Simultaneous Association between Quality of Corporate Environmental Performance and Financial Performance: Evidence from Select Asian Countries

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Abstract: This study empirically investigates the simultaneous association between the quality of environmental performance (EP) and financial performance of firms selected from three Asian countries—Japan, South Korea, and India. The content analysis technique based on a four-point scale was used to measure the quality of EP, whereas financial performance was measured based on the market-to-book ratio. Employing system generalized method of moments and fixed effects regression model in a system of two-equation model, the study finds that EP has a positive impact on financial performance. Similarly, the financial performance has a positive influence on the quality of EP. The findings of the study indicate that a firm can enhance its overall financial performance by improving its EP. This implies that firms not only improve their economic performance through environmentally responsible business practices, but also help in fulfilling some of the sustainable development goals of the United Nation's 2030 development agenda.

Keywords: Asian firms, content analysis, environmental performance, financial performance, system GMM model.

INTRODUCTION

The purpose of this study is to investigate the association between the quality of environmental performance (EP) and financial performance of firms from three Asian countries—Japan, South Korea, and India. After more than three decades of theoretical and empirical research on the association between the EP and financial performance of corporate firms (Angelo & Cudia, 2011; Horvathova, 2010; Plumlee et al., 2015), the results still remain to be inconclusive. The standard new classical theory states that improvement in EP is associated with an increase in cost and a decrease in net marginal benefits, because it involves significant investment and

modification of existing processes in order to reduce pollution and energy consumption (Horvathova, 2010; Walley & Whitehead, 1994). This is consistent with the "cost-concern school" and negative "traditionalist," where it is said that environmental improvement is concerned with an increased cost resulting in decreased earnings and lower market value (Hassel et al., 2005). Thus, a negative association exists between the EP and corporate financial performance. Empirically, a number of researchers observe negative association between the EP and financial performance (Cordeiro & Sarkis, 1997; Freedman & Jaggi, 1992; Hassel et al., 2005; Ho & Taylor, 2007; Smith et al., 2007).

On the contrary, the positive "revisionist" such as Porter (1991) advocates that environmental improvement is associated with the improvement in both social welfare and financial performance of firms. The value creation school also regards environmental efforts as a tool to increase competitive advantage and improve financial performance (Hassel et al., 2005). This is based on the argument that social and environmental disclosures reveal a commitment toward environment and society. It enables firms to develop and maintain a healthy relationship with the wide group of stakeholders, and reduces risk of being boycott by legitimizing their business activities in society, helps in the efficient utilization of scarce resources, increases profits by accessing socially or environmentally oriented markets, attracts socially responsible investments from both the national and international markets that increases market capitalization, and finally leads to value maximization. Empirically, many researchers (Albertini, 2013; Hart & Ahuja, 1996; Hidemichi et al., 2012; Konar & Cohen, 2001; Moneva & Ortas, 2010; Plumlee et al., 2015; Russo & Fouts, 1997) observe a positive association between the EP and financial performance. However, some researchers (Earnhart & Lizal, 2007; Wagner, 2005) fail to disentangle any clear relationship between the two.

The empirical research between the EP and financial performance of firms can be segregated mainly into two groups. One group has advocated that firms' financial performance depends upon EP or disclosure and other control variables. Considering EP as the explanatory variable, researchers empirically observe a positive, negative, and insignificant impact of it on the firms' performance (Albertini, 2013; Earnhart & Lizal, 2007; Moneva & Ortas, 2010; Plumee et al., 2015; Smith et al., 2007; Stanwick & Stanwick, 2000). On the contrary, another group considers financial performance as the determinant of EP (Baalouch et al., 2019; Jariya, 2015; Sulaiman et al., 2004; Suttipun & Stanton, 2012) and observes mixed results. However, Al-Tuwaijri et al. (2004) advocate that there is a bi-directional relationship between the EP and firm performance. The study also argues that the mixed results between the two are due to the failure of capturing the endogeneity between the two variables in the empirical literature. However, empirical evidence considering the bi-directional relationship between the EP and firm performance is scant in the extant literature.

Different theoretical approaches have been used to explain corporate environmental responsibility. Scholars have advocated both political economic theory and social political theory for explaining the existence and content of environmental responsibility (Huang & Kung, 2010). Corporate stakeholder theory and legitimacy theory, derived from the political economic theory (Gray et al., 1995), are the most widely used theories in the existing literature.

Stakeholder theory states that corporate firms must maintain a sound relationship with stakeholders to gain competitive advantage (Freeman et al., 2004). Maintaining a sound relationship with stakeholders is a challenging task as the needs of different stakeholders are different. However, there is a consensus relating to the social and environmental needs among the large stakeholder groups (Wilson, 2003). Thus, the relationship can be strengthened through the disclosure of social and environmental responsibilities in the published reports (O'Dwyer et al., 2005). It is thus contended that the disclosure of social and environmental responsibility can reduce information asymmetry between an organization and the stakeholders and improves the relationship between them.

