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Do Environmental Certifications Pay? A Bibliometric and Systematic Review of EMS and Eco-Label Impacts

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Abstract

This paper investigates how environmental certifications – specifically, formal Environmental Management Systems (ISO 14001, EMAS) and consumer-facing eco-labels – influence firm financial performance. Using a dual approach that includes a bibliometric review and a systematic analysis of key studies, we identify key trends, theoretical underpinnings, and methodological approaches across these distinct certification types. Our bibliometric results highlight a rapidly evolving field, with Environmental Management Systems (EMS) and eco-label research growing along different paths and showing varying levels of international collaboration. The systematic review complements these findings by examining evidence on how certifications impact internal efficiencies, market positioning, and overall profitability. We observe that benefits depend strongly on organizational context, implementation quality, and stakeholder engagement. By integrating insights from both reviews, this paper clarifies the conditions under which environmental certifications enhance financial outcomes and offers directions for future research aimed at advancing both environmental responsibility and firm-level success.

1. INTRODUCTION

In recent years, corporate sustainability has become a major priority for businesses across different sectors around the world. This change is largely driven by tougher environmental rules, higher expectations from stakeholders, and a shared global understanding of how urgent it is to fight climate change. A key milestone in this area was the 2015 Paris Climate Agreement, which brought almost 200 countries together to set ambitious goals aimed at keeping global temperatures well below 2°C pre-industrial levels (Palea & Drogo, 2020; Secinaro et al., 2020; United Nations, 2015). Building on that progress, subsequent climate meetings, such as COP26, have called for stronger efforts to lower greenhouse gas emissions and speed up the transition to cleaner energy on a global scale (UNFCC, 2021). These developments show a growing understanding that companies must do more to reduce their environmental impact while also remaining profitable.

One clear result of these global commitments is a wave of new regulations that require greater openness about a company's environmental record. The European Union (EU), for example, has introduced strict reporting rules through laws like the Non-Financial Reporting Directive (NFRD) and, more recently, the Corporate Sustainability Reporting Directive (CSRD). These rules force large or publicly important companies—including those listed on stock exchanges—to share detailed information about their social and environmental actions (EU, 2014). By making companies disclose more about their sustainability efforts, these laws aim to create a culture of greater accountability, encouraging businesses to handle environmental issues in a more organized way. At the same time, other policy measures—like the EU's Green Deal—set targets for carbon neutrality and raise the bar for companies to demonstrate good environmental behaviour (Benz et al., 2021).

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Besides these legal requirements, market forces also play a big role in guiding sustainability. More consumers and investors are factoring in a firm's environmental responsibility and resilience against climate risks when they decide what to buy or where to invest (Hamilton & Zilberman, 2006; Yu et al., 2017). Companies seen as doing poorly in sustainability could face consumer boycotts, negative publicity, and fewer opportunities for financing (Su et al., 2018; Wilburn & Wilburn, 2011). On the flip side, firms that prove strong environmental performance can benefit from premium pricing, loyal customers, and a potentially lower cost of capital. This mix of stakeholder demands, market possibilities, and government rules makes environmental certifications—especially those checked by credible third parties—central to a company's strategy (Bansal & Bogner, 2002; Orsato, 2006; Xu et al., 2016). For these reasons, businesses are increasingly turning to environmental certifications to demonstrate their commitment.

Environmental certifications are tools companies use to show they seriously address environmental issues. These certifications typically fit into two main groups: formal Environmental Management Systems (EMS), like ISO 14001 and EMAS (the EU's Eco-Management and Audit Scheme), and market-oriented certifications (often called eco-labels), such as EU Ecolabel, Leadership in Energy and Environmental Design (LEED), and Forest Stewardship Council (FSC). But each certification varies in what it covers, what it aims to achieve, and what results it can offer. Together, these certifications constitute key tools in corporate sustainability efforts, enabling organizations to formalize their environmental practices, benchmark performance, and signal accountability to stakeholders.

ISO 14001 and EMAS focus on structured environmental management. They require companies to set clear goals for cutting pollution, using energy more efficiently, and managing waste (Iraldo et al., 2009; Melnyk et al., 2003). ISO 14001 is well-known globally and offers a general framework that can be adapted to different industries, whereas EMAS, introduced by the EU, builds on ISO 14001 by adding stricter obligations like openly sharing environmental reports (Heras-Saizarbitoria & Boiral, 2013). Previous research suggests that firms adopting these standards often experience operational efficiency improvements, although some studies indicate that companies may also adopt them primarily for symbolic reasons rather than substantive environmental improvements (Boiral, 2011). Specifically, research suggests that putting an EMS in place can lead to savings in production, better innovation, and stronger reputation, which altogether can boost financial performance (Martín-de Castro et al., 2016; Su et al., 2018). However, these benefits are not guaranteed. Some studies say the outcomes depend a lot on how committed a company really is, which industry it is in, and how thoroughly the system is implemented (Hillary, 2004; Oliveira et al., 2016). If a company only adopts EMS in a superficial way, the results might be trivial or even harmful when considering the costs of auditing and compliance (Heras-Saizarbitoria et al., 2016). Additionally, the financial benefits of these certifications appear to depend on external regulatory pressures and market expectations (M. Delmas, 2001; Jiang & Bansal, 2003).

Eco-labels, on the other hand, aim at reassuring consumers that a product or service meets certain "green" standards (Esparon et al., 2014). By reducing the information gap between producers and consumers, eco-labels let consumers who care about the environment reward green companies with higher loyalty or a willingness to pay more (Hamilton & Zilberman, 2006). Yet the financial results of eco-labels can differ widely: in markets where buyers know and trust these labels, companies may benefit significantly (Amacher et al., 2004). In markets where people doubt the labels or have low environmental awareness, these certifications may not help firms gain better prices or bigger market shares (Ibanez & Blackman, 2016; Wen & Lee, 2020). Similarly, studies indicate that while consumers express interest in eco-labels, their actual willingness to pay a price premium is often lower than expected, which raises concerns about the effectiveness of voluntary certification programs (Roheim et al., 2011). Moreover, certification procedures can be inconsistent, and the effort and expenses needed to get and keep these labels might undermine potential benefits, especially for smaller companies (Boström & Hallström, 2010).

B-Corp certification, unlike EMS and eco-labels, integrates social and environmental impact assessments into a broader corporate responsibility framework. Unlike ISO 14001, which focuses on environmental management systems, or eco-labels, which emphasize market positioning, B-Corp certification evaluates a firm's overall contribution to sustainable business practices (Boiral et al., 2018). While some data shows that becoming a B-Corp can strengthen stakeholder relations and brand differentiation, studies are mixed regarding its financial impact, with some pointing to improved resilience or trust (Chen & Kelly, 2015), and others noting the added cost and complexity required for certification (Patel & Dahlin, 2022; Romi et al., 2018). Because B-Corp is fairly new, there is still limited research to clearly determine how it affects firm performance in the long run.

Overall, research suggests that different sustainability certifications can improve efficiency, build positive consumer attitudes, and enhance a company's market value. Still, the scale of these benefits is strongly dependent on several factors such as the industry sector, the size of the company, where it operates, how aware local consumers are, and whether the firm's sustainability approach is (Dangelico, 2017; Ibanez & Blackman, 2016; Nawrocka & Parker, 2009). For instance, empirical findings indicate that the financial impact of green certifications is highly contingent on firm size and regulatory frameworks, with large firms often able to absorb certification costs more easily than SMEs (Testa et al., 2020). Moreover, researchers use many different methods to evaluate financial performance, ranging from standard accounting ratios (like Return on Assets) to stock market indicators (like Tobin's Q) or narrower metrics like productivity or cost savings (Miroshnychenko et al., 2017; Wen & Lee, 2020). This variety makes it harder to compare findings directly, resulting in an ongoing debate over when and how environmental certifications boost financial outcomes.

Although some systematic reviews cover single certifications—like ISO 14001 (Boiral et al., 2018; Camilleri, 2022) or eco-labelling (Galarraga Gallastegui, 2002; Yokessa & Marette, 2019)—fewer studies compare multiple certification systems side by side. This is a notable gap, since many companies need to decide among different certifications or might use more than one at the same time, without fully knowing the relative costs and benefits (Orsato, 2006). Also, the theories that researchers use to explain these outcomes—such as institutional theory, stakeholder theory, the resource-based view, or signalling theory—are often used one at a time, making it unclear how these perspectives could be combined to understand certification strategies (Chen & Kelly, 2015; M. A. Delmas & Montes-Sancho, 2010).

Given these gaps, this review uses a two-step approach—bibliometric analysis along with a systematic review—to compare EMS-based certifications (e.g., ISO 14001, EMAS) and eco-labels. Although B-Corp is part of the ESG-oriented segment, we include it in the eco-label set given the relatively small body of work focused solely on it, and its partial overlap in outward-facing sustainability claims. We systematically searched major academic databases (Scopus and Web of Science) using keywords that capture these certifications and how they relate to financial outcomes. By applying bibliometric methods—like co-citation analysis, keyword mapping, and content clustering—we clarify which papers have been most cited, which themes are trending, and the central theories in this domain. Then, we performed a systematic review of key papers, examining their methods, contexts, and findings in detail, giving a fuller picture of how certifications affect firm performance.

Our study centres around three main research questions:

1. How does existing literature depict the relationship between different environmental certifications and financial outcomes?

2. In what ways do financial results vary between EMS-focused standards (ISO 14001, EMAS) and consumer-facing eco-labels, and which theoretical or contextual factors might explain these variations?

3. Which methodological approaches and knowledge gaps emerge from this bibliometric and systematic review, and how could upcoming research improve our understanding of this topic?

By comparing EMS standards with eco-labels, we aim to shed light on how each certification model corresponds to certain strategic objectives—such as streamlining internal processes or appealing to green-conscious consumers—and how they translate into financial benefits in various contexts. This combined perspective is especially helpful for scholars, managers, and policymakers seeking to figure out which certifications might give the best overall returns and how to avoid common challenges when putting these sustainability measures in place.

