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Environmental Management Practices and Financial Performance: Evidence from Large Listed Indian Enterprises

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ABSTRACT: Large enterprises have been at forefront of environmental management with active participation in industry wide programs and adoption of 'beyond compliance' approach with more resources at their disposal. The present study revisits the premise of environmental-financial linkage in the Indian context with focus on large listed enterprises. We develop a comprehensive dataset of 459 large listed Indian companies covering major manufacturing and service sectors of the economy over a eleven year period from 2008-09 to 2018-19. Static and dynamic regression models are used to gauge the impact of environmental management practices adoption on firm profitability (Return on Assets and Return on Equity) and market valuation (*Tobin Q*, Market to Book Value Ratio and Excess Valuation to sales ratio). Empirical results suggest a positive impact of environmental management on firm profitability and market valuation in context of large listed enterprises. These results are of interest to corporate and policy makers for recognizing the financial implications of corporate environmental management.

Keywords: *Environmental Management Practices, Dynamic panel data models, Firm Valuation, Firm Profitability, Large Enterprises, India*

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1. Introduction

Large corporations are progressively making organizational changes to integrate environmental concerns into their manufacturing decisions. With increased pressure from customers, regulators, employees and investors to assume environmental responsibility, they are shifting from a regulation driven reactive approach to a proactive beyond-compliance approach towards environmental management (Khanna & Damon, 1999; Ervin et al., 2012). Indian companies have been increasingly adopting formalised set of environmental management practices (*EMPs*). The number of ISO 14001 certified companies in India has soared from meagre 400 in 2001 to 8446 in 2019 (ISO, 2019; CPCB, 2001).

Although corporate move beyond minimum regulations to improve their environmental performance; adoption of *EMPs* involves costs, firm performance, better reputation and management participation (Curkovic & Sroufe, 2011). With limited resources at their disposal, firms' interest resides in understanding the financial implications of adoption of *EMPs*. There is an extensive body of research studying the impact of environmental management on firms' financial performance; both theoretically (Porter & Van der Linde, 1995; Shahgholian, 2019) and empirically (King & Lenox, 2001; Konar & Cohen, 2001; Melnyk et al., 2003; Lucas & Noordewier, 2016). While some studies deduce a positive relation between the two constructs (Hart & Ahuja, 1996; King & Lenox, 2001; Klassen & McLaughlin, 1996; Konar & Cohen, 2001; Russo & Fouts, 1997; Hourneaux et al., 2014; Lucas & Noordewier, 2016), some others find a negative relation (Wagner et al. 2002; Sariannidis et al., 2013; Chen et al., 2014), and there are some studies that fail to observe any linkage between environmental performance and financial performance (Iraldo et al., 2009; Böhringer et al., 2012; Duque et al., 2020).

The Carbon Majors Report, 2017 states that just hundred large enterprises have been source of more than 70% of world's greenhouse gas emissions since 1998 (Carbon Disclosure Project Worldwide, 2017). With increasing public awareness and regulatory surveillance, large scale enterprises have become increasingly proactive in environmental management disclosures to improve their legitimacy, reputation and financial performance. While we come across research in Small and Medium Enterprises (SMEs) exploring sustainability and performance, studies on large enterprises are few and numbered (Lee and Klassen, 2008; Zhu et al., 2010; Kliewe et al., 2013; Shashi et al., 2018). To fill in this gap, we make a novel attempt to investigate environment-financial linkage in 459 large listed Indian enterprises over an eleven year period.

This paper contributes to the existing literature on several counts. First, majority of studies examining the relation between environmental and financial performance have been carried in developed nations (Hart & Ahuja, 1996; Khanna & Damon, 1999; Klassen & McLaughlin, 1996; Konar & Cohen, 2001; Melnyk et al., 2003; Iraldo, Testa & Frey, 2009; Böhringer et al., 2012). The nature of corporate environmental management in developed countries is very different from developing countries. These countries are characterized by the absence of clear regulations, underdeveloped capital markets and inadequate data on emissions (Dasgupta et al., 2001; Dasgupta et al., 2006; Pargal & Wheeler, 1996; Sarkar & Sarkar, 2012). Furthermore, only a handful of studies have been conducted in Indian context (Gupta & Goldar, 2005; Kumar & Shetty, 2017; Shashi et al., 2019; Singh et al., 2020; Sudha, 2020). Despite regulatory measures in place, ground reality in India is disheartening with weak implementation of existing regulations, non-availability of environmental performance data, poor follow-up of previous regulatory actions and widespread bureaucracy and corruption (Kumar & Managi, 2009).

Second, earlier literature on environmental management focuses mainly on manufacturing sector because of its visible environmental impacts (Hoffman et al., 2012; Zhu et al., 2013; Kube et al., 2019). Service sector has attracted much less attention. Services might have low environmental impact at point of generation but the direct and indirect environmental effects of their supply chain in form of energy usage, carbon emissions and waste generation merit further investigation (Gil et al., 2001; Rosenblum et al., 2000). In the Indian context, existing studies measuring the impact of environmental practices on firm performance (Gupta and Goldar, 2005; Kumar & Shetty, 2017; Shashi et al., 2019; Singh et al., 2020; Sudha, 2020) have focused on manufacturing sector while India is predominantly a service driven economy; the service sector accounts for 55.39% share in country's Gross Value Added (Ministry of Finance, 2020).[1] Given the energy intensity and economic importance of service sector, it will be worth examining the relationship between the *EMP*s adopted by the firms in this sector and their financial performance. The present study examines the relationship using a comprehensive dataset of Indian companies covering both, major manufacturing and service sectors.

Third, given the flexibility in choice of environmental practices among firms, we build a comprehensive measure of environmental management through composite variables rather than using a single standard practice like ISO 14001 (Anton et al., 2004; Kumar & Shetty, 2018). Although previous empirical studies on environmental-financial linkage have found contradictory results, many of these studies suffer from model misspecification and/or limited data (McWilliams et al., 1999; Elsayed & Paton, 2005; Lin et al., 2019). In addition to controlling firm heterogeneity using longitudinal data, we also address endogeneity in environmental-financial relationship using dynamic panel data model (Elsayed & Paton, 2005; Endo, 2019). Dynamic panel data analysis controls for endogeneity and dynamics in environmental-financial performance relationship. This study uses generalised method of moments (GMM) to correct for endogeneity in firm's environmental and financial relationship.

To examine environmental-financial link, we use both accounting based measures (Return on Assets and Return on Equity) and market valuation based measures (*Tobin Q*[2], Market to Book Value Ratio and Excess Valuation to sales ratio[3]). Accounting based measures of performance are based on past data and give a short-term perspective

[1] Gross Value Added (GVA) is the rupee value of the amount of goods and services produced in an economy after deducting the cost of inputs and raw materials.

[2] Lindenberg and Ross (1981) define Tobin's *q* as the ratio of the firm market value to the replacement cost of its assets.