Legitimacy theory states that organizations must operate within the boundaries and norms of the broader society, to ensure the legitimacy of their activities, which must be in accordance with the "social contract" between the organization and society (Deegan & Samkin, 2009). This theory states that there must be consensus between the corporate firms and society to take care of the expectations of the society (Guthrie & Parker, 1990). To prove their compliance with societal expectations, the organizations need to signal their legitimacy to the stakeholders and this can be done by the disclosure of social and environmental activities (Deegan & Gordon, 1996). This not only provides a positive signal to the stakeholder, but also reduces the gap between the company actions and social concern. The voice of society at present is not confined to only the goods and services provided by the business, but also demand to reduce environmental degradation, safety of employees, and safeguard of the interest of host community. Thus, social engagement between the host community and firms is very necessary for the effective legitimating development (Amiolemen et al., 2018).

The *Brundtland Report* of World Commission for Environment and Development (WCED) in 1987 clearly indicates the three dimensions of sustainability—economic, social, and environmental, which are of equal importance. The importance of the organization's contribution toward environmental sustainability was further emphasized in the Rio-documents in 1992, also known as the Rio de Janeiro *Earth Summit*. Considering the importance of environment and the role of corporate firms toward environment, a large number of researchers has investigated the association between the EP and firm performance. Empirical studies can be discussed from two dimensions: considering environmental disclosure or performance as explanatory variable and considering EP or disclosure as a dependent variable.

Employing EP as the explanatory variable, a large number of researchers has investigated the influence of corporate EP on financial performance. Hart and Ahuja (1996) in the case of S&P 500 firms find evidence that reduction in emissions leads to an improvement in firm performance. Similarly, the findings of Russo and Fouts (1997) and Stanwick and Stanwick (2000) indicate a positive impact of EP on firm performance in the USA. Konar and Cohen (2001) also advocate that a reduction in toxic chemical emissions improves financial performance. In the case of European companies, Wagner et al. (2002) and Moneva and Ortas (2010) empirically observe positive impacts of EP and financial performance. In the case of Japan, Hidemichi et al. (2012) also confirm a positive impact of EP on firm performance. Using the Global Reporting Initiatives (GRI) guidelines, Plumlee et al. (2015) find a positive impact of environmental disclosure on firm value. In a review of 52 studies, Albertini (2013) demonstrates the positive impact of EP on firm performance.

However, some researchers empirically observe a negative influence of EP on firm performance. In this respect, a mention of the empirical findings of Freedman and Jaggi (1992), Hassel et al. (2005), Smith et al. (2007) and Ho and Taylor (2007) can be made. On the contrary, there are some cases where researchers find an insignificant influence of EP on financial performance. Rockness et al. (1986) fail to disentangle any significant impact of EP on the financial performance of US firms. The finding is consistent with the study by Choi (1999) in Korea, Sahay (2004) in India, and Angelo and Cudia (2011) in Japan.

Using EP as the determinant of firm performance, researchers also observe mixed results. For instance, Baalouch et al. (2019) examine the influence of various factors on the quality of environmental disclosure for French-listed companies and observe a significant positive influence of financial performance on the quality of environmental disclosure. In contrast, Suttipun and Stanton (2012), in the case of Thai companies, find a significant negative influence of financial performance on the environmental disclosure. On the contrary, many researchers observe an insignificant influence of financial performance on the EP. Sulaiman et al. (2004) in the context of companies from Malaysia and in the case of Arab Middle East and North African companies find no significant influence of profitability on the quality of environmental reporting. Similar results are obtained

by Jariya (2015) in the context of Sri Lanka. In Ghana, the findings of Welbeck et al. (2017) indicate an insignificant impact of financial performance on the EP. Also in India, Malarvizhi and Matta (2016) find no significant influence of profitability on environmental disclosure. Similarly, Zamil and Hassan (2019) indicate that greenhouse gas emissions and water consumption have a positive and significant impact on financial performance.

The review of relevant studies thus indicates that there is no consensus between the empirical association with EP and financial performance. Moreover, most of the earlier studies fail to incorporate the possible endogeneity between the two. The disclosure of the environmental responsibility of a firm can improve its financial performance. In other words, a firm with high financial performance would try to maintain the position in the long run through satisfying the needs of stakeholders and the voice of society. Thus, the firm with high performance is expected a disclosure of more information about social and EP. This bi-directional association between the EP and financial performance is examined by Al-Tuwaijri et al. (2004). Using the Hausman test, the study finds endogeneity between the EP and financial performance. The results indicate that both are positively associated, although not statistically significant in all cases. In this study, we also consider the reverse causality between the EP and financial performance in the context of three Asian countries.

The current study contributes to the empirical literature by considering the endogeneity between the EP and financial performance of firms[1]. In this study, financial performance indicates the market performance of firms as the literature indicates that improving EP through the disclosure of environmental information firms provide a positive signal to the market and consequently enhance market performance. Furthermore, the study also contributes to the empirical literature through comparative analysis of the association between the financial performance and EP across the firms in three Asian countries. Of them two countries namely Japan and South Korea have the developed industry-based economy where firms have been publishing sustainability reports for a long period of time (Carrots & Sticks, 2013). Besides, India is an emerging economy both in terms of economic indicators and publication of sustainability reports by the firms (Carrots & Sticks, 2013).