The paper is structured as follows: first, we describe our methodological process, including the inclusion criteria, search parameters, and review protocols. Next, we share our bibliometric results, outlining trends in publications, citation networks, and key thematic areas for both EMS and eco-label systems. Then we present a systematic review of the most prominent works, comparing their theoretical backgrounds, methodological approaches, and observed financial impacts. In conclusion, we sum up the main insights, highlight implications for both research and practice, and suggest paths for future work on how environmental certifications influence financial performance.

2. METHODOLOGY

2.1. Data Sources and Search Strategy

To address our research question and gain insights into the current debate on green certifications—including ISO 14001, EMAS, eco-labels, and B-Corp—and their impact on financial performance, we combine a systematic literature review with bibliometric techniques (such as citation analysis, keyword mapping, and content analysis). Bibliometric analysis, a quantitative and statistical examination of existing literature, allows us to identify the structure, impact, and key themes shaping the field of sustainability certifications and corporate performance. In particular, we focus on citation metrics, keyword co-occurrence, and content analysis to uncover intellectual patterns, influential works, and knowledge gaps (Christofi et al., 2021; Stanley, 2001).

We use Scopus and Web of Science (WoS) as our primary data sources, given their extensive coverage of peer-reviewed journals and their frequent use in bibliometric research (Aria & Cuccurullo, 2017; Geissdoerfer et al., 2017; Khan, 2022; Pham et al., 2021). Although Scopus generally offers broader coverage, including emerging or niche topics (Bretas & Alon, 2021; Martín-Martín et al., 2018; Pranckutė, 2021), WoS is often praised for its robust citation analysis and visualization tools (Falagas et al., 2008). Both databases are highly compatible with software solutions such as Bibliometrix (including the Biblioshiny package in R) (Aria & Cuccurullo, 2017; Derviş, 2020), which we employ to conduct our bibliometric mapping. Using these two databases also reduces the likelihood of missing relevant publications.

2.2. Search Strategy and Article Selection

Our search strategy aimed to capture research on environmental management systems (ISO 14001, EMAS), green certifications (eco-labels), and B-Corp, as each represents a distinct yet interconnected approach to corporate sustainability. ISO 14001 and EMAS operate as formal EMS standards, with EMAS, developed in the European Union, imposing additional disclosure requirements. Green certifications serve as market-based instruments that influence consumer and investor perceptions of environmental responsibility, while B-Corp emphasizes broader social and environmental performance.

Figure 1. should be placed around here

To ensure a systematic and replicable selection of relevant studies, we developed a structured keyword-based search strategy The search focused on two primary dimensions: (1) environmental certifications, including

green labels, environmental management systems, and sustainability-related certifications, and (2) financial performance, incorporating various economic and market-based indicators.

The search string included the following keywords related to environmental certifications: *eco label*, *eco certification*, *green label*, *green certification*, *environmental label*, *sustainability label*, *green product certification*, *carbon label*, *sustainability certification*, *eco-friendly certification*, *environmentally friendly certification*, *green award*, *sustainability award*, *environmental award*, *ISO 14001*, *EMAS*, *eco-management and audit scheme*, *environmental management system*, *B-Corp*, and *sustainable certification*.

To capture financial aspects, we included the following keywords: *financial performance*, *economic performance*, *firm performance*, *profitability*, *market value*, *competition*, *cost of equity*, *cost of debt*, *financial benefit*, *equity cost*, and *debt cost*.

The search was restricted to peer-reviewed journal articles published in English before 2025. To maintain relevance to the research scope, we limited the subject areas to business (BUSI), economics (ECON), and environmental sciences (ENVI). Furthermore, only journal articles (*article* document type) were included, excluding conference proceedings, book chapters, and grey literature.

Following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher et al., 2015), we retrieved 425 papers from Web of Science (WoS) and 448 from Scopus. After merging the datasets and removing duplicates, we obtained 588 unique records. We then applied our inclusion and exclusion criteria, selecting only empirical or conceptual studies that explicitly examined the relationship between environmental certifications and firm-level financial performance. Non-peer-reviewed publications and studies lacking explicit financial metrics were excluded, resulting in a refined set of 216 articles for full-text review. A final screening confirmed the inclusion of these 216 studies for bibliometric analysis and systematic review, as illustrated in the PRISMA flow diagram (Figure 1).

2.3. Bibliometric Analysis and Systematic Review

After collecting the data, we carried out a bibliometric analysis using Bibliometrix. This included an examination of citation counts, co-citation patterns, keyword mapping, and bibliographic coupling to explore how research on sustainability certifications and financial performance has evolved. We then conducted an in-depth systematic review of the most cited publications, focusing on the comparison between EMS-oriented certifications (ISO 14001, EMAS) and more consumer-facing labels (eco-labels, green labels). Although B-Corp appeared less frequently, we included it in our review where relevant, highlighting its comprehensive scope that integrates social and environmental dimensions.

2.4. Preliminary Overview of Selected Studies

A preliminary classification of the 216 articles reveals how scholars have approached these certifications from methodological, contextual, and thematic standpoints. Table 1 offers a concise breakdown by research method, certification focus, and geographic coverage.

In terms of research methods, 67.6% of the articles employ quantitative approaches, typically using statistical or econometric techniques to measure the impact of adopting sustainability certifications on firm-level performance indicators, highlighting a strong preference for statistical and econometric analyses when investigating the relationship between green certifications and financial performance. The remaining 32.4% are qualitative or conceptual in nature, with 14.8% dedicated to theoretical frameworks, 13.0% based on survey data, 2.8% structured in case studies, and 1.9% presented as review studies. While the prevalence of quantitative methods signals a strong empirical orientation, the presence of qualitative and conceptual work indicates ongoing efforts to refine theoretical underpinnings and explore emerging issues.

Regarding certification focus, ISO 14001 (31.9%) and EMS (37.0%) together form the largest group, highlighting extensive academic interest in structured environmental management systems. Eco-labels, at

25.5%, illustrate the significance of market-based instruments that allow firms to communicate their environmental responsibility to consumers, potentially influencing brand loyalty and purchase decisions. B-Corp, at 5.6%, captures a broader approach that includes both social and environmental aspects, although it remains less represented in the literature, likely due to its relatively recent adoption and broader scope that extends beyond purely environmental considerations.

Table 1 should be placed around here

On the geographical dimension, China is the most frequently studied single-country context (13.7%), reflecting both its rapidly growing economy and heightened global attention to its environmental practices The USA (9.6%), Spain (8.9%), Malaysia (7.5%), Indonesia (5.5%), Italy (5.5%), Taiwan (3.4%), and the UK (3.4%) follow as prominent single-country contexts. About 17.1% of the articles take an international or multi-country perspective, while the remaining 25.3% investigate various single-country contexts in smaller proportions. These findings underscore the global relevance of sustainability certifications, as well as the diverse economic and regulatory landscapes in which firms operate.

Overall, these descriptive results reveal a broad methodological spectrum and emphasize that EMS-based standards (ISO 14001, EMAS) attract significant attention relative to market-facing eco-labels. Nevertheless, eco-labels and, to a lesser extent, B-Corp, bring to the fore the importance of external stakeholder perceptions in shaping how firms integrate environmental practices. By integrating bibliometric methods with a systematic review of top-cited works focusing on EMS versus eco-labels, this study delineates not only how different certification mechanisms are approached in the literature but also the evolving discourse on their financial implications.

3. BIBLIOMETRIC LITERATURE REVIEW

3.1. Descriptive Statistics and Temporal Trends in EMS/ISO 14001 and Eco-labels Research

As shown in Table 2, the complete sample spans the period from 1995 to 2025 and includes 216 documents, whereas the subset devoted to EMS/ISO 14001 also covers the same timespan (1995–2025) with 149 documents. In contrast, the eco-labels /B-corp subset, comprising 67 documents, starts later (2004–2024). This different temporal scope suggests that studies on EMS/ISO 14001 have a longer history in the academic debate, while eco-labels and B-corp discussions have gained momentum relatively more recently.

Table 2 should be placed around here

Despite being a smaller subset, the eco-labels/B-corp group shows a notably higher annual growth rate (8.38%) compared to the relatively modest 2.34% in the EMS/ISO 14001 sample. This signals accelerating interest in consumer-facing or stakeholder-oriented certifications. It also aligns with the younger document age (6.24 vs. 9.23 years on average), reinforcing the idea that eco-labels and B-corps represent a more emergent yet rapidly growing research domain.

The average citations per document favour the EMS/ISO 14001 cluster (62.01 vs. 29.87), indicating that EMS/ISO 14001 scholarship may be both older and more established, thus allowing time for higher citation accumulations. By contrast, the eco-labels/B-corp subset has accumulated fewer citations, likely a function of its more recent emergence and smaller overall size.

An examination of annual production over time underscores these observations. While the EMS/ISO 14001 literature produced at least one publication annually from 1995 onward (albeit in very small numbers at first), the eco-labels/B-corp thread did not appear until 2004. Growth in that domain was gradual through the late 2000s but accelerated noticeably from around 2015 onward, with more frequent spikes in publication volume after 2016. Such an upward trajectory aligns with the notion that market-facing certifications have attracted increasing scholarly attention in recent years.

Looking at authors and collaboration, both samples exhibit similar rates of multi-authored papers: co-authors per document hover around 2.8–2.9, while the percentage of single-authored work is comparable (20–25%). One interesting contrast is the international co-authorship percentage, which is 4.478% for eco-labels/B-corp vs. 2.013% for EMS/ISO 14001. This suggests that research on eco-labels and B-corps may be more globally collaborative, possibly reflecting the international appeal of consumer-facing labels and broader stakeholder engagement frameworks.

3.2. Co-Occurrence Network and Temporal Trends in Research

To explore the conceptual structure of the literature, we analyse the co-occurrence network of keywords, mapping the relationships between the main research topics.

Figure 2 should be placed around here

As highlighted in Figure 2, the most central keywords in the network confirm the dominance of environmental management and environmental management systems, often appearing in connection with ISO 14001, reinforcing the pivotal role of structured sustainability practices. At the same time, keywords related to financial performance, profitability, competition, and investment illustrate an increasing interest in the economic and strategic dimensions of environmental certifications. While environmental impact and sustainable development remain conceptually relevant, the network highlights that corporate strategies around certifications are increasingly analysed in relation to market positioning and financial outcomes.

