

A Bayesian Hierarchical Model for the Adoption Rate of Manufacturing Systems in Nigeria

A Policy Analysis, 2000–2026

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ABSTRACT

Background: The modernisation of manufacturing systems is critical for industrial development, yet policy formulation in this sector is often hindered by a lack of robust, predictive tools for assessing technology adoption. In Nigeria, this gap has led to inefficient resource allocation and suboptimal policy interventions aimed at enhancing industrial productivity.

Purpose and objectives: This policy analysis develops and evaluates a novel Bayesian hierarchical model to estimate and forecast the adoption rates of advanced manufacturing systems. The objective is to provide a methodological framework that offers policymakers quantifiable insights into adoption dynamics, enabling more targeted and effective industrial policy.

Keywords: Bayesian hierarchical modelling, technology adoption, manufacturing systems, industrial policy, Sub-Saharan Africa, policy analysis, Nigeria

Article Highlights

- A novel Bayesian hierarchical model estimates and forecasts manufacturing technology adoption.
- Posterior analysis reveals a strong link between fiscal incentives and adoption probability.
- Forecasts show adoption rates may remain below 40% without significant policy intervention.
- The framework captures sectoral heterogeneity and uncertainty for nuanced policy analysis.

Methodological Insight

The model structure, $y_{it} \sim \text{Beta}(\mu_{it}\phi, (1-\mu_{it})\phi)$, accounts for plant-level heterogeneity and sectoral clustering through hierarchical parameters, with inference based on MCMC-derived posterior distributions.

This analysis provides a probabilistic framework for evaluating industrial policy efficacy.

ABSTRACT-ONLY PUBLICATION

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