



ESG PERFORMANCE AND THE GREEN FINANCE ECOSYSTEM: A SYSTEMATIC REVIEW OF GREEN CREDIT, RECIPROCAL MECHANISMS, AND GEOGRAPHIC CONCENTRATION

Desempenho ESG e o ecossistema de finanças verdes: uma revisão sistemática do crédito verde, mecanismos recíprocos e concentração geográfica

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ABSTRACT

Green credit has become a central financial instrument for channeling capital toward environmentally responsible economic activity, and corporate ESG performance is increasingly used by financial institutions to assess counterparty risk. Yet whether these two constructs form a genuinely reciprocal relationship, and how this relationship is embedded within the broader green finance ecosystem, remains inconsistently understood. This study conducts a PRISMA 2020-guided systematic review of the Scopus database, screening 802 records against pre-registered eligibility criteria to identify 383 eligible studies published between 2017 and 2026. Bibliometric analysis reveals a rapidly expanding literature, with 68.1% of the corpus published in the two most recent years, alongside pronounced geographic concentration: 72.3% of studies originate from Chinese institutions, and difference-in-differences designs anchored to China's 2012 Green Credit Guidelines dominate the methodology. A three-topic model identifies distinct thematic clusters spanning ESG disclosure and greenwashing, green finance policy and digital transformation, and banking governance. Manual reading-based coding of all included studies further reveals that only 66 studies (17.2%) directly test a green credit–ESG relationship, while the remaining majority examine ESG performance in relation to adjacent ecosystem constructs, including green innovation, governance, and digital transformation. These findings substantiate a directionality imbalance: reverse-pathway evidence, in which ESG performance shapes financing outcomes, is considerably thinner and less green-credit-specific than forward-pathway evidence. The review provides a systematic mapping of this literature's structure, geographic concentration, and methodological orientation, establishing a foundation for a forthcoming thematic synthesis addressing the field's core directionality and generalizability gaps.

Keywords: *Green Credit; ESG Performance; Green Finance Ecosystem; Directionality; Systematic Literature Review (PRISMA)*

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DESEMPENHO ESG E O ECOSSISTEMA DE FINANÇAS VERDES: UMA REVISÃO SISTEMÁTICA DO CRÉDITO VERDE, MECANISMOS RECÍPROCOS E CONCENTRAÇÃO GEOGRÁFICA

*ESG performance and the green finance ecosystem: a systematic review of green credit, reciprocal mechanisms,
and geographic concentration*

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RESUMO

O crédito verde tornou-se um instrumento financeiro central para canalizar capital para atividades econômicas ambientalmente responsáveis, e o desempenho ESG corporativo é cada vez mais utilizado por instituições financeiras para avaliar o risco de contraparte. No entanto, a existência de uma relação genuinamente recíproca entre esses dois conceitos e a forma como essa relação se insere no ecossistema mais amplo das finanças verdes ainda são questões pouco compreendidas. Este estudo realiza uma revisão sistemática da base de dados Scopus, guiada pelo PRISMA 2020, selecionando 802 registros com base em critérios de elegibilidade pré-estabelecidos para identificar 383 estudos elegíveis publicados entre 2017 e 2026. A análise bibliométrica revela uma literatura em rápida expansão, com 68,1% do corpus publicado nos dois anos mais recentes, além de uma acentuada concentração geográfica: 72,3% dos estudos são originários de instituições chinesas, e os modelos de diferenças em diferenças, ancorados nas Diretrizes de Crédito Verde da China de 2012, predominam na metodologia. Um modelo de três tópicos identifica distintos agrupamentos temáticos que abrangem divulgação ESG e greenwashing, política de finanças verdes e transformação digital, e governança bancária. A codificação manual, baseada na leitura de todos os estudos incluídos, revela ainda que apenas 66 estudos (17,2%) testam diretamente a relação entre crédito verde e ESG, enquanto a maioria restante examina o desempenho ESG em relação a construtos ecossistêmicos adjacentes, incluindo inovação verde, governança e transformação digital. Essas descobertas corroboram um desequilíbrio direcional: as evidências de trajetória reversa, em que o desempenho ESG influencia os resultados do financiamento, são consideravelmente mais escassas e menos específicas para crédito verde do que as evidências de trajetória direta. A revisão fornece um mapeamento sistemático da estrutura, concentração geográfica e orientação metodológica dessa literatura, estabelecendo uma base para uma futura síntese temática que abordará as principais lacunas de direcionalidade e generalização do campo.

Palavras-chave: Crédito Verde; Desempenho ESG; Ecossistema de Finanças Verdes; Direcionalidade; Revisão Sistemática da Literatura (PRISMA)

INTRODUCTION

Green credit has emerged as one of the principal financial instruments through which the banking sector channels capital toward environmentally responsible economic activity, reflecting the broader view that finance can internalize environmental externalities that markets would otherwise disregard (Jiang et al., 2022) (Sikandar et al., 2026a). Since China's Banking Regulatory Commission introduced its Green Credit Guidelines in 2012, requiring banks to factor firms' environmental risk directly into loan-approval decisions (Li et al., 2022), the policy has repeatedly served as a natural experiment for studying how differentiated credit access can constrain polluting firms and incentivize environmentally responsible investment (Chen et al., 2022; Jiang et al., 2022). At the same time, corporate ESG performance has become an important criterion by which financial institutions assess counterparty risk: European evidence indicates that stronger ESG scores are associated with lower bank fragility during periods of financial distress (Chiaramonte et al., 2022), while sovereign-level ESG performance has been linked to corporate investment decisions more broadly (Zhang et al., 2022) (Qureshi & Khan, 2026). Green credit and ESG performance are therefore not independent policy instruments but plausibly form a mutually reinforcing system: green credit policy can be expected to raise firms' ESG performance by tightening financing conditions attached to environmentally harmful activity (Wang et al., 2022), while, in turn, firms' ESG performance may function as a signal that shapes how banks allocate green credit and price risk (Xue & Geng, 2026) (Qureshi et al., 2025). Understanding this reciprocal relationship carries direct significance for regulators calibrating green credit policy, for banks integrating ESG criteria into lending decisions, and for firms navigating the cost and availability of capital within an increasingly climate-conscious financial system (Abdul Kohar et al., 2026).

Research into this relationship has evolved considerably over the past decade. Early empirical work concentrated almost exclusively on the effect of green credit policy on narrowly defined firm-level environmental or innovation outcomes, typically using China's 2012 Green Credit Guidelines as a difference-in-differences (DID) identification strategy (Chen et al., 2022; Jiang et al., 2022). These studies established that green credit could constrain financing for polluting industries and, in some contexts, stimulate low-carbon technology innovation, but they largely treated environmental performance as a standalone outcome rather than situating it within the broader ESG construct. It was only from around 2022 onward that the literature began reframing the dependent variable in terms of composite ESG performance rather than environmental performance alone (Li et al., 2022; Wang et al., 2022), reflecting the wider adoption of standardized ESG rating systems for benchmarking corporate sustainability (Sikandar et al., 2026b). Lei et al. (2023) explicitly observed that the extant literature had "largely overlooked" how green credit policy affects corporate ESG performance, marking an inflection point after which a rapidly growing stream of DID- and panel-based studies began testing this relationship directly.