[3] *MBVR* is the ratio of the product of the number of equity shares and the closing price of the share on the last day of the financial year to the book value of equity and reserves while EV/S is defined as the excess of market value of firm over book value of assets normalized by sales.

of financial performance. On the other hand, valuation based measures incorporate all relevant market and non-market information into firm valuation to give a long-term perspective of financial performance. To the best of our knowledge, no study has previously investigated the financial impact of environmental management system using static and dynamic panel data regressions while accounting for endogeneity concerns, specifically in the Indian or a developing country context.

Empirical results show a positive impact of environmental management on firm profitability and market valuation. Investors expect that cost of implementing *EMP*s to improve environmental performance will be offset in the coming years in the form of lower regulatory penalties, higher efficiency in operations and increased goodwill. Therefore, while immediate impact of *EMPs* adoption on firm profitability and valuation may be insignificant, in the long run green firms are compensated by market in terms of improved profits and higher valuation. This insight is useful in appreciating financial implications of corporate environmentalism for policy makers and corporations.

The remainder of this paper is organized as follows: Section 2 reviews the relevant literature. Section 3 describes the conceptual framework and constructs the hypotheses to be tested in the study. Section 4 covers description of data and Section 5 discusses the econometric estimation methods. The results are presented and discussed in section 6. This paper closes in section 7 with some concluding remarks.

2. Related Literature

The relationship between environmental management and firm performance remains a perplexing issue in the literature. Porter's 'win-win' argument states that improved environmental performance backed by properly designed environmental policy leads to enhanced economic benefits due to cost reduction and increased sales (Porter, 1991; Porter & Van der Linde, 1995). Although this hypothesis is intuitively attractive, empirical studies measuring the impact of environmental management on firm performance are inconclusive. Sinkin et al. (2008) examined the relationship between eco-efficient business strategies and firm's value in American context and found that improved environmental efficiency resulted in better financial performance. Fujii et al. (2012) studied the relationship between environmental performance and economic performance in Japanese manufacturing sector. The results show a positive impact of environmental performance as measured by CO_2 emissions on firms overall economic performance and profitability. Similar results have been reported by other studies (Dowell et al., 2000; King & Lenox, 2001; Konar & Cohen, 2001; Melnyk et al., 2003; Wagner & Schaltegger, 2004; Hourneaux et al., 2014; Lucas & Noordewier, 2016).

On the contrary, Friedman (1970) argued that any environmental expenditure is against the interest of shareholders and results in deterioration of firm performance and value (Jaggi & Freedman, 1992). Walley and Whitehead (1994) state that environmental management is a costly affair because considerable research expenditure has to be incurred to imbibe green processes and produce green products. Hassel et al. (2005) examined the impact of adopting green management strategies on stock returns and found a negative relation between the two. The results show that investors view environmental activities as being carried at the cost of future profits of firm (Thornton, Kagan & Gunningham, 2003; Sariannidis et al., 2013; Chen et al., 2014).

Furthermore, some studies have not found any linkage between environmental and financial performance. Cohen et al. (1997) study the environmental performance of Standard and Poor's 500 companies and find that neither the 'green companies' are rewarded nor penalized for their environmental efforts. Duque et al. (2020) study the impact of green innovation on financial performance in emerging markets multinationals from Latin America using panel data from 86 listed firms. They fail to establish a link between green practices and financial performance of a firm. Similar results have been reported by Iraldo et al. (2009) and Böhringer et al. (2012). Although the dominant view is that an improved environmental performance enhances financial strength of a firm, the evidence till date remains inconclusive.

This paper revisits environmental-financial performance premise to analyse the impacts of *EMP*s adoption. Indian industry (both manufacturing and services) is highly pollution intensive despite extensive environmental regulations due to limited institutional capacity, lack of trained personnel and inadequate data on emissions. Hence, there is a need to examine the impact of environmental management on financial performance in a developing country like India.

Existing studies have majorly used pooled or cross sectional data (Henriques & Sadorsky, 1996; Konar & Cohen, 2001; Boiral et al., 2012; Chiarini, 2017). In the presence of firm heterogeneity, inferences based on cross-sectional data are likely to be biased. Panel data analysis controls for firm-specific and period-specific heterogeneity. However, limited studies have used panel data to study environment-financial performance linkage. King & Lenox (2001) conduct a longitudinal study of American manufacturing firms and find that waste prevention leads to improvement in firm performance as measured by *ROA* and *Tobin Q*. In their study on 89 multinational corporations for the period 1994-97, Dowell et al. (2000) find that adherence to strict environmental regulations improves financial performance of firms. Rassier & Earnhart (2009) employ panel data analysis to examine the effect of Clean Water Act on financial performance of publically owned firms in chemical manufacturing industries. Empirical results show a negative impact of clean water regulation on future financial performance as measured by *Tobin Q*. We use eleven year panel data from 459 firms belonging to twenty one Indian industries to study impact of corporate environmentalism on financial performance.

Moreover, majority of existing studies have considered *EMP*-financial performance linkage in one direction i.e. adoption of better environmental practices improves firm performance. The considerations of dynamics and reverse causality are relevant in relationship between environmental management and financial performance. Hart & Ahuja (1996) state that delay in achieving financial gains from environmental initiatives can be attributed to increased short term costs due to restructuring in the organisation. In a study of 127 companies listed on S&P 500, empirical results suggested that it takes one to two years for environmental performance to positively impact firm performance as measured by *ROS, ROA* and ROE. The financial benefits were more for 'high polluters' than 'low polluting' firms across all models. Guenster et al. (2008) also suggests that market valuation of firm's environmental performance may be time variant i.e. market incorporates environmental information with a drift.

Dynamic panel data analysis controls for endogeneity and dynamics in environmental-financial performance relationship. We came across multiple studies using dynamic panel analysis to test environment Kuznets curve (EKC hypothesis) across countries but studies at firm level are limited (Coondoo & Dinda, 2002; Lee et al., 2010; Hua & Boateng, 2015). Elsayed & Paton (2005) conduct a static and dynamic panel data analysis to study the impact of environmental performance on financial performance in 227 UK firms belonging to 26 sectors during 1994-2000. Empirical results reveal a positive impact of environmental performance on *ROA* in chemical and telecommunication and a negative impact in textiles, clothing, metals and automobiles. Endo (2019) found a positive relation between environmental performance and firm value in Japanese manufacturing sector using static panel regression. However, with introduction of dynamic panel data models, this relation became insignificant. Controlling for firm-heterogeneity and endogeneity, we employ static panel least squares and dynamic panel GMM estimations to study the impact of *EMP*s adoption on firm's profitability and valuation in the Indian context.

3. Conceptual framework and hypotheses construction

The objective of this paper is to study the impact of environmental management system on financial performance in Indian firms. A conceptual relationship between adoption of *EMP*s and their financial implications is depicted in Figure1.

