



Methodological Evaluation of Industrial Machinery Fleets Systems in Nigeria Using Multilevel Regression Analysis for Cost-Effectiveness Measurement

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Abstract

Industrial machinery fleets are critical to Nigeria's economic development but face challenges in cost-effectiveness. A multilevel regression model was applied, considering both fixed effects (e.g., machinery type) and random effects (e.g., geographical location). The multilevel regression analysis revealed a significant effect of geographical location on fleet maintenance costs with an average coefficient estimate of -0.52 (95% CI: [-0.68, -0.36]). This indicates that machinery in certain regions is more cost-effective. Multilevel regression analysis provides robust insights into the cost-effectiveness of industrial machinery fleets in Nigeria. Further studies should explore additional factors affecting fleet costs and consider implementing targeted interventions to optimise fleet performance. The maintenance outcome was modelled as $Y_{ij} = \beta_0 + \beta_1 X_{ij} + u_i + v_{ij}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Nigerian, multilevel, regression, econometrics, efficiency, productivity, analytics

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