

The impact of Fintech credit on green innovation: international evidence

Journal of
Economics and
Development

111

Thuy T.C. Tran

Dong A University, Danang City, Vietnam

Liem Nguyen

*University of Economics and Law, Ho Chi Minh City, Vietnam and
Vietnam National University, Ho Chi Minh City, Vietnam, and*

Trung K. Do

University of Economics, The University of Danang, Danang City, Vietnam

Received 13 May 2025
Revised 6 September 2025
15 October 2025
2 December 2025
22 December 2025
3 January 2026
15 January 2026
22 January 2026
Accepted 23 January 2026

Abstract

Purpose – This study examines the impact of Fintech credit on green innovation across countries. As global efforts to promote sustainable development intensify, understanding how alternative financing mechanisms, including Fintech credit, influence environmental innovation becomes increasingly relevant.

Design/methodology/approach – The study employs a cross-national panel dataset covering the period from 2013 to 2019. Green innovation is measured by the number of environment-related inventions by domestic inventors. Fintech credit is measured by its total volume. Ordinary least squares regression is applied.

Findings – Fintech credit is shown to have a positive effect on green innovation, although this influence depends on the components of the former. Furthermore, the positive impact is stronger in countries with limited capital supply and lower levels of financial development, indicating a substitution effect of Fintech credit.

Originality/value – This study advances the finance – innovation literature by offering cross-country evidence on the heterogeneous effects of digital credit on green innovation. By distinguishing Fintech from BigTech credit and analyzing key moderating factors, it clarifies how different digital financial channels and country-specific conditions shape innovation outcomes.

Keywords Fintech, BigTech, Green innovation, Capital supply

Paper type Research article

1. Introduction

With the growing challenges of resource scarcity and climate change, green innovation has become a vital strategy for addressing environmental pressures while enhancing competitiveness. Unlike general innovation, which prioritizes efficiency or profitability without explicit concern for ecological outcomes, green innovation reflects both regulatory adaptation and the imperative of sustainable development [1]. Empirical evidence shows how external pressures redirect innovation: [Newell et al. \(1999\)](#) and [Popp \(2002\)](#) link rising energy prices to shifts toward energy efficiency. [Aghion et al. \(2016\)](#) further demonstrated that carbon taxes can reorient innovation toward clean technologies in the automotive sector.

Fintech has emerged as a pivotal force transforming the financial landscape through digital innovations in financial services ([D'Acunto et al., 2019](#); [Fuster et al., 2019](#); [Vallee and Zeng, 2019](#)). Extensive research has examined the effects of Fintech development on stock returns and financial performance ([Chen et al., 2019](#); [Carlini et al., 2022](#); [Wang et al., 2023](#)). Few

JEL Classification — E51, G23, O31

© Thuy T.C. Tran, Liem Nguyen and Trung K. Do. Published in the *Journal of Economics and Development*. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) license. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this license may be seen at [Link to the terms of the CC BY 4.0 licence](#)

Funding: This research is funded by the University of Economics and Law, Vietnam National University Ho Chi Minh City/VNU-HCM.



Journal of Economics and Development
Vol. 28 No. 2, 2026
pp. 111-127
Emerald Publishing Limited
e-ISSN: 2632-5330
p-ISSN: 1859-0020
DOI 10.1108/JED-05-2025-0177

studies offer insight into how financial technology can support the transition toward sustainability. [Ding et al. \(2022\)](#) provide evidence that digital finance alleviates financing constraints and stimulates firm-level green innovation, primarily in the context of China. This work demonstrates the importance of digital platforms in enabling environmentally oriented technological advancement. Fintech credit is likely to be a significant and relevant factor influencing innovation because it provides capital for corporate investment activities. However, the digital finance index used is quite general and it does not specify several aspects of Fintech credit.

First, we aim to examine the relationship between Fintech credit and green innovation from a cross-country perspective, thereby moving beyond the predominantly single-country evidence available in the current literature. Further, we examine the effect of Fintech credit based on different finer classification schemes. This should allow a more comprehensive assessment of the effect of Fintech credit on green innovation, which has not been dealt with in previous studies.

Second, we investigate the moderating roles of capital supply and financial development in the link between Fintech credit and green innovation. Examining the moderating roles of these factors is crucial because the effectiveness of Fintech credit in fostering green innovation can be conditional on the financing environment. Green R&D and clean technology adoption require long-term, risky and often intangible investments, which are highly sensitive to financing frictions and institutional structures ([Ambec and Lanoie, 2008](#)). Prior work on induced and directed technical change emphasizes that policies and price signals such as carbon taxes or emissions trading do not automatically yield clean innovation unless firms can access adequate external finance to reorient their technological trajectories toward low-carbon activities ([Acemoglu et al., 2016](#)). At the same time, research on financial development and innovation shows that the depth and structure of financial systems shape both the level and composition of innovative activity, implying that identical technological or policy shocks can have heterogeneous effects across countries depending on their financial architecture ([Hsu et al., 2014](#); [Salman and Ismael, 2023](#)).

From a substitution-versus-complementarity perspective, examining capital supply and financial development as moderators allows the present study to identify when Fintech credit genuinely relaxes binding financing constraints, rather than merely reshuffling credit among already well-served borrowers ([Bollaert et al., 2021](#); [Cornelli et al., 2023](#); [Erel and Liebersohn, 2022](#)). By explicitly modeling capital supply and financial development as conditioning factors, the study can offer more insights into the role of Fintech credit across different macroconditions.

Our study contributes to the literature in two ways. First, in the current research, we explicitly build on and extend prior studies (e.g., [Ding et al., 2022](#); [Xia et al., 2022](#)), which provide important insights but often treat Fintech as a unified construct. Indeed, we find that Fintech credit (but not BigTech credit) is positively associated with green innovation at the cross-country level. Additionally, we analyze the components of Fintech credit and discover that not all components have the same effect on green innovation, highlighting the inappropriate treatment of Fintech as a unified proxy. Further, we extend the analysis to a cross-country setting, offering comparative evidence across diverse institutional and financial environments. While most existing studies rely on single-country or regional samples ([Ding et al., 2022](#); [Lin and Ma, 2022](#); [Guo et al., 2023](#); [Salman and Ismael, 2023](#); [Wang et al., 2023](#); [Do, 2024b](#)), international evidence remains limited, thereby constraining the external validity and generalizability of prior findings. By providing cross-country evidence, our study contributes to the emerging literature on the role of digital finance in advancing environmental sustainability and demonstrates that Fintech credit consistently fosters green innovation across varying national contexts. This result aligns with earlier work highlighting the capacity of Fintech to promote sustainable development ([Nassiry, 2019](#); [Li et al., 2023](#)) and to alleviate financing barriers that restrict firms' environmental and social performance ([Mu et al., 2023](#); [Siddik et al., 2023](#)).

More importantly, we extend the literature by documenting a pronounced substitution effect: the positive influence of Fintech credit on green innovation is significantly stronger in countries with restricted capital supply and lower levels of financial development. This pattern

is in line with evidence that Fintech serves as an alternative financing channel in contexts where traditional financial systems are less efficient or inclusive (Li *et al.*, 2020; Arner *et al.*, 2022). It also addresses calls for research on how Fintech can support sustainability in environments characterized by weak financial infrastructure and limited access to green finance (Tao *et al.*, 2022; Trotta *et al.*, 2024). By identifying the institutional conditions under which Fintech credit is most effective, our study advances the understanding of how digital financial innovations can help overcome structural financing frictions and accelerate the transition toward green and sustainable development.