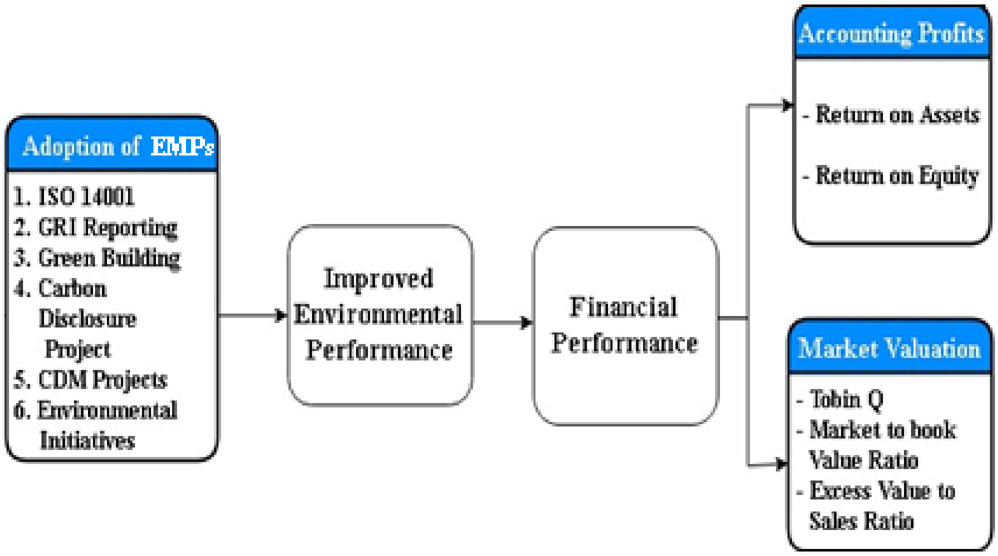

Figure 1: Conceptual Framework

Firms can gain sustainable competitive advantage by assuming environmental responsibility of their operations. Pollution is a waste of input and reflects firm's inefficiency in product design, choice of input and manufacturing process (Nehrt, 1996). A proactive environmental management strategy is expected to enhance firm performance through process innovation and product differentiation (Porter & van der Linde, 1995; Reinhardt, 1998; Shashi et al., 2019).

We study the effect of *EMP*s on firm performance using accounting and market value based measures. Firms adopt voluntary environmental measures in response to external factors like pressure from customers, investors and regulators, and internal capabilities like innovation and research and development (R&D). It is hypothesized that firms with efficient environmental management exhibit improved profitability due to reduced wastages, reduced cost of inputs, less public and regulatory pressure and improved competitiveness with increased product value (Arora & Cason, 1995). Therefore, we hypothesize that:

Hypothesis 1: Adoption of EMPs has a positive impact on firm profitability

To test above hypothesis we use commonly used measures of profitability based on accounting measures of firm performance: Return on Assets (*ROA*) and Return on Equity (*ROE*). Accounting measures of firm performance are easy to calculate and give a short-term perspective of firm performance (Hart & Ahuja, 1996; Jaggi & Freedman, 1992;). *ROA* measures the profit a firm generates with the money invested by its shareholders. Though *ROA* measures a firm's financial strength, it fails to indicate whether firm is having excessive debt or using debt to drive returns. *ROE* overcomes this shortcoming by measuring how efficiently a firm is using its shareholder's funds to generate profits. *ROE* indicates firm's ability to maximise return to its shareholders based on their investment in the firm (Alexander & Nobes, 2001; Stickney et al., 2007). Together, *ROA* and *ROE* present a clear picture of management's effectiveness.

Though accounting measures explain how firm earnings respond to managerial decisions, they fail to give a forecast of its future expectations. Accounting measures are based on past performance of firm and use historical costs of assets. Further they ignore value of intangible assets and inflationary effects. As a result their predictive value is quite low (Cochrane& Wood, 1984; Keats & Hitt, 1988).

On the other hand, market valuation based measures of performance are forward-looking and measure firm's ability to earn profits in future. They incorporate all relevant information and thus, unlike accounting measures, they are not limited to a single effect of firm performance (Lubatkin & Shrieves, 1986). Advanced environmental practices can enable a firm to achieve organizational efficiency thereby leading to improved perception of firm's ability to generate future economic earnings with lower business risks (Dowell et al., 2000; King & Lenox, 2002; Konar & Cohen, 2001). Gregory & Whittaker (2013) recommend that market value, accounting earnings and book value should be considered simultaneously in investigating the financial impact of environmental management. Therefore, it is hypothesized that firms which adopt environmental management practices send positive signals to the market resulting in higher firm valuation.

Hypothesis 2: Adoption of EMPs has a positive impact on the market valuation of a firm.

A firm's market value is generally measured using *Tobin Q*. In the present study, we use two additional measures of firm valuation; market to book value ratio (*MBVR*) and excess valuation to sales (*EV/S)* ratio.

Tobin Q is defined as the ratio of firm market value to its replacement cost of assets. Estimation of firm valuation, using *Tobin Q*, is problematic in a developing country like India with under-developed capital market due to non-availability of data on market value of debt and replacement costs of assets (Sarkar & Sarkar, 2012). *Tobin Q* suffers from omitted variable bias. Consequently, we use *MBVR* as an alternative measure of firm valuation. Unlike *Tobin Q*, no computational adjustments are required when we use *MBVR*.

Excess valuation to sales ratio, another measure of market valuation, is a measure of long-term wealth creation potential of firm. This ratio helps to measure value of premium or discount accorded by market to firm based on evaluation of future prospects of the firm. Spread between market value and book value of firm is a measure of its perceived ability to return to its stockholders a future amount in excess of their expected return (Connolly & Hirschey, 1986; Shalit & Sankar, 1977). EV/S controls for size and leverage variation across firms (Errunza & Senbet, 1981; Galbraith & Stiles, 2008; Thomadakis, 1977).

4. Description of Data

Sample: This study is based on firm level data from leading Indian industries. To trace the impact of manufacturing sector on environment, we first picked the CPCB list of 'most polluting' Indian industries. CPCB is a statutory body constituted in 1974 under the Water (Prevention and Control of Pollution) Act. It is the chief advisor to Government of India on matters related to air and water pollution. In 1991, CPCB identified 17 categories of highly polluting industries in India.[4] CPCB along with State Pollution Control Boards (SPCBs) keeps a check on pollution control facilities and compliance in these industries.

To build our sample, we first choose all the major manufacturing and service sector industries in India using CMIE Prowess database. The chosen manufacturing industries include the 17 polluting industries. Next we calculate their average energy intensity. Energy intensity of an industry has been calculated as ratio of energy cost[5]to net sales (Goldar, 2010; Sahu & Narayanan, 2011). The average energy intensity (in Rs crores) for the 25 industries is given in Appendix Table A1. There were some industries which had high energy intensity but were dropped due to small industry size. The small size of the industry might limit their aggregate environmental effect.

Next we pick all large listed enterprises from each of the industry.[6] Top industry performers are chosen as they are more likely to use a wider variety of environmental practices vis-a-vis smaller firms. Although selection of large and publically listed firms limits the extent to which we can generalize our findings to smaller firms, there is in fact substantial variation in sample, both within sector and over time. The firms differ

[4]CPCB list includes aluminium smelter, caustic soda, cement, copper smelter, distilleries, dyes and dye intermediates, fertilizers, integrated iron and steel, tanneries, pesticides, petrochemicals, drugs, pharmaceuticals, pulp and paper, oil refineries, sugar, thermal power plants and zinc smelter.
[5]Energy cost is defined as expenditure on power and fuel.
[6]In May, 2020 the definition of Micro and Medium enterprises was revised by the Finance Ministry. Large enterprises are units with turnover exceeding 250 crore and asset investment above 20 crore.

in size, products, processes and industries. A final database of 459 large listed Indian companies is created.[7]

Time Period: In order to understand how the adoption of *EMP*s has impacted firm performance, we form a panel database covering an eleven year period from 2008-09-10 to 2018-19. The data collected covers publically traded firms in both manufacturing and service sectors.

