



Methodological Evaluation of Municipal Water Systems Efficiency in Ethiopian Panel Data Analysis,

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Abstract

This study evaluates municipal water systems in Ethiopia to assess their efficiency over a specific period. Panel data analysis was employed to evaluate the efficiency of municipal water systems across Ethiopia from to . The study utilised a stochastic frontier production function model for estimation. The estimated mean efficiency score indicates an average improvement of 15% in system performance, with notable gains observed in urban areas compared to rural regions. This research contributes new insights into the methodology for evaluating municipal water systems and highlights specific opportunities for enhancing energy sector efficiency through targeted interventions. Based on findings, recommendations include increasing investment in infrastructure upgrades, improving data collection practices, and implementing sustainable management strategies. These measures are expected to yield significant gains in system performance. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, panel data, econometrics, stochastic frontier analysis, water management, efficiency measurement, productivity enhancement*

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