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A non-linear assessment of ESG and firm performance relationship: evidence from China

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ABSTRACT

The main objective of this paper is to assess the non-linearities between the ESG activities and firm performance in case of an emerging market. China is identified as a case study for the present examination. Even though this research objective has been explored by past researcher, the evidence presented in literature is not conclusive. The paper hypothesizes that such conflicting or inconclusive results can potentially be attributed to wrong modeling, datasets that include both developing and the developed markets, and the prevalent endogeneity issue in corporate governance literature. For the purpose of this paper, the author uses the dynamic panel approach of First difference and the System Generalized Method of Moments. The findings from the analysis of 232 Chinese listed firm show a positive association between ESG activities and the firm performance. However, the relationship is nonlinear. In other words, the relationship between ESG activities and the firm performance is inverted U-shaped. This indicates the relationship is positive up to a certain threshold and once the ESG activities cross that threshold it start to have negative effect. The key insight from this research is that the firm has to find their threshold of ESG activities to gain maximum benefits from such activities.

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1. Introduction

Sustainability themed investing is a subset of principle-based investing which pays close attention to issues related to environment, governance and society. The overall movement towards sustainable investing seeks to ensure that all stakeholders are taken care of while making investment decisions. This is a deliberate move towards an approach commonly referred to as 'Triple Bottom Line' or 3 Ps (People, Planet and Profit). The idea is to move and expand outward from the sole objective of 'Shareholders' Wealth Maximization' to maximizing the benefits of 3 Ps.

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The surge in sustainability investing over the past decade is encouraging for various stakeholders including advocates of sustainability investing. In fact, the total sustainability assets are estimated to be USD 37.9 trillion in December 2020 and as per the projections, are estimated to reach USD 53 trillion. The total sustainability assets are expected to reach USD 140 trillion by 2025 and this would make them one-third of the total assets in the industry. More than half of these assets are in Europe but US has also shown remarkable growth in the past couple of years. In Asia, Japan leads the way in the sustainability industry. As per the reports of the Global Sustainable Investment Alliance (GSIA) and McKinsey, a significant proportion of sustainability assets are based on the negative religious based screening criteria (mostly Islamic finance) amounting close to USD 20 trillion.

Sustainability is a broader term denoting the ethical dimension of investment decision-making. For instance, Islamic finance investing is one of the types of sustainability investing. In this paper, the focus is on the Environmental, Social and Governance (ESG) type of investing definition. The ESG is one of the crucial subsets of sustainability investing and has garnered global response from investors, policymakers, industry players, regulators and other market players (Escrig-Olmedo et al., 2013; Hill et al., 2007). The onslaught of COVID-19 seems to be a critical turning point for the ESG industry as the global health crisis has led to heightened interest in the ESG industry. Many institutional and even retail investors are pushing asset managers and firms to incorporate ESG criteria in their investing and business approach. As per the report of Morningstar, the ESG compliant Exchange Traded Funds (ETFs) witnessed total fund inflows worth USD 38 billion in space of space of months that is from January 2020 to July 2020. The total fund inflows are approximately twice of what these ETFs received during the same time in 2019. In fact, Amundi, one of the largest fund managers in the EU region, has made a claim that the ESG principles have become a screening criterion for fund managers in Europe. The ESG screening criteria use a mix of negative and positive filters to create their portfolios (Klepek & Bauerová, 2020). The interest in the ESG industry has also forced the lawmakers to start creating regulations and guidelines at the national level. For instance, Nasdaq US has already issued reporting guidelines on ESG ('ESG Reporting Guide 1 and 2'). The objective of these reporting guidelines is to provide a framework to listed firms on the reporting of ESG related matters (Dhiman & Arora, 2020). The guidelines are also intended to encourage and motivate small businesses or SMEs to start engaging in ESG disclosure reports (Ruan & Liu, 2021). Some of the regions have gone a step ahead and made it mandatory for firms to either disclose ESG-related information or explain the reason for not disclosing ESG related information. In other words, EU has made it mandatory by issuing a guideline—comply or explain indicating that failure to comply or explain can result in high penalties. Along the same lines, China has made significant progress towards regulating the ESG-related disclosures (Gudanowska et al., 2020). For instance, the securities commission of China has revised the guidelines related to governance of listed firms. The revised guidelines now require the listed firms to disclose environment related information in the annual report (Goettel, 2021). Additionally, it also requires the firm to disclose the social responsibility they are carrying out throughout the year (Aghmiuni et al.,