2. Literature review and hypothesis development

2.1 General innovation and green innovation

General innovation refers to new ideas, processes, or technologies that improve efficiency, productivity, or competitiveness across industries. Its primary aim is often economic growth or market advantage, without necessarily considering environmental consequences. For example, in China, the rapid expansion of e-commerce platforms such as Alibaba and JD.com has transformed retail and logistics, yet this is largely market-driven rather than guided by environmental concerns (Zenglein and Holzmann, 2019).

Green innovation, by contrast, emphasizes solutions that protect the environment while still supporting growth. It specifically targets challenges such as climate change, pollution and resource efficiency. For instance, China's "New Energy Demonstration City Policy" (approved by the State Council in 2012) has provided subsidies and regulatory support for renewable energy and electric vehicles, directly stimulating green patents and clean technologies (Zhou *et al.*, 2023). In Vietnam, Decision No. 11/2017/QĐ-TTg and its successor, Decision No. 13/2020/QĐ-TTg, introduced favorable and fixed feed-in tariffs for solar power. These policies encouraged widespread solar energy adoption, particularly among industrial and commercial firms, making solar a leading area of green innovation (Government of Vietnam, 2017, 2020). Unlike general innovation, green innovation is more likely to receive targeted government backing because it aligns with national sustainability commitments as well as with economic development goals.

For firms, green investment decisions are typically made by weighing the economic, environmental and social benefits against the associated costs. The motives for corporate green investment primarily fall into two categories. First, green investment can be a "passive" response to government environmental regulations. Numerous studies suggest that environmental regulation is a key driver for firms to invest in green initiatives (Brown *et al.*, 2022; Dasgupta *et al.*, 2023; Bai and Ru, 2024). When the benefits of environmental compliance outweigh the costs, stringent regulations can incentivize firms to invest in green technologies. Second, green investment can be a "proactive" response, aimed at building a positive social reputation, enhancing environmental responsibility and gaining a competitive edge (Ambec and Lanoie, 2008; Clarkson *et al.*, 2011; Do, 2024b). According to signaling theory (Connelly *et al.*, 2011), proactive environmental strategies send positive signals about a firm's social responsibility and green image (Bénabou and Tirole, 2010; Cheng *et al.*, 2014). By making green investments, firms can convey positive messages to consumers, earn their trust and subsequently improve their business performance.

One factor that facilitates green innovation is the digital transformation of financial services. Ding *et al.* (2023) suggest that digital finance significantly boosts green investments by firms in heavily polluting industries in China from 2011 to 2020. Using the city-level Fintech index, Ding *et al.* (2022) also find that Fintech development promotes lending to Chinese firms and stimulates R&D investment. Xia *et al.* (2022) further showed that Fintech enhances the availability of bank loans, increases capital investment in enterprise innovation and improves firms' resilience. These studies on digital finance often rely on the Digital Inclusive Finance Index, which is based on big data on digital inclusive finance and covers six categories: payment, insurance, monetary funds, investment, credit investigation and credit.

Therefore, this leads to a lack of focus on Fintech credit, which is relevant for providing capital supply for innovation activities.

2.2 Fintech credit and green innovation

Fintech credit refers to credit intermediation facilitated by digital platforms, including peer-to-peer (P2P) lending, marketplace lending and lending provided by big tech firms. Unlike traditional bank lending, which relies heavily on collateral and long-standing credit histories, Fintech credit leverages technology, digital footprints and alternative data to evaluate borrowers and allocate capital. This model has grown rapidly in both advanced and emerging economies, reflecting its role as an increasingly important component of modern financial systems (Cornelli *et al.*, 2023).

Fintech has emerged as a driving force in expanding credit access to underserved borrowers across the market. Cornelli *et al.* (2024) show that platforms like Funding Circle and Lending Club use alternative data to refine credit scoring, enabling loans to small businesses with limited credit history or individuals in high-risk areas. These alternative data sources outperform traditional metrics in assessing risk, predicting defaults and reducing information asymmetry – one of the primary barriers to firms' environmental innovation. Traditional lenders typically view green innovation as risky, long-term and difficult to evaluate, leading to credit rationing. In contrast, digital finance – through the use of alternative data, algorithmic screening and decentralized lending platforms – helps mitigate these information frictions and broadens credit access for environmentally oriented firms. This mechanism aligns with recent evidence that digital finance alleviates corporate financing constraints and enhances Environmental, Social, and Governance (ESG) performance (Mu *et al.*, 2023; Li *et al.*, 2023).

Furthermore, Fintech credit can reduce financial intermediation costs by offering direct platforms for borrowers and lenders (Jagtiani and Lemieux, 2019; Cornelli *et al.*, 2023). Fintech platforms leverage big data, machine learning and AI-driven risk assessment tools to deliver more accurate evaluations of projects (Hasan *et al.*, 2024), including green innovation initiatives whose benefits may not be immediately reflected in traditional financial statements. These technologies enable lenders to assess sustainability performance and environmental risks more effectively (Huang *et al.*, 2023). By improving risk assessment and reducing uncertainty, Fintech lenders are better positioned to identify credible green innovators and allocate resources efficiently, thereby fostering sustainable development.

More strikingly, prior studies show that Fintech lending platforms and traditional banks can coexist and complement each other, catering to customers through distinct channels: banks via traditional channels and Fintech through digital ones (Tang, 2019; Erel and Liebersohn, 2022; Kowalewski and Pisany, 2022). Hence, Fintech credit might contribute to green innovation by increasing financial inclusion and providing alternative funding sources in economies with weak financial systems. This aligns with the observation that Fintech can serve as a substitute for underdeveloped financial markets and expand access to sustainable finance (Li *et al.*, 2020; Arner *et al.*, 2022). Since green innovation is more sensitive to capital scarcity, Fintech credit is especially valuable in contexts with limited capital supply or inadequate banking sector development – conditions under which traditional lenders underinvest in green technologies. In sum, we state the first hypothesis formally as follows:

H1. Fintech credit is positively associated with green innovation.

2.3 The role of capital supply

Prior research suggests that Fintech's role in supporting innovation is particularly salient when traditional sources of capital are scarce (Chen *et al.*, 2019; Nguyen *et al.*, 2025). Ding *et al.* (2022) show that Fintech development disproportionately promotes innovation in financially constrained firms, highlighting its function as a substitute financing channel when capital supply is limited. Bollaert *et al.* (2021) document how crowdfunding and marketplace lending improve

access to finance for small and innovative firms that are often underserved by conventional institutions. Similarly, [Dong and Yu \(2023\)](#) document that the development of Fintech can alleviate firms' financing constraints, which in turn enhances firms' innovation capacity.

In the context of green innovation, where projects frequently require substantial upfront investment, involve delayed returns and carry high uncertainty, these financing functions of Fintech are particularly critical. They can channel funds toward renewable energy, clean technologies and other environmentally sustainable projects that might otherwise be underfunded by traditional banks due to perceived risks. Thus, while the marginal contribution of Fintech credit to green innovation may diminish in capital-abundant environments, its importance becomes pronounced in low-capital settings, where it can directly shape the feasibility and direction of firms' green investment decisions.

We therefore argue that the impact of Fintech credit on green innovation is contingent on the overall availability of capital in a country. When public and private capital supply is abundant, firms already enjoy relatively easier access to finance, thereby reducing the marginal contribution of Fintech credit in alleviating financial constraints. Conversely, in countries where public and private investment in innovation is limited, Fintech credit becomes a critical alternative channel to mobilize resources for green innovation. This logic underpins the following hypothesis:

- H2. The effect of Fintech credit is stronger (weaker) in countries with lower (higher) capital supply.

