



Evaluation of Power-Distribution Equipment Systems in South Africa Using Panel Data for Yield Improvement Analysis

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Abstract

Power distribution systems (PDS) in South Africa face challenges related to efficiency and reliability, impacting overall economic productivity. A mixed-method approach combining econometric techniques with field observations was employed. Panel data from multiple industries were analysed using a generalized least squares (GLS) model to estimate yield improvements. The GLS model revealed significant variation in PDS performance across different sectors, with an average improvement rate of 12% in yield attributed to optimal equipment configuration and maintenance protocols. The study underscores the importance of tailored optimization strategies for achieving sustainable yield improvements in South Africa's industrial landscape. Adoption of the identified optimization models should be encouraged alongside ongoing research into advanced PDS technologies. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \text{varepsilon}_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Pan-African, econometrics, panel-data, reliability, efficiency, productivity, distribution systems*

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