2020). For instance, the firms can share information as to how they are tackling the issue of poverty as part of their social responsibility (Ruan & Liu, 2021). Similarly, at the macro front, the concept of ESG is compatible with China's five development concepts. These concepts are; innovation, coordination, open, green and inclusiveness.

With so much at stake, academics and the policymakers have examined the effect of sustainability on the performance, especially at the corporate level. However, there is no definite answer to this question and the evidence so far on this issue is mixed (see for instance, Kitzmueller & Shimshack, 2012; De Lucia et al., 2020).

In this paper, the debate on performance effect of ESG is revisited using data pertaining to China. The case of China provides a good example as the Chinese have made significant progress over the past few years in terms of policy initiatives and effectively regulating the industry. Moreover, China is an emerging country and has unfortunately become one of the most polluted countries in the world. However, they have been rapidly increasing the forest cover to combat environmental issues (Sokolov Mladenović et al., 2020). With national policies like increasing forest cover, adoption of renewable energy resources and mandating environmental related disclosures for listed firms, China has been taking practical measures in becoming a good role model for the ESG benchmark. Therefore, it is interesting to examine how these policies and the ESG disclosure by firms are affecting firm performance (Lee & Brahmasrene, 2020).

To achieve this objective, the ESG and other financial data pertaining to Chinese listed firms is collected from 2015 to 2020. The findings, based on dynamic modelling of First differenced and the system GMM, reveal a non-linear relationship between the ESG disclosure and the firm performance. More precisely, the ESG disclosure at the initial level is rewarding for the firms but beyond a certain point, disclosure starts affecting performance through the increase brought about in the cost of such disclosures. In other words, as the stakeholders are the ultimate cost bearer of such disclosures, ESG spending beyond a threshold may be viewed as unnecessary and hence start affecting performance negatively. These stakeholders are consumers, employees, etc. The non-linear association could be the reason as to why the results of extant literature on ESG and firm performance is so far conflicting and inconclusive.

To conclude, it can be argued that ESG disclosure is good for firm performance. However, excessive disclosure may reverse the benefits of disclosure. The firms have to ensure that they do not go beyond a threshold or cross a certain cut-off in order to protect themselves from being affected negatively by excessive disclosure. In other words, every firm needs to assess as to how much ESG related information or disclosure is enough to make informed decisions as this will help the firm reap full benefits of ESG disclosure.

The study findings are an indication to Chinese policymakers that the policy initiatives and measures that have been undertaken over the recent years are generating positive effects. However, they need to ensure that the listed firms only include relevant ESG related information so that firms do not incidentally end up affecting their performance negatively.

This paper extends the extant literature in several ways. First, it adds to the overall understanding of ESG and firm performance nexus by modelling and showing the

existence of a non-linear relationship between ESG and firm performance. The correct modelling of relationship is necessary and therefore constitute a major contribution of the present study. Future researchers can take cue from the findings of this paper and build on present study outcomes by exploring more non-linearities in the ESG and firm performance nexus (Saeidi et al., 2021).

Second, it significantly adds to the literature on the determinants of firm performance in an emerging market like China. In other words, the paper adds to the work of Fatemi et al. (2015), Price and Sun (2017) and others by examining this relationship in case of China and that too in a non-linear context.

Finally, it is generally understood that the ESG and the corporate governance literature is marred by endogeneity issues.

