

Environmental Responsibilities and Firms Financial Performance: A Systematic Review and Bibliometric Analysis

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Abstract: The aim of this study is to present a systematic review and bibliometric analysis of 512 studies on environmental responsibilities and firm financial performance literature. The study aims to track the research trend and identify the reasons behind heterogeneity in the studied association. The Scopus database was comprehensively searched to collect bibliographic material, giving an overview of contributing and influential research areas, key authors, journals, and countries. Network visualization is used to identify clusters. Content analysis of the literature revealed the essential topics of the investigation. The systematic review revealed that geographical constraints, regulatory constraints, and lack of standardizability are significant reasons for heterogeneity. We identify three major researched areas: a) economic and financial impact, b) innovation, environment management system, and standards, and c) supply chain management development. Discussion on the significant clusters concludes that studies showing positive economic benefits dominate the literature. Overall, the results of different scientific production do not indicate consensus in one direction, but mixed results help to build a new perspective and expand the research horizon. Using a systematic process, this study recognizes the value-creation potential of proactive environmental management practices.

Keywords: bibliometric, environmental responsibilities, firm performance, systematic review.

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INTRODUCTION

Environmental degradation and pressure on the existing natural resources lead to an adverse environmental impact in terms of climate change, rising sea levels, and frequency of natural catastrophic events. This requires shifting from massive natural resources-based industries to a green business model, based on resource-efficient technology and sustainability (Kumar et al., 2019). The situation can be tackled through the collaborative efforts of all sectors of the economy (Chen, 2008). The transformation was widely accepted by 84 countries across the globe in 1997 by signing the Kyoto protocol in UNCCC (Böhringer, 2003). A shift in the school of management thought can be observed in the 1950s when the importance of environmental interactions was highlighted in the literature of systems schools.

Change in the business strategies from profit maximization to inclusion of capital and operating cost for environmental engagement and eco-innovation activities (Suteja et al., 2017). This is because of rising public awareness and government regulations over ecological issues (Tang et al., 2018). Implementing an environmental



engagement system will improve the economic benefit of firms in terms of adding a more environmentally friendly customer base (Nishitani, 2011). It also benefits firms in terms of societal impact, reducing energy-related costs and incentives from the government in terms of subsidy and tax deductions (Lagas, 2015).

Environmental management is the concept that creates linkages among the varying management functions and processes with environmental concerns (Gupta, 1995). Klassen & Whybark (1999) defined environmental performance as measures of firms' decisions and products on the ecological environment. It addresses the different issues of traditional management systems, which directly and indirectly impact the environment in negative way. The relationship between environmental engagement activities and the financial performance of firms is not directly linked (Bansal, 2005). Environmental engagement activities lead to an additional financial burden in modifying processes from fossil fuels to renewable energy sources. This extra cost will increase the cost of production and reduce sales, negatively affecting financial performance (Klassen & Whybark, 1999). Authors in the neoclassical thought school of management argue that whether this environmental engagement leads to an additional financial burden (Palmer et al., 1995)

Management literature has gained the significance of environmental Innovation and sustainable transformation (Schiederig et al., 2012; Maji et al., 2020). The study of environmental engagement in different management activities and its impact on firm performance is widely researched among scholars, policymakers, and industrialists. Nevertheless, there is no standard agreement among the studies regarding their relationship. Past literature is divided into three categories (Elshahat et al., 2015). One group of researchers thinks that additional expenditure on environmental engagement activities has no impact on profitability. In contrast, the other group feels that it positively affects firms' financial position and another group of researchers concludes no relationship. No attempt has been made in the past to identify the possible reasons behind this heterogeneity among the results. Therefore a general vision of the hypothesized association is defensible. To achieve this objective, this study analyses previously studied associations in published literature through the bibliometric lens and systematic review. Possible reasons behind the heterogeneity among the results are identified by using performance variable analysis. A systematic review of scientific production can serve as a foundation for future researchers (Moreno & Rosselli, 2012).

The results of bibliometric analysis map significant growth in literature. Through keyword network analysis, this study identifies three research hotspots. The first hotspot focused on environmental economics, financial performance, and environmental assessment of decisions. The second group of studies covers various environmental management systems. Whereas the last sub-group is focused on supply chain management and sustainable development. Apart from sub-group research areas, these subgroups' frequently used methods and models are identified. This paper concludes that the possible reason behind the heterogeneity among the results is the small sample size and geographically biased. Over time, the variables taken by the author to measure the performance are heterogeneous and not standardized. Positive association is found mainly in the studies on developed nations and large-sized firms. The association also varies based on the time horizon.