The clustering structure reveals interesting insights. The largest cluster, where "environmental management" and "ISO 14001" are central, represents the dominant research strand, focused on formalized environmental management systems and their corporate implications. A distinct red cluster, with "certification" as its dominant node, suggests that eco-labels and certification schemes form a separate research stream, reinforcing the idea that market-based certifications (eco-labels, B-Corp) have developed as a literature of their own.

The analysis also indicates the presence of multiple terms related to performance, including financial performance, environmental performance, economic effects, social effects, and investment, reflecting the broad scope of sustainability impact assessments.

Building on these findings, the temporal evolution of keywords provides further insight into the shifting focus of the literature over time. To capture major turning points in the research agenda, we divided the timespan into three periods: 1995–2015, 2016–2020, and 2021–2025.

Two main considerations guided this choice. First, we wished to capture the impact of key global events that reshaped the conversation around environmental responsibility. The 2015 Paris Agreement marked a significant turning point for climate policy, stimulating corporate interest in green initiatives and prompting more rigorous academic study of sustainability practices. Similarly, the onset of the COVID-19 pandemic around 2020 added pressures and uncertainties to global supply chains, risk management, and corporate disclosures, potentially altering how firms value and adopt environmental certifications. By segmenting the dataset into a pre-Paris Agreement window (1995–2015), a post-Paris but pre-COVID window (2016–2020), and a post-COVID window (2021–2025), we can more clearly identify emerging trends and shifts driven by these contextual factors.

Second, while the historical focus on EMS-based practices (e.g., ISO 14001) extends back into the mid-1990s, other types of sustainability certifications—particularly consumer-facing eco-labels and B-Corp—have gathered momentum more recently. Dividing the data into three periods also helps ensure each segment contains a sufficiently robust set of publications for meaningful analysis. This balanced approach allows us not only to observe when and how new research themes appear, but also to compare the relative prominence of different certifications and financial outcomes across distinct timeframes.

The examination of keyword usage reveals a progressive shift in scholarly focus. Figure 3 shows that between 1995 and 2015, research concentrated on environmental management, environmental policy, and sustainability, alongside emerging concerns about performance assessment and the role of managers in implementing environmental management systems. Terms such as "environmental management system (EMS)" and "performance assessment" underscore the early emphasis on internal organizational processes, reflecting an interest in how firms adopt structured practices to address regulatory pressures and societal expectations.

In the subsequent period, 2016 to 2020, the focus on environmental management persisted, although environmental management systems began to appear more frequently as a distinct keyword, indicating deeper scholarly interest in standardized practices such as ISO 14001 or EMAS. Notably, commerce and standards emerged, reflecting greater awareness of how environmental issues intersect with trade and market requirements. Additionally, innovation featured prominently, suggesting a growing appreciation for technological and managerial novelties that improve sustainability outcomes. Discussions of economic performance and costs became more explicit, while developing world surfaced as a thematic concern, highlighting the geographical expansion of research beyond mature economies.

Figure 3 should be placed around here

By 2021–2025, the range of topics broadened further. Certification appears as a more prominent keyword, reflecting the increasing influence of external, market-facing labels (e.g., eco-labels or B-Corp) and a recognition of their role in signalling sustainability commitments to consumers and investors. Environmental economics also gained ground, pointing to a more explicit connection between green practices and financial or market-based measures. Terms such as competition, firm size, sustainable development, and economic performance illustrate a shift toward strategic and economic dimensions of environmental responsibility, as firms grapple with balancing growth, competitiveness, and stakeholder pressure.

3.3. Authorship, Collaboration, and Journal Impact

An initial look at author impact, measured by total citations (TC), shows that Klassen R. and McLaughlin C. stand out with over 1,850 citations each, attributable to their foundational 1996 work, *The Impact of Environmental Management on Firm Performance*, published in Management Science. This study remains a key reference for exploring how corporate environmental strategies interface with financial outcomes, which explains its ongoing methodological and historical relevance. Other highly cited contributors include Testa F. (606 citations) and Iraldo F. (531 citations), both of whom focus on ISO 14001 and EMS adoption, illuminating the operational and managerial aspects of implementing formal environmental management systems. A second group of authors, including Ankele K., Hoffmann E., and Rennings K., ranks slightly lower in citation counts but similarly expands the empirical and theoretical foundations in the field.

Figure 4 should be placed around here

The co-authorship network in this field reveals a highly fragmented research landscape, with multiple small clusters of researchers working relatively independently. As illustrated in Figure 5**,** no single, dominant collaboration hub emerges, suggesting that studies on environmental certifications and firm performance are conducted by distinct research groups rather than a tightly connected academic community.

A few clusters stand out in terms of relative connectivity. Cluster 1, for instance, includes scholars such as Iraldo F., Daddi T., Marrucci L., and Testa F., who have notable connections in the field. Other clusters appear to be largely independent research teams, each potentially focusing on specific dimensions of sustainability certifications.

Overall, the structure of the network suggests that research on environmental certifications and firm performance is dispersed across multiple independent collaborations rather than converging into one large

international community. This dispersion might be due to the diverse nature of the topic, encompassing different certification types (ISO 14001, EMAS, eco-labels, B-Corp), varying disciplinary perspectives (e.g., management, economics, environmental science), and diverse spectrum of approaches (regulatory, strategic, operational) and contexts (different regions or industries) in which environmental certifications and their financial impacts are investigated.

Figure 5 should be placed around here

Finally, an examination of leading journals (see Table 3) reveals that the *Journal of Cleaner Production* is the most frequent publication venue, hosting 12.0% of the articles and accounting for 21.4% of total citations. *Business Strategy and the Environment* (6.5% of articles, 6.5% of citations) and *Sustainability (Switzerland)* (6.0% of articles, 4.3% of citations) follow. To ensure a robust analysis, we focused on journals with at least five published articles on the topic, allowing us to identify key publication outlets while maintaining a comprehensive view of the literature. Overall, the top five journals represent 29.6% of the papers and 38.7% of the citations, indicating a modest but notable concentration of research output. Nonetheless, the field is clearly not monopolized by a narrow set of specialized outlets: contributions also appear in broader management and production journals, including *Management Science*, which emerges as the second most cited journal due to the lasting impact of Klassen and McLaughlin's (1996) study. This distribution attests to a multidisciplinary interest in the topic, spanning from sustainability-oriented publications to those with a more general managerial or strategy focus.

Table 3 should be placed around here

Taken together, these three analyses (authors, collaboration, and journals) depict a field in continuous evolution, wherein particular groups of scholars are distinguished by higher citation counts and stable partnerships, while the majority of publications remains scattered in smaller research clusters. Meanwhile, the spread of articles across multiple journal outlets underscores the diverse disciplinary perspectives shaping research on environmental certifications and their financial implications—ranging from journals with a core focus on sustainability (*Journal of Cleaner Production*) to broader venues (*Management Science*) that nevertheless publish influential studies on the subject.

4. SYSTEMATIC REVIEW DISCUSSION

4.1. Introduction and Selection Methodology

This systematic review examines the relationship between environmental certifications and firm performance by analysing the five most cited papers on Environmental Management Systems (EMS)/ISO 14001 and the five most cited papers on eco-labels (such as green and sustainability certifications). The selection of these studies is based on total citation count, providing a perspective on the most influential works in the field.

The total citation count for the five selected EMS/ISO 14001 papers is significantly higher (1850, 474, 321, 285, and 183 citations) compared to the eco-labels' papers (204, 124, 116, 97, and 86 citations). This discrepancy suggests that EMS/ISO 14001 has been historically more studied, especially in the context of firm performance, while research on eco-labels has gained attention more recently. Additionally, examining the publication dates reveals that EMS studies were developed earlier, aligning with the earlier widespread adoption of ISO 14001. In contrast, eco-labels papers are relatively newer, reflecting the growing interest in market-driven sustainability initiatives. A detailed overview of the selected papers, including their theoretical motivations, key findings, and methodological approaches, is provided in Table 4.

4.2. Comparison of Theoretical Frameworks

The literature on EMS/ISO 14001 and eco-labels adopts distinct theoretical perspectives to explain the motivations behind certification and its potential impact on firm performance. Research on EMS/ISO 14001

is primarily grounded in institutional theory, stakeholder theory, and the resource-based view (RBV), emphasizing regulatory compliance, operational efficiency, and legitimacy-seeking behaviours.

The literature on Environmental Management Systems (EMS), particularly ISO 14001, applies multiple theoretical perspectives to explain firms' motivations for certification and its strategic implications. The most common frameworks include institutional and stakeholder theories, the resource-based view (RBV) and natural RBV, and strategic perspectives on competitiveness and innovation.

A foundational perspective in EMS adoption research combines institutional theory and stakeholder theory, both of which emphasize that firms seek certification in response to regulatory pressures, customer expectations, investor demands, and broader societal norms. Heras-Saizarbitoria et al. (2011) argue that firms adopt ISO 14001 to legitimize their operations and meet stakeholder expectations, particularly in industries where environmental concerns play a critical role in shaping corporate reputation. This aligns with the broader institutional view that firms comply with external expectations to maintain their social license to operate. The stakeholder perspective further reinforces this idea by suggesting that EMS certification is a means for firms to manage relationships with key constituencies, such as regulators, suppliers, and communities. By demonstrating environmental responsibility through certification, firms can strengthen trust and mitigate risks associated with non-compliance or reputational damage.

While stakeholder and institutional theories emphasize external drivers, RBV and natural RBV focus on the internal strategic benefits of EMS. Iraldo et al. (2009) argue that firms can leverage EMS adoption to improve operational efficiency, optimize resource use, and reduce environmental risks, ultimately leading to competitive advantages. This perspective suggests that EMS is not merely a compliance mechanism but a tool that enables firms to build unique capabilities that differentiate them from competitors. Expanding on this view, Miroshnychenko et al. (2017) introduce the natural RBV, which considers environmental capabilities as a source of long-term value creation. They propose that firms integrating EMS within their broader business strategy can develop resilience against environmental risks while simultaneously enhancing financial performance.

However, Heras-Saizarbitoria et al. (2011) raise concerns about self-selection bias, questioning whether the financial advantages attributed to ISO 14001 stem from the certification itself or from the fact that more efficient and better-performing firms are the ones that choose to get certified in the first place. This suggests that the observed benefits may not be a direct consequence of EMS adoption but rather a reflection of pre-existing organizational strengths. Such findings complicate the RBV perspective, indicating that while EMS can help firms optimize their operations, its financial benefits may be conditional on firm-specific factors rather than universally applicable.

