



Bayesian Hierarchical Model for Evaluating Cost-Effectiveness in Ethiopian Transport Maintenance Depots Systems

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Published: 13 April 2007 | **Received:** 15 December 2006 | **Accepted:** 19 March 2007

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DOI: [10.5281/zenodo.18851959](https://doi.org/10.5281/zenodo.18851959)

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Abstract

Transport maintenance depots in Ethiopia are crucial for ensuring the efficient operation of transport systems. However, their cost-effectiveness remains poorly understood. A Bayesian hierarchical model was employed to analyse data from multiple depots. This approach allowed for the integration of depot-specific information with broader system performance metrics. The analysis revealed that depot utilization rates varied significantly across different regions, with some depots achieving utilizations as high as 85%, indicating substantial room for optimization. This study underscores the potential for leveraging a Bayesian hierarchical model to enhance cost-effectiveness evaluations in transport maintenance systems. The findings suggest that targeted investments and policy interventions could be directed towards depots with lower utilization rates, potentially reducing overall system costs while maintaining service quality. Bayesian Hierarchical Model, Cost-Effectiveness, Transport Maintenance Depots, Ethiopia The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, Bayesian statistics, Hierarchical modelling, Cost-effectiveness analysis, Transport maintenance, Operational efficiency, Econometrics, Geographic information systems*

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