METHODS

We have selected three countries—Japan, South Korea, and India based on the survey reports of KPMG (2013) and Carrots and Sticks (2013). These three countries are selected purposively as the survey reports indicate that Japan and South Korea are advanced in publishing sustainability reports and India is in the emerging stage. Furthermore, in terms of industrial development, Japan and South Korea are well-developed, whereas India is still an agriculture-based economy and in the embryonic stage in terms of industrial development. The GRI sustainability report is considered in this study for analyzing the EP because in the GRI sustainability reporting framework there is a separate room for disclosing environmental-related information. G3 version (2006) and G3.1 version (2011) of the GRI framework contain 30 items relating to EP, and G4 version was launched in 2016 with four additional items. In this study, both the versions of GRI guidelines have been considered as per their applicability in a respective year.

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1. In this study, environmental performance and environmental disclosure are used synonymously. This is because after the publication of sustainability reports most of the researchers have used content analysis of the published reports for measuring the disclosure score and the same is used here as the indicator of performance. Hence disclosure and performance are considered to be the same when the published sustainability report is used as the basis. In this study also, the content analysis technique is used to measure disclosure level or environmental performance employing the sustainability report as the source of information.

Initially, we have selected all listed non-financial firms from these countries. Because the publication of sustainability report is pre-condition for this study, we have identified the firms who are publishing sustainability report in their website in English language. After identifying the firms, we have considered another criterion, i.e., publication of sustainability report continuously since 2009. The initial year 2008–2009 is considered because many Indian firms have started publishing sustainability report since 2009 as mentioned in the survey report of KPMG (2013). Based on all the criteria, finally we find 120 companies from three selected countries comprising 43 from Japan, 39 from South Korea, and 38 from India. Thus, the sample of this study contains 120 firms for a period of 10 years from 2009 to 2018.

Firm performance (MBR): Because the extant literature denotes that EP is more associated with the market value of firms, we use the market to book ratio (MBR) as the proxy for corporate financial performance (Choi et al., 2010; Lo & Sheu, 2007; Maji, 2019; Ortas et al., 2015). It is defined as market value of equity divided by book value of equity.

Quality of EP (EP$_Q$): The content analysis technique is used to compute the disclosure score of EP. It is a widely used research technique in the empirical literature to convert qualitative information into quantitative form by extracting relevant information from the published documents (Guthrie & Parker, 1990; Guthrie & Petty, 2000). Guthrie and Parker (1990) and Guthrie and Petty (2000) point out the three important aspects of content analysis—source of information, content of analysis, and unit of analysis. In this study, we use sustainability report as the source of information, GRI G3 and G4 frameworks as content for analysis, and a four-point scale (0–3) for unit of analysis.

To obtain the quality of disclosure, we have used scale instead of a binary coding system following Shareef and Davey (2005) and Wang et al. (2016). However, we did not follow the scoring technique of Shareef and Davey (2005) and Wang et al. (2016), who provide a maximum score for items expressed in numerical terms. Indeed, there are several items in the environmental disclosure that cannot be expressed in numerical terms. For instance, initiatives to reduce indirect energy consumption and reductions achieved (EN 7), strategies, current actions, and future plans for managing impacts on biodiversity (EN 14) cannot be expressed in numerical terms. But, qualitative descriptions of non-financial information are very important for the users or decision makers. In this regard, allotting maximum scores to only financial information or quantitative information cannot be pondered to be an appropriate methodology of scoring. In this respect, Marston and Shrives (1991) and Botosan (1997) argue that a number cannot be considered to be worth more than a comment. Furthermore, the items specified in the GRI framework for measuring EP can be further sub-divided. Thus, we assign code "0" if the item is not disclosed, code "1" if it is partly disclosed, code "2" if it is fully disclosed but in descriptive form without preciseness, and code "3" if the items are disclosed in numerical term or description for non-financial items but in a precise form.

After obtaining item-wise score, the quality of EP is computed by employing the following formula:

$$EP_{Q_{jt}} = \frac{\sum_{i=1}^{n} X_{ijt}}{N_j} \tag{i}$$

where N is the maximum possible score, "i" represents the item, and "t" is the time. "X_{ijt}" assumes the code 0–3. Here, the overall maximum score is computed by multiplying the number of items by 3. Simple arithmetic mean is used to compute the average score of a firm as well as for a particular year.

Other exogenous variables: To control the influence of other variables in the corporate EP and financial performance, we use firm size (*SIZE*), return on assets (*ROA*), and financial leverage (*LEV*). Firm size is measured by the natural log of total assets. ROA is defined as the ratio between the net profit and total assets, and leverage is measured by the ratio of debt capital to equity capital.

