African Laser Physics (Pure Science)

Methodological Evaluation of Manufacturing Plant Systems in Senegal Using Quasi-Experimental Design to Measure Efficiency Gains

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Abstract

This Data Descriptor examines the application of a quasi-experimental design to evaluate manufacturing plant systems in Senegal. A quasi-experimental design was employed, leveraging pre-existing data from industrial facilities. The study utilised regression discontinuity designs (RDD) with robust standard errors to account for potential confounding variables. The analysis revealed a significant increase in efficiency gains of approximately 15% across the sampled manufacturing plants when compared to baseline conditions. This quasi-experimental design successfully identified efficiency improvements, offering a novel approach for evaluating similar systems in other regions with limited resources. Further research should validate these findings through replication studies and explore scalability of this methodology in different sectors and countries. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, manufacturing systems, quasi-experimental design, productivity gains, econometric analysis, resource allocation, performance metrics*

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