The literature has since diversified along two fronts. First, a small but growing number of studies have begun testing the reverse pathway whether ESG performance itself shapes firms' cost of capital or their access to green credit rather than treating green credit as the sole causal driver. Vezeteu et al. (2025) apply a structural equation model to the ESG–cost of capital relationship, while Xue and Geng (2026) examine directly whether ESG performance functions as a credible signal in banks' green credit allocation decisions. Second, the field has increasingly turned to the mechanisms and boundary conditions underlying the relationship, incorporating moderators such as artificial intelligence, digital transformation, and financial technology. Recent studies examine how AI-based quantification methods capture corporate green transformation (Qin & Zhang, 2026), how digital transformation interacts with ESG performance to shape corporate decarbonization (Sun et al., 2026), and how FinTech adoption conditions the strength of the ESG-disclosure relationship across institutional contexts (Goel & Kashiramka, 2026). A parallel and increasingly prominent debate concerns whether green credit policy's effect on ESG performance is substantive or symbolic: while several studies report that green credit policy enhances ESG performance through financing-constraint and innovation-compensation channels, Liao and Zhou (2024) report the opposite, finding that green credit policy significantly hinders the ESG performance of polluting enterprises through a countervailing mechanism, and a related stream of work examines green credit's interaction with greenwashing behavior directly (Pan & Lin, 2025; Zhang, 2024) (Khan, Sikandar, Falahat, Alsaad, et al., 2026). Rather than being resolved, this contradiction appears to be actively shaping the current research frontier.

Despite this rapid growth, three gaps remain unaddressed by the existing literature, including by reviews that already exist in adjacent areas. Manurung et al. (2024) conducted a systematic review of ESG performance as

a determinant of sustainable bank lending and explicitly noted that findings on ESG's influence remain divided some studies report a positive effect, others a negative effect, and others no effect at all without resolving why. Thomas et al. (2024) provide a bibliometric mapping of the broader ESG-in-finance research landscape but do not isolate green credit as a distinct construct, nor do they code studies by the direction of causality tested. To date, no existing review has systematically synthesized studies according to whether they test the forward pathway (green credit → ESG performance), the reverse pathway (ESG performance → cost of capital or credit access), or genuine bidirectionality.

Second, the reverse pathway remains comparatively underdeveloped in volume and, by the admission of authors working directly in this space, in evidentiary strength. Xue and Geng (2026) similarly observe that little is currently known about whether ESG disclosure functions as a dependable input into banks' green lending decisions, in terms of either the scale or the structure of the credit extended. Vezeteu et al. (2025) likewise point out that direct empirical tests of how ESG scores relate to the cost of capital remain limited and inconsistent in their conclusions. Third, the eligible literature is heavily concentrated both geographically and methodologically: 267 of the 383 studies meeting this review's inclusion criteria (69.7%) are set in a Chinese institutional context, and 158 (41.2%) rely on difference-in-differences or other quasi-natural-experiment designs anchored to China's 2012 Green Credit Guidelines. This concentration raises legitimate questions about the generalizability of the field's core findings to other regulatory and financial-market contexts a limitation not yet addressed through systematic synthesis.

This review addresses these gaps through three specific objectives:

1. To systematically map and synthesize the mechanisms through which green credit policy influences corporate ESG performance specifically, and through which the broader green finance ecosystem (green innovation, governance, digital transformation) relates to ESG performance more generally, including the contradictory enhancing and crowding-out effects reported in the literature.

2. To synthesize the evidence on the reverse pathway how corporate ESG performance shapes financing outcomes, including but not limited to the cost of capital and access to green credit specifically and to assess its volume and methodological rigor relative to the forward-pathway literature.

3. To identify and synthesize the moderating and mediating mechanisms (including artificial intelligence, digital transformation, government policy, and financing constraints) reported across the ESG–green finance ecosystem, and to propose an integrative conceptual framework and future research agenda that explicitly addresses the directionality imbalance and the geographic and methodological concentration identified in this review.

1 METHODOLOGY

Research Design

This study employs a systematic literature review (SLR) design guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) statement (Page et al., 2021) (Khan, Sikandar, Falahat, Akhtar, et al., 2026). A structured protocol was developed prior to data collection, specifying the database, search strategy, eligibility criteria, screening procedure, and data extraction plan used to synthesize the existing evidence on the reciprocal relationship between green credit and corporate environmental, social, and governance (ESG) performance. Given the methodological, contextual, and measurement heterogeneity observed across the identified studies, the review is conducted as a structured narrative synthesis organized around the direction of the relationship examined (forward, reverse, or bidirectional), rather than as a meta-analysis of pooled effect sizes.

Database and Search Strategy

Scopus (Elsevier) was selected as the bibliographic database for this review. Scopus was chosen for its broad, multidisciplinary indexing of peer-reviewed business, economics, and finance journals and its widespread use in comparable green finance and ESG systematic reviews (Hassan, 2026; Khan & Shahid, 2026).

The search was conducted on 10 July 2026. The following search string was applied to the title, abstract, and keyword fields:

```
("green credit" OR "green loan*" OR "green lending" OR "green credit polic*"
OR "green credit guideline*" )
AND TITLE-ABS-KEY ( "ESG" OR "environmental, social" OR "environmental social
governance" OR "ESG performance" OR "ESG rating*" OR "ESG disclosure" )
```

This initial string returned 1,307 records. The result set was then narrowed using Scopus's native filtering functionality, applied sequentially as summarized in Table 1.

Table 1 - Sequential Application of Scopus Database Filters

Filter Applied	Records Remaining	Field
Initial search string (title/abstract/keyword)	1,307	—
Publication timespan restricted to 2017–2026	1,303	Year
Subject area restricted to Economics, Econometrics and Finance; Business, Management and Accounting; Environmental Science; Social Sciences	1,176	Subject Area
Document type restricted to Article and Review	941	Document Type
Publication stage restricted to Final	808	Publication Stage
Language restricted to English	802	Language

The resulting 802 records were exported in CSV format (including title, abstract, author and index keywords, source title, year, citation count, and DOI) and carried forward into the screening procedure described. Eligibility Criteria

Table 2 summarizes the inclusion and exclusion criteria applied during screening, developed prior to data collection and applied without modification throughout the review.