As the empirical studies gave conflicting outcomes with regard to the direction of the relationship between the financial performance and EP, both way causality has been examined in this study and it has been observed that there is a bi-directional association between the EP and financial performance. Thus, a two-equations model has been employed to examine the bi-directional association between the EP and financial performance among the sample firms. Also, we would believe that firms' environmental disclosure and financial performance tend to depend not only on the current values of the potential explanatory variables, but also on their previous values. Hence, we adopt dynamic specification of the model by incorporating a lagged dependent variable along with the covariates. The models are:

$$MBR_{j,t} = \beta_0 + \delta\beta_1 MBR_{j,\,t-1} + \beta_2 EP_{Q_{jt}} + \beta_3 SIZE_{jt} + \beta_4 LEV_{jt} + v_{j,t} + \mu_{j,t} \tag{1}$$

$$EP_{Q_{j,t}} = \gamma_0 + \delta\gamma_1 EP_{Q_{j,\,t-1}} + \gamma_2 MBR_{jt} + \gamma_3 ROA_{jt} + \gamma_4 SIZE_{jt} + v_{j,t} + \mu_{j,t} \tag{2}$$

We have considered 1-year lag of the response variable among the covariates. The optimum lag of 1 year has been identified based on Akaike information criterion, Schwarz information criterion, and Hannan–Quinn information criterion using sequential-modified LR test statistics as shown in Appendix I. The introduction of the lag makes the specification dynamic and the coefficient δ indicates the speed of adjustment. $v_{j,t}$ and $\mu_{j,t}$ are the unobserved firm specific effect and the idiosyncratic error, respectively. As we expect endogeneity between MBR and EP_Q, we adopt a two-step system generalized method of moments (system GMM) estimator to conduct our analysis based on the study of Blundell and Bond (1998). We have used system GMM as this model allows us to use more instruments and can produce more precise estimation (Bond, 2002). In order to test the validity of the model, we have conducted a second-order autocorrelation test and to ensure the validity of the instrumental variables the Sargan test of over identifying restrictions is used. Furthermore, in Equation 2, use of MBR and ROA as explanatory variables may not create the problem of multicollinearity as the degree of correlation is insignificant as shown in Appendix II.

For further robustness check of the results, we use an appropriate panel data regression model. Based on the outcome of Breusch–Pagan test and Hausman test, we find fixed effects model to be the more appropriate for the present data set. Therefore, the following two-equation models are employed for the purpose:

$$MBR_{i,t} = \beta_i + \beta_1 EP_{Q_{i,t}} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \varepsilon_{i,t} \tag{3}$$

$$EP_{Q_{i,t}} = \gamma_i + \gamma_1 MBR_{i,t} + \gamma_2 ROA_{i,t} + \gamma_3 SIZE_{i,t} + \varepsilon_{i,t} \tag{4}$$

Here, β_i and γ_i are the time invariant intercept of each firm and ε_{it} is the error component, $\varepsilon_i \backsim N, (0, \varepsilon_\varepsilon^2)$.

RESULTS AND DISCUSSION

Table 1 depicts the descriptive statistics containing minimum, maximum, mean, and skewness of the variables under study. A cursory look into the mean values of MBR indicates that the MBR of firms from Japan is considerably greater than that of South Korea and India. It is also imperative to note that the minimum value of MBR of Japan is very close to the mean value of MBR for South Korea and India. This clearly advocates that the market performance of Japanese firms in comparison with book performance is much better than that of the other two countries. The observed values of skewness in the cases of Japan and South Korea demonstrate that the distribution of MBR is not far from symmetry, whereas it is more skewed in the case of India. Similar results are observed in the case of firm size (SIZE). Average firm size is higher in the case of Japan compared to

Table 1 Descriptive Statistics

Country	Variables	Minimum	Maximum	Mean	Skewness
Japan	MBR	6.9830	26.8560	13.7090	0.571
	EP_Q	0.7200	0.9410	0.8639	−0.841
	ROA	0.0031	0.5048	0.0764	1.087
	SIZE	11.1200	19.2580	14.9411	−0.114
	DER	0.0070	4.0480	0.5285	1.261
South Korea	MBR	0.6110	12.3650	7.8064	0.456
	EP_Q	0.6700	0.9210	0.8317	0.234
	ROA	−0.0088	0.2680	0.0461	−1.590
	SIZE	11.2590	19.0250	12.2639	−0.467
	DER	0.0100	2.5820	0.2833	1.274
India	MBR	0.3720	39.8460	7.1120	2.045
	EP_Q	0.4147	0.9200	0.7911	2.282
	ROA	−0.0058	0.1854	0.0385	−1.200
	SIZE	8.7150	12.6990	9.7131	−2.211
	DER	0.0001	1.7200	0.3013	1.658

South Korea and India. Similarly, the distribution of firm size is much skewed in the case of India, when it is close to symmetry in the cases of Japan and South Korea.