METHODS

A systematic review helps to track the development of the body of knowledge in any domain. Moreover, it further helps identify the possibility of further research to strengthen the existing literature (Randolph, 2009). Bibliometric analysis is generally used to study the topic studied for a long time. It starts with locating relevant literature available in the area by targeting the studies published in prominent journals, book chapters, and presented at conferences. At the same time, a topic like environmental engagement, which has gained

prominence in the last decade, can be tracked through systematic review and bibliometric analysis. Peer-reviewed research papers on the current theme were identified from the online Scopus database. The Scopus database is more comprehensive in comparison to other databases. It covers more than 34000 peer-reviewed journals with over 5000 publishers worldwide in different areas of study; therefore, it is helpful to cover a sizeable portion of peer-reviewed papers.

This study used six steps literature review generic framework given by Templier & Paré (2015). The process begins with formulating the research question(s) and objective(s), identification of databases and searching literature using keywords, after initial results we further screened the results on the basis of inclusion and exclusion criteria, extraction of required information for bibliographic mapping, and data screening. The data for this bibliometric analysis was collected from the Scopus database. A search was conducted using the terms “Environmental management” OR “Environmental concern” AND “Financial performance” OR “Economic performance” within the title, abstract, and keywords of the articles. The search was limited to articles published in English and indexed in the business, management, economics, finance, and econometrics subjects. A total of 512 articles were collected for analysis.

Further, the data was cleaned by standardizing author names. Titles, keywords, and abstracts were also cleaned by removing special characters and non-English words. The data was analyzed using the VOSviewer software (Van Eck & Waltman, 2010), a tool for network analysis of keywords to identify research hotspots.

RESULTS AND DISCUSSION

In this section, we reported a comprehensive overview of the current state of the literature on environmental responsibilities and firm performance. This section highlights the contributing and influential authors, journals, and countries. This section also reports the publication trend in this domain. Additionally, we identified the most prominently researched hotspots. In last, we summarize the different variables used to measure the environmental responsibilities and firms’ financial performance.

Temporal Analysis

The temporal analysis showed that the number of publications in the field has been increasing steadily over time, with a significant increase in the number of articles published in the last five years. The temporal distribution of the articles was analysed by calculating the number of articles published each year, which revealed that the number of articles increased from 1 article in 1991 to a maximum of 2000 in 2020 and 12 in the first month of 2023. As shown in figure 1, the publication trend increased over time, with significant downturns in 2005, 2009, and 2013. At the same time, the year-wise cumulative citations show a mixed trend with major upturns between 2003 to 2004 and 2005 to 2013. A significant downturn in both publications and citations was noticed between 2014-15.

Most Cited Articles

Table 1 shows the top ten most cited articles in the selected sample, along with their authors, year of publication, number of citations, and the average citation per year. Orlitzky et al. (2003) article on “Corporate social and financial performance: A meta-analysis” has the highest citation count of 4114, which is 38.89% of total citations. Followed by Klassen & McLaughlin (1996) with 1634 citations, which is 15.94 % of total citations. These publications have significantly impacted this area of management research and can be considered seminal works. The average citation count per year were computed and compared, which shows that low-cited articles

Green et al. (2012) and Zhu et al. (2013) have more citation count per year than Klassen & McLaughlin's (1996) highly cited article.

