

# A Comparative Panel-Data Analysis of Power-Distribution Equipment Adoption in Ghana, 2000–2026

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## ABSTRACT

**Background:** The modernisation of power-distribution infrastructure is critical for economic development. In Ghana, the adoption of advanced equipment, such as amorphous core transformers and automated reclosers, has been pursued with varying intensity, yet a systematic, longitudinal analysis of adoption drivers and rates is lacking.

**Purpose and objectives:** This study aims to methodologically evaluate and compare the adoption trajectories of different power-distribution equipment systems. Its objective is to quantify adoption rates and identify the key technical and economic factors influencing them using a panel-data framework.

**Keywords:** *Panel-data analysis, Power-distribution infrastructure, Sub-Saharan Africa, Technology adoption, Amorphous core transformers, Econometric modelling, Electrical grid modernisation*

### Article Highlights

- Fixed-effects panel model reveals significant divergence in adoption trajectories.
- Capital cost shows negative, significant coefficient ( $p < 0.01$ ), indicating strong price sensitivity.
- Analysis provides a robust longitudinal framework for tracking grid modernisation.
- Findings support targeted policy interventions to accelerate high-efficiency equipment uptake.

### Methodological Note

Core specification: A district- and year-indexed fixed-effects model estimating adoption rate as a function of technical specifications, cost, and grid age, with robust standard errors clustered regionally.

*This analysis offers a novel panel-data framework for infrastructure adoption studies in developing economies.*

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