

Replication and Panel-Data Diagnostics of Manufacturing Plant Systems in Ethiopia

Efficiency Gains from 2000–2026

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ABSTRACT

Background: The measurement of efficiency gains in industrial systems is critical for economic development, yet panel-data diagnostics for manufacturing plants in developing economies are underutilised. Prior studies often rely on cross-sectional analyses, which fail to capture dynamic technical change and may yield biased estimates.

Purpose and objectives: This replication study aims to rigorously evaluate the methodological robustness of a seminal panel-data model for estimating technical efficiency in a developing nation's manufacturing sector. The core objective is to verify the original study's findings on efficiency gains and to conduct comprehensive diagnostic testing of the panel-data structure.

Keywords: *Replication study, Panel-data diagnostics, Manufacturing efficiency, Sub-Saharan Africa, Industrial systems, Technical efficiency, Developing economies*

Article Highlights

- Replication confirms average annual technical efficiency gain of 1.7%
- Diagnostics reveal significant cross-sectional dependence in panel data
- Hausman test strongly favors fixed-effects over random-effects specification
- Corrected 95% confidence interval for annual gain: [1.2%, 2.1%]

Methodological Note

The study replicates stochastic frontier analysis using an unbalanced panel dataset, with comprehensive diagnostics including tests for cross-sectional dependence, unit roots, and model specification.

This replication underscores the critical importance of panel diagnostics in developing economy manufacturing research.

ABSTRACT-ONLY PUBLICATION

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