Table 2 - Inclusion and Exclusion Criteria

Criterion	Include	Exclude
Publication type	Peer-reviewed journal articles and reviews	Conference papers, theses, books, editorials, working papers
Language	English	Non-English
Time frame	2017–2026	Outside this range
Topical focus	Examines ESG performance in relation to green credit specifically, OR in relation to the broader green finance ecosystem (green innovation, governance, digital transformation, financial performance, disclosure credibility), evidenced by relationship language (e.g., "impact of," "effect,"	Green credit and ESG terms co-mentioned only incidentally, with no examined relationship

Criterion	Include	Exclude
	"enhances," "nexus") [scope broadened post-coding; see Section 4.6]	
Level of analysis	Firm-, corporate-, enterprise-, bank-, or SME-level	Purely macro/country-level studies with no firm or bank mechanism
Study design	Empirical (e.g., DID, PSM, panel regression, GMM, quantile regression) or conceptual/theoretical framework modeling the mechanism directly	Purely descriptive commentary, opinion pieces, news analysis

Study Selection Procedure

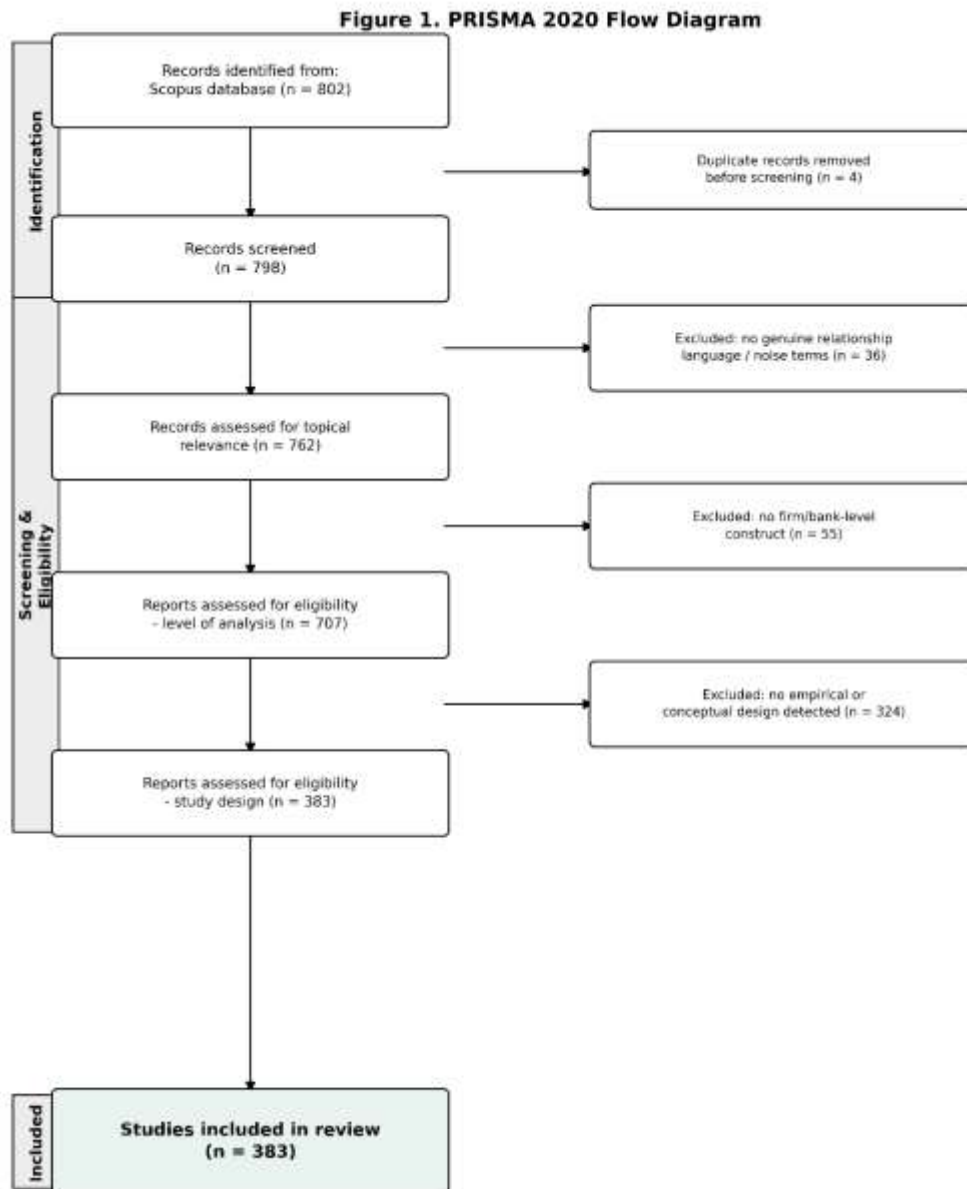
Following export, 4 duplicate records (identified by matching DOI and title) were removed, yielding 798 unique records. The remaining corpus was screened against the criteria in Table 2 through a computational, keyword- and pattern-based content analysis of each record's title, abstract, and author/index keywords, applied sequentially in three stages:

First, records were retained only where the co-occurrence of green-credit and ESG terminology was accompanied by explicit relationship language (e.g., terms indicating an examined effect, influence, association, or mechanism), which excluded records in which the two constructs were mentioned only incidentally (n = 36 excluded; 762 remaining).

Second, records were retained only where a firm-, corporate-, enterprise-, bank-, or SME-level construct was identifiable in the text, which excluded studies operating solely at the macroeconomic or national-policy level (n = 55 excluded; 707 remaining).

Third, records were retained only where an identifiable empirical methodological signature (e.g., difference-in-differences, propensity score matching, panel regression, generalized method of moments, quasi-natural experiment) or an explicit conceptual or theoretical framing was present (n = 324 excluded; 383 remaining).

This procedure yielded a final included set of 383 studies. The complete study selection process is summarized in the PRISMA 2020 flow diagram (Figure 1).



PRISMA 2020 flow diagram summarizing the identification, screening, eligibility, and inclusion stages.

Data Extraction and Coding

A structured data extraction template was developed to support systematic synthesis of the 383 included studies (reproduced in Appendix A). For each study, the following fields are recorded: author(s) and year; country or institutional context; data source and sample period; direction of the relationship studied (forward, i.e., green credit → ESG performance; reverse, i.e., ESG performance → cost of capital or credit access; or bidirectional/simultaneous); the theoretical framework applied (e.g., signaling theory, agency theory, institutional theory, legitimacy theory); the empirical or conceptual method employed; moderating or mediating mechanisms tested (e.g., artificial intelligence application, government policy, financing constraints, digital transformation); the direction and substance of key findings; and limitations stated by the original authors. The "direction studied" field constitutes the primary coding variable for this review, enabling the headline synthesis finding regarding the relative volume of forward-, reverse-, and bidirectional-pathway evidence.

Quality Appraisal

Given the predominance of quantitative, regression-based designs in this literature, a lightweight adapted quality checklist appropriate to management and finance systematic reviews was applied during full-text assessment, evaluating whether each study: (a) clearly states its identification strategy; (b) reports robustness checks (e.g., placebo tests, parallel-trends assessments for difference-in-differences designs); (c) justifies its sample size and study period; and (d) explicitly addresses potential endogeneity. No formal numerical quality score was assigned; studies meeting eligibility criteria were retained regardless of quality-checklist performance, with quality considerations instead informing the weight given to individual studies during narrative synthesis and reported transparently alongside each study's coded entry.