Sources of Data: Data on firm level environmental practices has been extracted from sustainability and business responsibility report of companies. Data on independent variables is extracted from CMIE Prowess database, audited annual reports and business responsibility reports of the companies. Use of publically available database removes subjectivity and gives a fair view of current environmental state in the sample companies.

The study aims to measure the impact of *EMP*s adopted by a firm on its financial performance. The variable *EMP* is the sum of various environmental practices adopted by a firm. It is measured through six environmental practices which cover the pro-active orientation of a firm towards environmental concerns. The environmental practices include:

I. ISO 14001 certification: This is an internationally recognized EMS standard released by International Organization for Standardization (ISO). It provides a comprehensive framework that an organization has to follow to frame an effective environmental management system. In fact, ISO 14001 is the most popular and widely used indicator of EMS of an organization.
II. GRI certified sustainability reports: Global Reporting Initiative (GRI) is an independent organization releases the standards on sustainability reporting and disclosure. It helps organizations understand and communicate impact of their business on environment, climate change, human rights etc.
III. BEE/LEED certified green buildings: A green building is one whose construction and operation does not disrupt air, land, plantation and energy. It promotes a healthier and greener environment. The construction and subsequent usage of green buildings exhibit environmental commitment of a company.
IV. Carbon Disclosure Project: CDP is a global disclosure system that enables companies to measure and manage their environmental impacts. Voluntary participation of a firm in CDP is a way of meaningful steps taken by them to address their environmental impacts.
V. Clean Development Mechanism (CDM) projects: CDM is a voluntary emission reduction project being operated by a company. This commitment is made under Kyoto Protocol to implement an emission reduction project in a developing country. It is an environmental investment and credit scheme, which provides the participating company with a standardized emission offset instrument, Carbon Emission Reductions (CERs).
VI. Environmental expenditure: This variable covers the entire gamut of pollution reduction and pollution control activities undertaken by firms in addition to above listed practices. It includes efforts made to preserve water, recycle and treat waste, use clean energy, provide environmental training to staff and hire

[7] The words ‘company’, ‘enterprise’ and ‘firm’ are used interchangeably throughout the study.

consultants. A company incurs environmental expenditure in some of these areas.

Since the firms have flexibility in their choice of environmental practices, comprehensiveness of *EMP*s varies across firms. Each of these environmental practices is represented by a dummy variable as described in Table 1. Among the six environmental practices, ISO 14001 accreditation with mean value 0.751 is most popular practice among large Indian firms.

Table 2 presents the summary of variables used in the study. This table gives mean and standard deviation of all dependent, explanatory and control variables used in study. Large listed firms on average adopt 2.56 EMPs with standard deviation of 1.95 implying large variability in environmental management practise among firms. High standard deviation of other variables reiterates the aforesaid statement about substantial variation in our sample companies. Correlation matrix of variables used in study is presented in Table 3. The correlation among variables is relatively low signifying absence of collinearity among independent variables.

5. Econometric Estimation

We aim to measure the impact of environmental management on firm's financial performance. Adoption of environmental management practices involves detailed assessment of products, processes and other corporate activities for their possible environmental impacts. Improvement in operational efficiency leads to improvement in regulatory compliance and reduction in fines, costs, wastages and pollutants. This improves firm's profitability. *EMP* adoption also leads to increased goodwill by building a positive image of firm in market. These positive signals by firm lead to an improvement in its market valuation. Voluntary environmental management is expected to impact the current and long term financial performance of a firm differently. While a large proportion of expenditure on *EMP*s is likely to be incurred immediately after its adoption, financial benefits are realised in the long term (Khanna & Damon, 1999; Guenster et al., 2008). Accordingly, the regression equation is:

$$ROA_{it} \text{ or } ROE_{it} = \beta_0 + \beta_1 EMP_{it} + \beta_2 FV_{it} + \varepsilon_{it} \qquad (1)$$

where *ROA* is the return on assets and *ROE* is the return on equity; *EMP* is sum of environmental practices; FV stands for firm specific variables. Subscripts i indicates firm and subscript t is for the time period; and ε is random error term.

Market valuation of a firm (MV) is attributable to value generated by its tangible (V_{TA}) and intangible assets (V_{IA}).

$$MV = V_{TA} + V_{IA} \qquad (2)$$

We use three market value based measures of firm's financial performance: *Tobin Q*, *MBVR* and *EV/S*. To test the proposed hypothesis using *Tobin Q*, we use a regression model following Konar & Cohen (2001) which studies impact of various factors on the intangible asset value of firm. On other hand, *EV/S* measures value of premium or discount accorded by market to firm based on evaluation of future prospects of the firm (Errunza & Senbet, 1981; Galbraith & Stiles, 2008; Thomadakis, 1977).

$$MV_{it} = \beta_0 + \beta_1 EMP_{it} + \beta_2 FV_{it} + \varepsilon_{it} \qquad (3)$$

where MV stands for *Tobin Q* or EV/S, *EMP* is sum of environmental practices; FV stands for firm specific variables. Subscripts i indicates firm and subscript t is for the time period; and ε is random error term.

In developing countries, like India, use of *Tobin Q* as a measure of market valuation may be problematic since capital markets are underdeveloped and data on market value of debt and replacement cost of assets is generally missing (Sarkar & Sarkar, 2012). Therefore, we use *MBVR* as an alternative measure of firm valuation. We consider market value of equity as a function of its book value, financial performance and environmental performance (Gregory & Whittaker, 2013; Hassel et al., 2005; Kumar & Shetty, 2017; Ohlson, 1995). We consider,

$$\frac{MV_{it}}{BV_{it}} = \beta_0 + \beta_1 \frac{1}{BV_{it}} + \beta_2 \frac{NI_{it}}{BV_{it}} + \beta_3 EMP_{it} + \beta_4 FV_{it} + \varepsilon_{it} \qquad (4)$$

where *MV* is market value of equity, *BV* is book value, *NI* is net income, *EMP* which is sum of environmental management practices in period i in firm t and FV represent firm specific non-environmental variables in period t by firm i.