A look into the mean values of EP (EP_Q) reveals that Japanese companies on average disclose 86.39% of the items specified in the GRI framework, followed by South Korea (83.17%) and India (79.11%). This implies that firms from all the countries disclose a substantial quantum of items specified in the GRI framework, which is an indication of commitment toward environment and society. Nevertheless, the quality of environmental disclosure is about 7% higher in the case of firms from Japan compared to that of Indian firms. Furthermore, although the range of EP_Q is less for Japan and also for South Korea, it is relatively more in the case of India. The distribution of EP_Q is also much skewed in the case of India as the observed value of skewness is high (2.282). In contrary, almost symmetrical distribution is observed for Japan and South Korea.

It is also evident from Table 1 that the average profitability of Japanese firms, measured by ROA, is relatively more (7.64%) as compared to firms from South Korea (4.61%) and India (3.85%). It is imperative to note that all the sample firms were profitable firms during the study period in the case of Japan, whereas some loss-making firms are present in the cases of South Korea and India. In the case of leverage (DER), the figures indicate that the average proportion of debt capital in the capital structure is more for Japanese firms, followed by India and South Korea.

Figure 1 shows the movement of EP (measured by disclosure score) of the three countries over the years during 2009–2018. Year-wise disclosure score for a country is computed by the simple arithmetic mean of the scores of all sample firms in the respective year. A cursory look into the figure reveals that there is a gradual improvement in the disclosure of environmental responsibility for all the three countries over the years. This is an indicator of positive attitude of the corporate enterprises toward environment. The disclosure score is the highest for the firms selected from Japan for all the years under study as compared to the other two countries. In the case of South Korea, the observed mean score of EP is found to be greater than that of India during the initial years of the study. However, in recent time the observed mean score is found to be almost identical. This implies that Indian firms gradually disclose more quality information about their environmental responsibility in the published report.
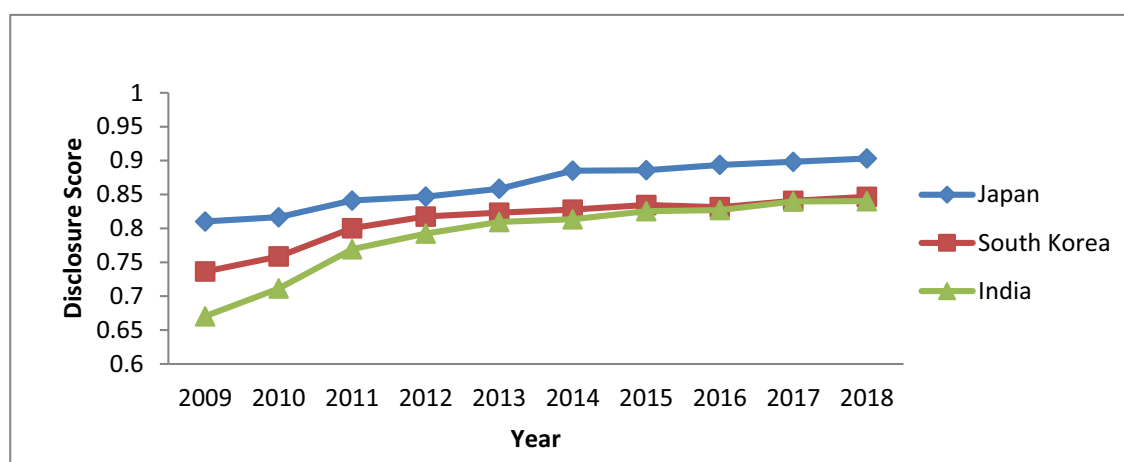
Figure 1 Movement of EP (quality)

To obtain overall comparative picture of EP of the three countries during the study period, box plot is used. It is a standardized way of portraying the distribution of data based on five statistics: minimum, first quartile, medium, third quartile, and maximum. The results are shown in Figure 2. The size of the box, which is the indicator of spread, reveals that spread is lowest in the case of Japan, followed by South Korea and India. This implies that the consistency in reporting by Japanese firms is relatively more as compared to the other two countries. Furthermore, the position of median within the box indicates almost symmetrical distribution in the case of japan and South Korea, while it is much skewed in the case of India. The negatively skewed distribution of disclosure score indicates that the extent of disclosure for a considerable numbers of firms is relatively less. However, outliers (below the minimum value) are present in all the three cases, which imply the existence of some non-performing firms with respect to disclosing environmental information.

