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Corporate Eco-Efficiency And Firm Performance Linkage

A LITERATURE REVIEW

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Abstract: This paper has made an endeavor to explore the direction of linkage between eco-efficiency and firm performance. By invoking the use of review of literature, this paper has comprehensively reviewed and presented the studies carried out in context of the linkage between eco-efficiency and firm performance. It was observed that there existed subjectivity in the type of measures used for gauging eco-efficiency as well as firm performance. This variability in results was attributed to the diversity in the different methods of measurement of the variables used in quantifying the variables. The nation in which the study has been done also had a major role behind the inconsistency of the results.

Index Terms **-** eco-efficiency, corporate eco-efficiency, firm performance, linkage between eco-efficiency and firm performance.

I. Introduction

The environmental situation is declining in light of present-day trends (Savitri and Abdullah, 2023). The global industrial and economic activities have exploited the renewable as well as non-renewable natural resources. This in turn has caused a perpetual and increasing contamination of the environment and have created a negative impact on both society and nature.

There is a pressing demand by the society as well as the other stakeholders on the corporates to respond to the rampant climate change (Osazuwa and Che-Ahmed, 2015). Due to this anticipation, businesses have certainly added environmental performance to their existing concerns for providing their customers with quality, service, and cost (Savitri and Abdullah, 2023).

Against this background, this paper is an endeavor to understand the trends and patterns in the extant literature relating to the linkage between eco-efficiency and firm performance.

OBJECTIVE

The objective of this paper is to comprehensively present the various empirical evidences from the extant literature relating to the linkage between eco-efficiency and firm performance.

METHODOLOGY

This paper makes use of the literature review methodology in order to bring forth the findings from the extant literature relating to the linkage between eco-efficiency and firm performance. As put forward by Molina-Azorin et al. (2009), for the purpose of narrowing down of the literature review, an internet search on popular databases like Google Scholar, Emerald Insight and Science Direct. The presence of keywords like eco-efficiency, corporate eco-efficiency and firm performance were used as screens in the title of the paper. To make the search more inclusive, the terms firm value as well as financial performance and firm value were also considered as firm performance. However, during the search, many papers were omitted. First, those papers which were conceptual were eliminated. Secondly, the papers which focused on corporate eco-efficiency but had a much wider scope were also eliminated.

II. FINDINGS

The review of literature has revealed that there is an existence of both positive as well as negative relationship between eco-efficiency and firm performance. Here, a positive relationship refers to a situation wherein an increased effort at eco-efficiency leads to betterment of firm performance. Whereas, a negative relationship between the two refer to the situation wherein increased eco-efficiency would lead to a decreased firm performance. The various scholarly evidences showing both- positive and negative/ no linkage between eco-efficiency and firm performance are presented in this section.

4.1 Studies pertaining to positive linkage between eco-efficiency and firm performance

Sinkin et al. (2008) conducted a study with an objective to explore the relationship between eco-efficiency and firm value in the US context. A sample of Fortune 500 firms was drawn wherein the firm value was measured using earning per share (EPS). The results pinpointed that firms with higher eco-efficiency had higher firm value.

Russo and Pogutz (2009) also examined the relationship between eco-efficiency and firm performance using a sample of Global Fortune 500 companies for the time period ranging from 2002 to 2005. In this paper, eco-efficiency was measured through the viewpoint of GHG emissions whereas the firm performance was quantified using market-based performance indicators i.e. Tobin's Q as well as accounting-based indicators i.e. return on sales (ROS), return on equity (ROE), and return on assets (ROA). The findings revealed that better eco-efficiency levels were linked to higher financial returns.

Another study was done by Doran and Ryan (2012) to explore if the eco-efficient firms did better than the non-eco-efficient firms in terms of financial performance in the Irish context. A sample of 2181 firms for the years ranging from 2006-2008 was considered. Eco-efficiency was studied from the perspective of eco-innovation which was measured using the CIS (Community Innovation Survey) method. The data analysis discovered that there existed a positive linkage between eco-efficiency and financial performance.

Czerny and Letmathe (2017) also tried to analyse the linkage between eco- efficiency and firm performance in case of European nations. The sample for the same comprised of 283 firms based in the carbon intensive industries. In this paper, the eco-efficiency was measured using the GHG emissions reduction whereas the firm performance was measured using proxies such as ROE (return on equity), ROCE (return on capital employed), ROA (return on assets), EBIT (earnings before interest and tax) margin and profit per employee. The analysis of data found out that there existed a positive as well as statistically significant relationship between eco-efficiency and firm performance.