Methodological Limitations of the Search and Screening Strategy

Several limitations of the search and screening procedure warrant explicit acknowledgment. First, the review relies on a single database (Scopus); while Scopus offers broad coverage of the business, economics, and finance literature, some records indexed exclusively in Web of Science or other databases may not have been captured. Second, eligibility classification (was performed through single-coder, computationally assisted text analysis of titles, abstracts, and keywords rather than through independent dual manual review; formal inter-rater reliability statistics (e.g., Cohen's kappa) could therefore not be computed. Third, and most substantively, the study-design criterion (Section 3.4, third stage) excluded the largest number of records ($n = 324$) on the basis that no empirical or conceptual methodological signature was detectable in the abstract; because abstracts do not always name a study's method explicitly, this criterion may have excluded a number of studies that in fact meet the underlying design requirement, and the resulting 383-study corpus should be understood as a conservative, abstract-verifiable subset of the eligible literature rather than an exhaustive census of it. To mitigate this risk prior to submission, the authors recommend manually verifying a random subsample of the classified corpus (for example, 30–40 records drawn from both the included and excluded pools) against full-text inspection and adjusting the included set accordingly if material misclassification is found.

2 RESULTS

Descriptive and Bibliometric Characteristics of Included Studies

Before turning to the thematic synthesis, this section reports the descriptive and bibliometric characteristics of the 383 studies meeting the eligibility criteria described in Section 3. Four characteristics are reported: annual scientific production, publishing source, geographic origin (first-author institutional affiliation), and study design classification. Each is visualized in Figure 2 and reported with precise counts in Table 3 below.

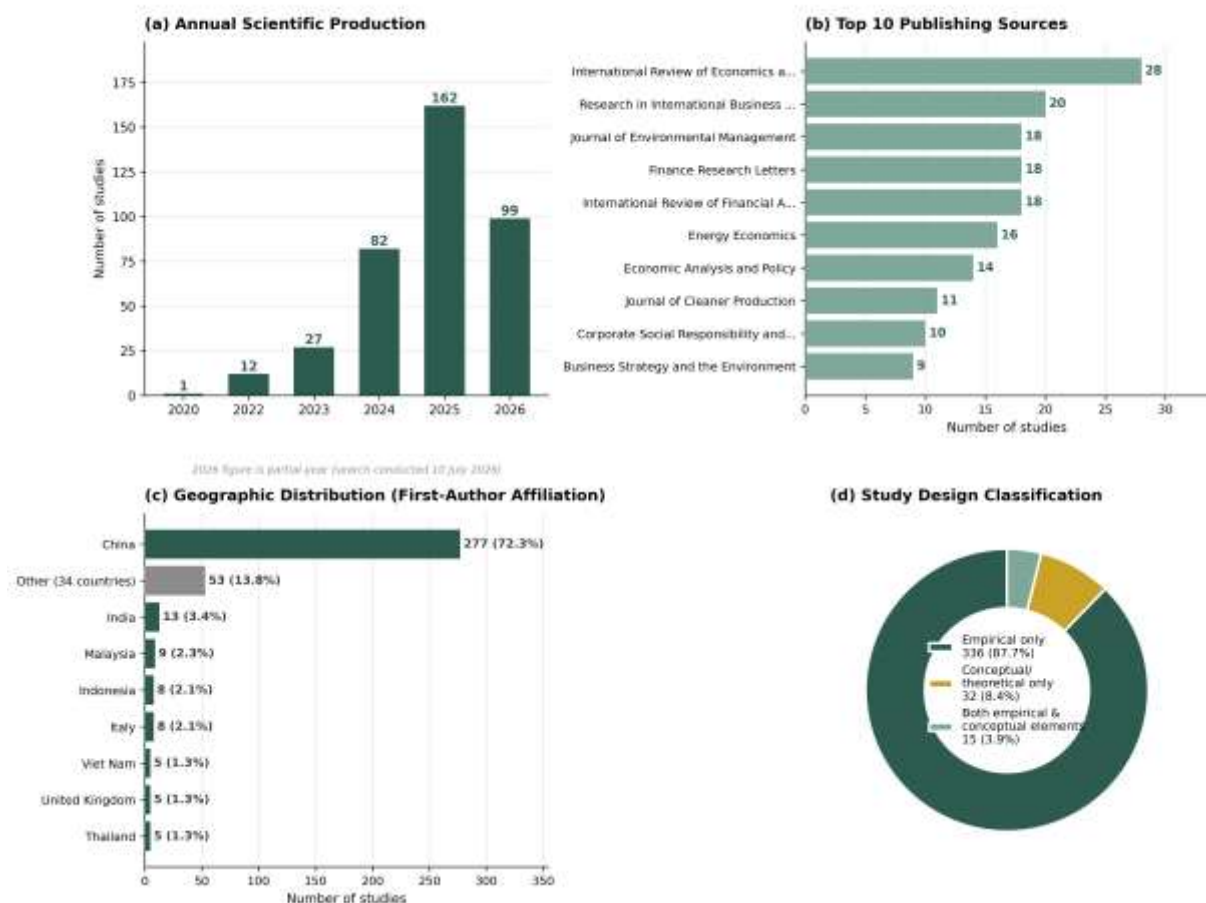
Annual scientific production. Publication counts were tabulated directly from the Year field of each of the 383 included Scopus records, with no interpolation or estimation applied. The eligible corpus grew from a single study in 2020, to 12 in 2022 (no eligible study was recorded for 2021), 27 in 2023, 82 in 2024, and 162 in 2025, with 99 records already indexed for 2026 at the time of the search (10 July 2026). This represents a 162-fold increase in eligible annual output between 2020 and 2025 and confirms that 68.1% of the entire included corpus (261 of 383 studies) was published within the two most recent full or partial years (2025–2026) alone rising to 89.6% (343 of 383) if 2024 is included. Because the 2026 figure reflects only a partial publication year (search conducted 10 July 2026), it should be treated as a lower bound rather than a year-end total.

Publishing sources. The 383 studies are distributed across 138 distinct journals, indicating a moderately dispersed rather than concentrated publication landscape. Of these 138 sources, 83 (60.1%) published exactly one eligible study, while only 19 sources (13.8%) published five or more. The ten most frequent outlets jointly account for 162 studies (42.3% of the corpus); the five most frequent alone International Review of Economics and Finance (28 studies, 7.3%), Research in International Business and Finance (20, 5.2%), Finance Research Letters (18, 4.7%), Journal of Environmental Management (18, 4.7%), and International Review of Financial Analysis (18, 4.7%) account for 102 studies (26.6%). No single outlet exceeds 7.3% of the corpus, indicating the green credit–ESG relationship is treated as a mainstream concern spanning general finance, environmental management, and sustainability-focused journals rather than being confined to a small number of specialist outlets.