Another theoretical approach focuses on the potential for EMS to drive process and product innovation. Rennings et al. (2006) examine whether EMS adoption stimulates environmental innovations and productivity improvements, particularly through pollution reduction and efficiency gains. Their work contributes to the discussion on whether proactive environmental management can generate dual benefits—economic and environmental—through improved resource efficiency. This aligns with broader debates on whether regulatory-driven environmental investments lead to firm-level innovation that enhances market competitiveness.

Finally, Klassen & McLaughlin (1996) explore how EMS affects firms' strategic positioning, arguing that environmental excellence can function as an indicator of strong management capabilities. They propose that proactive environmental management is associated with superior operational performance and lower long-term risks, positioning certified firms favourably in competitive markets. Their findings support the idea that EMS adoption is not just a compliance measure but also a strategic tool that firms can leverage to improve financial and environmental performance simultaneously.

Table 4 should be placed around here

The literature on eco-certifications, including eco-labels and sustainability ratings, presents a range of theoretical perspectives that seek to explain firms' motivations for adopting certifications and their potential financial implications. These perspectives, while distinct, often intersect in their examination of market dynamics, firm strategy, and consumer behavior.

A predominant theoretical foundation is signaling theory, which suggests that eco-certifications serve as a mechanism to reduce information asymmetry in markets where consumers cannot directly verify environmental quality. This perspective is central in Hamilton & Zilberman (2006), who argue that third-party certifications function as signals that differentiate firms genuinely committed to sustainability from those engaged in greenwashing. Their work, rooted in environmental economics and credence goods theory, highlights how certification schemes must maintain credibility through monitoring and enforcement to ensure they remain valuable signals. Without sufficient credibility, the market may fail to reward certified firms, and the differentiation advantage of eco-labels could erode.

Closely related to signalling theory is the industrial organization economics approach, which frames eco-certifications as strategic tools in competitive markets. Amacher et al. (2004) develop a duopoly model showing that firms' decisions to certify depend on cost structures and strategic interaction. In some cases, both firms in a market may adopt certification to remain competitive, while in others, a single firm may leverage eco-labelling as a differentiator to capture a niche consumer segment. This perspective aligns with competitive differentiation strategies, as firms use certification to position themselves favourably in sustainability-conscious markets, creating potential price premiums and brand advantages.

However, the economic viability of eco-certifications remains contingent on market conditions. Market-based perspectives, such as those found in Ibanez & Blackman (2016), question the assumption of a universal win-win scenario for sustainability and financial performance. Their empirical study in sustainable agriculture challenges the "win-win" premise by showing that while certification improves environmental practices, financial gains are not guaranteed. They emphasize that the success of certification depends on consumer willingness to pay, the extent of cost increases associated with compliance, and the overall market structure. This insight connects to the broader discussion of how external conditions shape the effectiveness of eco-certifications.

Further enriching this debate, sustainable product innovation literature, as discussed by Dangelico (2017), considers how eco-certifications fit within firms' broader innovation and branding strategies. Rather than focusing solely on immediate financial returns, her work suggests that firms may pursue eco-certifications as part of a long-term brand positioning strategy. By aligning sustainability commitments with product development and marketing, firms can strengthen their reputation and appeal to environmentally conscious consumers, potentially unlocking market advantages over time. This perspective introduces a dynamic element to the discussion—eco-certifications are not merely static tools for differentiation but can be integrated into firms' broader strategic innovation efforts.

Finally, in the context of service industries, sustainable tourism management perspectives, such as those in Esparon et al. (2014), highlight the role of consumer perception and legitimacy-seeking behaviour. Their research suggests that in industries where direct consumer interaction is crucial (e.g., hospitality and tourism), eco-certifications serve not only as a market signal but also as a legitimization tool, reinforcing a firm's reputation and trustworthiness among ethical consumers. This perspective aligns with both signalling theory and broader stakeholder-driven motivations, as firms aim to meet the expectations of not only consumers but also regulatory bodies, NGOs, and industry peers.

The divergence in theoretical approaches between EMS/ISO 14001 and eco-labels reflects their different institutional and market functions. While EMS studies emphasize regulatory legitimacy, stakeholder

management, and operational efficiency, eco-labels research focuses on competitive advantage, consumer signalling, and branding strategies. Furthermore, the audience for these certifications differs: EMS is primarily targeted at regulators, investors, and supply-chain partners, reinforcing corporate legitimacy and regulatory compliance, whereas eco-labels cater to consumers and sustainability-conscious buyers, leveraging branding and signalling mechanisms to influence purchasing behaviour. Ultimately, these distinct theoretical perspectives illustrate how firms pursue certification for different strategic purposes, with EMS focusing on internal governance and efficiency, while eco-labels operate as market signals that enhance competitiveness in sustainability-driven industries.

4.3. Comparison of Methodological approaches

The reviewed EMS studies and green certification studies employ notably different methodologies, reflecting their distinct research questions and data availability. EMS/ISO 14001 studies often rely on firm-level quantitative data over time. For example, two EMS papers used panel data with before-and-after comparisons: Heras-Saizarbitoria et al. (2011) analyse five-year financial panels with matched control firms to isolate ISO 14001 effects, and Miroshnychenko et al. (2017) harness a large international panel (3,490 firms) with fixed-effects regressions. These designs aim to control for confounding factors and identify causal links (or lack thereof) between EMS adoption and performance. Other EMS studies use cross-sectional surveys combined with econometric modelling: Rennings et al. (2006) and Iraldo et al. (2009) surveyed managers about innovations and performance, then ran regression analyses. Klassen & McLaughlin (1996) took a different empirical tack by doing a stock-market event study, capturing investors' real-time valuation of environmental management events. In general, EMS studies emphasize quantitative metrics like ROA, productivity, stock returns, or self-reported cost/turnover changes, and they often attempt to address endogeneity (through matching, panel models, or instrumental logic).

By contrast, green certification (eco-label) studies in this set are more heterogeneous in method. Two of these papers are purely theoretical models rooted in economics (Amacher et al., 2004; Hamilton & Zilberman, 2006). They use game theory and mechanism design to predict firm behaviour and market outcomes under different certification scenarios. These yield insights on policy and strategic dynamics (like fraud, investment incentives) but do not use data. On the empirical side, Ibanez & Blackman (2016) applied a quasi-experimental design at the micro level (farm-level matching & diff-in-diff) – a rigorous approach to pin down causal impacts of certification on farmers. This resembles program evaluation methods common in development economics.

Another empirical approach is survey-based perception analysis, as in Dangelico (2017) and Esparon et al. (2014). Dangelico's survey gathered managers' views on motivations and outcomes of eco-labeled product launches, using statistical techniques like factor analysis and structural equation modelling to infer relationships. Esparon et al. (2014) surveyed tourism consumers, employing Importance-Performance Analysis – a technique from marketing research – to understand consumer attitudes toward certification attributes. These studies are more qualitative/attitudinal in nature compared to the hard financial metrics in many EMS papers. They capture stakeholder perceptions and self-reported performance rather than objective profit measures.

In sum, EMS studies lean towards longitudinal and quantitative designs focusing on internal performance metrics, whereas green certification studies vary widely: some are conceptual, others quasi-experimental in field settings, and others survey-based focusing on market perceptions. This difference stems from the phenomena examined – EMS is an internal management tool (with data available on firm performance), while green product certifications interface with customers and markets (often requiring different data like surveys or theoretical modelling of market behaviour). The variety of methods on the green certification side means findings there are drawn from both analytical predictions and observational insights, which sometimes makes direct comparison challenging.

4.4. Differences in how EMS vs eco-labels impact financial performance

Despite a shared general goal of improving environmental and business outcomes, EMS and eco-labels impact financial performance through different pathways. EMS (ISO 14001, EMAS) primarily enhances internal efficiencies, risk management, and process innovation, with financial benefits typically arising from cost reductions, improved compliance, and productivity gains. Studies linking EMS to positive financial outcomes often attribute these effects to efficiency improvements. Rennings et al. (2006) found that well-implemented EMS systems drive process and product innovations, leading to productivity growth, while Iraldo et al. (2009) observed that competitive benefits emerge only when EMS adoption leads to real environmental improvements, such as increased efficiency. Klassen & McLaughlin (1996) suggest that EMS signals, such as environmental awards, create value by indicating strong management quality or reduced risk exposure, though their analysis focuses on short-term market reactions rather than long-term financial effects. However, not all studies find financial benefits. Heras-Saizarbitoria et al. (2011) concluded that ISO 14001 certification alone does not boost performance, as already-efficient firms often adopt it as a symbolic credential. Similarly, Miroshnychenko et al. (2017) found that investors may view superficial EMS adoption as a cost rather than a value-enhancing strategy. Thus, the financial impact of EMS depends largely on whether it is integrated as a proactive tool driving innovation and resource efficiency or merely adopted for compliance.

By contrast, green product certifications and eco-labels primarily affect financial performance through revenue generation—enhancing market demand, pricing power, and brand value. These certifications differentiate products as environmentally superior, attracting consumers and allowing firms to charge premium prices. However, empirical findings on their effectiveness remain mixed. While some studies highlight their market advantages, others suggest that financial benefits are highly context dependent. Dangelico (2017) found that firms pursue eco-labels primarily for market-driven motives and that well-differentiated green products can achieve superior sales and profit margins. Esparon et al. (2014) similarly noted that eco-certified tourism businesses were perceived more favourably, suggesting such certifications can enhance customer loyalty and willingness to pay. Yet, the market benefits of green labels are not universal. Ibanez & Blackman (2016) found that organic coffee farmers, despite receiving price premiums, faced higher costs and lower yields, resulting in no net financial gain. This aligns with Amacher et al. (2004), who argue that green quality investments are financially viable only when consumer willingness to pay is high enough to offset costs. Moreover, Hamilton & Zilberman (2006) emphasize that eco-label credibility is crucial—if consumers doubt certification claims, market premiums can erode, reducing potential financial gains.

