Multilevel Regression Analysis for Evaluating Industrial Machinery Fleet Efficiency in Tanzanian Settings

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Abstract

Industrial machinery fleets play a critical role in Tanzania's manufacturing sector, enhancing productivity and economic growth. A multilevel regression model will be employed to analyse data from multiple levels including machines, operators, and maintenance teams. Uncertainty around estimates will be quantified using robust standard errors. The multilevel regression analysis revealed that the interaction between operator experience and machine age significantly influenced fleet efficiency gains in Tanzanian settings. This study provides a deeper understanding of factors affecting industrial machinery efficiency, offering insights for policy makers aiming to improve productivity in Tanzania. Policy-makers should consider interventions focused on training operators and upgrading older machines to enhance overall fleet performance. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Tanzania, Multilevel Regression, Hierarchical Analysis, Industrial Efficiency, Econometrics, Cluster Sampling, Data Mining*

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