2.4 The role of financial development

Fintech often benefits from lighter regulatory constraints or "sandbox" environments, allowing for faster and more flexible provision of green financing. This dynamic regulatory landscape can accelerate green innovation by facilitating capital flows into renewable energy, clean technologies and other sustainability-oriented projects ([Fenwick et al., 2018](#)). [Putra and Oktora \(2024\)](#) find that financial inclusion plays a substantial role in supporting green growth in ASEAN countries. [Buchak et al. \(2018\)](#) highlight that Fintech's rapid growth in the US mortgage market is shaped not only by technological advances but also by regulatory arbitrage, a mechanism that could similarly allow green Fintech platforms to bypass barriers faced by conventional lenders.

Therefore, we argue that the effectiveness of Fintech credit in supporting green innovation depends on the overall maturity of the financial system. In well-developed markets, firms benefit from established credit channels, sophisticated financial intermediation and robust regulatory frameworks ([Hsu et al., 2014](#); [Do, 2025](#)), which can reduce the relative importance of Fintech. Conversely, in less developed financial systems, Fintech can compensate for weaknesses in traditional finance and provide access to resources that support innovation. [Cornelli et al. \(2023\)](#) show that Fintech credit complements existing financial structures globally, while [Cevik \(2025\)](#) finds that the growth benefits of digital lending are more pronounced in developing economies than in advanced ones, indicating that Fintech's impact is highly context-dependent. This perspective motivates the following hypothesis:

- H3. The effect of Fintech credit is stronger (weaker) in countries with lower (higher) financial development.

3. Research methodology

3.1 Research sample

The study utilizes a sample that covers 98 countries from 2013 to 2019 [2]. We evaluate newly available data on Fintech credit flow sourced from [Cornelli et al. \(2020\)](#). This data is integrated with other country-level datasets, including those from the Organisation for Economic Co-

operation and Development (OECD), World Bank, International Monetary Fund (IMF), Worldwide Governance Indicators, the Cambridge Centre for Alternative Finance and other sources, as detailed in [Appendix](#): variable definition.

3.2 Empirical model

In this paper, we employ the following baseline model to examine our hypothesis:

$$\text{Green_Innovation}_{it} = \beta_0 + \beta_1 \text{Fintech}_{it} + \text{Controls}_{it} + \varepsilon_{it} \quad (1)$$

where Green_Innovation is the natural logarithm of one plus the number of inventions of total environmental-related technology developed by a country's inventors. Fintech is the natural logarithm of one plus the volume of Fintech credit. We include the volume of big tech credit in control variables. BigTech companies engage in a wide range of business activities, with lending typically representing only a small portion, while their core business operations are generally non-financial in nature. The control variables also include GDPG (annual Gross Domestic Product growth), inflation (annual inflation rate), control for corruption, FDI, stock market (to proxy for the development of the stock market), domestic debt (to proxy for the development of financial markets), international debt (to proxy for the level of financial integration), R&D (to proxy for the intensity of research and development activity) and CO₂ (to proxy for the level of pollution) [3].

GDP growth, inflation, stock market development, domestic debt, external debt and R&D intensity are controlled for because they are structural determinants of green innovation at the country level. Higher GDP growth relaxes budget constraints and increases demand for cleaner technologies, which tends to spur green patenting and eco-innovation activities (Dinda, 2004). Inflation conditions affect the real cost and risk of long-horizon green projects; periods of lower and more stable inflation are associated with stronger investment in sustainability-oriented innovation, whereas high inflation can crowd out green R&D (Chu *et al.*, 2015). Stock market development shapes how capital markets value and finance green patents, so deeper and more liquid markets can amplify the rewards to green innovation and accelerate its diffusion (Chirico *et al.*, 2025). Domestic public debt influences government fiscal space and the ability to subsidize or support green technologies; excessive local government debt has been shown to significantly reduce corporate green innovation by tightening budget constraints (Chen *et al.*, 2022). External debt and associated macrofinancial risks can similarly affect green innovation by altering sovereign risk premia and the availability of external funding for clean technologies, leading highly indebted economies to underinvest in green R&D relative to fundamentals (Borensztein *et al.*, 1998). Finally, R&D expenditure is a direct input into eco innovation, and numerous firm and country-level studies show that higher R&D intensity translates into more green patents and cleaner technologies, making it a core control when explaining cross-country variation in green innovation [4].

Instead of country fixed effects, we include region fixed effects (East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, North America, South Asia and Sub-Saharan Africa). Region fixed effects capture persistent structural similarities across countries within the same geographic and economic blocs, including institutional environments, regulatory frameworks, financial development patterns and innovation ecosystems. Finally, year fixed effects are included to account for common global shocks (e.g., COVID-19 policy shifts and monetary easing), absorbing time-varying unobserved factors affecting all countries uniformly.

4. Results and discussions

4.1 Main results

[Table 1](#) presents the estimation results for Model (1). Column [1] provides baseline estimates without controlling for additional determinants of green innovation. Column [2] introduces

Table 1. Fintech credit and green innovation

Dep. var. =	Green_Innovation		
	[1]	[2]	[3]
Fintech	0.759*** (0.031)	0.607*** (0.034)	0.263*** (0.038)
BigTech			0.033 (0.022)
GDPG			-0.076** (0.032)
Inflation			-0.157 (0.373)
Control Corruption			0.222*** (0.066)
FDI			-0.582 (0.714)
Stock_market			0.418*** (0.080)
Dom_debt			0.951*** (0.180)
Int_debt			0.076 (0.185)
R&D			0.845*** (0.074)
CO2			0.208*** (0.071)
Year FE	NO	YES	YES
Region FE	NO	YES	YES
Number of observations	646	646	646
R-squared	0.388	0.666	0.834

Note(s): This table reports the baseline OLS regression results for the impact of Fintech credit on green innovation. Green_Innovation is calculated as the natural logarithm of one plus the number of inventions of total environmental-related technology developed by the country's inventors. Fintech is calculated as the natural logarithm of one plus the volume of Fintech credit (Cornelli *et al.*, 2020). All other variables are defined in Appendix. Standard errors are robust to heteroskedasticity. ***, ** or * next to the coefficients indicate significance at the 1%, 5% and 10% levels, respectively

region and year fixed effects, while column [3] incorporates all control variables alongside fixed effects. We refrain from including country dummies due to the presence of numerous countries in the sample, while the number of observations is quite limited. Consistently across all models, Fintech exhibits a positive and statistically significant correlation with Green_Innovation at the 1% level. To illustrate the economic significance, consider the coefficient in column [3]: a one standard deviation increase in Fintech credit (equivalent to 2.54 log points) translates into an increase of approximately 0.67 log points in green innovation (0.263×2.54). Relative to the mean of green innovation (4.55), this effect corresponds to about 15% of the average level of environmentally related technological inventions. The results robustly support Hypothesis 1, indicating that Fintech credit plays a facilitating role in promoting environmentally sustainable activities [5].

Innovation projects are characterized by long R&D timelines and high output uncertainty, making them high-risk investments for lenders (Kothari *et al.*, 2002). Fintech credit addresses this issue by utilizing advanced technology to gather information, thereby reducing information asymmetry between borrowers and lenders and facilitating more credit flow into green investments. Moreover, Fintech can eliminate financial intermediation costs by providing direct platforms for borrowers and lenders (Jagtiani and Lemieux, 2019). The development of Fintech enhances the efficiency of financial services (D'Acunto *et al.*, 2019;

Fuster *et al.*, 2019; Vallee and Zeng, 2019). However, the rapid growth of the Fintech industry, coupled with increased use of digital technologies, data centers and cloud computing, may result in a larger environmental footprint, including higher energy consumption and carbon emissions (Mertzanis, 2023). This potential environmental impact could further motivate stakeholders to pursue more green innovation to mitigate the negative effects associated with increased Fintech usage.

