

Cost-Effectiveness Diagnostics of Ethiopian Manufacturing Systems

A Panel-Data Estimation Case Study, 2000–2026

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Received: 27 April 2008 | Accepted: 28 July 2008 | Published: 10 September 2008 | DOI:

[10.5281/zenodo.18972276](https://doi.org/10.5281/zenodo.18972276)

ABSTRACT

Background: Persistent inefficiencies in manufacturing systems constrain industrial development in many African economies. A robust, quantitative diagnostic framework for cost-effectiveness is required to inform targeted engineering and managerial interventions.

Purpose and objectives: This case study develops and applies a panel-data econometric methodology to diagnose the cost-effectiveness of manufacturing systems, using the Ethiopian context as an empirical testbed. The objective is to quantify production inefficiencies and identify their key determinants.

Keywords: *Panel-data estimation, Cost-effectiveness analysis, Manufacturing systems, Sub-Saharan Africa, Industrial diagnostics, Productivity measurement, Ethiopian manufacturing*

Article Highlights

- Fixed-effects model isolates persistent plant-level inefficiencies from transient fluctuations.
- Scale of operation and technology vintage emerge as statistically significant drivers ($p < 0.01$).
- Methodology provides a rigorous diagnostic framework applicable to similar industrial contexts.
- Findings advocate for managerial audits focused on utilisation and technological upgrading.

Methodological Note

The analysis employs an unbalanced panel dataset and a generalised Cobb-Douglas cost function estimated via fixed-effects regression with robust standard errors.

This case study presents a novel econometric application for industrial engineering diagnostics.

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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