Bayesian Hierarchical Model for Assessing Cost-Effectiveness in Ethiopian Manufacturing Plants Systems

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Abstract

Manufacturing plants in Ethiopia are critical for economic development but face challenges related to cost-effectiveness. A Bayesian hierarchical model will be applied to analyse data from Ethiopian manufacturing plants, accounting for variability across different scales of operation. The analysis revealed significant differences in operational costs among various plant sizes, with manufacturing units under 100 employees showing the highest cost-effectiveness ratio (CER) compared to larger units. Bayesian hierarchical modelling provided insights into how scale affects cost-efficiency and can guide policymakers in resource allocation. Policymakers should prioritise support for smaller manufacturing units as they demonstrate superior economic performance relative to their size. manufacturing systems, cost-effectiveness, Bayesian hierarchical model, Ethiopian economy The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, Bayesian Statistics, Hierarchical Modelling, Cost-Effectiveness Analysis, Manufacturing Systems, Econometrics, Quality Control*

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