Another distinction between EMS and eco-labels lies in timescale and scope. EMS benefits can yield immediate cost savings, such as reduced energy consumption, whereas eco-label benefits often require long-term brand building and consumer education before firms can command a price premium. Heras-Saizarbitoria et al. (2011) highlight that short-term studies may underestimate the benefits of EMS, particularly when self-selection effects influence firm performance, while the competitive advantage of eco-certifications may take time to materialize through brand recognition and reputational capital.

While both certification types have the potential to improve financial performance, their success is highly contingent on several factors. One major source of variation is context, including industry, country, and firm size. EMS tends to generate financial benefits in industries where process efficiency improvements can directly lower costs, such as manufacturing, but has weaker effects in service sectors with lower environmental cost exposure (Heras-Saizarbitoria et al., 2011). Eco-labels, meanwhile, perform better in consumer markets where sustainability is a key purchasing factor (Dangelico, 2017), while in commodity markets with price-sensitive consumers, such as agriculture, eco-label premiums may not offset production costs (Ibanez & Blackman, 2016). Country-specific factors, such as regulatory frameworks and consumer awareness, also shape outcomes. In markets with strong environmental policies or sustainability-conscious

consumers, firms are more likely to gain financial benefits from certification than in regions where green considerations hold less weight (Esparon et al., 2014). Firm size further influences the cost-benefit balance—large firms can absorb certification costs with minimal financial strain, whereas for SMEs, such expenses may outweigh potential advantages (Miroshnychenko et al., 2017).

Motivation and implementation quality also play a crucial role. Firms that integrate EMS or eco-labels into their core strategy—using them as a foundation for operational improvements or product differentiation—are more likely to see financial gains. In contrast, symbolic or compliance-driven adoption often results in negligible or even negative effects (Iraldo et al., 2009). Miroshnychenko et al. (2017) argue that lax auditing and vague ISO 14001 requirements allow firms to achieve certification without substantial operational changes, contributing to investor skepticism regarding its financial value.

Time lags and performance measurement differences further contribute to discrepancies across studies. Some benefits, particularly for EMS, may take years to materialize, whereas short-term studies might fail to capture their full impact (Heras-Saizarbitoria et al., 2011). Additionally, financial performance has been measured inconsistently—some studies focus on market-based metrics (e.g., stock price reactions), while others rely on accounting indicators (e.g., ROA, revenue growth), leading to different conclusions regarding certification effectiveness (Klassen & McLaughlin, 1996).

Lastly, External enabling factors, such as complementary assets and market conditions, also shape certification outcomes. For eco-labels, consumer awareness and effective marketing are crucial—without them, willingness to pay remains low (Esparon et al., 2014). EMS-driven performance gains, in contrast, are more dependent on R&D investment, employee training, and innovation capabilities—without these, firms may comply procedurally but fail to capture meaningful efficiency gains (Rennings et al., 2006).

4.5. Gaps and opportunities for Future Research

Although this review has highlighted valuable insights on how EMS and eco-labels affect firm performance, several important areas remain underexplored. One pressing need is to use longer time horizons in studying these certifications. Much of the current research relies on a handful of post-adoption years or on cross-sectional data, which may overlook slower-evolving benefits—like a gradual reputational boost—or costs that appear only after competitive advantages erode (Heras-Saizarbitoria et al., 2011). Future studies could track firms for a decade or more, observing how ISO 14001, EMAS, or eco-labels perform during different economic cycles and whether certifications retain their value over time (Miroshnychenko et al., 2017). Such a longitudinal approach would also reveal how early movers fare once other companies catch up, clarifying whether the advantage of being certified diminishes in more mature markets.

Another key direction involves broadening the performance metrics and understanding the intermediate steps that connect certification to financial results. While many studies focus on Return on Assets (ROA) or short-term stock market fluctuations, additional measures—like risk management, access to new financing, or operational flexibility—may capture subtler benefits (Rennings et al., 2006). For instance, EMS adoption can produce incremental cost savings or reduce volatility in earnings if better environmental practices limit the likelihood of accidents or regulatory penalties (Iraldo et al., 2009). Eco-labels might help a firm break into consumer segments that are willing to pay more, yet these gains might not show up immediately in accounting data. By examining mediators such as brand equity or innovation rates, researchers could pinpoint the “why” behind positive outcomes. In other words, a study might demonstrate that improved environmental performance—achieved through certification—reduces compliance costs, fosters community goodwill, and eventually translates into higher profitability.

Contextual factors also warrant attention, particularly among smaller firms and in emerging regions. Scholars have traditionally centred on larger corporations in developed countries, partly because these organizations have more resources and are more visible in databases (Hillary, 2004). Yet small and medium-sized

enterprises (SMEs) may face different pressures and have fewer capabilities to handle certification requirements, making the balance between upfront costs and potential rewards more delicate (Miroshnychenko et al., 2017). Likewise, in emerging markets with lower consumer awareness or weaker enforcement, the financial payoff of certifications may be limited, or conversely, they may act as a crucial passport for exporting to stricter countries. Studying diverse contexts would clarify whether widely reported modest impacts reflect certain Western markets or if there are unique patterns elsewhere.

There is also a need for comparative studies that explicitly contrast multiple certification schemes rather than evaluating them in isolation (Rennings et al., 2006). For instance, one might compare outcomes between ISO 14001 and EMAS for firms in the same sector and region, or between different eco-labels targeting similar product categories. Variations in transparency requirements (like EMAS's mandatory reporting) or the stringency of audits could systematically shape financial returns (Iraldo et al., 2009). Similarly, investigating how purely private eco-labels stack up against government-endorsed standards would help managers and policymakers decide which approach encourages stronger performance benefits. Better understanding these differences would also inform design choices for future certification programs, indicating which elements—e.g., public disclosure, rigorous compliance checks—tend to yield more consistent advantages.

In addition, consumer behaviour remains a somewhat underexplored piece of the puzzle. While some studies analyse perceived value of eco-labels (Esparon et al., 2014), fewer research designs measure actual consumer purchasing over the long run or how consumer trust may evolve, especially if instances of greenwashing or fraud come to light (Hamilton & Zilberman, 2006). A deeper dive into how eco-label credibility builds or wanes over time could reveal whether certain label features—like frequent third-party audits or strong marketing campaigns—lead to more stable price premiums and brand loyalty. Furthermore, event studies could evaluate how revelations of certification fraud (or poor enforcement) affect stock prices, providing robust evidence of how critical trust in certifications is to a firm's bottom line.

Lastly, there is a methodological gap in how studies integrate environmental and financial performance data. Few articles attempt to quantify, for instance, the precise economic return of each improvement in environmental metrics. Future research could construct models that examine both sets of outcomes together, identifying which organizational processes or capabilities produce genuine "win-win" benefits. Another option is to conduct broader quantitative syntheses (e.g., meta-analyses) across different industries and certifications, assessing which moderating variables—such as region, firm size, or competitive intensity—most strongly influence whether green certifications pay off (Heras-Saizarbitoria et al., 2011). By systematically aggregating findings, scholars might isolate best practices or highlight persistent contradictions in the data that require more targeted investigation.

Tackling these issues would greatly enrich our understanding of when and how environmental certifications yield financial benefits. Longer-term studies expanded performance measures, deeper exploration of smaller firms and new markets, direct scheme-to-scheme comparisons, closer attention to consumer dynamics, and integrated environmental-financial metrics are all needed to move the debate beyond conditional or mixed findings. Addressing these gaps would not only support more concrete guidance for managers and investors but also help policymakers refine certification programs to promote robust environmental outcomes alongside sustainable economic gains.

5. CONCLUSIONS

This review set out to clarify how environmental certifications – particularly EMS frameworks such as ISO 14001 and EMAS, as well as eco-label schemes – may shape a firm's financial trajectory. A two-phase method was adopted: first, a bibliometric study traced the intellectual structure of the field, revealing growing yet somewhat fragmented communities of authors, varied research hubs worldwide, and key journals leading the conversation. Our data show that while the EMS literature has a longer history and higher average

citation count, eco-label studies exhibit a faster annual growth rate, reflecting an increasing emphasis on consumer-facing certifications.

Second, a systematic review of major contributions offered deeper insight into the mechanisms at play. EMS-based certifications appear to benefit firms primarily by refining internal processes, cutting operational risks, and improving efficiency. In contrast, eco-labels typically target consumer perceptions and can open up opportunities for premium pricing or wider market access, provided that trust in the label remains robust. Nonetheless, financial outcomes are far from guaranteed, partly because of inconsistencies in how performance is measured (ranging from ROA and productivity to stock market indicators) and partly due to the pivotal role of context. For instance, large manufacturers in regions with stringent regulations might profit significantly from EMS adoption, whereas a small agricultural producer might find eco-labels more relevant for accessing green-conscious export markets.

Several themes also stand out from our examination of publication trends and theoretical perspectives. Institutional and stakeholder theories frequently underpin EMS-related studies, emphasizing compliance and legitimacy. Eco-label research leans more on signalling and consumer behaviour theories, focusing on market differentiation. Yet there is ample room for cross-pollination, especially considering frameworks like B-Corp that integrate social and environmental aspects in ways that overlap with eco-label ambitions.

Taken together, these findings suggest that a general assumption of financial advantage from certification is too simplistic. Instead, firm size, sector, geographic setting, and actual implementation quality strongly modulate the relationship between certifications and profit. Future research might adopt more comprehensive timeframes and broader outcome metrics, compare multiple certifications in the same empirical context, or investigate consumer trust through longitudinal datasets.

Despite the contributions of this study, certain limitations should be acknowledged, as they offer opportunities for further research. First, the analysis relies on specific databases (Scopus and Web of Science), potentially excluding relevant literature available in other databases or in languages different from English.

Second, our findings predominantly reflect the characteristics and research trends prevalent in developed countries, given that most empirical studies in our sample focus on listed companies from these contexts. This geographical concentration could limit the generalizability of our conclusions, especially regarding small and medium-sized enterprises (SMEs) or firms operating in emerging markets, which have received relatively less attention despite their substantial global economic relevance.

Lastly, while we systematically reviewed the most cited papers in the field, the selection of only the top five papers per category may not fully capture the breadth of existing research. Some valuable insights from less cited but methodologically rigorous studies may have been overlooked.