Table 2 shows the results of Equations 1 and 2 where the system GMM estimation technique has been adopted to address the problems of endogeneity and unobserved heterogeneity. The lag value of the response variable has been incorporated into the model to know the impact of the previous year value of the variable and the speed of adjustment. Analysis has been conducted in three panels: panel A for Japan, panel B for South Korea, and panel C for India. In Equation 3, the influence of EP (EP_Q) on firm performance (MBR) has been
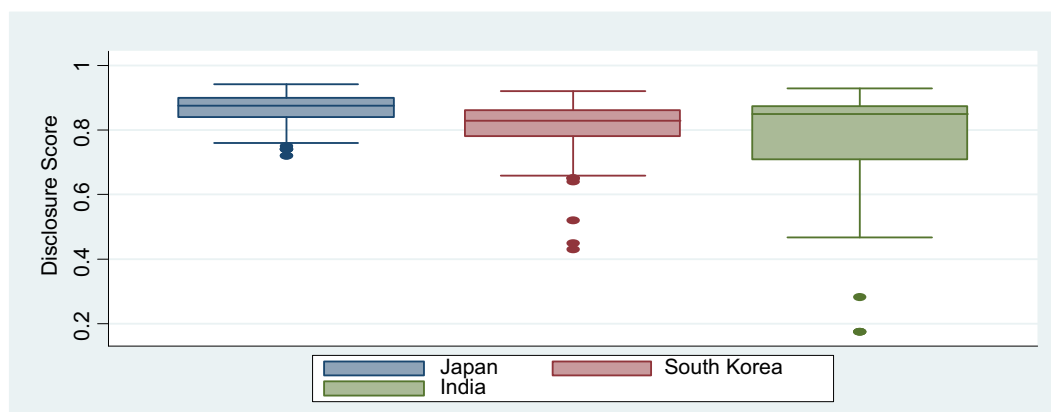

Figure 2 Box Plots of Quality of EP

Table 2 Results of System GMM Model

Country	Equation 1			Equation 2		
	Variables	Coefficient	z-statistic	Variables	Coefficient	z-statistic
Panel A: Japan	Constant	−11.157***	−3.035	Constant	−0.525***	5.201
	MBR_{t-1}	0.123*	1.672	EP_{Qt-1}	0.506***	5.622
	EP_Q	25.949***	4.096	MBR	0.005***	3.989
	SIZE	0.078	0.259	ROA	0.273***	2.715
	LEV	−0.948*	−1.766	SIZE	00023***	5.094
	Wald chi-square = 109.91***			Wald chi-square = 46,487.3***		
	Test for AR(1)[1] z = 1.716*			Test for AR(1)[1] z = 2.874***		
	Test for AR(2)[2] z = 1.053			Test for AR(2)[2] z = 0.212		
	Sargan test chi-square = 31.928			Sargan test chi-square = 33.818		
Panel B: South Korea	Constant	−6.937**	−2.408	Constant	0.272***	6.378
	MBR_{t-1}	0.360***	3.834	EP_{Qt-1}	0.628***	9.389
	EP_Q	9.581***	3.128	MBR	0.006***	2.726
	SIZE	0.184	1.242	ROA	0.059**	1.851
	LEV	−0.572	−0.763	SIZE	0.002	0.102
	Wald chi-square = 74.697***			Wald chi-square = 369.214***		
	Test for AR(1)[1] z = 1.967**			Test for AR(1)[1] z = 3.096***		
	Test for AR(2)[2] z = 1.540			Test for AR(2)[2] z = 0.828		
	Sargan test chi-square = 23.349			Sargan test chi-square = 23.632		
Panel C: India	Constant	2.287	1.320	Constant	0.329***	5.880***
	MBR_{t-1}	0.798***	22.51	EP_{Qt-1}	0.635***	10.701***
	EP_Q	−0.469	−0.381	MBR	0.001	1.007
	SIZE	0.029	0.194	ROA	−0.019	−0.705
	LEV	−1.999**	−1.996	SIZE	−0.002	−0.635
	Wald chi-square = 1,072.72***			Wald chi-square = 161.696***		
	Test for AR(1)[1] z = 1.404			Test for AR(1)[1] z = 2.617***		
	Test for AR(2)[2] z = 0.867			Test for AR(2)[2] z = 0.775		
	Sargan test chi-square = 25.689			Sargan test chi-square = 24.192		

Notes:
***, **, and *Significance at 1, 5, and 10%, respectively
[1]Arellano–Bond first-order autocorrelation test (H_o: no autocorrelation)
[2]Arellano–Bond second-order autocorrelation test (H_o: no autocorrelation)
[3]Test for over-identifying restrictions in GMM dynamic model estimation

examined after controlling the impacts of firm size (*SIZE*) and leverage (*LEV*). The Wald chi-square test indicates the overall significance of the model. The Sargan test shows that there is no evidence of over-identifying restrictions in the GMM dynamic model estimation. Although first-order autocorrelation is present, there is no evidence of second-order autocorrelation. Hence, the estimates are consistent (Arellano and Bond, 1991).

