



# Bayesian Hierarchical Model for Measuring Adoption Rates of Power-Distribution Equipment Systems in Ethiopia: An Evaluation Study

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## Abstract

This study evaluates the adoption rates of power-distribution equipment systems in Ethiopia by utilising a Bayesian hierarchical model. A Bayesian hierarchical model was employed to analyse data on power-distribution equipment systems across different regions in Ethiopia. This approach allows for the incorporation of spatial and temporal variability, providing a nuanced understanding of adoption trends. The analysis revealed that adoption rates varied significantly by region, with a notable difference in adoption between urban and rural areas, indicating the need for tailored strategies to promote wider use. This study demonstrates the effectiveness of Bayesian hierarchical models in evaluating complex systems like power-distribution equipment. The findings provide actionable insights into regional disparities in technology uptake. Policy makers should prioritise targeted interventions in regions with lower adoption rates, leveraging the identified spatial patterns to optimise resource allocation and improve energy access. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Ethiopia, Bayesian hierarchical model, power distribution, adoption rates, stochastic processes, spatial analysis, econometrics*

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