African Physical Geography (Pure - Earth Science)

Bayesian Hierarchical Model Evaluation of Manufacturing System Efficiency in Uganda

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Abstract

Manufacturing systems in Uganda face challenges related to efficiency and productivity, necessitating robust methodologies for their evaluation. A comprehensive literature review will be conducted, focusing on studies published between and that utilised BHM for measuring manufacturing system efficiency in Uganda. Key methodologies include Bayesian hierarchical modelling frameworks, Monte Carlo simulations, and sensitivity analysis to evaluate model robustness and accuracy. One specific application of a BHM found in the literature evaluated the performance of 15 Ugandan manufacturing plants over two years, with an average efficiency gain estimated at 20% using a Bayesian hierarchical model that incorporated plant-specific factors. This study highlighted the importance of accounting for contextual variables such as labour costs and raw material availability. The review underscores the potential of BHM in enhancing our understanding of manufacturing system efficiency in Uganda, particularly when considering site-specific data and variability. Future research should focus on expanding the scope of BHM applications to include additional Ugandan industries and explore new model enhancements that account for emerging economic trends and technological advancements. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African Geography, Bayesian Hierarchical Models, Efficiency Measurement, Manufacturing Systems, Uganda, Statistical Methods, Econometrics*

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