To overcome model misspecification, we include a number of control variables that can impact environment-financial performance relationship (Alexopoulos et al., 2018). Firm specific variables used in this study are R&D intensity, advertising intensity, asset age, multinational status, sales growth, size and age of firm. Firm size is a relevant variable due to possible existence of economies of scale in environmentally oriented investments. The smaller firms may not be as socially responsible as larger firms are (Makni et al., 2008; Waddock & Graves, 1997). Larger firms receive higher public attention, possess more slack resources, experience economies of scale which in turn, 'encourages' them to have better environmental performance (Fombrun & Shanley, 1990; Clarkson et al., 2011). Sales-asset ratio has been used as a measure of firm size. Next we include R&D intensity (research and development expenditure divided by sales) and advertising intensity (advertising expenditure divided by sales). R&D intensity and advertising intensity proxy firm innovation and omitting these variables can lead to misleading results. While R&D expenditure might help to add environment friendly attributes to product offerings, advertising can be used to raise consumer awareness about green products. This helps the firm to differentiate its product offering from competitors (McWilliams & Siegel, 2000). We use debt-equity ratio as a measure of firm's risk (Waddock & Graves, 1997). A firm with high debt-equity ratio is expected to have lower market valuation (Shetty & Kumar, 2017). Next variable used is Assetage which is calculated as ratio of net fixed assets to total assets.[8] Firms with older equipment and technology are likely to be less efficient and less profitable (Konar & Cohen, 2001). Firm age (years since incorporation) has also been included as a control variable. Age represents the lifecycle stage of the firm which has an impact on

[8]The age of a firm's assets is proxied by dividing the value of the property, plant, and equipment of firm (net of accumulated depreciation) by its gross value. This gives us a 0-1 scale for the age of a firm's assets, with a firm closer to 1 having newer assets.

profitability (Hanks et al., 1993). MNC status enables access to better technology, more finances and hence is assumed to lead to better financial performance (Shetty & Kumar, 2017). Sales Growth (SG) is a measure of future growth opportunities and is expected to have a positive impact on firm performance (Konar & Cohen, 2001).

Two econometric methods are used to gauge the relationship between *EMP*s adoption and firm performance. We first use static regression to test hypothesis 1 and hypothesis 2 controlling for firm specific and period specific unobserved heterogeneity, and then use dynamic regression model to control for potential biases associated with endogeneity.

Under static panel least square estimation we use both random and fixed effects model. Random effects model assumes individual specific effect to be a random variable uncorrelated with all explanatory variables. On the other hand, fixed effects model allows individual specific effects to be correlated with explanatory variables. Hausman test is used to check the consistency of random effects vis-a-vis fixed effects model (Wooldridge, 2010). Hausman test statistics reject null hypothesis and fixed effects model is selected (Tables 4 and 5).

Besides heterogeneity, endogeneity of explanatory variables in regression model may affect our empirical estimates. Dynamic panel regression is an effective way of controlling endogeneity. A simple way of allowing dynamic effects is inclusion of lagged dependent variable in regression equation. However, introduction of lagged dependent variable violates strict exogeneity and can lead to inconsistent standard estimators. Following Arellano and Bond (1991), we control for potential endogeneity of all explanatory variables using GMM estimation. This approach works well in small time periods with large individual units. Arellano–Bond estimator controls for potential endogeneity by setting up a GMM estimation to deploy additional instruments obtained by orthogonality conditions existing between lagged value of dependent variable and differenced disturbances (Baum et al., 2003). Instrumental variables are all the right-hand side variables lagged twice or more. The efficiency of GMM estimation is dependent on effectiveness of instruments and non-correlation between error terms. Consequently, we use Sargan test based on full Arellano and Bond (1991) instrument set to test the over-identifying conditions and Arellano–Bond test to check first- and second-order autocorrelation in the first differenced errors. Sargan test statistics indicates the appropriateness of instruments used in our dynamic regression model. AR(1) and AR(2) values suggest that errors are not serially correlated.

6. Empirical Results

Regression results for hypothesis 1, measuring impact of *EMP*s on firm profitability using static fixed effects and dynamic panel regression are presented in Table 4. Specifications 1 and 2 show impact on *ROA* while specifications 3 and 4 show impact on *ROE*. We find no statistically significant impact of *EMP* on *ROA* and *ROE* under static regression. This finding is consistent with the findings of Cohen et al. (1997). Under dynamic regression, environmental management shows a significant positive impact on *ROE* in current year (*EMP*) along with one year (EMP_{t-1}) and two year positive lag (EMP_{t-2}). A similar result is obtained by Angelia and Suryaningsih (2015). However, *ROA* improves one year post *EMP* implementation, i.e., adoption of an additional environmental practice in time period t improves firm's profitability in t+1 and t+2 time period . In the initial years of *EMP*s implementation, a firm undergoes many structural changes which involve financial costs. Subsequently, it is able to optimise resource usage by adoption of efficient and lean production practices. This leads to cost savings and reduction in wastages, thereby enhancing its long run profitability (Cochrane & Wood, 1984; Khanna & Damon, 1999). Under dynamic analysis, *ROA* and *ROE* improve by 0.79% and 0.33% respectively in t+1 while by 1.27% and 0.42% respectively in t+2 time period. A favourable impact of *EMP* on firm profitability supports past findings (Hart & Ahuja, 1996; Alexopoulos et al., 2018).

We also find a statistically significant and positive impact of advertising intensity on firm profitability and valuation. Increase in advertising intensity by one unit, improves *ROA* by 2.34% and *ROE* by 0.70% under static regression. Under dynamic analysis, increase in advertising intensity by one unit improves *ROA* by 0.14% and *ROE* by 0.027%. Advertising enables product differentiation leading to customer loyalty and building of brand value. Increased brand value creates potential for higher selling prices that results in higher revenue and improved profits (Hirschey & Weygandt, 1985). Sales/asset ratio has a positive and statistically significant coefficient across all specifications. One unit increase in sales/asset ratio improves *ROA* by 1.99% and *ROE* by 0.04% under static regression. Under dynamic analysis, increase in sales/asset ratio by one unit improves *ROA* by 1.89% and *ROE* by 0.04%. Bigger firms with more resources at their disposal exhibit higher market valuation and profitability (Fombrun & Shanley, 1990; Waddock & Graves, 1997; Clarkson et al., 2011; Alexopoulos et al., 2018). We find a statistically significant negative relationship between Assetage and *ROA and ROE*. This shows that firms with older equipment and obsolete technology are less efficient and less profitable. This finding concurs with the finding of Konar & Cohen (2001). The impact of MNC status on firm profitability is positive and significant across all specifications. Multinational Corporations enjoy benefits of internationalisation with economies of scale and scope. They are able to reduce costs and improve productivity leading to improved financial performance (Helpman et al., 2004). Leverage has a statistically significant positive impact on *ROE*. Usage of debt has a negative impact on revenue as more money is spent on servicing debt but if return on investment is higher than interest cost, use of debt leads to exponential increase in firms' profitability (Abor, 2005; Robb and Robinson, 2009). We obtain similar results for a large sample of 1439 large Indian enterprises (listed and unlisted) implying the robustness of the results (Appendix Table 2).

