Methodological Assessment of Industrial Machinery Fleet Systems in Ethiopia Through Multilevel Regression Analysis

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Abstract

The industrial machinery fleet systems in Ethiopia have been pivotal to economic growth but face significant operational challenges. A multilevel regression model was employed to analyse data at both the national and regional levels, accounting for variability across different sectors and regions in Ethiopia. The multilevel regression model revealed a significant reduction ($p < 0.05$) in operational risks by adopting advanced maintenance protocols in machinery fleets. Multilevel regression analysis provided robust insights into the effectiveness of risk mitigation strategies within industrial machinery fleet systems, demonstrating that systematic improvements can lead to substantial reductions in operational inefficiencies. The findings suggest implementing a standardised maintenance schedule and regular training for operators as key interventions to enhance system performance and safety. Industrial Machinery Fleet Systems, Multilevel Regression Analysis, Risk Reduction, Ethiopia The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, Multilevel Regression, Industrial Machinery, Fleet Systems, Methodology, Econometrics, Hierarchical Analysis*

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