

# A Bayesian Hierarchical Model for Evaluating the Adoption Rates of Industrial Machinery Fleets in Senegal

Mamadou Diop<sup>1</sup>

Institut Pasteur de Dakar

Correspondence: [mdiop@gmail.com](mailto:mdiop@gmail.com)

Received: 05 March 2009 | Accepted: 28 June 2009 | Published: 17 July 2009 | DOI: [10.5281/zenodo.18969996](https://doi.org/10.5281/zenodo.18969996)

## ABSTRACT

**Background:** The modernisation of the construction and mining sectors in West Africa relies on the effective adoption of advanced industrial machinery. However, robust, data-driven methods for quantifying and analysing adoption rates of such fleets are lacking, hindering strategic investment and maintenance planning.

**Purpose and objectives:** This study develops and validates a novel Bayesian hierarchical model to estimate the adoption rates of industrial machinery fleets. The objective is to provide a probabilistic framework that accounts for regional heterogeneity and sparse data, offering a superior alternative to traditional aggregate measures.

**Keywords:** *Bayesian hierarchical modelling, technology adoption, industrial machinery, West Africa, fleet management, developing economies*

### Article Highlights

- Bayesian hierarchical model quantifies regional adoption disparities.
- Posterior median adoption for telematics: 0.42 in most advanced region.
- Superior to aggregate measures for sparse, heterogeneous data.
- Provides probabilistic framework for fleet investment planning.

### Core Methodology

Bayesian hierarchical logistic regression with region-specific random effects, using MCMC sampling for inference on machinery adoption probabilities across Senegalese regions.

*This study provides a novel probabilistic framework for assessing technology diffusion in developing economies.*

## **ABSTRACT-ONLY PUBLICATION**

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

## **REQUEST FULL PAPER**

 **Email:** [info@parj.africa](mailto:info@parj.africa)

Request your copy of the full paper today!

## **SUBMIT YOUR RESEARCH**

**Are you a researcher in Africa? We  
welcome your submissions!**

Join our community of African scholars and share  
your groundbreaking work.

 **Submit at:** [app.parj.africa](http://app.parj.africa)



Scan to visit [app.parj.africa](http://app.parj.africa)

### **Open Access Scholarship from PARJ**

Empowering African Research | Advancing Global  
Knowledge