By addressing these limitations, future studies can build upon our work to refine theoretical models, expand empirical evidence, and develop actionable insights for firms, policymakers, and investors navigating the complexities of environmental certification and financial performance.

REFERENCES

Amacher, G. S., Koskela, E., & Ollikainen, M. (2004). Environmental quality competition and eco-labeling. Journal of Environmental Economics and Management, 47(2), 284–306. https://doi.org/10.1016/S0095-0696(03)00078-0

Aria, M., & Cuccurullo, C. (2017). bibliometrix : An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, *11*(4), 959–975. https://doi.org/10.1016/j.joi.2017.08.007

Bansal, P., & Bogner, W. C. (2002). Deciding on ISO 14001: Economics, Institutions, and Context. *Long Range Planning*, *35*(3), 269–290. https://doi.org/10.1016/S0024-6301(02)00046-8

Benz, L., Paulus, S., Scherer, J., Syryca, J., & Trück, S. (2021). Investors' carbon risk exposure and their potential for shareholder engagement. *Business Strategy and the Environment*, *30*(1), 282–301. https://doi.org/10.1002/bse.2621

Boiral, O. (2011). Managing with ISO Systems: Lessons from Practice. *Long Range Planning*, *44*(3), 197–220. https://doi.org/10.1016/j.lrp.2010.12.003

Boiral, O., Guillaumie, L., Heras-Saizarbitoria, I., & Tayo Tene, C. V. (2018). Adoption and Outcomes of ISO 14001: A Systematic Review. *International Journal of Management Reviews*, *20*(2), 411–432. https://doi.org/10.1111/ijmr.12139

Boström, M., & Hallström, K. T. (2010). NGO Power in Global Social and Environmental Standard-Setting. *Global Environmental Politics*, *10*(4), 36–59. https://doi.org/10.1162/GLEP_a_00030

Bretas, V. P. G., & Alon, I. (2021). Franchising research on emerging markets: Bibliometric and content analyses. *Journal of Business Research*, *133*, 51–65. https://doi.org/10.1016/j.jbusres.2021.04.067

Camilleri, M. A. (2022). The rationale for <scp>ISO</scp> 14001 certification: A systematic review and a cost–benefit analysis. *Corporate Social Responsibility and Environmental Management*, *29*(4), 1067–1083. https://doi.org/10.1002/csr.2254

Chen, X., & Kelly, T. F. (2015). B-Corps—A Growing Form of Social Enterprise. *Journal of Leadership & Organizational Studies*, *22*(1), 102–114. https://doi.org/10.1177/1548051814532529

Christofi, M., Pereira, V., Vrontis, D., Tarba, S., & Thrassou, A. (2021). Agility and flexibility in international business research: A comprehensive review and future research directions. *Journal of World Business*, *56*(3), 101194. https://doi.org/10.1016/j.jwb.2021.101194

Dangelico, R. M. (2017). What Drives Green Product Development and How do Different Antecedents Affect Market Performance? A Survey of Italian Companies with Eco-Labels. *Business Strategy and the Environment*, *26*(8), 1144–1161. https://doi.org/10.1002/bse.1975

Delmas, M. (2001). Stakeholders and competitive advantage: the case of ISO 14001. *Production and Operations Management*, *10*(3), 343–358. https://doi.org/10.1111/j.1937-5956.2001.tb00379.x

Delmas, M. A., & Montes-Sancho, M. J. (2010). Voluntary agreements to improve environmental quality: symbolic and substantive cooperation. *Strategic Management Journal*, *31*(6), 575–601. https://doi.org/10.1002/smj.826

Derviş, H. (2020). Bibliometric Analysis using Bibliometrix an R Package. *Journal of Scientometric Research*, *8*(3), 156–160. https://doi.org/10.5530/jscires.8.3.32

Esparon, M., Gyuris, E., & Stoeckl, N. (2014). Does *ECO* certification deliver benefits? An empirical investigation of visitors' perceptions of the importance of *ECO* certification's attributes and of operators' performance. *Journal of Sustainable Tourism*, *22*(1), 148–169. https://doi.org/10.1080/09669582.2013.802325

EU. (2014). *EU Taxonomy, Corporate Sustainability Reporting, Sustainability Preferences and Fiduciary Duties: Directing finance towards the European Green Deal COM/2021/188 final.* European Commission.

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. *The FASEB Journal*, *22*(2), 338–342. https://doi.org/10.1096/fj.07-9492LSF

Galarraga Gallastegui, I. (2002). The use of eco-labels: a review of the literature. *European Environment*, *12*(6), 316–331. https://doi.org/10.1002/eet.304

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? *Journal of Cleaner Production*, *143*, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

Hamilton, S. F., & Zilberman, D. (2006). Green markets, eco-certification, and equilibrium fraud. *Journal of Environmental Economics and Management*, *52*(3), 627–644. https://doi.org/10.1016/j.jeem.2006.05.002

Heras-Saizarbitoria, I., Arana, G., & Boiral, O. (2016). Outcomes of Environmental Management Systems: the Role of Motivations and Firms' Characteristics. *Business Strategy and the Environment*, *25*(8), 545–559. https://doi.org/10.1002/bse.1884

Heras-Saizarbitoria, I., & Boiral, O. (2013). ISO 9001 and ISO 14001: Towards a Research Agenda on Management System Standards*. *International Journal of Management Reviews*, *15*(1), 47–65. https://doi.org/10.1111/j.1468-2370.2012.00334.x

Heras-Saizarbitoria, I., Molina-Azorín, J. F., & Dick, G. P. M. (2011). ISO 14001 certification and financial performance: selection-effect versus treatment-effect. *Journal of Cleaner Production*, *19*(1), 1–12. https://doi.org/10.1016/j.jclepro.2010.09.002

Hillary, R. (2004). Environmental management systems and the smaller enterprise. *Journal of Cleaner Production*, *12*(6), 561–569. https://doi.org/10.1016/j.jclepro.2003.08.006

Ibanez, M., & Blackman, A. (2016). Is Eco-Certification a Win–Win for Developing Country Agriculture? Organic Coffee Certification in Colombia. *World Development*, *82*, 14–27. https://doi.org/10.1016/j.worlddev.2016.01.004

Iraldo, F., Testa, F., & Frey, M. (2009). Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European union. *Journal of Cleaner Production*, *17*(16), 1444–1452. https://doi.org/10.1016/j.jclepro.2009.05.013

Jiang, R. J., & Bansal, P. (2003). Seeing the Need for ISO 14001. *Journal of Management Studies*, *40*(4), 1047–1067. https://doi.org/10.1111/1467-6486.00370

Khan, M. A. (2022). ESG disclosure and Firm performance: A bibliometric and meta analysis. *Research in International Business and Finance*, *61*, 101668. https://doi.org/10.1016/j.ribaf.2022.101668

Klassen, R. D., & McLaughlin, C. P. (1996). The Impact of Environmental Management on Firm Performance. *Management Science*, *42*(8), 1199–1214. https://doi.org/10.1287/mnsc.42.8.1199

Martín-de Castro, G., Amores-Salvadó, J., & Navas-López, J. E. (2016). Environmental Management Systems and Firm Performance: Improving Firm Environmental Policy through Stakeholder Engagement. *Corporate Social Responsibility and Environmental Management*, *23*(4), 243–256. https://doi.org/10.1002/csr.1377

Martín-Martín, A., Orduna-Malea, E., Thelwall, M., & Delgado López-Cózar, E. (2018). Google Scholar, Web of Science, and Scopus: A systematic comparison of citations in 252 subject categories. *Journal of Informetrics*, *12*(4), 1160–1177. https://doi.org/10.1016/j.joi.2018.09.002

Melnyk, S. A., Sroufe, R. P., & Calantone, R. (2003). Assessing the impact of environmental management systems on corporate and environmental performance. *Journal of Operations Management*, *21*(3), 329–351. https://doi.org/10.1016/S0272-6963(02)00109-2

Miroshnychenko, I., Barontini, R., & Testa, F. (2017). Green practices and financial performance: A global outlook. *Journal of Cleaner Production*, *147*, 340–351. https://doi.org/10.1016/j.jclepro.2017.01.058

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., & Stewart, L. A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, *4*(1), 1. https://doi.org/10.1186/2046-4053-4-1

Nawrocka, D., & Parker, T. (2009). Finding the connection: environmental management systems and environmental performance. *Journal of Cleaner Production*, *17*(6), 601–607. https://doi.org/10.1016/j.jclepro.2008.10.003

Oliveira, J. A., Oliveira, O. J., Ometto, A. R., Ferraudo, A. S., & Salgado, M. H. (2016). Environmental Management System ISO 14001 factors for promoting the adoption of Cleaner Production practices. *Journal of Cleaner Production*, *133*, 1384–1394. https://doi.org/10.1016/j.jclepro.2016.06.013

Orsato, R. J. (2006). Competitive Environmental Strategies: When Does it Pay to Be Green? *California Management Review*, *48*(2), 127–143. https://doi.org/10.2307/41166341

Palea, V., & Drogo, F. (2020). Carbon emissions and the cost of debt in the eurozone: The role of public policies, climate-related disclosure and corporate governance. *Business Strategy and the Environment*, *29*(8), 2953–2972. https://doi.org/10.1002/bse.2550

Patel, P. C., & Dahlin, P. (2022). The impact of B Corp certification on financial stability: Evidence from a multi-country sample. *Business Ethics, the Environment & Responsibility*, *31*(1), 177–191. https://doi.org/10.1111/beer.12403

Pham, H.-H., Dong, T.-K.-T., Vuong, Q.-H., Luong, D.-H., Nguyen, T.-T., Dinh, V.-H., & Ho, M.-T. (2021). A bibliometric review of research on international student mobilities in Asia with Scopus dataset between 1984 and 2019. *Scientometrics*, *126*(6), 5201–5224. https://doi.org/10.1007/s11192-021-03965-4

Pranckutė, R. (2021). Web of Science (WoS) and Scopus: The Titans of Bibliographic Information in Today's Academic World. *Publications*, *9*(1), 12. https://doi.org/10.3390/publications9010012

Rennings, K., Ziegler, A., Ankele, K., & Hoffmann, E. (2006). The influence of different characteristics of the EU environmental management and auditing scheme on technical environmental innovations and economic performance. *Ecological Economics*, *57*(1), 45–59. https://doi.org/10.1016/j.ecolecon.2005.03.013