The estimated coefficient of lag dependent variable (MBR_{t-1}) is significant for all the three panels. This advocates in favor of the appropriateness of the dynamic model specification. The general interpretation of the lag of dependent variable, which ranges between 0 and 1, is that a value close to 1 is the indicator of lower adjustment speed and lesser competition in the market. On the contrary, a value close to 0 implies higher adjustment speed and greater competition. The observed coefficients of MBR_{t-1} are 0.123, 0.360, and 0.798, respectively, for Japan, South Korea, and India. This implies that the adjustment speed and competition is more in the case of Japan, followed by South Korea and India. The coefficient of EP_Q is found to be positive and significant at the 1% level for both Japan and South Korea. This implies, disclosing more information

on environmental responsibility firms can enhance financial performance. This is consistent with the proposition of stakeholder theory and legitimacy theory. The results are consistent with the findings of Stanwick and Stanwick (2000), King and Lenox (2002), Hidemichi et al. (2012), and Plumlee et al. (2015). However, in the case of India the impact of EP_Q is found to be insignificant. Two plausible explanations may be put forward for this insignificant association. First, the quality of EP as measured by the disclosure score is relatively less for Indian firms as compared to other nations such as Japan and South Korea. Second, disclosure of environmental information has not yet gained momentum in India and hence the investors are also less concerned about the EP. It is only after 2013, the disclosure of corporate social responsibility along with EP has become mandatory only for top 100 listed firms. But the nations such as Japan and South Korea are much advanced in this respect as evident from the survey reports of KPMG and Carrots and Sticks (2013). The observed insignificant association in the case of India supports the findings of Sahay (2004) in Indian context. Firm size is positively associated with financial performance, but the results are not statistically significant for all the three panels. On the contrary, the influence of leverage is negative but insignificant for all the cases except for India.

In Equation 2, the estimated coefficient of lagged dependent variable $\left(EP_{Q_{t-1}}\right)$ is significant for all the three panels. The observed coefficients indicate that the adjustment speed is moderate in the case of Japan, but relatively less for South Korea and India. The observed coefficient of MBR is found to be positive and significant in the cases of Japan and South Korea. This implies that firms with high market to book value disclose more information about environmental responsibility. The results support the findings of Baalouch et al. (2019) for listed companies from France. On the contrary, the association is found to be positive but not statistically significant in the case of India. This finding support the empirical outcomes of Suttipun and Stanton (2012) for Thai companies, Akrout and Othman (2013) for companies in Arab Middle East and North Africa, Jariya (2015) for companies in Sri Lanka, and Welbeck et al. (2017) in the case of Ghana. It is important to note here that for all the above cases the disclosure of environmental responsibility is in the embryonic stage. Among the control variables, ROA is positively and significantly associated with EP in the cases of Japan and South Korea, whereas it is insignificant in the case of India. This once again advocates that profitable companies of Japan and South Korea disclose more information about EP, which is not apprehended in the case of India. Similarly, the impact of firm size is not significant in the cases of India and South Korea. The Wald chi-square test is significant for all the three cases and indicates the overall goodness of fit of the model. Similarly, Sargan test and test for AR(2) indicate that there is no evidence of over-identifying restrictions and no evidence of second-order autocorrelation respectively.

The results of fixed effects regression models (Equations 3 and 4), shown in Table 3, also corroborate the results of the system GMM model. In Equation 3, the estimated coefficient of EP_Q is found to be positive and significant in the cases of Japan and South Korea. This implies that by improving the quality of EP by one unit, firms can enhance financial performance by 34.126 units and 8.695 units, respectively, for Japan and South Korea. However, in the case of India, as observed earlier, the association is positive but not statistically significant. Similarly, the influence of MBR on EP_Q (Equation 4) is observed to be positive and significant in the cases of Japan and South Korea, which implies that firms with higher financial performance disclose more information relating to the quality of environmental responsibility. In India, the result is insignificant. In the case of ROA also, the estimated coefficient is found to be positive and significant for all except for India. The coefficient of size is found to be positive and significant for all the panels, which indicates that large firms provide more information about environmental responsibility. The observed values of F-statistics and R^2 speak about the goodness of fit of the models used here. Thus, the results of both system GMM model and fixed effects model are consistent and hence, the results are tenable.

Table 3 Results of Fixed Effects Model

Country	Equation 3			Equation 4		
	Variables	Coefficient (t- statistic)	R^2 (F-statistic)	Variables	Coefficient (t-statistic)	R^2 (F-statistic)
Panel A: Japan	Constant	−15.925*** (−6.805)	0.540 (122.158***)	Constant MBR ROA SIZE	0.307*** (7.061) 0.013*** (15.71) 0.106*** (2.710) 0.025*** (7.948)	0.626 (174.396***)
	EP_Q	34.126*** (15.13)				
	SIZE	0.012 (1.068)				
	LEV	−0.065 (−0.985)				
Panel B: South Korea	Constant	−5.950*** (−2.506)	0.354 (20.704***)	Constant MBR ROA SIZE	0.296*** (3.876) 0.008*** (3.701) 0.417*** (4.322) 0.027*** (5.626)	0.426 (37.372***)
	EP_Q	8.695*** (4.770)				
	SIZE	0.304** (2.044)				
	LEV	−0.852* (−1.949)				
Panel C: India	Constant	5.408*** (4.130)	0.317 (19.038***)	Constant MBR ROA SIZE	0.673*** (14.051) 0.009 (1.389) 0.367 (1.425) 0.019*** (4.043)	0.234 (15.460***)
	EP_Q	0.928 (0.447)				
	SIZE	0.273*** (2.600)				
	LEV	−5.730*** (−6.655)				

Notes:
***, **, and *Significance at 1, 5, and 10% levels, respectively; Model used: Fixed effects model based on the outcome of the Hausman test

CONCLUSION AND POLICY IMPLICATIONS

The current study is a modest attempt to investigate empirically the association between the quality of EP and financial performance of firms selected from three Asian counties—Japan, South Korea, and India. Employing a two-equation system GMM model to examine bi-directional association between the two variables, the study finds some interesting results applicable for policy purposes.