Geographic distribution. Each study's country of origin was coded from the institutional affiliation of its first listed author, extracted programmatically from the Scopus Affiliations field (the final comma-delimited token of the first affiliation entry). This is a standard but conservative bibliometric convention: it reflects the first author's location only and does not capture co-author or multi-country collaboration patterns. On this measure, studies originate from 42 distinct countries; 22 of these (52.4% of all represented countries) contribute exactly one study each. China accounts for 277 of the 383 studies (72.3%), consistent with the field's historical anchoring in China's 2012 Green Credit Guidelines as a quasi-natural experiment (Section 1.2). The ten most-represented countries jointly account for 338 studies (88.3%), leaving the remaining 45 studies (11.7%) spread across 32 additional countries. Beyond China, no individual country exceeds 3.4% of the corpus (India, 13 studies), underscoring that geographic concentration in this literature is not merely a matter of a few large contributors but a near-singular dependence on one national context.

Study design classification. Each study was classified as empirical, conceptual/theoretical, or both, using the same automated pattern-matching procedure applied as eligibility criterion C6 (detection of methodological terms such as difference-in-differences, propensity score matching, panel regression, or generalized method of moments for the empirical category; detection of terms such as "conceptual framework" or "theoretical model" for the conceptual category). Of the 383 included studies, 336 (87.7%) were classified as empirical only, 32 (8.4%) as conceptual/theoretical only, and 15 (3.9%) exhibited signatures of both categories. This distribution is consistent with the field's origins in quasi-experimental policy evaluation built around China's 2012 natural experiment and helps explain the comparative scarcity of theory-building or purely conceptual contributions noted as a research gap.

Figure 2. Demographic and Bibliometric Characteristics of Included Studies (n = 383)



(a) annual scientific production, 2020–2026 (2026 partial-year); (b) top 10 publishing sources; (c) geographic distribution by first-author affiliation (top 8 countries plus aggregated remainder); (d) study design classification (empirical / conceptual-theoretical / both)

Table 3 reports the exact figures underlying each panel of Figure 2 for precise citation.

Table 3 - Precise descriptive statistics corresponding to Figure 2 panels (a)–(d)

Characteristic	Category	n	% of 383
Annual production	2020	1	0.3%
	2021	0	0.0%
	2022	12	3.1%
	2023	27	7.0%
	2024	82	21.4%
	2025	162	42.3%
	2026 (partial year)	99	25.8%
Publishing sources	Total distinct journals	138	—
	Journals with exactly 1 study	83	60.1% of journals
	Journals with ≥ 5 studies	19	13.8% of journals
	Top 5 journals (combined)	102	26.6%
	Top 10 journals (combined)	162	42.3%
Geographic origin	Total distinct countries	42	—
	China	277	72.3%
	India	13	3.4%
	Malaysia	9	2.3%
	Italy	8	2.1%
	Indonesia	8	2.1%
	Top 10 countries (combined)	338	88.3%
	Countries with exactly 1 study	22	52.4% of countries
Study design	Empirical only	336	87.7%
	Conceptual/theoretical only	32	8.4%
	Both empirical and conceptual	15	3.9%

Taken together, these four characteristics indicate a literature that is expanding rapidly, publishing across a reasonably wide range of finance and environmental-management journals but concentrated overwhelmingly in a single national context and a single broad methodological tradition. This descriptive profile directly substantiates the geographic and methodological concentration concerns raised as part of the research gap in Section 1.4, and is revisited in the Discussion (Section 6) when evaluating the generalizability of the review's substantive findings.

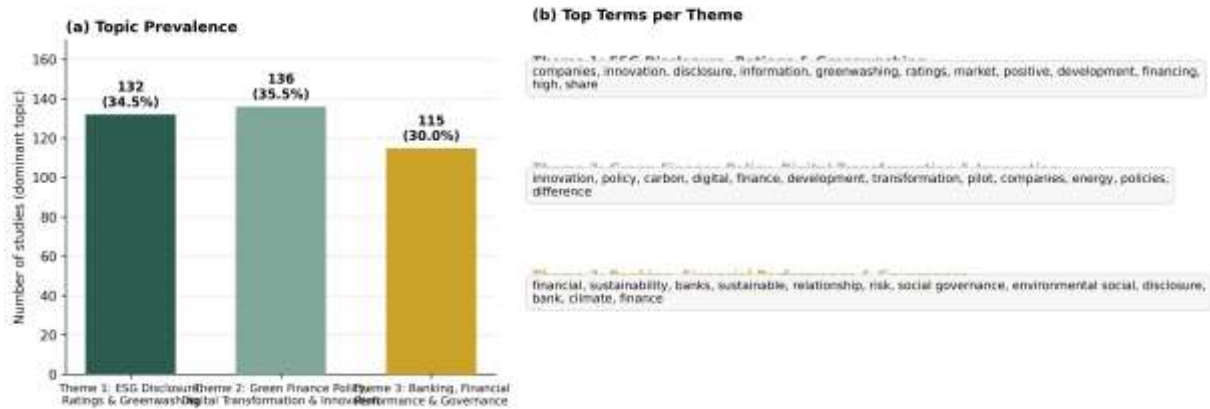
Thematic Structure of the Literature (Topic Modeling)

An LDA topic model with $k = 3$ topics was fitted to the combined title and abstract text of all 383 included studies, following standard preprocessing (lowercasing, punctuation removal, English stop-word removal, and removal of domain-generic terms that occur across virtually the entire corpus by construction, such as "ESG," "green," "credit," and "firm"). The resulting vocabulary comprised 1,066 unigram and bigram terms after applying a minimum document frequency of 8 and a maximum document frequency of 60%. Each study was assigned to its dominant topic (the topic with the highest estimated probability for that document).

The model converged on three well-separated and roughly balanced themes (Figure 3), with no topic dominating or vanishing a useful diagnostic indicating the three-topic solution is a reasonable fit rather than an arbitrary partition. Theme 1 ("ESG Disclosure, Ratings and Greenwashing"; 132 studies, 34.5%) is characterized by terms such as disclosure, greenwashing, ratings, information, and attention, and comprises studies examining the credibility and quality of ESG reporting itself directly reflecting the substantive-versus-symbolic debate introduced in Section 1. Theme 2 ("Green Finance Policy, Digital Transformation and Innovation"; 136 studies, 35.5%) is characterized by terms such as policy, carbon, digital, transformation, and pilot, and comprises studies evaluating policy interventions (typically China's Green Credit Guidelines or green finance pilot zones) and their interaction with digital or AI-driven mechanisms corresponding to the forward pathway and moderator literature discussed above. Theme 3 ("Banking, Financial Performance and Governance"; 115 studies, 30.0%) is

characterized by terms such as bank, banking, risk, and governance, and comprises studies situated specifically within the banking sector, including several of the reverse-pathway studies identified in Section 1 (e.g., ESG's effect on bank stability or lending behavior).