Majid et al. (2020) investigated the impact of eco-efficiency actions on the performance of firms from 28 European countries. In this paper, performance was gauged using Turnover as a metric and eco-efficiency actions was measured by three types of variables namely- resource efficiency actions, offering green products and impact on production cost. The resource efficiency actions were further divided into eight categories like saving water, saving energy, recycling, minimizing waste, designing products which are durable, saving materials and usage of renewable energy. The data was analyzed by invoking the use of Ordered logit regression model and it was put forward that firms with higher eco-efficiency actions outperform those which are not eco-efficient. It was also concluded that eco-efficiency actions lead to improved performance.

Satrio and Kunto (2020) undertook a scholarly research with an aim to understand relationship between eco-efficiency and firm value. The sample consisted of 81 firms based in Indonesia for a time period 2014-2018. Firm value was proxied by calculating the natural logarithm of the stock prices of the firm at the end of the year. Also, the eco-efficiency was measured using a dummy variable where a score of 1 was assigned to the firm if it implemented ISO practices and was awarded a 0 if it did not implement the same. The data was analysed using multiple linear regression and it was concluded that positive as well as significant relationship between eco-efficiency and firm value.

Kamande and Lokina (2013) examined the relationship between the environmental performance measured from the eco-efficiency perspective and profitability in the Kenyan context. Eco-efficiency was measured using three proxies namely- eco-efficiency of water, fuel, and electricity whereas financial performance was captured using return on assets (ROA). The analysis concluded that better eco-efficiency scores brought higher financial returns.

Osazuwa and Che-Ahmad (2016) made an attempt to unfurl the impact of leverage and profitability on the linkage between eco-efficiency and firm value in the Malaysian setting. The sample consisted of 667 firms bifurcated into eco-efficient and non-eco-efficient firms for which data was collected for the year 2013. Earning per share (EPS) and book value of equity shares were used as proxies for gauging financial

performance. The analysis brought forth that there was a positive association between eco-efficiency and firm value along with the existence of positive moderating relationship of profitability.
Meutia et al. (2019) undertook a study with an objective to analyse if better eco-efficiency scores led to better financial performance in Indonesia. For furthering the purpose of the study, a sample of 80 firms were considered for a time period of 2012-2016. Return on assets (ROA) was used as a metric of financial performance and eco-efficiency was calculated by dividing number of units produced per year by the usage of electricity per year. The analysis pinpointed that there was a positive as well as a significant impact of eco-efficiency on the financial performance in the Indonesian context.
Sudha (2020) carried out a study with the aim to examine the impact of Corporate environmental performance gauged using eco-efficiency variables on the corporate financial performance on a sample of S&P BSE 500 firms. Herein, eco-efficiency was measured using Energy & water intensity and Material intensity whereas variables such as return on assets (ROA), return on equity (ROE) and return on sales (ROS) were used as proxies for firm performance. The analysis brought about that eco-efficiency had a positive impact on the corporate financial performance.
Safitri et al. (2021) conducted a study with an objective to understand the impact of corporate governance, eco-efficiency on firm value in context of Indonesian state-owned enterprises. The eco-efficiency was measured using the proxy if the firm held an ISO 14001 certificate, whereas the firm value was metricized using ROA (return on assets). The data analysis brought forward that there existed a positive as well as significant relationship between eco-efficiency and firm value.
Noor et al. (2022) explored the effect of eco-efficiency on firm value in the Indonesian context. Additionally, this research also explored this relationship by using financial performance as a moderating variable. The sample consisted of 140 firms based in the energy sector and the data was collected for a time period between 2017-2021. For the purpose of this paper, the financial performance was gauged using ROA (return on assets) and ROE (return on equity). Eco- efficiency was measured using a dummy variable wherein, the firm was given a score of 1 if it implemented ISO 14001 practices for environmental practices and a score of 0 was awarded if the ISO practices were not put into place. The firm value was measured using price book value stock. The data was analysed using panel data regression and it was revealed that eco-efficiency had a positive effect on the firm value.
Alnaim et al. (2023) conducted a scholarly research with an objective to comprehend the link between eco-efficiency strategy and financial performance in case of Jordan. For furthering this objective, the sample comprised of 209 managers employed at health, safety and operations firms listed on the Amman stock exchange. The data was collected using primary survey by the use of a self-constructed questionnaire. The results put forth that there existed a positive and significant relationship between eco-efficiency and financial performance.
Savitri and Abdullah (2023) carried out a scholarly study with an aim to understand the effect of eco-efficiency and good governance on firm value. This relationship was tested using profitability as a mediating variable. The sample for the purpose of this study consisted of 165 firm year observations of the firms listed on the Indonesian stock exchange selected using purposive sampling. The time period of the study was ranged from 2016 to 2020. The firm value was measured using the Tobin's Q ratio, the profitability was proxied using ROA (return on assets), eco-efficiency was gauged by the fact if the company held an ISO 14001 certificate. The data was then analysed and it was revealed that the increased amount of eco-efficiency reaped greater profits and therefore, enhanced the firm value.