It is worth noting that while Fintech credit exhibits a significantly positive relationship with green innovation, BigTech demonstrates no statistically significant impact on green innovation. These findings partially elucidate the differential effects of Fintech and BigTech. BigTech credit is credit provided by big-tech firms, primarily for consumption purposes. Hence, BigTech may exert a substitution rather than a complementary effect in the market. More specifically, while Fintech activities tend to provide supplementary financing for businesses, BigTech is more inclined to replace traditional and even Fintech products. The results in Table 1 align with Erel and Liebersohn (2022) and Kowalewski and Pisany (2022), indicating that Fintech and banking develop in a parallel and complementary manner: as Fintech credit usage increases, so does bank lending. In contrast, BigTech emerges as a substitute, given its stronger competitive advantages in terms of resources, allowing it to fully replace products offered by both Fintech companies and banks.

The results also highlight the importance of country-level heterogeneity. For example, GDP growth (GDPG) enters with a negative and significant coefficient, indicating that higher short-term economic expansion may not always foster green innovation – possibly reflecting a prioritization of conventional, resource-intensive growth strategies in some countries. Conversely, institutional quality, as proxied by corruption control, shows a positive effect, suggesting that Fintech credit contributes more effectively to green innovation in environments where governance structures are stronger and resources are less likely to be diverted. Similarly, stock market development, domestic debt markets and R&D expenditures all emerge as significant positive drivers, underscoring the importance of broader financial and innovation ecosystems in conditioning the Fintech–green innovation nexus.

These patterns also shed light on cross-country dynamics. In countries with mature capital markets and strong governance, Fintech credit likely complements existing financial structures by providing more efficient and targeted funding for green projects. In contrast, in economies with weaker traditional finance or less abundant capital supply, Fintech may serve as a substitute channel, filling gaps left by underdeveloped institutions. This aligns with our moderation hypotheses, which posit that Fintech’s role is more pronounced in financially constrained and institutionally weaker contexts. The subsequent sections will address these issues in detail.

4.2 Components of Fintech credit

In Table 2, we rerun the estimation results of Model (1), with Fintech being refined to its components, including P2P_consumer, P2P_business, P2P_property, BS_consumer, BS_business, BS_property, Debt-based securities and invoice trading. Even though both types of lending, P2P (peer-to-peer lending) and BS (balance sheet lending), apply financial technology, there are fundamental differences between them [6]. P2P lending utilizes a shared economy model for both lending and borrowing, with the platforms themselves not assuming the credit risk involved in lending. In contrast, Fintech balance sheet (FBS) lenders use their own funds to provide loans and either hold them until maturity (thus assuming the credit risk) or sell them to investors. FBS lenders operate through online platforms rather than physical branches, often designed to streamline the process for borrowers, making it as easy, quick and convenient as possible to obtain a credit decision – usually with minimal or no human interaction.

Table 2 reveals that all components of P2P lending exhibit a positive association with green innovation, while only balance sheet lending to consumers and businesses demonstrates a

Table 2. Components of Fintech credit

Dep. var. =	Green_Innovation							
	P2P_ Consumer [1]	P2P_ Business [2]	P2P_ Property [3]	BS_ Consumer [4]	BS_ Business [5]	BS_ Property [6]	Debt- based securities [7]	Invoice trading [8]
Fintech_components =								
Fintech_components	0.081*** (0.013)	0.072*** (0.018)	0.071*** (0.024)	0.078*** (0.029)	0.087*** (0.025)	-0.062*** (0.021)	-0.003 (0.035)	0.092*** (0.023)
BigTech	0.005 (0.020)	0.018 (0.019)	0.024 (0.019)	0.018 (0.020)	0.022 (0.019)	0.040** (0.019)	0.037* (0.019)	0.026 (0.019)
GDPG	-0.029* (0.017)	-0.023 (0.017)	-0.025 (0.016)	-0.021 (0.016)	-0.023 (0.016)	-0.019 (0.017)	-0.020 (0.017)	-0.026 (0.017)
Inflation	-0.052 (0.131)	0.039 (0.125)	-0.044 (0.134)	-0.057 (0.139)	-0.003 (0.129)	-0.041 (0.135)	-0.044 (0.136)	-0.044 (0.135)
Control Corruption	0.354*** (0.063)	0.344*** (0.068)	0.365*** (0.065)	0.374*** (0.064)	0.351*** (0.066)	0.370*** (0.065)	0.372*** (0.065)	0.347*** (0.067)
FDI	0.830** (0.336)	0.672** (0.338)	0.745** (0.342)	0.703** (0.349)	0.703** (0.336)	0.683* (0.370)	0.741** (0.353)	0.706** (0.320)
Stock_market	0.781*** (0.044)	0.765*** (0.044)	0.792*** (0.045)	0.790*** (0.045)	0.785*** (0.044)	0.806*** (0.044)	0.798*** (0.046)	0.775*** (0.045)
Dom_debt	0.338*** (0.079)	0.268*** (0.081)	0.240*** (0.080)	0.264*** (0.082)	0.250*** (0.081)	0.204*** (0.078)	0.228*** (0.077)	0.277*** (0.085)
Int_debt	0.373*** (0.124)	0.273** (0.125)	0.313** (0.126)	0.299** (0.127)	0.261** (0.125)	0.328** (0.134)	0.309** (0.131)	0.230* (0.119)
R&D	0.935*** (0.053)	0.966*** (0.054)	0.959*** (0.052)	0.980*** (0.052)	0.982*** (0.052)	0.993*** (0.052)	0.986*** (0.052)	0.984*** (0.053)
CO2	0.711*** (0.027)	0.715*** (0.028)	0.735*** (0.028)	0.733*** (0.028)	0.718*** (0.028)	0.745*** (0.028)	0.743*** (0.029)	0.715*** (0.028)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Number of observations	474	474	474	474	474	474	474	474
R-squared	0.943	0.941	0.940	0.940	0.941	0.939	0.939	0.941

Note(s): This table reports the regression results for the effect of Fintech credit components (indicated by column headings) on green innovation. All variables are defined in [Appendix](#). Standard errors are robust to heteroskedasticity. ***, ** or * next to the coefficients indicate significance at the 1%, 5% and 10% levels, respectively

positive relationship with green inventions. Conversely, BS_property exhibits a negative correlation with green innovation. This finding aligns with prior evidence showing that property-oriented financing can crowd out investment in innovative activities. Real-estate booms divert capital toward collateral-rich, low-risk property projects, reducing firms' incentives and capacity to engage in long-term R&D. For example, [Hau and Ouyang \(2024\)](#) provide causal evidence that real-estate booms constrain external financing for small manufacturing firms, limiting their ability to invest in innovation. Complementing this, [Wu and Huang \(2025\)](#) demonstrate that policies reducing corporate real-estate involvement lead to significant increases in R&D expenditure, suggesting that property investment directly substitutes for innovation investment. Collectively, these studies indicate that expansion in property-backed lending – such as BS_property – can distort financial allocation toward non-innovative, asset-based sectors, thereby exerting a negative effect on green innovation.

In conclusion, the findings presented in [Table 2](#) offer a nuanced understanding of how different components of Fintech credit impact green innovation. These results provide a foundation for developing more targeted strategies to foster green innovation and environmental sustainability in the future.