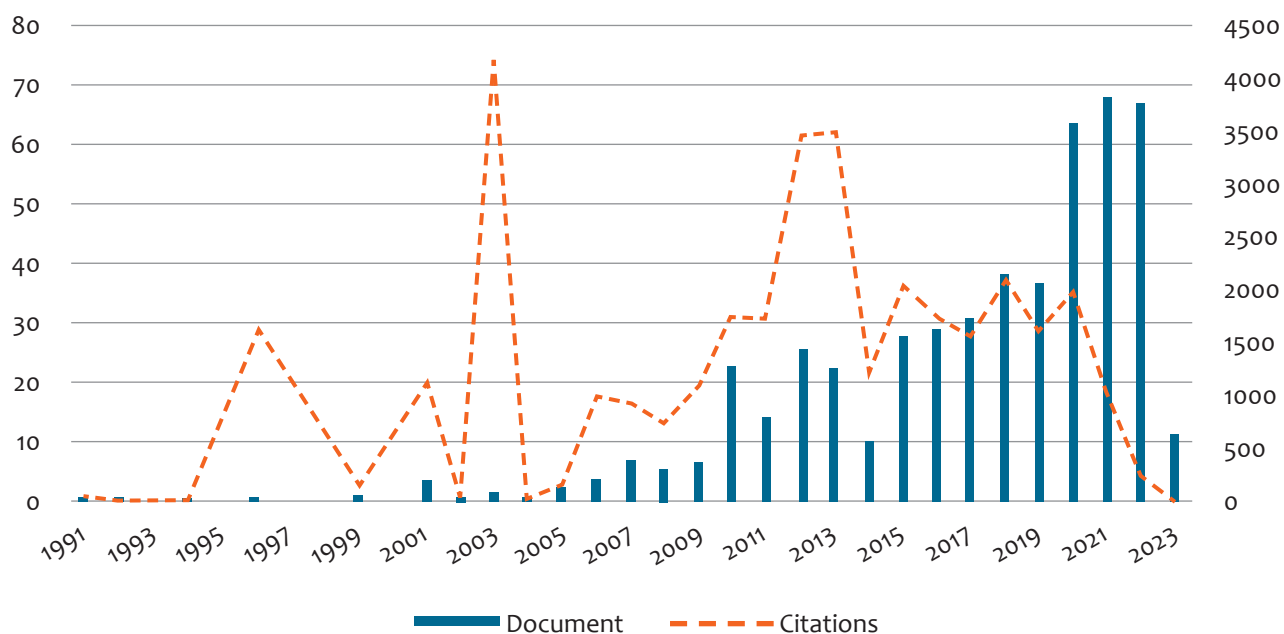


Figure 1 Number of articles and citations over the year

Table 1 Top 10 articles

Articles	Authors	Year	Cited by	Average citation per year
"Corporate social and financial performance: A meta-analysis"	Orlitzky M., Schmidt F. L., Rynes S. L.	2003	4114	205.7
"The impact of environmental management on firm performance"	Klassen R. D., McLaughlin C. P.	1996	1634	60.5
"Green supply chain management practices: Impact on performance"	Green K. W., Zelbst P. J., Meacham J., Bhaduria V. S.	2012	845	76.8
"Impact of lean manufacturing and environmental management on business performance: An empirical study of manufacturing firms"	Yang M. G., Hong P., Modi S. B.	2011	673	56.1
"Institutional-based antecedents and performance outcomes of internal and external green supply chain management practices"	Zhu Q., Sarkis J., Lai K.-H.	2013	634	63.4
"Environmental risk management and the cost of capital"	Sharfman M. P., Fernando C. S.	2008	620	41.3
"Sustainable operations: Their impact on the triple bottom line"	Gimenez C., Sierra V., Rodon J.	2012	584	53.1
"Corporate reputation and social performance: The importance of fit"	Brammer S. J., Pavelin S.	2006	573	33.7
"Using fuzzy DEMATEL to evaluate the green supply chain management practices"	Lin R.-J.	2013	457	45.7
"Sustainability in action: Identifying and measuring the key performance drivers"	Epstein M. J., Roy M. -J.	2001	453	20.6

Influential and contributing countries

The countries corresponding to the affiliated authors of every article were taken for the analysis. The analysis shows (Table 2, Part A) that china is the top contributor (116 documents) in terms of the number of documents. At the same time, the United States (Part B) is the most influential country in this area (10479 citations). The analysis shows that the literature is from all the regions that have developed, developing, and emerging countries, which shows the importance of environmental responsibilities for businesses in all kinds of markets.