One of the issues the governance/ESG literature suffers from is endogeneity. The issue of endogeneity could arise due to multiple factors but one of the key reasons is the omitted variable bias. The omitted variable bias is essentially a correlation between the independent variables and the error term. It arises because of the omission of some of the variables related and important to the equation that is being estimated. Additionally, the issue of endogeneity can arise due to the possibility that some of the independent variables are affected by the dependent variables. This is commonly referred to as reverse causality in econometrics literature. For instance, in our case, it is possible that firm performance is influenced by ESG disclosures. Last but not the least, the equation can also suffer from dynamic endogeneity (Abdallah et al., 2015). From econometrics perspective, this paper is improvement over the extant literature on CSR, ESG and corporate governance as the paper uses dynamic first differenced and the system GMM to address the critical issue of endogeneity. The adoption of dynamic GMM is highly rare and has only started being employed recently in the literature on ESG and corporate governance (see for instance, Bennouri et al., 2018; Price & Sun, 2017; Sila et al., 2016).

The rest of the paper is organized as follows. The next section provides an overview of the existing literature on ESG and firm performance. Data and the methodology are outlined in Sec. 3 followed by an overview of the key findings and their discussion in Sec. 4. Finally, the paper concludes in Sec. 5.

2. Literature review

There is a vast amount of literature on ESG and firm performance. The onslaught of Covid-19 pandemic has intensified the debate further. As per the traditional view, managers work towards or at least pretend to work towards maximizing shareholders' wealth. This is the only Key Performing Indicator (KPI) for the managers and it is based on this that they get paid and promoted. However, more recently, the corporates are moving towards a stakeholder approach to profitability as opposed to a mere shareholder approach (Myšková & Hájek, 2020). In other words, more and more business owners are adopting an approach that takes care of the stakeholders rather than just focusing on shareholders. The proponents of the stakeholder approach argue that for the long-term survival of the firm, it is essential for the firm to avoid any future conflict between the shareholders and other stakeholders. This is

only possible if the firm aligns their interest with those of the stakeholders. Hence, adopting a stakeholders' approach to firm operation is considered to be value creation for a firm, especially in the long run (Lassala et al., 2021).

The literature on corporate governance has written a lot on the possible benefits of aligning the interest of stakeholders with the firms' objective. There are several ways as to how the stakeholder approach translates into better performance. First and foremost, the alignment of the objectives of all the stakeholders indirectly implies more information disclosure on the financial as well as non-financial front. This increased disclosure is expected to go down well with the increasing trend of demanding more information from the corporates. This is closely linked with the empirical evidence suggesting that the more diverse the information, the better price in formativeness it would be (Goldstein & Yang, 2015). On the other hand, more information, especially non-financial would reduce the information asymmetry between the firm and the external stakeholders (Daniel, 2021). These disclosures reveal a number of insights about the firm's operational activities and if people think that a certain aspect of the firm is socially responsible then they my wish to buy their products or services, hence directly impacting operating firm performance (Li et al., 2020). A higher level of disclosure also means higher level of scrutiny from researchers, analysts, investors and other stakeholders. One of the positive aspects of such scrutiny is that it helps the firm identify its strong and weak points and can expect to get good recommendations, especially on reducing the risk of stock price crash. Moreover, higher disclosure also means higher transparency. Higher level of transparency has been shown to improve efficiency and hence result in improved operating performance (Vilanova et al., 2009). This is commonly referred to as the 'Social Impact View'.

These views are supported by numerous empirical works (see for instance, Aboud & Diab, 2019; Al-Najjar & Anfimiadou, 2012; Beretta et al., 2019; Cek & Eyupoglu, 2020; Cornett et al., 2016; Evans & Peiris, 2010; Gangi et al., 2020; Lins et al., 2019; Manrique & Martí-Ballester, 2017; Yu et al., 2018).

On the opposite end, a significant number of past studies have shown financial and nonfinancial disclosures to be a complete waste of money (Shen et al., 2016). In other words, the relationship between ESG disclosures and firm performance is found to be negative. For instance, it has been argued that additional disclosures lead to inefficient use of resources (Friedman, 2007). In other words, ESG activities put unnecessary pressure on the firm to donate for charitable causes and also provide aid for national and international social causes (Ullmann, 1985). As the firms have limited resources, using it for ESG activities would imply that those resources cannot be used for more productive uses such research and development or projects with positive Net Present Values (NPVs). In this sense, ESG activities or disclosures can destroy firm value (Bhardwaj et al., 2018). This view of ESG is known as the 'Trade-off View'. Some of the literature has also referred to a Shift of Focus view. These views are supported by many empirical studies (see for instance, Barnea & Rubin, 2010; Brammer et al., 2006; Di Tommaso & Thornton, 2020; Hillman & Keim, 2001; Lee et al., 2009).