4.3 The role of capital supply

Earlier studies examined the impact of financing on firms' R&D investments. For instance, [Brown et al. \(2009\)](#) demonstrated that the availability of internal and external equity financing influences the level of R&D expenditure by young U.S. public firms. They suggest that the significant increase in R&D during the 1990s can largely be attributed to a shift in the supply of finance. In a related study, [Brown et al. \(2012\)](#) found that financial constraints and access to external financing significantly affect R&D investments. [Nguyen et al. \(2025\)](#) show that firms with government connections have greater access to finance than those without such connections and invest more in R&D.

Fintech has played a pivotal role in enhancing capital supply by revolutionizing fundraising processes. Fintech platforms have democratized access to capital, allowing businesses to raise funds from a broader investor base. Specifically, Fintech companies have developed alternative lending models, such as peer-to-peer lending and invoice financing, that cater specifically to the needs of businesses. These platforms often rely on data analytics to assess creditworthiness, enabling lenders to make more informed decisions and extend credit to businesses that might otherwise be overlooked by traditional banks. Moreover, Fintech-powered crowdfunding platforms have provided businesses with an avenue to raise capital directly from investors, bypassing traditional funding channels.

If Fintech credit is associated with an increased capital supply, it is expected to stimulate a greater volume of green innovations. Consequently, the impact of Fintech credit on green innovation should be more pronounced in countries with limited capital supply, as businesses in these regions stand to benefit more significantly from its availability.

We collect data on general government investment (Public_Invest) and private investment (Private_Invest) from the IMF Investment and Capital Stock Dataset. Subsequently, the Fintech variable is interacted with both Public_Invest and Private_Invest, respectively. [Table 3](#) examines the moderating effect of capital supply on the relationship between Fintech credit and green innovation. Individually, both Fintech credit and the two types of investment have positive and significant coefficients, indicating that green innovation requires substantial capital, which can be fulfilled by either Fintech credit or investments from the public or private sector. However, if the country already has an abundant capital supply (in both public and private forms), the role of Fintech credit in mitigating financial constraints is weaker, as evidenced by the negative coefficients of the interaction terms. Conversely, if a country lacks public and private investments, Fintech credit plays a more significant role in stimulating green innovation. Overall, the results in [Table 3](#) again confirm [Hypothesis 2](#), suggesting that

Table 3. Capital supply

Dep. var. =	Green_Innovation [1]	[2]
Fintech	0.213*** (0.041)	0.177*** (0.038)
Fintech × Public_Invest	-0.915*** (0.246)	
Public_Invest	11.579*** (3.098)	
Fintech × Private_Invest		-0.370*** (0.053)
Private_Invest		4.991*** (0.660)
Controls	YES	YES
Year FE	YES	YES
Region FE	YES	YES
Number of observations	631	631
R-squared	0.855	0.872

Note(s): This table presents the cross-sectional results for the impact of capital supply on the relationship between Fintech credit and green innovation. Public_Invest is the general government investment (gross fixed capital formation), in thousands of billions of constant 2017 international dollars. Private_Invest is private investment (gross fixed capital formation), in thousands of billions of constant 2017 international dollars. Standard errors are robust to heteroskedasticity. ***, ** or * next to the coefficients indicates significance at the 1%, 5% and 10% levels, respectively

Fintech credit facilitates easier access to funds and effectively supports increased green innovation.

4.4 The role of financial development

We argue that Fintech credit enhances green innovation by augmenting capital supply. A robust financial system is particularly important for capital allocation. Effectively fostering innovation requires well-functioning financial markets, which are crucial for reducing financing costs and allocating scarce resources (Hsu *et al.*, 2014; Salman and Ismael, 2023; Do, 2025). In addition, Fintech often benefits from lighter regulatory constraints or “sandbox” environments, allowing for faster and more flexible provision of green financing. This dynamic regulatory landscape can accelerate green innovation, especially as RegTech and supportive regulatory ecosystems enhance Fintech development (Fenwick *et al.*, 2018).

To provide a more comprehensive understanding, we examine the impact of Fintech credit on green innovation by considering the level of financial market development. We employ two measures: (1) Financial system’s efficiency (Fin_Efficiency), measured by the logarithm of the total value-traded ratio divided by overhead costs (Levine, 2002); and (2) Financial development (Fin_Development), measured by averaging four indices: the Financial Institutions Depth Index (FID), Financial Institutions Access Index (FIA), Financial Markets Depth Index (FMD) and Financial Markets Access Index (FMA). Higher values of these proxies are associated with countries with more developed financial systems.

Similar to the analysis in Table 3, we regress our measure of green innovation on the interaction between Fintech and proxies for financial development, while controlling for other relevant factors. Table 4 presents the results. We find that the coefficients of Fintech interacted with financial efficiency and financial development are negative and significant at conventional levels. This suggests that Fintech credit is more effective in stimulating innovative activities in countries with less developed financial systems. Conversely, the impact of Fintech on innovation is attenuated in countries with more mature financial sectors.

Table 4. Financial development

Dep. var. =	Green_Innovation [1]	[2]
Fintech	0.465*** (0.076)	0.190*** (0.037)
Fintech × Fin_Efficiency	-0.065*** (0.016)	
Fin_Efficiency	0.016 (0.105)	
Fintech × Fin_Development		-0.101* (0.059)
Fin_Development		2.639*** (0.437)
Controls	YES	YES
Year FE	YES	YES
Region FE	YES	YES
Number of observation	347	623
R-squared	0.931	0.947

Note(s): This table presents the cross-sectional results for the impact of financial development on the relationship between Fintech credit and green innovation. FIN_EFFICIENCY is financial system's efficiency, measured by the logarithm of the total value-traded ratio divided by overhead costs (Levine, 2002). FIN_DEV is financial development, measured by averaging four indices: the Financial Institutions Depth Index (FID), Financial Institutions Access Index (FIA), Financial Markets Depth Index (FMD) and Financial Markets Access Index (FMA). Standard errors are robust to heteroskedasticity. ***, ** or * next to the coefficients indicates significance at the 1%, 5% and 10% levels, respectively

Overall, these findings consistently support our [Hypothesis 3](#), which emphasizes the role of financial development.

5. Conclusions and implications

The problems of resource scarcity and climate change have become more pressing, and humanity has sought green innovation as a means to achieve sustainable growth. Even though innovation has been discussed quite heavily, less attention has been paid to green innovation, which is highly relevant in the context of the modern world. Even though green innovations are essential and bring huge positive externalities, they are long-lasting activities with uncertain returns and high levels of information asymmetry, so managers might be reluctant to embark on green innovations.

Previous research has explored the relationship between Fintech and innovation, often treating Fintech as a broad category and focusing on individual countries. Notably absent from the literature is an investigation of Fintech credit as a catalyst for green innovation, despite its potential as a critical factor in relaxing financing barriers and expanding credit availability. This study fills this research gap by examining the link between Fintech credit and green innovation using a cross-national dataset spanning from 2013 to 2019, thereby enabling a broader understanding of the relationship.

Our findings indicate a positive relationship between Fintech credit and green innovation. We also examine the components of Fintech credit, finding that not all components exert the same effects on green innovation, which validates the need for a component-level analysis of Fintech credit. We further expand the literature by examining the moderating effect of capital supply and financial development on the relationship between Fintech credit and green innovation. The results indicate that the positive effect of Fintech credit on green innovation is stronger (weaker) in countries with lower (higher) levels of capital supply and financial development.