Regression results showing the impact of *EMP* adoption on firm valuation for hypothesis 2 are presented in Table 5. Under static regression, we do not find any impact of environmental management on concurrent market valuation. It is only in the second year that we find significant impact of *EMPs* on *EV/S*. Under dynamic regression, we find a positive and statistically significant impact of *EMP* on concurrent firm Tobin Q and EV/S. MBVR improves one year post *EMP* adoption while market valuation improves in t+2 time period for all measures of market valuation. Firm's *Tobin Q* improves by 1.03 units and 0.65 units in period t and t+2 respectively. Results are consistent with previous studies showing positive impact of corporate environmentalism on *Tobin Q* (Dowell et al., 2000; Okada & Iwata, 2011; Wagner, 2010). With one additional environmental practice, dynamic EV/S improves by 52.18 units concurrently and by 60 units in t+2 respectively. Positive and significant impact of *EMP* on EV/S shows that investors are attracted to environmentally pro-active firms because of potential of long-term wealth creation and above average returns (Cochran and Wood, 1984; Khanna & Damon; 1999). Dynamic *MBVR* increases by 0.41 units in period t and by 2.18 units in t+2 respectively. Firms adopting higher number of environmental practices are considered less risky compared to their peers and are thus a preferred investment alternative (Gregory & Whittaker, 2013; Hassel et al., 2005; Kumar & Shetty, 2017). Guenster et al. (2008) suggests that though market assigns a value-relevance to firm's environmental management, market valuation of environmental performance may be time variant i.e. market incorporates environmental information with a drift.

Results suggest that firm size has a positive impact on firm valuation. Firms with slack resources available for environmental investments take advantage of investment opportunities available in market to enhance their profitability and valuation (Makni et al., 2008; Waddock & Graves, 1997; Wagner, 2010; Alexopoulos et al., 2018). Increase in advertising intensity improves firm's financial performance under static and dynamic panel analysis. One unit increase in advertising intensity leads to an increase of 13.56 units in *Tobin Q*, 2.29 units in EV/S and 2.41 units in *MBVR* under static analysis and increase of 35.98 units in *Tobin Q*, 5.68 units in EV/S and 3.12 units in *MBVR* under dynamic analysis.

Advertising by green firms sends out a positive signal to market about its future growth potential. Customers assign a higher value to environmentally pro-active firms as compared to their peers (Konar & Cohen, 2001; McWilliams & Siegel, 2000). Under dynamic regression, we find a positive impact of MNC and negative impact of Assetage on firm valuation respectively. MNCs implement processes that enable more efficient utilisation of resources and ability to relocate activities to reduce costs (Helpman et al., 2004). Pantzalis (2001) found that MNCs operating in developing economies witness higher market valuation. Ageing asset stock of a firm makes it less efficient thereby, reducing profitability and market valuation (Konar and Cohen, 2001).

Dynamic panel estimates suggest a joint positive and significant impact of *EMP*, EMP_{t-1} and EMP_{t-2} adoption on firm's market valuation and profitability (Dowell et al., 2000; King & Lenox, 2001; Makni et al., 2008). Environment friendly products and processes enhance firm profitability either through cost savings or revenue gains. Investment in *EMP*s reduces costs through efficient utilisation of existing resources with lower wastages and environmental liabilities. This improves firms' profitability and they are valued highly by market (Sinkin et al., 2008; Mishra & Suar, 2010). Customer preference for products from environmentally pro-active companies increases their revenue (Delmas & Toffel, 2004; Henriques & Sadorsky, 1996; Rivera, 2000). Adoption of *EMP*s leads to improved investor perception of firm's ability to generate future economic earnings with lower business risks resulting in higher market valuation of the firms (Dowell et al., 2000; Klassen & McLaughlin, 1996; Konar & Cohen, 2001).

Growing firms with increased sales and ability to spend more on advertising are able to improve their financial performance both in short run and long run. Such firms are able to communicate their environmental initiatives to public through media and annual reports. They succeed in differentiating themselves from competitors and convince customers about their superior product offering. Improvement in firm's environmental performance adds to its goodwill and reputation. These voluntary environmental initiatives are valued by market and hence in the long run, environmentally responsible firms exhibit higher profitability and market valuation. The results also show that big firms are more likely to adopt voluntary environment practices. This may be due to 'increased public scrutiny' and economies of scale enjoyed by bigger firms (Henriques & Sadorsky, 1996; McWilliams & Siegel, 2001; Alexopoulos et al., 2018).

Though static panel data model controls for firm specific effects, the potential endogeneity of explanatory variables still exists. Controlling for reverse causality and endogeneity under dynamic panel analysis strengthens our results with significant and positive impact of *EMP*s adoption on profitability and valuation measures. Thus, allowing for dynamics in environmental-financial performance relationship is important as static regression estimates may be biased downwards (Elsayed and Paton, 2005; Endo, 2019). Firms that choose to improve their environmental performance over time experience improved financial performance in subsequent periods.

7. Conclusion

This study sought to establish empirical evidence on the relationship between corporate environmental management and firm performance in a developing country like India. We use a panel data of 459 Indian companies for a period of eleven years. Use of static panel analysis controls for firm heterogeneity while dynamic panel GMM estimation controls for endogeneity and reverse causality in environment- financial performance relationship along with heterogeneity.

The study presents new evidence on whether 'it pays to be green' using five alternative measures of firm performance: *ROA, ROE, Tobin Q, MBVR and EV/S.* Empirical results show that environmentally pro-active large firms experience improvements in profitability and valuation. These firms implement a number of green practices such as ISO14001 accreditation, sustainability reporting, participating in CDP, adoption of CDM projects and use of green buildings. Such firms are able to convince customers of their superior product offering and differentiate themselves from market competitors. Corporate environmentalism is valued by market and in the long run such firms exhibit higher profitability and valuation.

The results of this study can be used by firms and policy makers to understand the financial implications of environmental management. Firstly, policy makers need to acknowledge that in a developing country like India which is characterised by low compliance and ineffective surveillance, the most effective tool of stirring business firms towards environmental responsibility is by making them appreciate 'costs and benefits' of environmental management.. The policy makers should understand the coherence of the industry policy and environmental policy. The two are inherently intertwined and should be coordinated in their implementation as industrial upgrading can foster greener growth, and green growth can help in industrial upgrading in turn. Implementation of technologically superior processes can lead to cost-effective solutions to environmental problems without undermining economic output. Thirdly, corporate directors need to understand that though costly in short run, *EMP*s can be nurtured as a rare and valuable resource that can be harnessed to give the firm a sustainable competitive advantage over its competitors. Large Indian enterprises are continuously striving for improvement in performance by adopting varied green practices. This can show the way to small and medium industry players. The government should acknowledge that the key to improving productivity, environmental compliance and maintaining the competitiveness of the Indian industries will increasingly rely on innovation and entrepreneurship. More and more skill development programs and Industrial Training Institutes should be promoted.

The study is not free of limitations. This study is based on secondary data. Supplementing it with primary data can provide a deeper insight into motivations and barriers to environmental management at firm level. Lack of data on environmental performance of Indian firms limits our ability to study the effectiveness of the environmental practices adopted. Studying the variation in financial impact of *EMP*s across developing countries can be an interesting area of future.

