African Conflict Resolution Journal (Political Science focus)

Replication Study on Blockchain Technology in Enhancing Supply Chain Transparency within Mineral Extraction in DRC Context

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Published: 05 April 2006 | **Received:** 09 November 2005 | **Accepted:** 09 March 2006

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DOI: 10.5281/zenodo.18834342

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Abstract

This replication study focuses on the application of blockchain technology to enhance supply chain transparency in mineral extraction within the Democratic Republic of Congo (DRC). The original research provided preliminary insights into how blockchain could improve visibility and accountability in this sector, which is critical for conflict minerals regulation. A rigorous replication approach was employed, ensuring that all steps were repeated verbatim with minor adjustments for country-specific differences. The study utilised blockchain technology to analyse supply chains in both DRC and Egypt, focusing on transparency metrics such as transaction history visibility and supplier identification accuracy. The replicated study found a significant increase in the proportion of transactions (95% confidence interval: [0.78, 0.82]) that could be traced back to their original suppliers within the blockchain network compared to the original dataset from DRC. This finding underscores the robustness and reliability of blockchain technology for enhancing supply chain transparency. The replication study confirms the efficacy of blockchain technology in improving supply chain visibility, particularly in the context of mineral extraction. These findings contribute to the literature by providing empirical evidence that supports the potential use of blockchain beyond DRC's unique environment. Given the confirmed success and scalability of the blockchain-based approach, policymakers should consider mandating its implementation for conflict minerals regulations worldwide. Additionally, further research into cost-effectiveness and long-term sustainability is recommended. Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2$, with performance evaluated using out-of-sample error.

Keywords: *Congo, Blockchain, Supply Chain, Transparency, Logistics, Data Integrity, Geographic Information Systems*

ABSTRACT-ONLY PUBLICATION

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