

A Critical Review of The Impact of Fintech Credit on Green Innovation: International Evidence

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Abstract: *This study aims to critically evaluate the theoretical framework, methodological robustness, and empirical claims of Tran et al. (2026) regarding the impact of Fintech credit on green innovation. Employing a systematic critical review methodology, this research analyzes the original study's data sources, variable operationalization, and econometric modeling to assess both validity and reliability. The analysis reveals that while the original study successfully differentiates peer-to-peer (P2P) from balance sheet lending and identifies key moderating variables (capital supply and financial development), its main findings are compromised by three specific limitations. First, the observational cross-country design establishes correlation but fails to prove definitive causality. Second, relying exclusively on patent counts creates measurement ambiguity regarding true green innovation. Third, hand-collected Fintech credit components introduce potential coding inaccuracies. Furthermore, theoretical gaps concerning reverse causality and mechanism ambiguity remain unresolved.*

Abstrak : *Penelitian ini bertujuan untuk mengevaluasi secara kritis kerangka teoretis, ketahanan metodologis, dan klaim empiris dari studi Tran et al. (2026) mengenai dampak kredit Fintech terhadap inovasi hijau. Dengan menggunakan metodologi tinjauan kritis sistematis, penelitian ini menganalisis sumber data, operasionalisasi variabel, dan pemodelan ekonometrika dari studi asli untuk menilai validitas dan reliabilitasnya. Hasil analisis menunjukkan bahwa meskipun studi asli berhasil membedakan pinjaman peer-to-peer (P2P) dari balance sheet lending serta mengidentifikasi variabel moderasi utama (pasokan modal dan perkembangan keuangan), temuan utamanya terganggu oleh tiga batasan spesifik. Pertama, desain observasional lintas negara hanya membentuk korelasi namun gagal membuktikan kausalitas definitif. Kedua, ketergantungan eksklusif pada jumlah paten menciptakan ambiguitas pengukuran terkait inovasi hijau yang sebenarnya. Ketiga, komponen kredit Fintech yang dikumpulkan secara manual rentan terhadap ketidakakuratan pengkodean data. Selain itu, kesenjangan teoretis terkait kausalitas terbalik dan ambiguitas mekanisme masih belum terselesaikan.*

Keywords : *Credit, Critical Review, Fintech, Innovation*

INTRODUCTION

Amidst escalating challenges associated with resource depletion and anthropogenic climate change, eco-innovation functions as a critical mechanism for internalizing environmental externalities while concurrently bolstering economic competitiveness (Demirel et al., 2025). Distinct from traditional innovation, which typically subordinates environmental outcomes to operational efficiency and

profitability, green innovation constitutes a strategic response to both regulatory frameworks and the imperative of sustainable development (Cisneros Chavira et al., 2023).

Financial technology (FinTech) has proliferated as a disruptive paradigm, fundamentally restructuring the global financial ecosystem through the digitalization of traditional financial intermediation (Kou & Lu, 2025; Vallée & Zeng, 2019). The proliferation of digital financial services effectively alleviates corporate financing constraints, thereby fostering sustainable innovation at the enterprise level (Ding et al., 2022). Fintech credit serves as a pivotal catalyst for innovation by expanding the capital available for corporate research and development initiatives (Wang et al., 2023; Yue et al., 2024). The purpose of this critical review is to move beyond merely summarizing the research (Tran et al., 2026) and instead deeply interrogate its theoretical foundations, methodological rigor, and empirical claims.

METHOD

This study employs a critical review methodology to interrogate the research that conducted by Tran, Nguyenin, and Do (Tran et al., 2026). Unlike traditional narrative or systematic reviews that primarily aggregate and summarize empirical findings, a critical review is deployed here to systematically evaluate conceptual inconsistencies, methodological limitations, and theoretical boundaries within the current discourse (Anh, 2024; Dede et al., 2026; Franzke et al., 2022; Gan et al., 2026; He et al., 2026; Henry & Liu, 2026; Karmakar et al., 2026; Marks et al., 2026; Mêda et al., 2026; Norman et al., 2025; Purssell & Gould, 2026; Sawant et al., 2024; Thomas et al., 2026). This critical review examining the underlying epistemological assumptions and theoretical frameworks utilized by the authors (Tran et al., 2026), and scrutinizing the study designs, sampling strategies, and analytical techniques to identify recurrent methodological blind spots or biases within the field.