Table 2 the most influential and contributing countries

Part A: on the basis of number of documents				Part B: on the basis of citations			
Id	Country	Documents	Citations	Id	Country	Documents	Citations
1	China	116	6120	1	United States	74	10479
2	United States	74	10479	2	China	116	6120
3	Spain	55	3999	3	Australia	34	5894
4	United Kingdom	49	3029	4	Spain	55	3999
5	Australia	34	5894	5	United Kingdom	49	3029
6	Italy	29	1026	6	Hong Kong	20	2061
7	Malaysia	24	990	7	France	23	1637
8	France	23	1637	8	Japan	15	1463
9	Hong Kong	20	2061	9	Taiwan	15	1273
10	India	19	1105	10	Germany	16	1263

Influential and contributing authors and journals

As shown in Table 3, the number of documents was used to identify the most contributing author in this field. The top three contributing authors were Lai, Zhang, and Wang (Part A) has the most scientific publications. The number of citations were used to identify the most influential authors Orlitzky, Rynes, and Schmidt are the most influential authors, as they received 4114 citations in their paper (Part B). These results indicate that they are the leading expert in this research area. Additionally, Table 4 presents the ten most contributing and influential journals according to the number of documents published (Part A) and the number of citations (Part B). Journal Of Cleaner Production has the most published articles as well as the citation count (Documents 165, citation 9101). Organization Studies journal produces one most influential articles with 4114 citations. The analysis shows that the top three journals cover 69.09% of total citations. Whereas the top 3 journals in part A of table 4 produce 78% of total articles. Having a list of top influencing journals and authors is in helping to understand the research hotspot in a given domain and to identify the future scope of studies.

Network Visualization

Network visualization is done using the authors and index keywords, as these keywords give an idea about the model constructs, methodology, and context. Network visualization of the co-occurrence of keywords within a dataset helps researchers to identify emerging trends and research hotspots in that area. This helps future researchers to get a better understanding of the structural dynamics of a given area. Our dataset includes 3135 keywords. To generate the more robust, we take those keywords which appear at least 18 times; a total of 50 keywords meet these criteria with link strength ranging between 1658 to 82 and a total of 1004 links

(5912 link strength) in 3 different clusters (Figure 2). Different colours represent the different clusters (Table 5) or research hotspots. The larger the size of the circle, most predominantly those keywords were used.

Table 3 The Most Influential and Contributing Authors

Part A: on the basis of documents				Part B: on the basis of citations			
Id	Author	Documents	Citations	Id	Author	Documents	Citations
1	Lai K. -H.	10	1513	1	Orlitzky M.	1	4114
2	Zhang Y.	9	175	2	Rynes S. L.	1	4114
3	Wang Y.	7	250	3	Schmidt F. L.	1	4114
4	Wang Z.	7	327	4	Klassen R. D.	1	1634
5	Zhu Q.	7	1379	5	Mclaughlin C. P.	1	1634
6	Wong C. W. Y.	6	496	6	Lai K. -H.	10	1513
7	Chen Y.	5	128	7	Zhu Q.	7	1379
8	Daddi T.	5	50	8	Sarkis J.	2	942
9	Marrucci L.	5	50	9	Zelbst P. J.	2	877
10	Zhang X.	5	262	10	Bhadauria V. S.	1	845

Table 4 The Most Influential and Contributing Journals

Part A: on the basis of number of documents				Part B: on the basis of citations			
Id	Source	Documents	Citations	Id	Source	Documents	Citations
1	Journal Of Cleaner Production	165	9101	1	Journal Of Cleaner Production	165	9101
2	Business Strategy And The Environment	40	1466	2	Organization Studies	1	4114
3	International Journal Of Production Economics	28	3272	3	International Journal Of Production Economics	28	3272
4	Resources, Conservation And Recycling	13	683	4	Management Science	1	1634
5	Production Planning And Control	10	447	5	Business Strategy And The Environment	40	1466
6	Ecological Economics	9	1124	6	Ecological Economics	9	1124
7	Ieee Transactions On Engineering Management	9	246	7	Supply Chain Management	6	1103
8	Journal Of Business Ethics	8	578	8	Strategic Management Journal	2	689
9	Environmental And Resource Economics	7	288	9	Long Range Planning	3	686
10	Resources Policy	7	117	10	Resources, Conservation And Recycling	13	683