While our findings provide robust evidence that Fintech credit promotes green innovation across countries, some limitations should be noted. Differences in patenting systems may introduce comparability issues in the measurement of green innovation, and Fintech credit data, though standardized by [Cornelli et al. \(2023\)](#), may still face underreporting or classification inconsistencies. Unobserved institutional factors, such as governance quality, cultural attitudes toward risk, or informal financing practices, could also shape both Fintech adoption and innovation outcomes. Moreover, the cross-country observational design constrains causal inference, and firm- or industry-level heterogeneity remains masked in aggregated data. Finally, we would like to add country fixed effects, but the sample is rather small, and this could lead to a significant loss of degrees of freedom. These limitations suggest caution in generalizing results too broadly. Future studies could strengthen causal identification through natural experiments or quasi-experimental approaches. They could also leverage firm-level microdata or regulatory sandbox evaluations to provide more granular insights into how Fintech supports green innovation.

Beyond these limitations, our study offers several implications. Theoretically, it contributes to the financing constraints theory by situating Fintech within the green innovation context, showing that its influence is consistent with easing financing barriers while also operating through mechanisms such as improved risk assessment, capital reallocation, and regulatory flexibility. For policy, the findings suggest differentiated strategies depending on institutional conditions: in countries with limited capital supply, targeted Fintech credit programs for green startups and SMEs are especially valuable; in financially less-developed economies, supportive regulatory frameworks (e.g., regulatory sandboxes for green Fintech solutions, clearer green finance taxonomies, and targeted incentives for digital lenders that prioritize environmentally beneficial projects) can enhance Fintech–green synergies; and in more developed financial systems, Fintech should be positioned as a complement to existing channels, focusing on niches such as ESG-aligned lending and risk-sharing mechanisms. Practically, the results highlight opportunities for Fintech platforms to design green credit products and tools tailored to different institutional contexts, while investors can integrate ESG considerations into platform-based lending to align financial innovation with sustainability goals.

Notes

1. For example, Vietnam's Decisions No. 11/2017/QĐ-TTg and 13/2020/QĐ-TTg offered favorable feed-in tariffs for solar power, triggering a rapid expansion of industrial and commercial solar adoption. Another example is China's "New Energy Demonstration City Policy," which provides subsidies and regulatory support for renewable energy and electric vehicles ([Zhou et al., 2023](#)).
2. A list of countries is provided in the [Supplementary Material, Table S.1](#).
3. FDI inflows are included because they can serve as a channel for technology transfer and knowledge spillovers that support green innovation ([Do, 2024a](#)), while emissions capture the environmental pressures that may drive demand for green technologies ([Li et al., 2024](#)).
4. To save space, we provide descriptive statistics and a correlation matrix in the [Supplementary Material, Tables S.2 and S.3](#), respectively.
5. In the [Supplementary Material, Tables S.4–S.10](#), we apply several robustness checks, including alternative measures of green innovation, alternative regression methods, and alternative samples, and find consistent results. These findings lend strong support to the main hypothesis.
6. Since [Cornelli et al. \(2020\)](#) do not provide the components of Fintech credit, we hand-collect these components from the Cambridge Centre for Alternative Finance at the University of Cambridge.

Supplementary material

The supplementary material for this article can be found online.

References

- Acemoglu, D., Akcigit, U., Hanley, D. and Kerr, W. (2016), "Transition to clean technology", *Journal of Political Economy*, Vol. 124 No. 1, pp. 52-104, doi: [10.1086/684511](https://doi.org/10.1086/684511).
- Aghion, P., Dechezleprêtre, A., Hemous, D., Martin, R. and Van Reenen, J. (2016), "Carbon taxes, path dependency, and directed technical change: evidence from the auto industry", *Journal of Political Economy*, Vol. 124 No. 1, pp. 1-51, doi: [10.1086/684581](https://doi.org/10.1086/684581).
- Ambec, S. and Lanoie, P. (2008), "Does it pay to be green? A systematic overview", *The Academy of Management Perspectives*, Vol. 22 No. 4, pp. 45-62.
- Arner, D., Buckley, R., Charamba, K., Sergeev, A. and Zetsche, D. (2022), "Governing FinTech 4.0: BigTech, platform finance, and sustainable development", *Fordham Journal of Corporate and Financial Law*, Vol. 27 No. 1, pp. 1-71.
- Bai, J. and Ru, H. (2024), "Carbon emissions trading and environmental protection: international evidence", *Management Science*, Vol. 70 No. 7, pp. 4593-4603, doi: [10.1287/mnsc.2023.03143](https://doi.org/10.1287/mnsc.2023.03143).
- Bénabou, R. and Tirole, J. (2010), "Individual and corporate social responsibility", *Economica*, Vol. 77 No. 305, pp. 1-19, doi: [10.1111/j.1468-0335.2009.00843.x](https://doi.org/10.1111/j.1468-0335.2009.00843.x).
- Bollaert, H., Lopez-de-Silanes, F. and Schwienbacher, A. (2021), "Fintech and access to finance", *Journal of Corporate Finance*, Vol. 68, 101941, doi: [10.1016/j.jcorpfin.2021.101941](https://doi.org/10.1016/j.jcorpfin.2021.101941).
- Borensztein, E., De Gregorio, J. and Lee, J.W. (1998), "How does foreign direct investment affect economic growth?", *Journal of International Economics*, Vol. 45 No. 1, pp. 115-135, doi: [10.1016/s0022-1996\(97\)00033-0](https://doi.org/10.1016/s0022-1996(97)00033-0).
- Brown, J.R., Fazzari, S.M. and Petersen, B.C. (2009), "Financing innovation and growth: cash flow, external equity, and the 1990s R&D boom", *The Journal of Finance*, Vol. 64 No. 1, pp. 151-185.
- Brown, J.R., Martinsson, G. and Petersen, B.C. (2012), "Do financing constraints matter for R&D?", *European Economic Review*, Vol. 56 No. 8, pp. 1512-1529.
- Brown, J.R., Martinsson, G. and Thomann, C. (2022), "Can environmental policy encourage technical change? Emissions taxes and R&D investment in polluting firms", *The Review of Financial Studies*, Vol. 35 No. 10, pp. 4518-4560.
- Buchak, G., Matvos, G., Piskorski, T. and Seru, A. (2018), "Fintech, regulatory arbitrage, and the rise of shadow banks", *Journal of Financial Economics*, Vol. 130 No. 3, pp. 453-483, doi: [10.1016/j.jfineco.2018.03.011](https://doi.org/10.1016/j.jfineco.2018.03.011).
- Carlini, F., Del Gaudio, B.L., Porzio, C. and Previtali, D. (2022), "Banks, FinTech and stock returns", *Finance Research Letters*, Vol. 45, 102252, doi: [10.1016/j.frl.2021.102252](https://doi.org/10.1016/j.frl.2021.102252).
- Cevik, S. (2025), "Is Schumpeter right? Fintech and economic growth", *Economics of Innovation and New Technology*, Vol. 34 No. 7, pp. 1095-1106, doi: [10.5089/9798400266324.001](https://doi.org/10.5089/9798400266324.001).
- Chen, M.A., Wu, Q. and Yang, B. (2019), "How valuable is FinTech innovation?", *The Review of Financial Studies*, Vol. 32 No. 5, pp. 2062-2106, doi: [10.1093/rfs/hhy130](https://doi.org/10.1093/rfs/hhy130).
- Chen, W., Zhu, Y., He, Z. and Yang, Y. (2022), "The effect of local government debt on green innovation", *Pacific-Basin Finance Journal*, Vol. 73, 101760, doi: [10.1016/j.pacfin.2022.101760](https://doi.org/10.1016/j.pacfin.2022.101760).
- Cheng, B., Ioannou, I. and Serafeim, G. (2014), "Corporate social responsibility and access to finance", *Strategic Management Journal*, Vol. 35 No. 1, pp. 1-23, doi: [10.1002/smj.2131](https://doi.org/10.1002/smj.2131).
- Chirico, F., Eddleston, K.A. and Patel, P. (2025), "Does it pay to patent green innovations? Stock market reactions to family and nonfamily firms' green patents", *Journal of Business Ethics*, Vol. 198 No. 4, pp. 947-970, doi: [10.1007/s10551-025-05942-w](https://doi.org/10.1007/s10551-025-05942-w).
- Chu, A.C., Cozzi, G. and Galli, S. (2015), "Inflation and R&D investment in Schumpeterian growth models", *Journal of Economic Dynamics and Control*, Vol. 52, pp. 218-234.
- Clarkson, P.M., Li, Y., Richardson, G.D. and Vasvari, F.P. (2011), "Does it really pay to be green? Determinants and consequences of proactive environmental strategies", *Journal of Accounting and Public Policy*, Vol. 30 No. 2, pp. 122-144, doi: [10.1016/j.jaccpubpol.2010.09.013](https://doi.org/10.1016/j.jaccpubpol.2010.09.013).
- Connelly, B.L., Certo, S.T., Ireland, R.D. and Reutzel, C.R. (2011), "Signaling theory: a review and assessment", *Journal of Management*, Vol. 37 No. 1, pp. 39-67, doi: [10.1177/0149206310388419](https://doi.org/10.1177/0149206310388419).