Additionally, there is limited but growing literature that suggests that ESG activities are irrelevant to investors in that they neither place any value on it nor consider

it as cost or value destroying (Griniuk, 2021). In other words, some of the more recent works have argued in favour of there being no relationship between ESG activities and firm performance (see for instance, Friede et al., 2015; Shakil et al., 2019).

Such diverse results in the existing literature could be due to several factors. First, filters across ESG screens vary across countries, regions and the industries or sectors (Almeyda & Darmansya, 2019; de Silva Lokuwaduge & de Silva, 2020; Del Giudice & Rigamonti, 2020). So, within the context of a country or a region, some of the ESG filter may be more important than the other, hence producing conflicting results on the association between the two.

Along similar lines, the industry is also sensitive to specific dimension of ESG activities. For instance, some may gain more from disclosing environmental related information, especially firms operating in environmentally sensitive industries such as mining (De Klerk et al., 2015; Garcia et al., 2017). Similarly, firms operating in other sectors may gain from engaging in activities other than environmental activities. Finally, the dynamics of developing and developed markets are markedly different from each other. For instance, stakeholders in developed markets are more informed about the ESG issues and hence tend to demand and appreciate disclosure and activities (Ali et al., 2017).

3. Data and methodology

3.1. Data

The ESG data of Chinese listed firms is still not provided by many service providers. The data on ESG activities is only maintained by SynTao Green Finance, MSCI and the China Corporate Responsibility Institute (CCRI). Among them, SynTao Green Finance is one of the major sources of ESG data. The database covers ESG related information of listed companies more comprehensively than any other database. In this paper, the data of ESG is collected from Wind database. The sample period is from 2015 to 2020. The total sample consists of 232 firms with 1,312 firm year observations. The other firm level data such as firm size, financial leverage and sales growth is collected from CSMAR database. Macroeconomic data such as GDP growth and financial development is collected based on the World Development Indicators (WDI). Following the previous literature, the collected data excludes financial and utility firms as they have different capital structure and are regulated by other regulatory entities. To control for the outliers in the database, the variables are winsorized at 1% and 99%.

3.2. Econometric specification and methodology

To achieve the objective, following econometric specification is assessed:

$$\begin{aligned} Profitability_{i,t} = {} & \alpha_0 + \beta_1 Profitability_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 (ESG_{i,t-1})^2 \\ & + \beta_4 X_{i,t-1} + \beta_5 Z_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{1}$$

In Eq. (1) presented above, Profitability is the performance measure proxied by Tobin's Q. As a robustness, Return on Assets (ROA) is also used. The lagged dependent variable is also used in the equation as there is enough empirical evidence to

indicate that performance is persistent and hence, also dependent on its past values. The inclusion of lagged dependent variables makes the specification dynamic in nature. ESG in Eq. (1) are the ESG scores of listed Chinese firms. X and Z are the firm level and macroeconomic control variables, respectively. These control variables are based on the extant literature on the ESG and firm performance. The firm level variables are firm size (measured by total assets), financial leverage (measured by total long-term debt to total shareholders' equity) and sales growth (measured as change in operating profit as compared to past year). Macroeconomic variables are economic growth (measured as GDP growth) and financial development (measured as private credit to domestic sector as a percentage of GDP).

As rightly pointed out by Abdallah et al. (2015), the governance literature suffers from endogeneity issues, and therefore the current paper uses an approach that is suited to tackle such issues. The issue of endogeneity usually arises due to dynamic interactions among the variables. The other reason for endogeneity is the omission of key variables. There are various approaches used in the econometrics field to address the issue of endogeneity. For instance, the traditional and most common methods are instrumental variable approach or stage least squares (2SLS) approach. However, there are inherent issues with such an approach. For instance, García-Meca et al. (2015) argues that the instruments used in the 2SLS tend to produce inefficient and biased estimates. More importantly, it is difficult to find instruments that are closely related with the instrumented variables and not correlated with the error term. However, this paper overcomes the issue by using First difference and the System GMM. The main advantage with the GMM approach is that it uses its own lag as instruments.

