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Methodological Framework for Panel-Data Estimation of Industrial Machinery Fleet Adoption in Nigeria, 2000–2026

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Chinweike Okonkwo¹

¹ Department of Civil Engineering, University of Lagos

Correspondence: cokonkwo@hotmail.com

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ABSTRACT

Background: The adoption of modern industrial machinery fleets is a critical driver of productivity and economic development. However, in many developing economies, there is a paucity of robust methodological frameworks for quantifying and analysing the determinants of this adoption over time, hindering effective policy and investment decisions.

Purpose and objectives: This article presents a novel methodological framework for estimating the adoption rates of industrial machinery fleets using panel-data econometrics. Its primary objective is to provide a replicable, statistically rigorous procedure for modelling temporal and cross-sectional variation in adoption, specifically tailored to the structural engineering context.

Keywords: *Panel-data econometrics, Industrial machinery adoption, Sub-Saharan Africa, Technological diffusion, Fleet management systems, Developing economies, Nigeria*

Article Highlights

- Proposes a novel panel-data framework for modelling machinery fleet adoption over time.
- Employs two-way fixed effects to control for unobserved firm and time heterogeneity.
- Identifies financial capacity as the key hypothesized driver of adoption intensity.
- Provides rigorous application guidelines for researchers in developing economies.

Core Model Specification

$y_{it} = \alpha + \beta X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$, where y_{it} is adoption intensity for firm i in period t , with cluster-robust inference.

This is a methodology article presenting a framework, not empirical results.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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