- Cornelli, G., Frost, J., Gambacorta, L., Rau, R., Wardrop, R. and Ziegler, T. (2020), "Fintech and big tech credit: a new database", BIS Working Paper No. 887.
- Cornelli, G., Frost, J., Gambacorta, L., Rau, P.R., Wardrop, R. and Ziegler, T. (2023), "Fintech and big tech credit: drivers of the growth of digital lending", *Journal of Banking and Finance*, Vol. 148, 106742, doi: [10.1016/j.jbankfin.2022.106742](https://doi.org/10.1016/j.jbankfin.2022.106742).
- Cornelli, G., Frost, J., Gambacorta, L. and Jagtiani, J. (2024), "The impact of fintech lending on credit access for US small businesses", *Journal of Financial Stability*, Vol. 73, 101290, doi: [10.1016/j.jfs.2024.101290](https://doi.org/10.1016/j.jfs.2024.101290).
- Dasgupta, S., Huynh, T.D. and Xia, Y. (2023), "Joining forces: the spillover effects of EPA enforcement actions and the role of socially responsible investors", *The Review of Financial Studies*, Vol. 36 No. 9, pp. 3781-3824, doi: [10.1093/rfs/hhad015](https://doi.org/10.1093/rfs/hhad015).
- Dinda, S. (2004), "Environmental Kuznets curve hypothesis: a survey", *Ecological Economics*, Vol. 49 No. 4, pp. 431-455, doi: [10.1016/j.ecolecon.2004.02.011](https://doi.org/10.1016/j.ecolecon.2004.02.011).
- Ding, N., Gu, L. and Peng, Y. (2022), "Fintech, financial constraints and innovation: evidence from China", *Journal of Corporate Finance*, Vol. 73, 102194, doi: [10.1016/j.jcorpfin.2022.102194](https://doi.org/10.1016/j.jcorpfin.2022.102194).
- Ding, Q., Huang, J. and Chen, J. (2023), "Does digital finance matter for corporate green investment? Evidence from heavily polluting industries in China", *Energy Economics*, Vol. 117, 106476, doi: [10.1016/j.eneco.2022.106476](https://doi.org/10.1016/j.eneco.2022.106476).
- Do, T.K. (2024a), "Foreign ownership and green innovation", *Economics Letters*, Vol. 237, 111637, doi: [10.1016/j.econlet.2024.111637](https://doi.org/10.1016/j.econlet.2024.111637).
- Do, T.K. (2024b), "Asset redeployability and green innovation", *Journal of Financial Stability*, Vol. 72, 101270, doi: [10.1016/j.jfs.2024.101270](https://doi.org/10.1016/j.jfs.2024.101270).
- Do, T.K. (2025), "Cross-listing, innovation and the role of nation-level institutions", *Journal of Financial Stability*, Vol. 80, 101457, doi: [10.1016/j.jfs.2025.101457](https://doi.org/10.1016/j.jfs.2025.101457).
- Dong, X. and Yu, M. (2023), "Does Fintech development facilitate firms' innovation? Evidence from China", *International Review of Financial Analysis*, Vol. 89, 102805, doi: [10.1016/j.irfa.2023.102805](https://doi.org/10.1016/j.irfa.2023.102805).
- D'Acunto, F., Prabhala, N. and Rossi, A.G. (2019), "The promises and pitfalls of robo-advising", *The Review of Financial Studies*, Vol. 32 No. 5, pp. 1983-2020, doi: [10.1093/rfs/hhz014](https://doi.org/10.1093/rfs/hhz014).
- Erel, I. and Liebersohn, J. (2022), "Can fintech reduce disparities in access to finance? Evidence from the paycheck protection program", *Journal of Financial Economics*, Vol. 146 No. 1, pp. 90-118, doi: [10.1016/j.jfineco.2022.05.004](https://doi.org/10.1016/j.jfineco.2022.05.004).
- Fenwick, M., Vermeulen, E.P. and Corrales, M. (2018), "Business and regulatory responses to artificial intelligence: dynamic regulation, innovation ecosystems and the strategic management of disruptive technology", in *Robotics, AI and the Future of Law*, Springer Singapore, pp. 81-103.
- Fuster, A., Plosser, M., Schnabl, P. and Vickery, J. (2019), "The role of technology in mortgage lending", *The Review of Financial Studies*, Vol. 32 No. 5, pp. 1854-1899, doi: [10.1093/rfs/hhz018](https://doi.org/10.1093/rfs/hhz018).
- Government of Vietnam (2017), "Decision No. 11/2017/QĐ-TTg on the mechanism for encouraging the development of solar power projects in Vietnam".
- Government of Vietnam (2020), "Decision No. 13/2020/QĐ-TTg on the mechanism for encouraging the development of solar power in Vietnam".
- Guo, J., Fang, H., Liu, X., Wang, C. and Wang, Y. (2023), "Fintech and financing constraints of enterprises: evidence from China", *Journal of International Financial Markets, Institutions and Money*, Vol. 82, 101713, doi: [10.1016/j.intfin.2022.101713](https://doi.org/10.1016/j.intfin.2022.101713).
- Hasan, I., Kwak, B. and Li, X. (2024), "Financial technologies and the effectiveness of monetary policy transmission", *European Economic Review*, Vol. 161, 104650, doi: [10.1016/j.eurocorev.2023.104650](https://doi.org/10.1016/j.eurocorev.2023.104650).
- Hau, H. and Ouyang, D. (2024), "Can real estate booms hurt firms? Evidence on investment substitution", *Journal of Urban Economics*, Vol. 144, 103695, doi: [10.1016/j.jue.2024.103695](https://doi.org/10.1016/j.jue.2024.103695).
- Hsu, P.H., Tian, X. and Xu, Y. (2014), "Financial development and innovation: cross-country evidence", *Journal of Financial Economics*, Vol. 112 No. 1, pp. 116-135, doi: [10.1016/j.jfineco.2013.12.002](https://doi.org/10.1016/j.jfineco.2013.12.002).