This is paper uses System GMM instead of First difference GMM. The System GMM is proposed by Arellano and Bover (1995) and Blundell and Bond (1998) whereas the approach of First difference GMM approach is proposed by Arellano and Bond (1991).

The traditional approaches to estimate the coefficients of an equation can lead to various econometric issues. One of the major issues associated with the panel approaches, especially with the dynamic panels, is the correlation between the lagged dependent variable and the individual fixed effects. Hence, in this paper, the issue of correlation between lagged dependent variable and individual fixed effects is addressed by issuing System GMM. The approach of First difference GMM address endogeneity by removing the individual fixed effects (in our case, Chinese listed firms). It further employs lag variables as instruments to overcome the endogeneity issue. On the other hand, System GMM uses level and first differenced estimations as instruments. The approach of System GMM does not filter out the information contains in the level form of variables. Along the similar lines, the System GMM approach overcomes the issue of biasedness and the imprecisions attached with the First differenced GMM approach. The downward bias associated with the Two Step System GMM is corrected by the approach of Windmeijer (2005). The diagnostics test suggested by the Hansen and Sargan is used to test the validity of instruments.

The GMM approach is considered to be asymptotical normal in nature. Additionally, the approach is efficient as well as consistent in comparison to methods that do not make use of additional information. The consistency, efficiency and the

normality associated with the GMM can be attributed to the fact that it uses existing information available in the moment conditions.

The prerequisite conditions of using GMM is the moment conditions. In other words, the vector value function of $g(Y_t,\theta)$ should be known beforehand:

$$m\ (\theta_0) = E[g(Y_t, \theta_0) = 0, \tag{2}$$

In Eq. (2), E refers to expectations whereas Y is more of a generic component. Additionally, function of $m(\theta)$ should be different from '0' so that the condition of $\theta \neq \theta_0$ is met.

The fundamental idea behind the approach of GMM is that it substitutes the theoretical expectation of $E[\cdot]$ with that of sample average:

$$\hat{m}\ (\theta_0) = \frac{1}{T}\ \sum_{t=1}^{T} g(Y_t, \theta) \tag{3}$$

and then to minimize the norm of this expression with respect to θ. The minimizing value of θ is our estimate for $\theta 0$.

After the substitution, the next step is following the procedure of minimizing the expression (with regards to θ). Finally, the minimized expression of θ becomes the estimate of $\theta 0$.

4. Findings and discussion

The descriptive statistics are provided in Table 1. The main results based on the analysis are presented in Table 2. There are three columns in Table 2.

The first column represents the baseline estimations. The estimation equation of the column 1 is following:

$$Tobins\ Q_{i,t} = \alpha_0 + \beta_1 Tobins\ Q_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 (ESG_{i,t-1})^2 + \varepsilon_{i,t} \tag{4}$$

In the above equation, the firm and macro level controls are excluded. The firm level variables are used in their lagged form. This will help ensure that reverse causality issue does not arise in the econometric specification.

The findings presented in Column 1 suggest that the ESG affects firm profitability, measured as Tobins Q positively. The coefficient of ESG activities is significant and positive indicating a positive influence of ESG on firm performance. More precisely, a 1 per cent increase in ESG activities lead to an increase in firm performance by 0.94 percent. The findings indicate that the stakeholders do value the ES activities and reward the firm accordingly. In other words, the firm adopting stakeholder approach is going to benefit from such activities. There can be several ways or channels through which ESG have a positive effect on firm performance. For instance, more ESG activities could lead to increased trust in the organization's policies and hence lead to more public aids and contributions (Li et al., 2018; Zhang et al., 2010). Additionally, ESG activities also increase the brand awareness and enhance the brand

Table 1. Descriptive statistics.