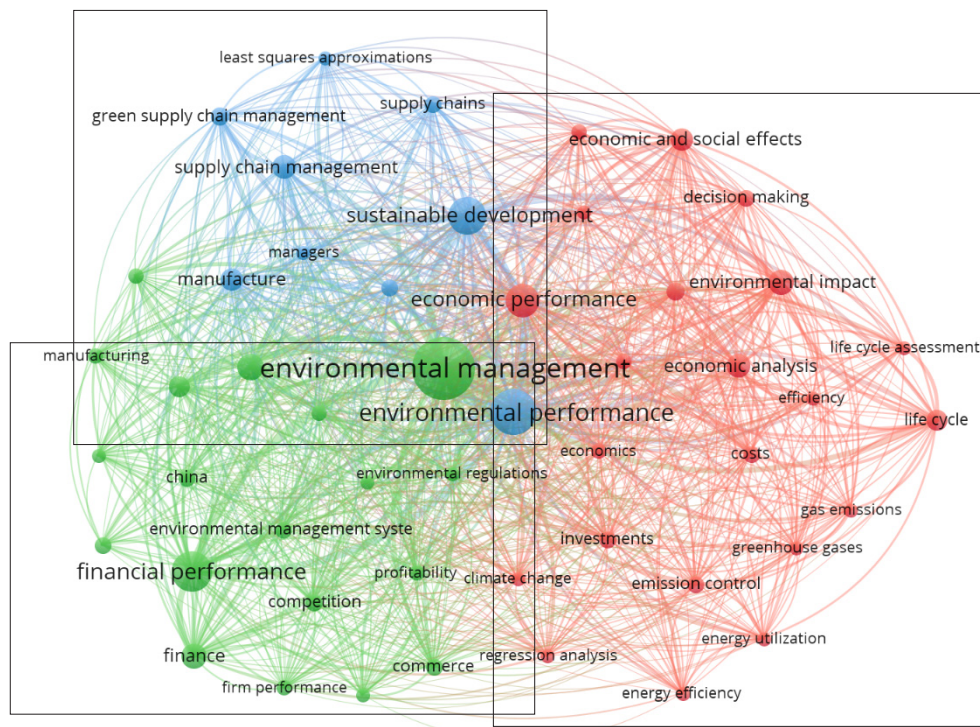


Figure 2 Co-occurrences of keywords

Cluster 1, in red, includes a total of 22 keywords. The top five keywords are Economic performance (108), Environmental impact (58), Economic analysis (53), Economic and social effects (48), and life cycle (40). Research in this cluster focuses on the economic and social impacts of different environmental decisions. Further, some keywords represent environmental effects such as climate change, greenhouse gases, and gas emissions. The most predominantly used methodology comes out to be regression analysis, as this keyword has been used more than 20 times. Life cycle assessment, energy utilization, energy efficiency, and emission control are the keywords that predominantly appear, which represent the actions taken from a management perspective as their environmental responsibility.

Cluster 2, in green colour, includes keywords such as environmental management (152), environmental management systems (26), financial performance (152), Sustainability (64), Finance (62), and Innovation (22), which indicates the literature in this cluster is focused upon developing environmental management system and their possible economic impact over the firm. However, the majority of the literature comes out in china context. More detailed pieces of evidence can be explored in future in other contexts. Iso 14001 were widely discussed in the literature, which also suggests the optimization of organization operation to minimize the environmental impact.

Cluster 3, in blue colour, comes out to be the smallest cluster with a total of 9 keywords. Keywords such as Environmental performance (194), Sustainable development (129), Supply chain management (22), Manufacture (48), and Green supply chain management (32) are predominantly used, which indicates that in this cluster, research is focused upon supply chain management, manufacturing process and how does it impact the environmental performance of the organization. The Least Squares Approximations methodology comes out to be predominantly used in this cluster. The keywords list will help stakeholders identify the relevant scientific evidence from various databases. However, we summarize the keywords of the overall literature so future scholars can select keywords as per their constructs and research objectives.

Table 5 Clusters

Cluster 1	N	Cluster 2	N	Cluster 3	N
Climate change	21	China	27	Environmental performance	194
Costs	26	Commerce	26	Green supply chain management	32
Decision making	28	Competition	26	Least Squares Approximations	18
Economic analysis	53	Environmental Economics	40	Managers	21
Economic and environmental performance	24	Environmental management	370	Manufacture	48
Economic and social effects	48	Environmental management systems	26	Performance	27
Economic performance	108	Environmental regulations	21	Supply chain management	55
Economics	24	Finance	62	Supply chains	28
Efficiency	19	Financial performance	152	Sustainable development	129
Emission control	28	Firm performance	24		
Energy efficiency	18	Industrial performance	19		
Energy utilization	20	Industry	21		
Environmental and economic performance	33	Innovation	22		
Environmental impact	58	Iso 14001	27		
Environmental technology	23	Manufacturing	23		
Gas Emissions	19	Performance assessment	23		
Greenhouse gases	19	Pollution control	19		
Industrial economics	21	Profitability	23		
Investments	26	Sustainability	64		
Life cycle	40				
Life cycle assessment	20				
Regression analysis	21				