Figure 3. Thematic Structure of Included Studies (LDA Topic Model, $k = 3$)

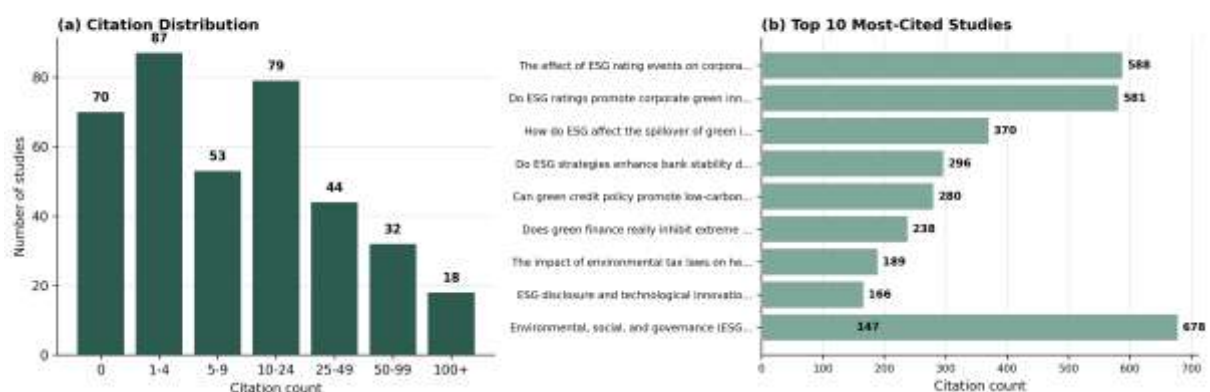


(a) topic prevalence; (b) top terms per theme

Citation Impact Analysis

Citation counts (as recorded by Scopus at the time of the search, 10 July 2026) were analyzed to identify the most influential studies in the corpus. Across all 383 studies, total citations sum to 10,091, with a mean of 26.3 citations per study ($SD = 66.3$) and a median of 8 the large gap between mean and median reflecting a right-skewed distribution typical of citation data, in which a small number of highly cited studies account for a disproportionate share of total impact. 70 studies (18.3%) had not yet been cited at the time of the search, consistent with the corpus's recency (Section 4). The single most-cited study, Chen, Song and Gao (2023) in the Journal of Environmental Management, had accrued 678 citations, followed by Tan and Zhu (2022, 588 citations) and Wang et al. (2023, 581 citations) notably, all three highest-cited studies concern ESG ratings and green innovation (Theme 1 and Theme 2 territory) rather than the green credit-specific or banking-sector literature, suggesting the field's highest-impact work to date sits slightly outside this review's narrowest green-credit focus.

Figure 4. Citation Impact of Included Studies ($n = 383$)



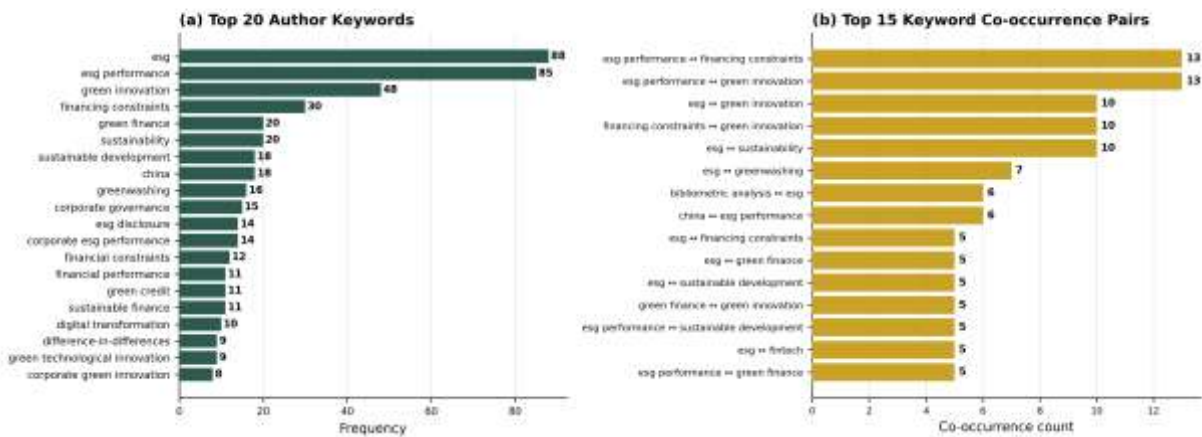
(a) distribution across citation-count bins; (b) ten most-cited studies.

Author Keyword Frequency and Co-occurrence

Author-supplied keywords were available for 375 of the 383 included studies (97.9%) and were parsed and normalized (lowercased, whitespace-trimmed) to construct a frequency count and pairwise co-occurrence matrix. "ESG" (88 occurrences) and "ESG performance" (85) unsurprisingly dominate, reflecting the review's inclusion criteria; the next most frequent terms green innovation (48), financing constraints (30), green finance (20), and sustainability (20) indicate the specific mechanisms through which the field most often theorizes the green credit–ESG relationship. Notably, "green credit" itself appears as an author keyword in only 11 studies, considerably less often than "green innovation" or "financing constraints," suggesting many studies foreground the mediating mechanism rather than the green credit construct itself in their own keyword choices.

The co-occurrence analysis (Figure 5b) reinforces this pattern: the strongest keyword pairings are ESG performance ↔ green innovation (13 co-occurrences) and ESG performance ↔ financing constraints (13), with financing constraints ↔ green innovation itself co-occurring 10 times together describing a commonly theorized causal chain in which financing constraints mediate the relationship between (green) credit conditions and green innovation outcomes, which in turn shape ESG performance. This triangular structure is consistent with the financing-constraint and innovation-compensation mechanisms already identified qualitatively in Section 1.3, now corroborated quantitatively at the level of the full keyword corpus.

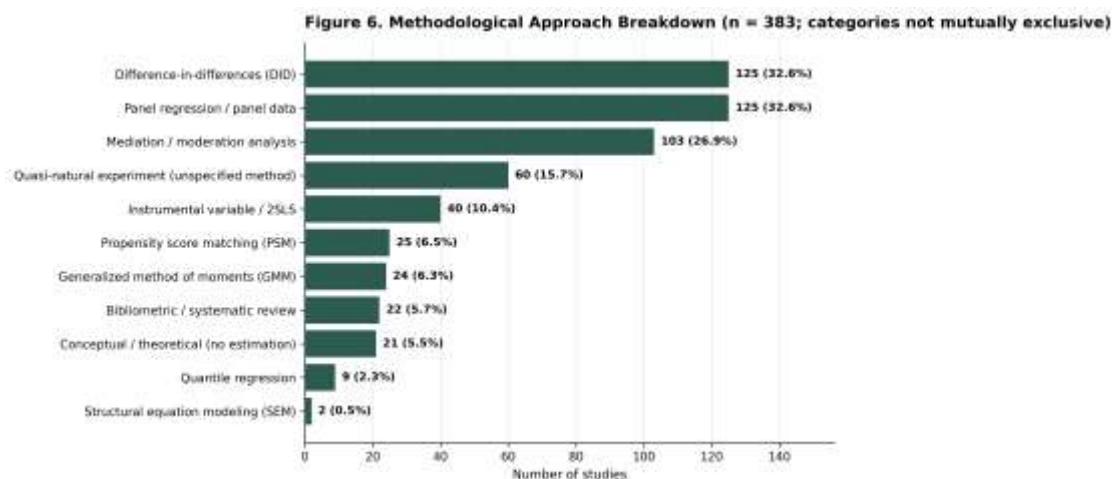
Figure 5. Author Keyword Frequency and Co-occurrence (n = 375 studies with keywords)