Roheim, C. A., Asche, F., & Santos, J. I. (2011). The Elusive Price Premium for Ecolabelled Products: Evidence from Seafood in the UK Market. *Journal of Agricultural Economics*, *62*(3), 655–668. https://doi.org/10.1111/j.1477-9552.2011.00299.x

Romi, A., Cook, K. A., & Dixon-Fowler, H. R. (2018). The influence of social responsibility on employee productivity and sales growth. *Sustainability Accounting, Management and Policy Journal*, *9*(4), 392–421. https://doi.org/10.1108/SAMPJ-12-2016-0097

Secinaro, S., Brescia, V., Calandra, D., & Saiti, B. (2020). Impact of climate change mitigation policies on corporate financial performance: Evidence-based on European publicly listed firms. *Corporate Social Responsibility and Environmental Management*, *27*(6), 2491–2501. https://doi.org/10.1002/csr.1971

Stanley, T. D. (2001). Wheat From Chaff: Meta-Analysis As Quantitative Literature Review. *Journal of Economic Perspectives*, *15*(3), 131–150. https://doi.org/10.1257/jep.15.3.131

Su, L., Swanson, S. R., & Chen, X. (2018). Reputation, subjective well-being, and environmental responsibility: the role of satisfaction and identification. *Journal of Sustainable Tourism*, *26*(8), 1344–1361. https://doi.org/10.1080/09669582.2018.1443115

Testa, F., Todaro, N., Gusmerotti, N. M., & Frey, M. (2020). Embedding corporate sustainability: An empirical analysis of the antecedents of organization citizenship behavior. *Corporate Social Responsibility and Environmental Management*, *27*(3), 1198–1212. https://doi.org/10.1002/csr.1875

UNFCC. (2021). *COP26 reaches consensus on key actions to address climate change*. United Nations Climate Change.

United Nations. (2015). *Paris Agreement*.

Wen, H., & Lee, C.-C. (2020). Impact of environmental labeling certification on firm performance: Empirical evidence from China. *Journal of Cleaner Production*, *255*, 120201. https://doi.org/10.1016/j.jclepro.2020.120201

Wilburn, K. M., & Wilburn, R. (2011). Achieving Social License To Operate Using Stakeholder Theory. *Journal of International Business Ethics*, *4*(2), 3–16.

Xu, X. D., Zeng, S. X., Zou, H. L., & Shi, J. J. (2016). The Impact of Corporate Environmental Violation on Shareholders' Wealth: a Perspective Taken from Media Coverage. *Business Strategy and the Environment*, *25*(2), 73–91. https://doi.org/10.1002/bse.1858

Yokessa, M., & Marette, S. (2019). A Review of Eco-labels and their Economic Impact. *International Review of Environmental and Resource Economics*, *13*(1–2), 119–163. https://doi.org/10.1561/101.00000107

Yu, H.-C., Kuo, L., & Kao, M.-F. (2017). The relationship between CSR disclosure and competitive advantage. *Sustainability Accounting, Management and Policy Journal*, *8*(5), 547–570. https://doi.org/10.1108/SAMPJ-11-2016-0086

Figure 1. Methodological process and results.

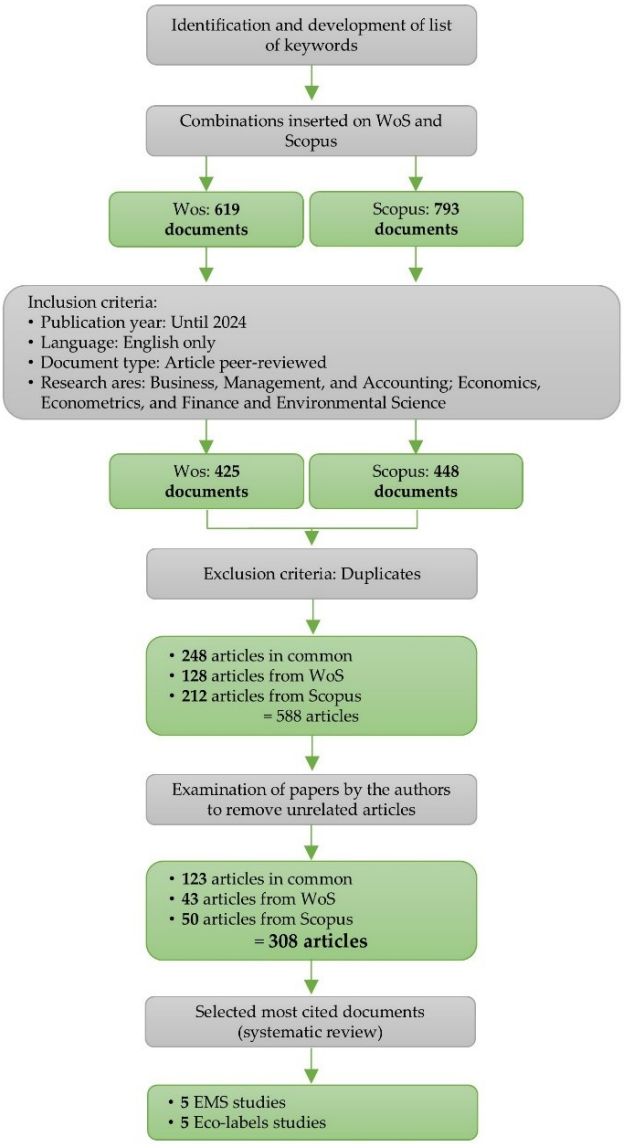

Table 1. Sample description.

Research Method			**# of Articles**	**% of Articles**
Quantitative			146	67.6
Qualitative/ Conceptual			70	32.4
	of which	Theoretical	32	14.8
		Survey	28	13.0
		Review	4	1.9
Certifications				
EMS			80	37.0
ISO 14001			69	31.9
Eco-Labels			55	25.5
B-Corp			12	5.6
Countries				
China			20	13.7
USA			14	9.6
Spain			13	8.9
Malaysia			11	7.5
Indonesia			8	5.5
Italy			8	5.5
Taiwan			5	3.4
UK			5	3.4
International			25	17.1
Others			37	25.3

Table 2. Summary of Articles

	Results		
Description	**Complete sample**	**EMS/ISO14001**	**Eco-labels/B-corp**
MAIN INFORMATION			
Timespan	1995:2024	1995:2024	2004:2024
Sources	126	91	53
Documents	216	149	67
Annual Growth Rate %	2.34	2.34	8.38
Document Average Age	8.3	9.23	6.24
Average citations per doc	52.04	62.01	29.87
References	11932	8046	4110
DOCUMENT CONTENTS			
Keywords Plus	736	577	253
Author's Keywords	610	405	252
AUTHORS			
Authors	553	383	181
Authors of single-authored docs	29	19	10
AUTHORS COLLABORATION			
Single-authored docs (no.)	32	21	11
Single-authored docs (%)	25.4	23.1	20.8
Co-Authors per Doc	2.9	2.9	2.8
International co-authorships %	2.8	2.0	4.5

Figure 2. Topics' relevance as analysed in the co-occurrence network.

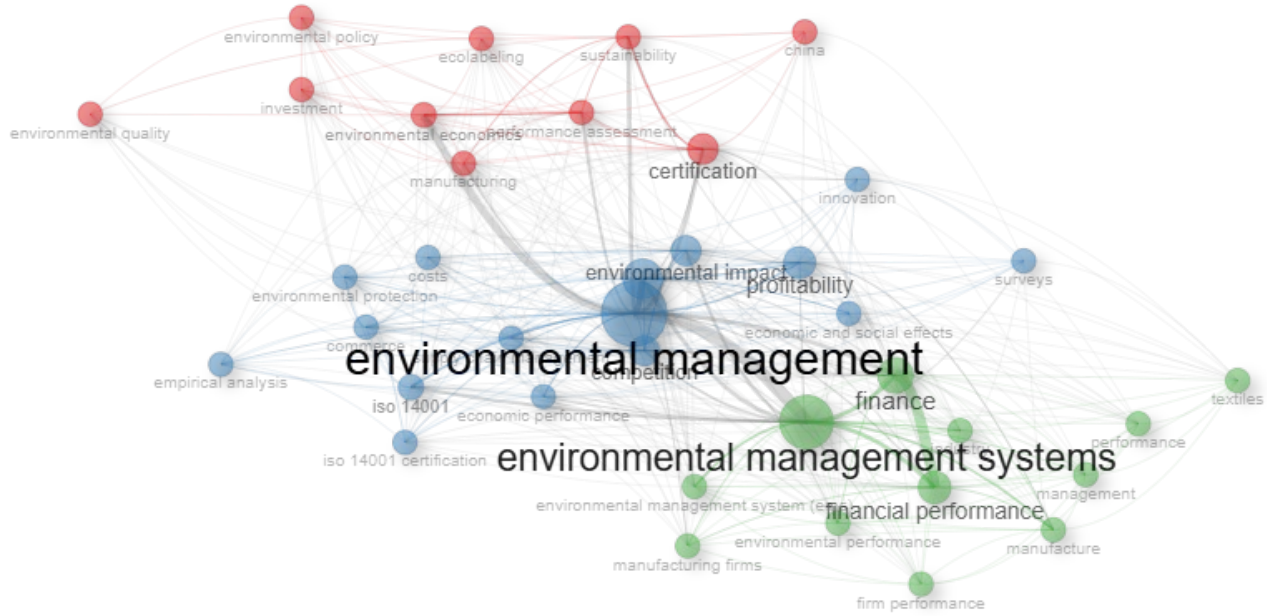

Figure 3. Thematic evolution.