Note: This table shows the clusters made through co-occurrences of all keywords using Vos-viewer. N denotes the number of times that keyword occurs

Multifariousness

Meta-analysis of 64 outcomes from 37 empirical studies concluded that 55% of the literature shows a positive impact on financial performance, 15% of studies show a negative impact, and 30% of studies show no effect (Horváthová, 2010). To identify the reasons behind these heterogeneities. The variables used by the authors over time to measure these constructs are identified and summarized in this section (Table 6). Environmental performance measures are broadly classified into internal and external factors (Liu & Anbumozhi, 2009). Internal factors can be investments in research and development of eco-innovation products, greening supply chain networks, change in GHG, or other pollutant emissions. External factors can be shareholder pressure and

government regulations. The financial performance of a firm can be measured through different techniques. Similar results can be observed from this review paper. Some authors measure growth in terms of sales, market share, profits, return on assets, and size of the firms. Some authors measure economic benefits in terms of tax benefits, government agencies' subsidies, and compliance cost reduction (Orlitzky & Benjamin, 2001).

Different studies have examined the various relationships between environmental and financial performance. Studies like Liu & Anbumozhi (2009) and Elshahat et al. (2015) show the negative relationship between environmental and economic performance. Tang et al. (2018) and Sardana et al. (2020) show a positive relationship between the variables. Stakeholders' pressure shapes the relationship between environmental and economic performance (Wagner, 2011). Corporate sustainability influences financial performance more certainly in low-innovation organisations measured through research and development intensity in terms of frequency in Innovation and expenditure than in high-innovation firms (Wagner, 2010). Hang et al. (2019) show causality based on time horizon and conclude that environmental performance does not affect financial performance in the short term. Whereas there is no positive effect in the long term observed.

Criteria for evaluating environmental performance are not standardized in previous studies. The relationship established is far from the standardization (Horváthová, 2012). Environmental performance and some measurement variables like emission pollution are not clearly defined, which leads to the generalizability of the studies. From the variable studies of different papers, it is expected that various quantitative variables to measure the environmental performance are used by the authors, which includes some type of emission in the environment and ignores the other relevant variables to measure the environmental variables. Constraint in the choice of variables is identified from the review. Important variables such as firm size, geographical location, capital, and industry, which are highly important and highly correlated to the financial performance and the economic growth of a firm, are ignored (Wagner, 2001; Telle, 2006) or taken as control variables which indicate inconsistency and biases in the results.

The sample size in the reviewed papers is very small (Konar & Cohen, 2001), and the sample also has the problem of geographical bias (Morgan et al., 2009). The casual studies between environment and financial performance highly focus on developed countries (Horvathova, 2010). The inconclusiveness of the results is explained by the different methodologies adopted for estimation and variability in the inputs used to measure environmental and financial performance (Derwall et al., 2005; Ullmann, 1985). Telle (2006) found a neutral association using random-effect panel data and a positive association while using ordinary least square regression. King & Lenox (2001) analyze the data of 652 US firms for 1987-1996. Ordinary least square gives a positive relationship, but when similar data is analyzed using random effects panel analysis, Results change from positive to unobservable firm-specific characteristics, impacting the results.

A company can gain an advantage over its competitors until the company can create a high marginal economy compared to its competitors (Peteraf & Barney, 2003). A company's actions towards the protection and perseveres of the ecosystem make a company unique and provide such an advantage (Zamil & Hassan, 2019). But how can they implement environmental engagement activities that do not impact the financial performance of the organizations? (Orlitzky et al., 2003; Orsato, 2006), This study helps them identify the variables having a constructive impact on financial performance. This paper summarizes the results of previous research in terms of performance variables, which helps practitioners and future researchers conduct further empirical analysis. A theoretical understanding of environmental engagement activities on financial performance helps determine how the policymakers, regulators, and government can motivate corporates for the green transformation and enforce environmentally friendly regulations for public welfare. Additionally, bibliometric findings help future researchers to track scientific production and identify the research hotspots for further studies.