First, we find that the speed of adjustment and level of competition with respect to EP and market performance are relatively more in the case of Japan as in comparison with South Korea and India. In line with the outcome of environmental disclosure score, which is considerably more in the case of firms from Japan, the results of the study imply that competitive market structure may induce Japanese firms to assume more environmental responsibility and disclose more information in the published report in order to satisfy the needs of the stakeholders. Furthermore, the Japanese Government and other agencies have initiated several reformative steps to enhance the socially and environmentally responsible business practices of the corporate firms. For instance, Japanese Business Federation established Council for Better Corporate Citizen (CBCC) in 1989 for supporting Japanese companies to be recognized as good corporate citizen. Similarly, law relating to Promotion of Business Activities with Environmental Conservation, 2005 and voluntary guidelines relating to environmental reporting in 2007 developed by the Ministry of the Environment also paved the way for boosting the environmental disclosure practices of Japanese firms. The results, thus, suggest that the Government and other related agencies should take some steps for enhancing the socially and environmentally responsible business practices of the corporate firms.

Second, we find significant positive impact of EP on financial performance in the cases of Japan and South Korea. This demonstrates that firms can improve financial performance by improving EP and the reverse is

also true. In Indian context, the results are positive but not significant. There is, thus, a need for the Indian firms to disclose more quality information about the environmental responsibility to capitalize its benefits in improving corporate performance. Third, the impact of financial performance on environmental disclosure is also positive and significant for all except for India. This implies that firms with higher MBR disclose more environmental-related information. This should not be limited to only profitable firms; rather all firms should disclose more information about environmental responsibility.

Finally, the significant outcome of this paper is that there is a bi-directional association between the EP and financial performance. The study, thus, advocates that firms should disclose more information in the published report to improve the financial performance by satisfying the needs of the stakeholder. Furthermore, environmental and social concern of the corporate firms not only improves the financial performance, but also supports the fulfillment of the Sustainable Development Goals (SDGs) of the United Nations, which is the prime motto of all member counties. Although the government of all member countries has taken many initiatives to achieve the SDGs throughout the globe, it may not be feasible without the contribution of large corporate sector among others. Indeed, in its *Brundtland Report* states that every company must fulfill their responsibilities toward the society and environment apart from financial responsibility.

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APPENDIX

Appendix I: VAR Lag Order Selection Criteria

Lag	LagL	LR	FPE	AIC	SC	HQ
0	−4609.660	NA	0.457563	10.56967	10.59153	10.57803
1	−2260.324	4671.760	0.002182*	5.194815*	5.333433*	5.265934*
2	−2231.537	56.98128	0.002182	5.224111	5.391596	5.270097
3	−2221.531	19.71327	0.002149	5.208548	5.492787	5.317288
4	−2210.108	22.40249	0.002171	5.219032	5.590729	5.361230
5	−2187.064	44.97747	0.002137	5.202897	5.662052	5.378553
6	−2179.246	15.18986	0.002177	5.221640	5.768253	5.430755
7	−2163.803	29.85856*	0.002180	5.222917	5.856989	5.465491
8	−2152.542	21.67197	0.002204	5.233773	5.955302	5.509804

Notes:

Endogenous variables: MBR, EP_Q SIZE LEV; exogenous variables: Constant

*Lag order selected by the criterion

LR, sequential modified LR test statistic (each test at 5% level); FPE, final prediction error; AIC, Akaike information criterion; SC, Schwarz information criterion; HQ, Hannan–Quinn information criterion

Appendix II: Correlation Matrix

Country	Variables	ROA	SIZE	LEV	MBR	EP_Q
Japan	ROA	1.000				
	SIZE	0.178*	1.000			
	LEV	0.003	−0.269**	1.000		
	MBR	−0.042	0.185*	−0.268**	1.000	
	EP_Q	0.137*	0.264**	−0.136*	0.446***	1.000
South Korea	ROA	1.000				
	SIZE	0.129*	1.000			
	LEV	0.013	−0.067	1.000		
	MBR	0.013	0.224**	−0.014	1.000	
	EP_Q	0.144*	0.107	−0.005	0.378***	1.000
India	ROA	1.000				
	SIZE	0.023	1.000			
	LEV	0.110	−0.011	1.000		
	MBR	0.014	0.112*	−0.215**	1.000	
	EP_Q	0.079	0.109*	−0.112*	0.079	1.000

Note:

***, **, and *Significance at 1, 5, and 10% levels by two-tailed test