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Methodological Evaluation and Panel-Data Estimation of Efficiency Gains in Nigerian Manufacturing Systems

A Case Study (2000–2026)

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ABSTRACT

Background: Persistent inefficiencies in manufacturing systems constrain industrial productivity and economic development in many regions. A robust, quantitative methodology for measuring longitudinal efficiency gains in such contexts is required for targeted engineering interventions.

Purpose and objectives: This case study aims to methodologically evaluate and measure efficiency gains within a representative set of manufacturing plants. The primary objective is to estimate total factor productivity (TFP) growth and identify its key determinants using panel-data econometrics.

Keywords: *Panel-data estimation, Manufacturing systems, Efficiency gains, Sub-Saharan Africa, Stochastic frontier analysis, Industrial productivity, Nigerian manufacturing*

Article Highlights

- Panel-data analysis reveals a 2.7% average annual TFP growth in Nigerian manufacturing.
- Efficiency gains are strongly linked to process control upgrades and workforce training.
- The fixed-effects model provides a robust framework for longitudinal efficiency measurement.
- Results advocate for institutionalised data collection to monitor productivity trends.

Methodological Insight

The study employs a Cobb-Douglas production function within a fixed-effects panel model to isolate plant-specific efficiency gains from 2000–2026, controlling for labour and capital inputs.

This case study provides a replicable framework for measuring longitudinal efficiency in industrial systems.

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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