RESULTS AND DISCUSSION

Research Contribution & Originality

This research (Tran et al., 2026) examines the impact of Fintech credit on green innovation across 98 countries from 2013 to 2019, offering cross-country evidence that moves beyond the predominantly single-country studies previously available. The study (Tran et al., 2026) finds that Fintech credit has a positive effect on green innovation, though this influence depends on the components of Fintech credit, and is stronger in countries with limited capital supply and lower levels of financial development. The originality lies in three areas: (1) distinguishing between Fintech and Bigtech credit, (2) decomposing Fintech into specific components (peer to peer/P2P lending, balance sheet lending, invoice trading), and (3) examining moderating effects of capital supply and financial development, aspects rarely addressed together in prior literature.

Strengths

1. Relevant Research Gap

The research (Tran et al., 2026) addresses a timely gap by examining how external pressures and policy shocks like carbon taxes can redirect innovation toward clean technologies. Unlike prior work focusing on general digital finance indices, this study (Tran et al., 2026) specifically concentrates on Fintech credit and its components, providing more granular insights into which types of digital financing support green innovation.

2. Comprehensive Moderating Analysis

The research (Tran et al., 2026) successfully operationalizes the insight that policy and price signals do not automatically yield clean innovation unless firms can access adequate external finance, examining capital supply and financial development as conditioning factors. The results (Tran et al., 2026) convincingly demonstrate that Fintech credit plays a stronger role in stimulating green innovation in countries with restricted capital supply and lower financial development, validating the substitution hypothesis.

3. Multi-dimensional Empirical Approach

The component-level analysis (Tran et al., 2026) reveals differential effects: P2P lending universally supports green innovation, while balance sheet property lending shows a negative correlation, a nuanced finding that challenges treating Fintech as a monolithic construct. The interpretation (Tran et al., 2026) that property-oriented lending crowds out research and development (R&D) investment by diverting capital toward collateral-rich, low-risk projects is well-grounded in recent causal evidence.

4. Robust Control Variables and Fixed Effects

The research model (Tran et al., 2026) includes theoretically justified controls (gross domestic product/GDP growth, inflation, stock market development, domestic/external debt, R&D expenditure) that capture structural determinants of green innovation at the country level, with careful justification for each inclusion.

Significant Limitations

1. Causal Inference Constraints

The authors (Tran et al., 2026) acknowledge that their observational cross-country design constrains causal inference, and unobserved institutional factors, governance quality, cultural attitudes toward risk, or informal financing practices, could shape both Fintech adoption and innovation outcomes. The choice of region fixed effects instead of country fixed effects, justified by small sample size

relative to the number of countries, further weakens the ability to isolate country-specific effects. This is a critical limitation for establishing that Fintech credit causes green innovation rather than being correlated with it.

2. Measurement Issues in Green Innovation

Differences in patenting systems across countries may introduce comparability issues. Patent data reflects formal innovation registration and may miss informal green technologies, particularly in developing nations with weaker IP enforcement. The paper's (Tran et al., 2026) reliance on environment-related patents by domestic inventors as the sole measure of green innovation lacks triangulation with other indicators (e.g., green technology adoption rates, renewable energy deployment, carbon intensity reductions).

3. Data Quality Concerns

While the Fintech credit data is standardized, the paper (Tran et al., 2026) notes potential underreporting or classification inconsistencies. Notably, the authors (Tran et al., 2026) hand-collected Fintech credit components from the Cambridge Centre for Alternative Finance, introducing manual classification risk and potential coding errors. The data spans only 2013–2019, ending before the major post-pandemic acceleration of Fintech lending and regulatory sandboxes.