Table 6 Summary of Variables used to measure environment and economic performance

Author(s)	Study	Sample Size (Number of companies)	Environmental performance measurement variables	Financial performance measurement variables
Liu X., Anbumozhi V.	“Determinant factors of corporate environmental information disclosure: an empirical study of Chinese listed companies”	175	Government pressure, Shareholder pressure, Creditor pressure, Firm size, Firm location, Age as a listed company	Firm size, profitability, financial leverage, Capital intensity, and Return on assets
Elshahat I., Wheatley C., Elshahat A.	“Is pollution profitable? A cross-sectional study”	1654	Hazardous wastes, Regulatory problems, Ozone-depleting chemicals, Substantial emissions, Agricultural chemicals	Firm age as the number of years since established, firm size as the value of assets, R&D expenditure divided by sales (as one central moderator variable) and sales growth
Wagner M.	“The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects”	2478	Characteristics of the firm’s products, community aspects, and corporate governance	Return on Assets, return on equity, return on sales, Return on Capital Employed.
Gallego-Álvarez I., Segura L., Martínez- Ferrero J.	“Carbon emission reduction: The impact on the financial and operational performance of international companies”	89	Variation in greenhouse gases emissions	Specific environmental taxes, Appropriate treatment of environmental expenditures, pollution allowances as tradable permits, and general Federal income tax issues
Wagner M.	“Corporate performance implications of extended stakeholder management: New insights on mediation and moderation effects”		Country location, stakeholder pressure, and integration	The market value of a firm, Return on Assets, Return on sales
Hang M., Geyer- Klingenberg J., Rathgeber A. W.	“It is merely a matter of time: A meta-analysis of the causality between environmental performance and financial performance”	142	Green process design, special resource combinations of the firm, “end-of-pipe solutions” such as air filters, water clearers	
Jacobs B. W.	“Shareholder value effects of voluntary emissions reduction”	248		Change in sale, market share, profitability, financial and marketing measures. Control variable: firms’ size, industry type and export percentage

CONCLUSION

After three decades, studies measuring the relationship between environmental engagement and firm financial performance are inconclusive in the previous literature (Konar & Cohen, 2001, Wagner, 2001). This paper summarizes the literature using bibliometric analysis and examines the contradictory results. We also attempt to identify possible reasons behind this heterogeneity—512 articles from the peer-reviewed journal were taken for the analysis. The results identified the most highly influential and contributing authors, articles, journals and countries in the field. Different measurement variables used by the authors in their studies are analyzed both from an environmental and financial perspective and classified on the basis of their relevance which is further used to support a shred of evidence as to the possible reasons behind these heterogeneities of results. Small sample size, geographical constraints, regulatory constraints, lack of standardizability of variables, ignorance of important determinants, and methodology selection are the reasons identified from the analysis and the literature. This literature can help future scholars and practitioners choose variables to derive associations. Measuring firms' behaviour towards green transformation is worthwhile in the context of financial incentives and institutional theory. The majority of the research is focused on the data derived from developed nations; a cross-country analysis and comparative studies between developed and developing nations can be done in the future, which helps policymakers and practitioners to make the decision regarding the amount of risk involved in different geographical regions, what will be the benefits and cost for the firm in environmental engagement activities. Impact of other control variables like government regulations in the country, specifically in emerging economies like India where carbon emission is high and flexibility in regulation can be considered. Standardization in further studies can be maintained by taking only those companies which follow the GRI standards to report their environmental initiatives. A multi-company study helps to generalize the causal relationship between environmental and economic performance, and possible variables can be identified in the future in environmental performance, which negatively impacts the firm's financial performance (Elshahat et al., 2015). Further studies can be conducted on the specific content of different industries (Tang et al., 2018). Despite Significant contributions, our study is not free from traditional review-based studies. The data for this study is taken only from the Scopus database published in peer-reviewed journals and in English. They may introduce biases in data and limit the generalizability of studies. Future research should consider using a wider range of databases and languages to improve the generalizability of the results. Future research directions may include investigating, how different environmental management practices across the industry group, firm size, and over the year impacts financial performance. Examining the long term impact on financial performance can give additional insights. Further the stakeholder perceptions and response towards the firms' environmental initiative need to be accessed.

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