Multilevel Regression Analysis of Industrial Machinery Adoption Rates in Senegal's Fleet Systems

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Abstract

Industrial machinery adoption rates in Senegal's fleet systems have been studied to understand their impact on productivity and efficiency. A multilevel regression model was employed to analyse data from a sample of fleet systems. The model includes fixed effects at the system level and random effects at the unit level within each system. The multilevel analysis revealed that the adoption rate varied significantly by system type, with maintenance frequency being a key determinant of machinery uptake. The findings suggest that incorporating system-specific factors in regression models improves the accuracy of predicting industrial machinery adoption rates. Future studies should consider expanding the sample to include more diverse fleet systems and investigate long-term effects on productivity. multilevel regression, Senegal, industrial machinery, fleet systems, engineering applications The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, multilevel regression, stochastic frontier, productivity, econometrics, hierarchical analysis, industrial organisation*

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