



Bayesian Hierarchical Model for Measuring Adoption Rates in Ugandan Manufacturing Plants Systems,

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Abstract

Manufacturing plants in Uganda have adopted various systems to enhance productivity and efficiency, but adoption rates can vary significantly across different sectors and plant sizes. The intervention study employs a Bayesian hierarchical logistic regression model, accounting for plant-specific characteristics such as size, sector, and industry practices. Data on system adoption were collected from 100 randomly selected manufacturing plants over two years. Bayesian hierarchical modelling revealed significant differences in adoption rates across sectors (e.g., agriculture vs. manufacturing) with proportions ranging between 45% to 65%, indicating substantial variability that traditional models might overlook. The Bayesian approach provided more nuanced insights into the factors influencing system adoption, offering a refined tool for future analysis and policy development in Ugandan manufacturing sectors. Manufacturing plant managers should consider sector-specific strategies to improve system adoption rates. Policy makers can leverage these findings to design targeted interventions aimed at enhancing productivity across different industries. 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: *Uganda, Bayesian hierarchical model, intervention study, adoption rates, manufacturing systems, productivity improvement, statistical methods*

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