industrial machinery fleets in developing economies are critical for productivity, yet systematic analysis of their operational yield is limited. In Uganda, a lack of robust methodological frameworks hinders the empirical measurement of performance improvements and the identification of key drivers.

Purpose and objectives: This working paper aims to methodologically evaluate approaches for analysing fleet systems and to develop a panel-data estimation model for quantifying yield improvement. The objective is to provide a replicable analytical framework for engineering management.

Keywords: *Industrial machinery, Panel-data estimation, Yield improvement, Sub-Saharan Africa, Developing economies, Methodological evaluation, Fleet management*

Article Highlights

- Evaluates methodological frameworks for analysing industrial fleet systems in developing economies.
- Develops a novel panel-data estimation model using a two-way fixed effects specification.
- Identifies maintenance scheduling consistency as a superior predictor of yield compared to fleet age.
- Provides a replicable analytical framework for engineering management and policy benchmarking.

Core Econometric Model

The analysis employs a two-way fixed effects model: $Y\_it = \alpha + \beta X\_it + \mu\_i + \lambda\_t + \varepsilon\_it$, where Y_it is availability-adjusted yield. Inference uses cluster-robust standard errors.

This paper presents a methodological framework, not a case study of a single firm.

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