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Synergizing Green Finance, ESG, FinTech, and the Circular Economy: Empirical Evidence from the European Union

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Abstract

This study investigates how Green Finance, Environmental, Social and Governance (ESG) performance and Fintech adoption have individual and synergistic effects on the circular economy performance across 30 European Union member states over a period of 2000-2024. This study provides empirical evidence on how these mechanisms promote circular economy performance in the EU. Using panel data with country fixed effects; this research operationalizes Circular Economy performance through Resource Productivity (RSP) from Eurostat. Green Finance is proxied by Log Renewable Energy Consumption (LREC) and ESG performance is constructed into an index (ESGI) using CO_2 emissions capita, life expectancy at birth, and Government Effectiveness via principal component analysis; FinTech adoption is captured through a composite index (FTI) using mobile cellular subscriptions as well as Log of internet users. The study estimates four panel regression models and conducts quantile regression across the 25th, 50th and 75th percentiles. The results confirm all three hypotheses. Green Finance (LREC) exerts a positive and statistically significant effect on circular economy performance across all model specifications ($\beta = 0.077$ to 0.128). ESG performance is the strongest driver, with the composite ESGI achieving $\beta = 0.141$ ($p < 0.05$) in the integrated model. FinTech adoption significantly facilitates circular economy performance, with effects amplified at higher performance quantiles. Further quantile regression analysis reveals that the impacts of both ESG and FinTech will have greater impacts at the median (Q50; .571 and .234; respectively) than they will at lower quantiles. These findings present significant information for EU policymakers, as well as for national governments and financial institutions making efforts to enable the transition from linear to circular based economies.

Keywords: *Circular economy, Green Finance, Fintech, ESG performance, Resource Productivity, European Union, Panel Data, Quantile Regression*

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DECLARATION

I, Sana Majid, hereby declare that I have produced the work presented in this thesis, during the scheduled period of study. I also declare that I have not taken any material from any source except where due reference has been given, and that amount of plagiarism is within the acceptable range. If a violation of HEC rules on research has occurred in this thesis, I shall be liable to punishable action under the plagiarism rules of the HEC.

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