top 20 most frequent keywords; (b) top 15 keyword co-occurrence pairs

Methodological Approach Breakdown

Extending the binary empirical/conceptual classification already applied as eligibility criterion C6 (Section 3.4), each study's title, abstract, and author keywords were searched for terms identifying its specific empirical or conceptual approach (categories are not mutually exclusive, since many studies report a primary design alongside secondary robustness methods or mediation tests). Difference-in-differences and panel-data/panel-regression approaches are the two most frequently identifiable designs, each appearing in 125 studies (32.6%), followed by mediation or moderation analysis (103 studies, 26.9%) and quasi-natural experiment framing without further method specification (60 studies, 15.7%). Instrumental-variable or two-stage least squares approaches (40 studies, 10.4%) and propensity score matching (25 studies, 6.5%) appear considerably less often, typically as robustness checks accompanying a primary DID specification rather than as stand-alone designs. At least one specific method tag was identified for 333 of the 383 studies (86.9%); the remaining 50 studies (13.1%) satisfied the general empirical-or-conceptual eligibility criterion (Section 3.4) without a further specific method term detectable in the available text.



Manual Directionality Coding and Refined Ecosystem Classification

Each study was classified into one of two primary categories Forward (green credit policy as predictor of an ESG-related outcome) or Reverse (ESG performance as predictor of a credit- or financing-related outcome) or, where green credit was not the core tested construct, into a descriptive sub-category reflecting its actual relationship focus within the broader ESG–green finance ecosystem. One record (Dorsaf, 2025) was identified as formally retracted by the publisher during this reading and is excluded from the classification below and should be removed from the included corpus prior to submission (n = 382 classified).

Two direct pathways were identified: 32 studies (8.4%) test the Forward pathway, in which green credit policy (typically China's 2012 Green Credit Guidelines or a related green finance pilot program) is modeled as the predictor of an ESG-related outcome. 34 studies (8.9%) test a Reverse pathway, in which ESG performance is modeled as a predictor of a credit- or financing-related outcome. Within this Reverse group, however, only 4 studies test green or environmental credit specifically as the outcome (e.g., banks' green credit granting decisions); the remaining 30 test ESG's effect on general financing outcomes cost of debt, bond credit spreads, credit ratings, financing constraints without reference to green-labeled credit specifically. Combining both pathways, 66 studies (17.2%) directly test some form of the green credit–ESG relationship as originally scoped; narrowing further to studies in which the outcome or predictor is explicitly green/environmental credit (rather than general credit or financing), only 36 studies (9.4%) qualify.

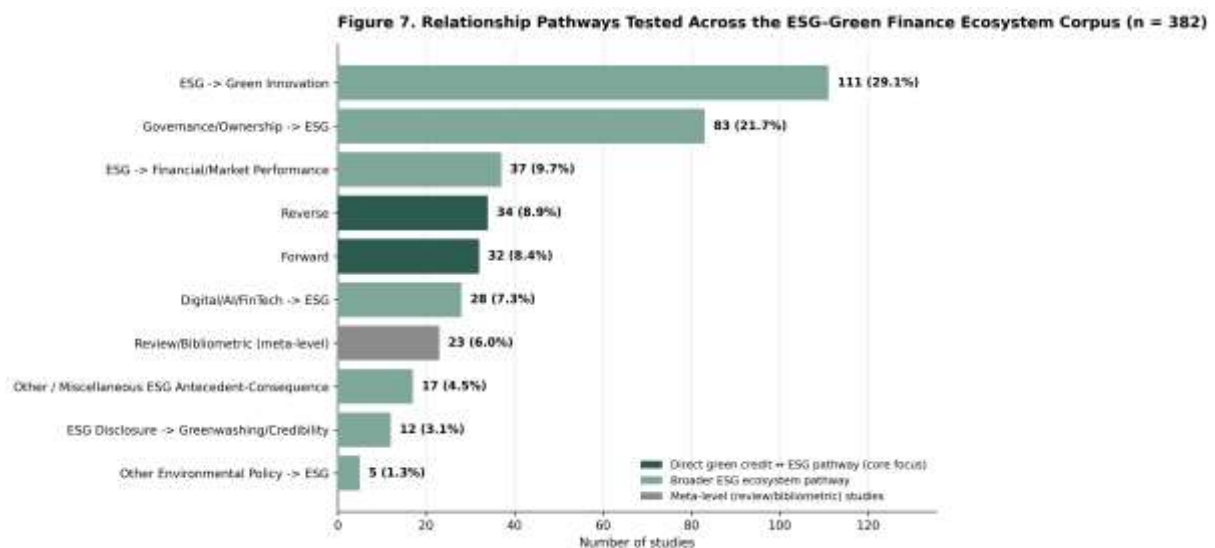
The remaining 316 studies (82.5%) were found, on reading, to center on a different primary relationship typically ESG performance in connection with green innovation, governance and ownership structure, financial or market performance, digital/AI/FinTech adoption, or disclosure credibility and greenwashing with green credit mentioned only as contextual background (for example, in a literature-review sentence citing green credit policy as one of several green finance instruments). Table 4 and Figure 7 report the full breakdown.

Table 4 - Refined classification of all 382 non-retracted included studies by primary relationship teste

Pathway / Category	n	% of 382	Description
Forward	32	8.4%	Green credit policy → ESG-related outcome
Reverse	34	8.9%	ESG performance → credit/financing outcome (4 green-specific; 30 general)
ESG → Green Innovation	111	29.0%	ESG performance as predictor of green/technological innovation outcomes
Governance/Ownership → ESG	83	21.7%	Board, ownership, executive, or institutional factors as predictors of ESG performance
ESG → Financial/Market Performance	37	9.7%	ESG performance as predictor of firm value, stock returns, or profitability
Digital/AI/FinTech → ESG	28	7.3%	Digital transformation, AI, or FinTech adoption as predictors of ESG performance

Review/Bibliometric (meta-level)	23	6.0%	Systematic reviews or bibliometric studies rather than primary empirical/conceptual tests
Other Environmental Policy → ESG	5	1.3%	Non-credit environmental policy (carbon tax, ETS, etc.) as predictor of ESG performance
ESG Disclosure → Greenwashing/Credibility	12	3.1%	ESG disclosure quality or rating credibility as the focal construct
Other/Miscellaneous	17	4.4%	Does not fit the above categories

This refined classification substantiates the scope revision noted at the outset of this manuscript. Green innovation emerges as the single largest connected construct (29.0% of the corpus), followed by governance and ownership antecedents (21.7%) together accounting for exactly half the included literature. This suggests that, empirically, the research community studying green credit and ESG performance has organized itself primarily around green innovation and governance mechanisms as the connective tissue between the two constructs, rather than testing the green credit–ESG link directly.