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Table 1: Descriptive statistics of environmental practices

Variable	Measurement (YES=1 NO=0)	Mean	S.D.
GRI	The organization releases GRI certified sustainability reports.	0.392	0.441
ISO 14001	The organization is ISO 14001 certified.	0.752	0.213
Green Buildings	The organization uses green buildings, which are BEE/LEED certified.	0.210	0.315
CDM	The firm is running CDM projects.	0.129	0.325
CDP	The firm is part of CDP	0.219	0.417
Envtexp	The firm is incurring environmental expenditure	0.124	0.286

Notes: GRI- Global Reporting Initiative; CDM- Clean Development Mechanism; CDP- Carbon Disclosure Project; Envtexp- Environmental expenditure

Table 2: Summary statistics of financial and other characteristics of firms

Variable	Meaning	Definition	Mean	S.D
ROA	Return on Assets	Ratio of net income to total assets	10.076	86.832
ROE	Return on Equity	Ratio of net income to shareholders' equity	14.533	14.887
Tobin Q	*Tobin Q* or Q ratio	Ratio of market value of firm to the replacement cost of its assets	14.161	50.77
MBVR	Market to Book Value Ratio	Ratio of the product of the number of equity shares and the closing price of the share on the last day of the financial year to the book value of equity and reserves	3.003	5.962
EV/S	Excess Valuation to Sales Ratio	Ratio of excess of market value of firm over book value of assets normalized by sales.	6.235	15.90
EMP	Environmental Management Practice	Sum of *EMP*s adopted by a firm	2.56	1.95
ADV	Advertising intensity	Ratio of advertising expenditure to sales	0.0092	0.0624
RD	R&D intensity	Ratio of research and development expenditure to sales	0.004	.0219
SG	Growth of sales	Salest–Salest-1/ Salest-1×100	28.298	12.357
LEV	Leverage	Long-term debt to total assets ratio	0.312	3.27
MNC	Multinational status	Value of 1 if company is MNC else 0.	0.429	0.137
Assetage	Age of firm's assets	Net fixed assets/ total assets	0.603	0.192
Sales/asset	Sales asset ratio	Net sales/ Total assets	5.612	24.26
AGE	Age of firm	Number of years since incorporation	33.251	26.389

Table 3: Correlation matrix

	ROA	*ROE*	*Tobin Q*	*MBVR*	EV/S	*EMP*	RD	LEV	Salesasset	Assetage	SG	ADV	AGE	MNC
ROA	1	0.365	-0.127	0.347	-0.022	0.188	0.135	-0.17	0.27	0.007	-0.025	0.301	0.118	0.315
ROE	0.365	1	-0.008	0.19	0.079	0.097	0.063	-0.123	0.162	-0.044	-0.014	0.196	0.037	0.145
Tobin Q	-0.127	-0.008	1	-0.124	0.158	-0.012	-0.013	-0.031	0.033	-0.069	-0.013	0.38	-0.01	0.031
MBVR	0.347	0.19	-0.124	1	0.031	0.191	0.092	-0.083	0.214	-0.011	-0.001	0.405	0.217	0.261
EV/S	-0.022	0.079	0.158	0.031	1	-0.08	0.015	0.113	-0.142	-0.209	0.017	-0.015	0.071	0.34
EMP	0.188	0.097	0.012	0.191	0.08	1	0.118	-0.089	0.054	0.165	-0.023	0.244	0.044	0.222
RD	0.135	0.063	-0.013	0.092	0.015	0.118	1	-0.121	0.165	-0.003	-0.013	0.031	0.336	0.183
LEV	-0.17	-0.123	-0.031	-0.083	0.113	-0.089	-0.121	1	-0.089	-0.206	-0.014	-0.167	0.059	-0.120
Sales/asset	0.27	0.162	0.033	0.214	-0.142	0.054	0.003	-0.089	1	0.151	-0.026	0.286	0.023	0.083
Assetage	0.007	-0.044	-0.069	-0.011	-0.209	0.165	-0.003	-0.206	0.151	1	-0.045	0.103	0.078	0.0143
SG	-0.025	-0.014	-0.013	-0.001	0.017	-0.03	-0.013	-0.014	-0.026	-0.045	1	-0.02	-0.040	-0.028
ADV	0.301	0.196	0.38	0.405	-0.015	0.244	0.031	-0.167	0.286	0.103	-0.02	1	0.084	0.336
AGE	0.118	0.037	-0.01	0.217	0.071	0.044	0.336	0.059	0.023	0.078	-0.040	0.084	1	0.084
MNC	0.315	0.145	0.031	0.261	0.34	0.222	0.183	-0.120	0.083	0.014	-0.028	0.336	0.084	1

Note: *ROA*= Return on assets, *ROE*= Return on equity, *MBVR*= Market to book value ratio, EV/S= Excess valuation to sales ratio,*EMP*= Total environmental management practices adopted by firm, RD= R&D intensity, LEV=Leverage, Sales/asset= Sales to asset ratio, Assetage= ratio of net fixed assets to total assets, SG= Sales growth, ADV= Advertising intensity, Age= number of years since firm's inception, MNC= Multinational Corporation.

Table 4: Impact of *EMPs* on profitability

Variables	ROA		ROE	
	Fixed Effects (1)	Dynamic Effects (2)	Fixed Effects (3)	Dynamic Effects (4)
DV_{t-1}		0.0102*** (0.000355)		0.422*** (0.00289)
DV_{t-2}		0.0104*** (0.000361)		0.163*** (0.0115)
EMP	-0.408 (0.779)	-0.205 (0.127)	-0.0684 (0.278)	0.130*** (0.741)
EMP_{t-1}	-0.833 (0.724)	0.893*** (0.107)	-0.318 (0.407)	0.325*** (0.0797)
EMP_{t-2}	-0.965 (0.872)	1.226* (0.175)	0.362 (0.368)	0.420*** (0.148)
RD	14.62 (10.78)	4.941* (2.542)	1.117 (4.189)	0.0436 (0.737)
ADV	2.338** (1.166)	0.555** (0.0813)	0.101* (0.688)	0.195* (0.205)
LEV	0.373 (0.619)	0.0137 (0.0290)	0.318*** (0.1055)	0.337*** (0.00229)
Sales/Asset	1.991*** (0.129)	1.893*** (0.000943)	0.0378*** (0.0120)	0.0430*** (0.00137)
Assetage	-37.42*** (14.08)	-27.01*** (0.310)	-2.209*** (0.529)	-2.021* (0.115)
SG	0.000145 (0.000354)	0.0000407*** (0.00018)	7.19e-0 (0.000258)	0.000114 (8.53e-05)
MNC	3.696*** (0.991)	1.313* (2.133)	0.820* (1.324)	0.408*** (0.101)
AGE	0.630 (0.528)	0.410*** (0.0146)	-0.0330 (0.0100)	0.00243 (0.00440)
Hausman test statistics	21.35***		10.82***	
Industry effects	Y	Y	Y	Y
Constant	-0.932 (5.208)	8.070* (4.194)	3.146** (1.510)	1.088*** (0.219)
f(*EMP*, EMP_{t-1}, EMP_{t-2}) Prob>f	0.64 (0.590)		0.64 (0.591)	
f(*EMP*, EMP_{t-1}, EMP_{t-2}) Prob>chi2		69.49*** (0.000)		123.90*** (0.000)
Sargan test statistics		4.204		10.124
AR(1)		0.177		0.924
AR(2)		0.090		0.921
Observations	3970	3480	3970	3480
Number of companies	459	458	459	458

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note- DV= dependent variable, *EMP*= Total environmental management practices adopted by firm, RD= R&D intensity, Lev=Leverage, Assetage= ratio of net fixed assets to total assets, SG= Sales growth, ADV= Advertising intensity, Age= number of years since firm's inception, MNC= Multinational Corporation, 1/BV= 1/Book value, NI/BV= Net income/ Book value