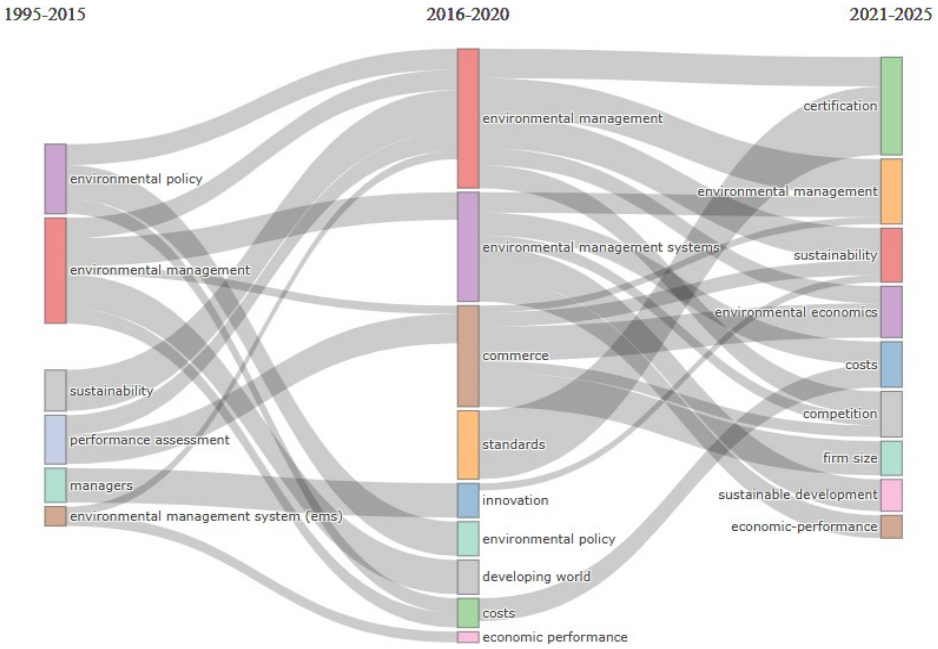

Figure 4. Author impact by TC index

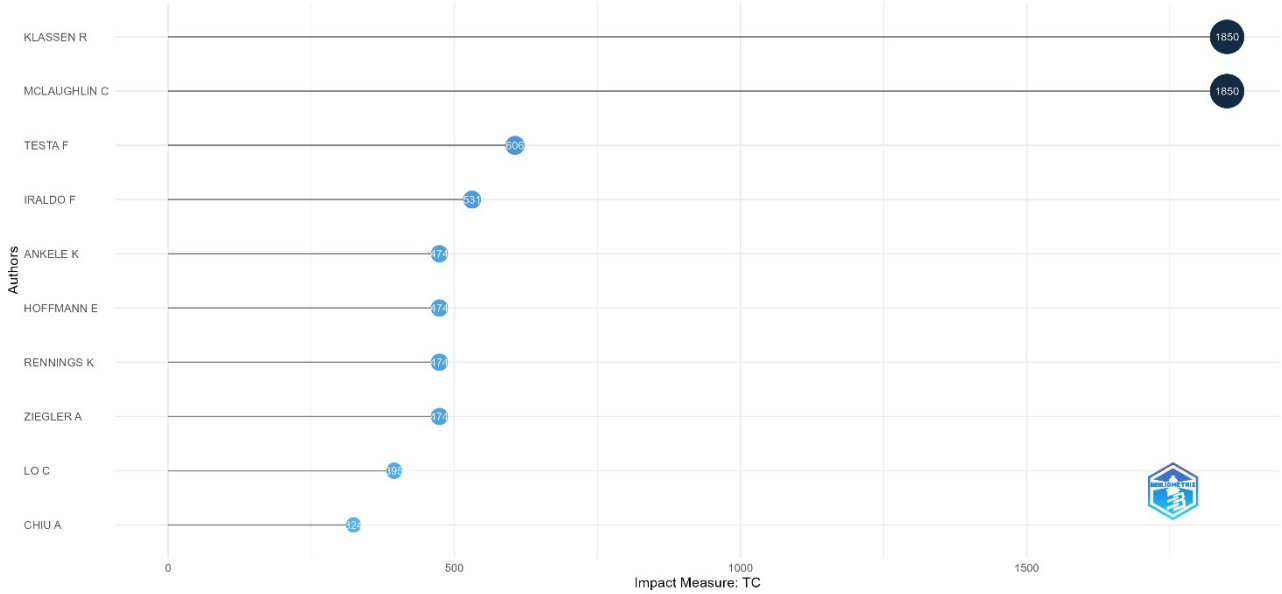

Figure 5. Author network

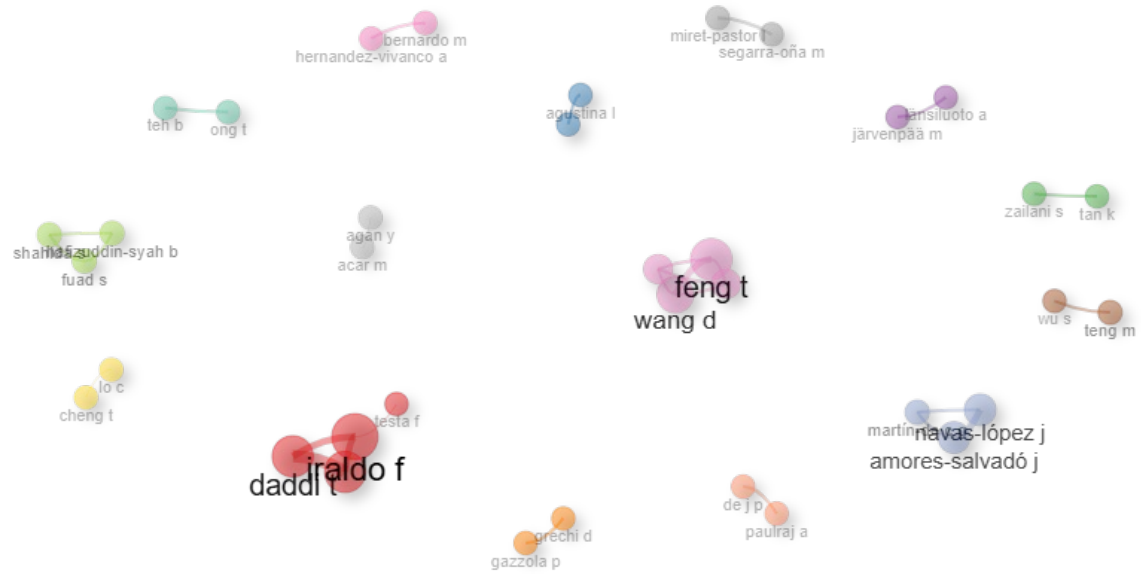

Table 3. Most influential Journals

#	Journal	Number of Articles		Number of Citations	
1	Journal of Cleaner Production	26	12.04%	2408	21.42%
2	Business Strategy and The Environment	14	6.48%	727	6.47%
3	Sustainability	13	6.02%	479	4.26%
4	Corporate Social Responsibility and Environmental Management	6	2.78%	315	2.80%
5	International Journal of Production Economics	5	2.31%	418	3.72%
	Total	**64**	**29.63%**	**4347**	**38.67%**

Table 4. Summary of top-cited studies on EMS and eco-labels included in the analysis, presented in sequence by total citations

Certification Type	Theoretical Framework	Data & Sample	Methodology	Key Hypotheses	Financial variable	Main findings
EMS (general environmental management)	Ems linked to performance via risk reduction, process efficiency and market expectations	U.S. publicly traded firms with environmental "events"	Event study	Does environmental management yield improved market valuation?	Stock market returns	Environmental awards improve stock returns; environmental crises hurt them
EMS – EMAS (EU Eco-Management & Audit Scheme)	Ecological modernization theory and "double dividend" logic	Survey of German EMAS-certified facilities (~1,277 respondents)	Survey and linear regressions	More mature EMS implementations drive environmental innovation and economic performance	Self-reported economic performance improvements	More mature EMS firms show innovation and higher economic performance
EMS – EMAS (EU)	Resource-Based View (RBV); competitive advantage through EMS	Survey of firms in EU (70 EMAS adopters vs 31 non-adopters)	Survey and linear regressions	EMS adoption improves environmental performance and financial performance	Market share, sales growth, innovation, brand image	Environmental gains mediate competitive benefits, but no automatic market gain
Mixed "Green practices" (including ISO	Integrative framework using natural Resource-Based View (RBV)	Global sample of 3,490 listed companies	Linear regression	Pollution prevention and ISO 14001 adoption positively impact CFP	Return on Equity (ROE) and Tobin's Q	Internal green practices drive profitability; ISO 14001 itself had no
EMS – ISO 14001	Trade-off hypothesis and Stakeholder theory	Spanish firms (2000–2005), 98 certified vs 98 non-certified	Panel regression	ISO 14001 firms already have higher performance before certification	Return on Assets (ROA) and sales growth	ISO 14001 firms don't gain financial performance post-certification
Green Certification – Eco-labeling (theoretical)	Industrial organization economics – duopoly model	No empirical data (analytical model)	Theoretical analysis (game theory	How does eco-labeling affect market competition and welfare?	Firm profit and market outcomes	Eco-labelling can reduce excessive investment and increase environmental
Green Certification – Eco-certification and fraud	Environmental economics of information – credence goods	No empirical data (analytical model)	Theoretical modelling (equilibrium	How do market structure and policy affect green fraud and profits?	Firm profits, output, and fraud levels	Eco-certifications can reduce fraud and raise firm profits with the right
Green Certification – Organic (Eco-label for coffee)	Win–Win sustainable agriculture premise	382 coffee farmers in Colombia (56 certified vs 168 non-certified)	Difference-in-differences model	Does organic certification improve farm sustainability and financial performance?	Yield, coffee income, net revenue per hectare	Organic certification improves sustainability but not net farm income
Green Certification – Eco-labeled green products	Sustainable product innovation literature	188 Italian companies with eco-labeled products	Survey and linear regressions	What drives green product development and its market success?	Market performance of green products	Market-driven green innovation has the greatest impact; performance improves
Green Certification – ECO Certification (Tourism)	Sustainable tourism management perspective	610 tourists in Australia's World Heritage area	Survey (descriptive statistics)	Do tourists perceive certified operators as better?	Customer-perceived performance	Certified tourism firms perceived as better but unclear financial impact

Reference
Klassen & McLaughlin (1996)
Rennings et al. (2006)
Iraldo et al. (2009)
Miroshnychenko et al. (2017)
Heras-Saizarbitoria et al.(2011)
Amacher et al. (2004)
Hamilton & Zilberman (2006)
Ibanez & Blackman (2016)
Dangelico, (2017)
Esparon et al. (2014)