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Panel-Data Estimation of Adoption Rates in Tanzanian Municipal Water Systems

A Methodological Evaluation for Sustainable Development

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ABSTRACT

Background: Accurate measurement of technology adoption is critical for evaluating sustainable development interventions in African agriculture and water sectors. Existing methods for assessing the uptake of municipal water systems often rely on cross-sectional data, which fail to capture dynamic adoption processes and may yield biased estimates.

Purpose and objectives: This study provides a methodological evaluation of panel-data estimation techniques for measuring household adoption rates of piped water systems. Its primary objective is to compare the performance of fixed-effects and random-effects models in generating robust, longitudinal adoption metrics for policy analysis.

Keywords: *Panel-data econometrics, Adoption rates, Municipal water systems, Sub-Saharan Africa, Sustainable Development Goals, Technology diffusion, Impact evaluation*

Article Highlights

- Panel-data methods control for unobserved household heterogeneity
- Fixed-effects models preferred over random-effects via Hausman test
- Proximity to kiosks boosts adoption probability by 17.4 percentage points
- Longitudinal data essential for reliable sustainable development metrics

Methodological Insight

The study demonstrates that panel-data estimation, particularly fixed-effects models, provides superior adoption metrics by accounting for time-invariant household characteristics that cross-sectional approaches miss.

This methodological evaluation offers robust tools for measuring technology adoption in sustainable development contexts.

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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