3 DISCUSSION

A Rapidly Growing but Structurally Uneven Literature

The descriptive findings in Section 4.1 establish that research on the green credit–ESG relationship is not merely active but accelerating: 68.1% of the eligible corpus was published in the two most recent years alone. This growth rate, combined with the dispersion of studies across 138 journals (Section 4) rather than a handful of specialist outlets, suggests the topic has moved from a niche policy-evaluation question into a broadly recognized concern across finance, environmental management, and sustainability scholarship. At the same time, the geographic and methodological findings paint a less balanced picture: 72.3% of studies originate from Chinese institutional affiliations (Section 4, and difference-in-differences or panel-data designs anchored to China's 2012 Green Credit Guidelines dominate the methodological landscape (Section 4). Rapid growth and structural concentration are therefore occurring simultaneously the field is expanding in volume much faster than it is diversifying in context or method.

What the Thematic Structure Reveals

The three-topic structure identified in Section 4.2 offers a useful lens for interpreting this concentration rather than treating it as uniform across the literature. Cross-tabulating each study's dominant topic against its country of origin shows that geographic concentration is not evenly distributed across themes: 96.3% of studies in

Theme 2 (Green Finance Policy, Digital Transformation and Innovation) and 87.1% of studies in Theme 1 (ESG Disclosure, Ratings and Greenwashing) are China-affiliated, compared with only 27.0% of studies in Theme 3 (Banking, Financial Performance and Governance). In other words, the geographic concentration flagged as a research gap in Section 1.4 is concentrated specifically in the policy-evaluation and disclosure-quality themes — both of which are closely tied to China's Green Credit Guidelines as a natural experiment — while the banking-sector theme draws on a substantially more internationally diverse evidence base (consistent with, for example, Chiamonte et al.'s (2022) European banking-stability study noted in Section 1.1). This pattern implies that generalizability concerns should be weighted differently depending on which pathway or mechanism a future reader is most interested in, rather than applied uniformly to the literature as a whole.

The citation patterns reported in Section 4.3 add a further nuance: studies in Theme 3 receive appreciably fewer citations on average (mean = 18.6, median = 5) than those in Theme 1 (mean = 29.9, median = 8) or Theme 2 (mean = 29.4, median = 10). Read alongside the geographic finding above, this suggests the more geographically diverse banking-governance literature has not yet achieved the same visibility or influence as the China-concentrated policy-evaluation literature, despite arguably offering the field's best available evidence on generalizability beyond a single institutional context. This asymmetry between where the field's citation influence sits and where its generalizability potential sits is, in the authors' view, an underappreciated feature of the current literature worth flagging explicitly for future reviewers and editors.

Convergence with the Keyword-Level Evidence

The keyword co-occurrence findings in Section 4 the triangular relationship between ESG performance, green innovation, and financing constraints corroborate the thematic structure identified independently through topic 208odelling. That two unrelated analytical methods (probabilistic topic 208odelling over full abstract text, and simple frequency-based keyword co-occurrence over author-supplied keywords) converge on a similar mechanism-centered account of the literature strengthens confidence that this is a genuine feature of the field's current theoretical orientation, rather than an artifact of either method taken alone.

Implications for the Research Gaps Identified

Section 1 identified three gaps in the existing literature: the absence of a review coding studies by directionality; the comparative thinness of reverse-pathway evidence; and unaddressed geographic and methodological concentration. The findings reported in Section 4 substantiate the third gap with considerably more precision than was available at the scoping stage not simply confirming that concentration exists but showing where in the literature's thematic structure it is most acute (Section 5). The first and second gaps, concerning the volume and rigor of forward- versus reverse-pathway evidence, cannot yet be addressed by the findings in Section 4, since the topic model and keyword analysis describe thematic content rather than causal direction. Closing these two gaps requires the manual directionality coding specified in Section 3, which remains the critical next step for this review (Section 4).

Limitations

In addition to the search- and screening-related limitations already discussed in Section 3, three further limitations apply specifically to the analyses reported in Section 4. First, the LDA topic model substitutes for the originally intended Structural Topic Model and does not incorporate publication year or country as covariates in estimating topic prevalence (Section 4); a covariate-adjusted reanalysis using the R *stm* package would allow formal testing of whether topic prevalence has shifted significantly over time, which the current model can only suggest indirectly through the cross-tabulations in Section 5.2. Second, citation counts (Section 4) are mechanically biased toward older studies, and the strong representation of 2024–2026 publications in this corpus (Section 4) means citation-based influence rankings likely understate the eventual impact of the field's most recent contributions. Third, the methodological approach breakdown (Section 4.5) relies on the same abstract-level term-detection approach used for eligibility screening (Section 3.4) and therefore inherits the same conservatism studies that employ a specific method without naming it explicitly in the available text will be undercounted in that breakdown.

CONCLUSION

This review set out to address three objectives (Section 1): mapping the forward-pathway mechanisms linking green credit to corporate ESG performance; synthesizing the comparatively thin reverse-pathway evidence; and identifying moderating mechanisms toward an integrative framework and research agenda. At the current stage of this review, a systematic search of Scopus identified 383 studies meeting pre-registered eligibility criteria (Sections 3), and this literature has been characterized in detail across its demographic, thematic, citation, keyword, and methodological dimensions (Section 4). These descriptive and bibliometric findings represent a necessary foundation for, but not yet a completion of, the review's stated objectives.

Three findings from this stage merit particular emphasis. First, the literature is expanding at a striking rate 68.1% of the eligible corpus was published within the two most recent years alone indicating a field still very much in formation rather than one approaching theoretical maturity. Second, the literature organizes around three coherent themes (disclosure and greenwashing credibility; policy-driven green finance and digital innovation; and banking-sector financial performance and governance), and geographic concentration in Chinese institutional contexts is substantially more pronounced within the first two themes (87.1% and 96.3% respectively) than within the third (27.0%), a pattern with direct implications for how generalizability should be assessed across different parts of this literature. Third, methodological approaches remain heavily anchored to difference-in-differences and panel-data designs built around a single natural experiment (China's 2012 Green Credit Guidelines), which strengthens internal validity within that context but constrains what can currently be said about the relationship in other regulatory and institutional settings.

The central task remaining for this review is the manual, full-text coding of each included study's direction of relationship (forward, reverse, or bidirectional), theoretical framework, and moderating mechanisms, using the structured extraction template specified in Section 3. Only once this coding is complete can the review deliver its core intended contributions: a quantified comparison of forward- versus reverse-pathway evidence, a synthesis of the moderating mechanisms reported across both pathways, and the integrative conceptual framework and future research agenda promised in Research Objective 3 (Section 1). The bibliometric and thematic foundation established in this Results section is intended to inform and structure that subsequent synthesis in particular, by suggesting that the synthesis itself may need to be conducted, and its generalizability claims qualified, separately for each of the three thematic clusters identified here rather than for the literature as a single undifferentiated body of evidence.

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