4.2 Studies pertaining to negative or no linkage between eco-efficiency and firm performance

Tatsuo et al. (2010) conducted a similar research in the Japanese context wherein eco efficiency was used as a proxy to measure environmental performance. The eco-efficiency variable was measured using Carbon dioxide emissions and the financial performance was quantified using a single accounting-based measure of performance- return on assets (ROA). The data analysis brought forward that there is an inverted U-shaped relationship between eco-efficiency and financial performance. The results implied that increased eco-efficiency resulted in better financial results till a particular point of time. Thereafter, the relationship between both the variables became a trade-off.
Madaleno and Robaina (2020) investigated the link between eco-efficiency and firm performance by taking a sample of 63303 firms pertaining to 13 nations belonging to the European Union. While eco-efficiency was proxied by eco-innovation which was further quantified using ten different sub variables namely. The firm performance was quantified using two variables i.e., turnover growth and employment growth. It was found out that increase in eco efficiency leads to negative turnover as well as employment growth and therefore, decreasing the firm performance.

Seoul et al. (2014) explored the impact of eco- efficiency on the firm performance on a sample of 272 South Korean firms pertaining to 16 different industries. Herein, the eco-efficiency was measured using Carbon dioxide emissions and Energy consumed whereas the financial performance was gauged using Assets, Equity, Profit and Sales. The data was analysed using data envelopment analysis (DEA) and it was concluded that there existed no relationship between the eco-efficiency scores and financial performance. However, in case of a very few industries a significant relationship was found between eco-efficiency and a few measures of financial performance.
Suh et al. (2014) conducted a study with an objective to discern the relationship between eco-efficiency and financial performance in the South Korean context. 272 firms belonging to 16 different industry sectors consisted of the sample for the same. Eco-efficiency was measured using social performance indicators namely- (1) value-added inducing and production-inducing economic spillover effects and (2) the amount of greenhouse gases emitted and energy used. The results revealed that in case of almost all the industries in the sample, there existed no relationship between eco-efficiency and financial performance. It was also found out that manufacturing and service intensive industries have a higher eco-efficiency scores in comparison to others.
Rodríguez-García et al. (2022) conduced a research with an objective to comprehend the relationship between eco-efficiency and financial performance in case of Latin American nations. Herein, the sample consisted of 102 firms based in Chile, Colombia, Brazil and Mexico for a time period ranging from 2010 to 2017. For the purpose of this research, eco-efficiency was proxied using a ratio calculated by dividing carbon dioxide emissions with sales whereas the financial performance was measured using Tobin’s Q ratio. The data analysis brought out that in case of Brazil and Chile, there existed a stronger relationship between eco-efficiency and financial performance. Whereas, the relationship in case of Colombia was not as strong and there existed no relationship in case of Mexico.

III. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

This paper puts forth that despite existence of scholarly evidences pin pointing towards both positive as well as a negative relationship between eco-efficiency and firm performance, there are still higher number of studies that substantiate a positive link. In a major portion of scholarly studies that have been reviewed for the purpose of this paper have studied the direct relationship between eco-efficiency and firm performance.

Our study also concludes that there is a serious dearth of literature that lays emphasis on the relationship between eco-efficiency and firm performance in Indian context. India is one of the rapidest growing developing economies and has labelled as the fourth highest emitter of carbon dioxide in the year 2017 (The Hindu Business Line, 2018). Additionally, India has dedicated to the United Nations Framework Convention on Climate Change to cut down the carbon emissions by the year 2030 from the 2005 levels. Therefore, the need of the hour is that the corporates working in India should be made aware of the type of relationship between eco-efficiency and firm performance of firms.
Also, the policy makers could be benefited from such a study in the Indian setting. Lastly, this study focuses on the impact of eco-efficiency variables on firm performance. However, this study has not focused on how the firm performance can have an impact on the eco-efficiency. This might be true due to the fact that firms with a better firm performance are in a better position to allocate large amount of resources towards projects that are directed at preventing damages to the environment (Molina-Azorin, 2009). Given this, a study that lays emphasis on the impact of financial performance on the eco-efficiency performance of the firm can be conducted.

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