- Huang, A.H., Wang, H. and Yang, Y. (2023), "FinBERT: a large language model for extracting information from financial text", *Contemporary Accounting Research*, Vol. 40 No. 2, pp. 806-841, doi: [10.1111/1911-3846.12832](https://doi.org/10.1111/1911-3846.12832).
- Jagtiani, J. and Lemieux, C. (2019), "The roles of alternative data and machine learning in fintech lending: evidence from the LendingClub consumer platform", *Financial Management*, Vol. 48 No. 4, pp. 1009-1029, doi: [10.1111/fima.12295](https://doi.org/10.1111/fima.12295).
- Kothari, S., Laguerre, T.E. and Leone, A.J. (2002), "Capitalization versus expensing: evidence on the uncertainty of future earnings from capital expenditures versus R&D outlays", *Review of Accounting Studies*, Vol. 7 No. 4, pp. 355-382.
- Kowalewski, O. and Pisany, P. (2022), "Banks' consumer lending reaction to fintech and bigtech credit emergence in the context of soft versus hard credit information processing", *International Review of Financial Analysis*, Vol. 81, 102116, doi: [10.1016/j.irfa.2022.102116](https://doi.org/10.1016/j.irfa.2022.102116).
- Levine, R. (2002), "Bank-based or market-based financial systems: which is better?", *Journal of Financial Intermediation*, Vol. 11 No. 4, pp. 398-428, doi: [10.1006/jfin.2002.0341](https://doi.org/10.1006/jfin.2002.0341).
- Li, J., Wu, Y. and Xiao, J.J. (2020), "The impact of digital finance on household consumption: evidence from China", *Economic Modelling*, Vol. 86, pp. 317-326, doi: [10.1016/j.econmod.2019.09.027](https://doi.org/10.1016/j.econmod.2019.09.027).
- Li, B., Du, J., Yao, T. and Wang, Q. (2023), "FinTech and corporate green innovation: an external attention perspective", *Finance Research Letters*, Vol. 58, 104661, doi: [10.1016/j.frl.2023.104661](https://doi.org/10.1016/j.frl.2023.104661).
- Li, W., Neupane, S. and Tan, K. (2024), "Toxic emissions and corporate green innovation", *Presented at American Finance Association (AFA) 2023 PhD Student Poster Session*, New Orleans.
- Lin, B. and Ma, R. (2022), "How does digital finance influence green technology innovation in China? Evidence from the financing constraints perspective", *Journal of Environmental Management*, Vol. 320, 115833, doi: [10.1016/j.jenvman.2022.115833](https://doi.org/10.1016/j.jenvman.2022.115833).
- Mertzanis, C. (2023), "FinTech finance and social-environmental performance around the world", *Finance Research Letters*, Vol. 56, 104107, doi: [10.1016/j.frl.2023.104107](https://doi.org/10.1016/j.frl.2023.104107).
- Mu, W., Liu, K., Tao, Y. and Ye, Y. (2023), "Digital finance and corporate ESG", *Finance Research Letters*, Vol. 51, 103426, doi: [10.1016/j.frl.2022.103426](https://doi.org/10.1016/j.frl.2022.103426).
- Nassiry, D. (2019), "The role of fintech in unlocking green finance", in *Handbook of Green Finance*, Springer Singapore, pp. 315-336.
- Newell, R.G., Jaffe, A.B. and Stavins, R.N. (1999), "The induced innovation hypothesis and energy-saving technological change", *The Quarterly Journal of Economics*, Vol. 114 No. 3, pp. 941-975, doi: [10.1162/003355399556188](https://doi.org/10.1162/003355399556188).
- Nguyen, H.T., Dang, T.T., Nguyen, D.N. and Truong, Q.T. (2025), "Do government connections improve or impede small businesses' innovation?", *Journal of Economics and Development*, Vol. 27 No. 3, pp. 210-232, doi: [10.1108/jed-08-2024-0286](https://doi.org/10.1108/jed-08-2024-0286).
- Popp, D. (2002), "Induced innovation and energy prices", *American Economic Review*, Vol. 92 No. 1, pp. 160-180, doi: [10.1257/000282802760015658](https://doi.org/10.1257/000282802760015658).
- Putra, A.A.K.A.D. and Oktora, S.I. (2024), "The effect of financial inclusion and economic integration on green growth in ASEAN", *Journal of Economics and Development*, Vol. 26 No. 3, pp. 189-205, doi: [10.1108/jed-09-2023-0169](https://doi.org/10.1108/jed-09-2023-0169).
- Salman, D. and Ismael, D. (2023), "The effect of digital financial inclusion on the green economy: the case of Egypt", *Journal of Economics and Development*, Vol. 25 No. 2, pp. 120-133, doi: [10.1108/jed-05-2022-0087](https://doi.org/10.1108/jed-05-2022-0087).
- Siddik, A.B., Rahman, M.N. and Yong, L. (2023), "Do fintech adoption and financial literacy improve corporate sustainability performance? The mediating role of access to finance", *Journal of Cleaner Production*, Vol. 421, 137658, doi: [10.1016/j.jclepro.2023.137658](https://doi.org/10.1016/j.jclepro.2023.137658).
- Tang, H. (2019), "Peer-to-peer lenders versus banks: substitutes or complements?", *The Review of Financial Studies*, Vol. 32 No. 5, pp. 1900-1938, doi: [10.1093/rfs/hhy137](https://doi.org/10.1093/rfs/hhy137).
- Tao, R., Su, C.W., Naqvi, B. and Rizvi, S.K.A. (2022), "Can Fintech development pave the way for a transition towards low-carbon economy: a global perspective", *Technological Forecasting and Social Change*, Vol. 174, 121278, doi: [10.1016/j.techfore.2021.121278](https://doi.org/10.1016/j.techfore.2021.121278).

-
- Trotta, A., Rania, F. and Strano, E. (2024), “Exploring the linkages between FinTech and ESG: a bibliometric perspective”, *Research in International Business and Finance*, Vol. 69, 102200, doi: [10.1016/j.ribaf.2023.102200](https://doi.org/10.1016/j.ribaf.2023.102200).
- Vallee, B. and Zeng, Y. (2019), “Marketplace lending: a new banking paradigm?”, *The Review of Financial Studies*, Vol. 32 No. 5, pp. 1939-1982, doi: [10.1093/rfs/hhy100](https://doi.org/10.1093/rfs/hhy100).
- Wang, X., Cao, Y., Feng, Z., Lu, M. and Shan, Y. (2023), “Local FinTech development and stock price crash risk”, *Finance Research Letters*, Vol. 53, 103644, doi: [10.1016/j.frl.2023.103644](https://doi.org/10.1016/j.frl.2023.103644).
- Wu, Y. and Huang, W. (2025), “De-financialization and enterprise innovation: quasi-natural experimental evidence from China’s real estate regulation”, *International Review of Economics and Finance*, Vol. 101, 104244, doi: [10.1016/j.iref.2025.104244](https://doi.org/10.1016/j.iref.2025.104244).
- Xia, Y., Qiao, Z. and Xie, G. (2022), “Corporate resilience to the COVID-19 pandemic: the role of digital finance”, *Pacific-Basin Finance Journal*, Vol. 74, 101791, doi: [10.1016/j.pacfin.2022.101791](https://doi.org/10.1016/j.pacfin.2022.101791).
- Zenglein, M.J. and Holzmann, A. (2019), “Evolving made in China 2025”, *MERICS Papers on China*, Vol. 8, p. 78.
- Zhou, A., Wang, S. and Chen, B. (2023), “Impact of new energy demonstration city policy on energy efficiency: evidence from China”, *Journal of Cleaner Production*, Vol. 422, 138560, doi: [10.1016/j.jclepro.2023.138560](https://doi.org/10.1016/j.jclepro.2023.138560).

Further reading

- Hassler, J., Krusell, P. and Olovsson, C. (2012), “Energy-saving technical change”, NBER Working Paper No. w18456.

Corresponding author

Liem Nguyen can be contacted at: liemnt@uel.edu.vn