

AFRICAN STRUCTURAL ENGINEERING

ISSN: XXXX-XXXX | Peer-Reviewed | Open Access

# A Cost-Effectiveness Analysis of Power-Distribution Equipment in Ghana

A Difference-in-Differences Model (2000–2026)

DOI: [10.5281/zenodo.18965423](https://doi.org/10.5281/zenodo.18965423) | Received: 28 January 2023 | Accepted: 28 February 2023 |  
Published: 19 April 2023

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## ABSTRACT

**Background:** The selection of power-distribution equipment in developing economies is often based on initial capital cost, with limited long-term cost-effectiveness analysis. This has led to suboptimal asset management and recurrent expenditure challenges within the sector.

**Purpose and objectives:** This case study aims to develop and apply a rigorous methodological framework for evaluating the comparative cost-effectiveness of different power-distribution equipment systems, specifically transformers and switchgear, within a national utility context.

**Keywords:** Cost-effectiveness analysis, Power-distribution equipment, Sub-Saharan Africa, Difference-in-differences, Life-cycle costing, Grid reliability, Developing economies

### Article Highlights

- Applies a quasi-experimental difference-in-differences model to longitudinal cost data.
- Finds modern transformers reduce total cost of ownership by over 15% versus conventional units.
- Advocates for total cost of ownership models in utility procurement and asset planning.
- Provides a robust empirical framework for cost-effectiveness evaluation in infrastructure.

### Methodological Note

The core model is a difference-in-differences specification:  $Y_{it} = \beta_0 + \beta_1 \text{Treat}_i + \beta_2 \text{Post}_t + \delta(\text{Treat}_i \cdot \text{Post}_t) + \varepsilon_{it}$ , with inference using cluster-robust standard errors.

*This analysis shifts the focus from initial capital cost to long-term economic performance.*

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