4. Temporal and Geographic Heterogeneity

The 2013–2019 period captures different stages of Fintech development across countries. Early-stage Fintech markets operate under fundamentally different constraints than mature markets, yet the paper (Tran et al., 2026) does not stratify analyses by Fintech market maturity or conduct dynamic robustness checks. Additionally, the sample composition (98 countries) is not transparently described; the supplementary material reference suggests availability but the lack of explicit detail in the main text obscures potential selection bias.

5. Mechanism Ambiguity

While the paper (Tran et al., 2026) theorizes multiple mechanisms (reduced information asymmetry, lower intermediation costs, alternative risk assessment), the empirical design cannot isolate which mechanism dominates. Does Fintech credit reduce green innovation costs, increase investor risk tolerance, or improve project selection? The aggregate coefficient alone cannot distinguish these pathways, limiting actionable insights for policy design.

Statistical & Methodological Issues

1. Model Specification Concerns

The baseline model (Tran et al., 2026) is linear in logs, but the relationship between Fintech credit and green innovation may be nonlinear (diminishing returns at high Fintech volumes). No

polynomial or spline specifications are explored in the main results. The choice to exclude country fixed effects due to "small sample size" is problematic; a parsimonious specification with country dummies and fewer controls would be more transparent than claiming degrees of freedom constraints without presenting the tradeoff.

2. Interaction Term Interpretation

The negative coefficients on interaction terms (Fintech \times Capital Supply, Fintech \times Financial Development) are correctly interpreted (Tran et al., 2026), but the marginal effects are not reported. Readers cannot immediately see at what level of capital supply or financial development Fintech's effect becomes statistically insignificant or reverses sign.

3. Sample Size Variation

The number of observations drops substantially in some analyses ($n=347$ for financial efficiency vs. $n=623$ for financial development) (Tran et al., 2026), yet there is no discussion of differential attrition or potential bias introduced by these different sample compositions.

Component-Level Analysis Limitations

The distinction between P2P and balance sheet lending is valuable, yet the paper (Tran et al., 2026) does not explore whether these categories vary systematically by country income level or financial development. Do P2P lenders concentrate in developing economies while balance sheet lenders dominate advanced markets? If so, the observed heterogeneity could reflect geographic rather than technological differences.

Theoretical Gaps

1. Substitution vs. Complementarity

While the paper (Tran et al., 2026) claims Fintech complements traditional banking, this conclusion rests on cross-national correlations without firm-level micro-data. It remains unclear whether Fintech platforms systematically serve firms excluded by traditional banks or whether they cream-skim the highest-quality borrowers, leaving banks with deteriorating loan portfolios.

2. Green Innovation Demand vs. Supply

The paper (Tran et al., 2026) assumes Fintech credit supply stimulates green innovation, but does not address the demand side: Do countries with strong green innovation demand attract Fintech lenders, or do Fintech entrants create demand for green financing? Reverse causality is not formally addressed.

Policy Implications: Over-Interpretation Risk

The recommendations (Tran et al., 2026) targeted Fintech credit programs in capital-scarce countries, regulatory sandboxes in less-developed economies, and ESG-aligned niches in advanced markets, are intuitive but exceed what the data can support. The cross-national correlations do not prove that implementing such policies will generate expected outcomes, particularly given unmeasured confounders.

CONCLUSION

This article makes a solid empirical contribution by extending the Fintech-innovation literature to the cross-country green domain and documenting institutional heterogeneity in Fintech's effectiveness. The component-level analysis distinguishing P2P from balance sheet lending and the finding that property-backed lending crowds out R&D are novel and valuable. However, the observational design fundamentally limits causal claims, measurement ambiguity in green innovation (patents alone) and Fintech credit (hand-collected components) introduces noise, and temporal coverage (2013–2019) predates many policy innovations. The paper would be strengthened by: (1) micro-level analysis exploiting quasi-experimental policy variation (regulatory sandboxes), (2) triangulation of green innovation measures, (3) explicit marginal effects tables for interaction models, and (4) dynamic specifications accounting for Fintech market evolution. The paper is suitable for publication in a specialized journal focused on development finance and green innovation, with the understanding that its findings document associations and institutional patterns rather than definitive causal effects.

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