Table 5: Impact of *EMPs* on market valuation

Variables	*Tobin Q*		*EV/S*		*MBVR*	
	Fixed Effects (1)	Dynamic Effects (2)	Fixed Effects (3)	Dynamic Effects (4)	Fixed Effects (5)	Dynamic Effects (6)
DV_{t-1}		0.0456*** (0.000901)		0.455** (0.000434)		0.182*** (0.000583)
DV_{t-2}		0.00055 (0.210e-05)		0.0021*** (8.90e-05)		-6.22e-06 (6.40e-05)
1/BV					5.528* (3.404)	3.48* (2.281)
NI/BV					4.329* (6.409)	1.213* (3.626)
EMP	0.104 (1.434)	1.026* (0.398)	18.00 (23.41)	52.18*** (14.33)	1.529 (1.815)	0.0310 (0.194)
EMP_{t-1}	1.229 (1.304)	1.313 (1.912)	11.63 (12.44)	17.43 (18.476)	-0.0839 (0.966)	0.407* (0.231)
EMP_{t-2}	0.736 (1.877)	0.648* (0.386)	2.365** (9.802)	60.00*** (15.27)	2.145 (1.896)	2.185* (1.306)
RD	-15.82 (11.89)	-40.80* (22.64)	-60.9 (42.62)	-76.2** (69.91)	-37.65 (26.93)	-6.443 (6.643)
ADV	13.56*** (11.27)	35.98*** (3.003)	2.292*** (10.91)	5.686*** (0.509)	2.406* (4.772)	3.123*** (0.370)
LEV	-1.535 (0.995)	0.0454 (0.0306)	-22.86 (25.42)	3.912 (2.029)	-1.355 (1.206)	0.260*** (0.0594)
Sales/asset	0.616* (0.521)	0.609** (0.289)	2.837** (3.048)	2.866*** (1.777)	0.131* (0.135)	0.346** (0.204)
Assetage	-16.13 (2.617)	-15.98*** (10.99)	-42.03 (42.79)	-24.50*** (40.36)	-10.22 (12.77)	-1.058* (0.557)
SG	0.00631 (0.00236)	0.0105 (0.000311)	0.113 (0.0484)	0.711 (0.000315)	0.000748 (0.00165)	0.0124 (0.000146)
MNC	10.96 (20.65)	22.69*** (11.22)	14.73 (32.56)	15.10*** (5.187)	2.894 (7.584)	30.94*** (5.272)
AGE	-0.143 (0.0989)	-0.574 (0.00721)	-1.924 (1.529)	-24.81 (0.770)	-0.0598 (0.0923)	-0.473 (0.0686)
Hausman test statistics	72.26***		13.13**		13.24***	
Industry effects	Y	Y	Y	Y	Y	Y
Constant	1.799*** (0.615)	0.715 (0.806)	4.123*** (1.028)	0.0430 (2.227)	1.583 (3.118)	1.283 (3.266)
Sargan test statistics		15.86		17.38		25.17
AR(1)		1.496		0.8284		1.224
AR(2)		0.8502		0.7791		0.676

Observations	3970	3480	3970	3480	3970	318
Number of companies	459	458	459	458	459	458

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note- DV= dependent variable, *EMP*= Total environmental management practices adopted by firm, RD= R&D intensity, Lev=Leverage, Assetage= ratio of net fixed assets to total assets, SG= Sales growth, ADV= Advertising intensity, Age= number of years since firm's inception, MNC= Multinational Corporation, 1/BV= 1/Book value, NI/BV= Net income/ Book value

Appendix

Table A1: Energy Intensity of industries

Industry	Ratio of Energy Cost to Net Sales (Rs. Crore) for 2018-19	Nature
Aluminium	0.1205	Manufacturing
Air Transport	0.2498	Service
Banking*		Service
Cement	0.2176	Service
Chlor Alkali	0.2709	Manufacturing
Copper Smelter**	0.1009	Manufacturing
Distillery	0.0078	Manufacturing
Dyes and Dye Intermediary	0.0493	Manufacturing
Fertilizer	0.115	Manufacturing
Healthcare	0.0251	Service
Hotels and Tourism	0.0493	Service
IT	0.0066	Service
Iron and Steel	0.0658	Manufacturing
Oil refinery	0.0318	Manufacturing
Pesticide	0.0277	Manufacturing
Petrochemicals	0.0231	Manufacturing
Pharmaceutical	0.0302	Manufacturing
Pulp and Paper	0.1153	Manufacturing
Real Estate	0.0043	Service
Sugar	0.0149	Manufacturing
Tanneries	0.0214	Manufacturing
Telecom	0.1256	Service
Thermal Power	0.0142	Manufacturing
Zinc Smelter**	0.183	Manufacturing

*: For Banks, Power and fuel cost insignificant as compared to turnover.

**: Industries dropped due to small size (Firms<10)

Table A2: Impact of *EMP*s on profitability in Large scale companies

	ROA		ROE	
	Fixed Effects (1)	Dynamic Effects (2)	Fixed Effects (3)	Dynamic Effects (4)
DV_{t-1}		0.0288*** (0.0141)		0.460*** (0.00855)
DV_{t-2}		0.129*** (0.00935)		0.170*** (0.0395)
EMP	-2.280 (1.889)	0.0727 (0.406)	-0.0955 (0.173)	0.0831 (0.0510)
EMP_{t-1}	1.366 (1.634)	-0.438 (0.418)	-0.318 (0.407)	-0.102 (0.135)
EMP_{t-2}	0.225 (0.533)	0.0151* (0.305)	0.362 (0.368)	0.0769* (0.208)
RD	-8.524 (9.603)	-2.619 (5.107)	-0.464 (1.585)	-0.392 (1.185)
ADV	2.335*** (0.781)	0.143* (0.840)	0.706** (0.738)	0.0269* (0.249)
LEV	-0.0425 (0.0358)	-0.00213 (0.00245)	0.678* (0.351)	0.679*** (0.0352)
Sales/asset	2.095*** (0.0363)	1.673*** (0.0180)	0.108*** (0.0279)	0.0247** (0.0476)
Assetage	-37.77** (5.599)	-25.41** (2.251)	-0.154* (0.574)	-1.965* (1.032)
SG	-4.30e-06 (2.30e-05)	-2.64e-06 (1.64e-05)	0.000128** (6.32e-05)	0.000134** (5.63e-05)
MNC	-22.07 (19.04)	1.464 (1.388)	0.307 (0.816)	-0.222 (0.898)
AGE	0.0336 (0.0311)	0.0655 (0.124)	-0.0131** (0.00637)	0.0247 (0.0476)
Hausman test statistics	15.43***		11.72***	
Constant	43.72*** (19.93)	9.428*** (3.463)	0.859 (0.926)	2.649* (1.595)
Sargan test statistics		3.683		10.41
AR(1)		0.1577		0.8594
AR(2)		0.0798		0.8960
Observations	9656	7874	9656	7874
Number of companies	1439	1437	1439	1437

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1