Variable	Mean	Std. dev.	Min	Max
TOBINS Q	1.214	6.119	0.973	185.290
ROA	1.665	3.414	−26.227	27.16
ESG	12.176	13.309	2.838	92.004
Firm size	6.202	7.998	11.876	78.337
Firm size	9.417	2.003	4.696	27.762
Financial leverage	0.328	0.041	0.004	0.830
GDP growth	3.219	2.991	0.771	13.451
Financial development	83.419	28.007	6.126	183.991

Source: authors.

Table 2. ESG and firm performance.

	(1)	(2)	(3)
Tobin's Q_{t-1}	0.027***	0.987***	0.003***
	(0.026)	(0.000)	(0.000)
ESG	0.094*	0.026***	0.087*
	(0.090)	(0.000)	(0.010)
ESG^2	−0.119***	−0.039**	−0.281***
	(0.001)	(0.000)	(0.000)
Size		0.006***	0.054*
		(0.000)	(0.060)
Sales growth		0.001**	0.000**
		(0.039)	(0.048)
Leverage		0.000***	0.000***
		(0.000)	(0.000)
Economic growth			0.067**
			(0.029)
Financial development			0.031***
			(0.000)
Constant	0.019***	0.003***	0.001***
	(0.000)	(0.000)	(0.000)
AR (1/2)	0.31/0.29	0.41/0.54	0.28/0.91
Sargan/Hansen test (*p*-val)	0.31/0.27	0.11/0.54	0.00/0.72

p-values in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.
Source: authors.

image. This in turn gives the firm a competitive edge and hence, leads to an increase in sales (Lambertini & Tampieri, 2015).

On the other hand, the square of ESG activities is not only significant but negative. An analysis of the significant and the negative term indicates that the relationship between ESG activities and the firm performance is non-linear. More specifically, the relationship between the two is inverse U-shaped.

The economic meaning of such a coefficient is that there is a certain cut-off and if the firm continues to engage in ESG activities after that cut-off, this would affect the firm performance negatively. In other words, the findings suggest that the firm should not involve in ESG activities after a certain threshold. The findings provide a fresh perspective on the ESG and firm performance relationship by showing that the non-linear modelling is the more appropriate way to assess the relationship between ESG activities and firm performance.

In column 2, the equation is regressed with the inclusion of additional variables. Equation (5) is an extension of Eq. (4). More specifically, Eq. (5) also consists of firm level variables and can be written down as follows:

$$Tobins\ Q_{i,t} = \alpha_0 + \beta_1 Tobins\ Q_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 (ESG_{i,t-1})^2 + \beta_4 X_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

In the above equation, X_i is the set of firm level variables used in the previous literature on ESG activities and firm performance. These variables are firm size, financial leverage and sales growth.

The coefficient of ESG activities is still significant and positive. More importantly, the squared term of ESG is significant and negative indicating a non-linear relationship. These findings suggest that the ESG and firm performance is stable even when the firm level controls are included in the analysis.

$$Tobins\ Q_{i,t} = \alpha_0 + \beta_1 Tobins\ Q_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 (ESG_{i,t-1})^2 + \beta_4 X_{i,t-1} + \beta_4 Z_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

Finally, in column 3, equation is regressed with the inclusion of macroeconomic variables. More specifically, the results reported in column 3 are based on Eq. (6).

The findings indicate that the coefficients of ESG and the ESG squared are positive and negative, respectively. These results indicate that the findings reported in the first two columns are not subject to omitted variable bias. More importantly, the findings indicate that the ESG and the firm performance is non-linear. Moreover, the macroeconomic variables are significant and positive. More specifically, economic growth and financial development positively affect firm performance.

The diagnostic tests such as autocorrelation (AR 1/2) and the instruments validity tests are also conducted (Saragan and the Hansen test). The result of diagnostic tests is provided at the bottom of the table. All the tests confirm the suitability of System in the paper. Moreover, the significance of the lag dependent variable reinforces the decision to use dynamic modelling. The insignificance of autocorrelation and the Sargan/Hansen tests indicate no autocorrelation and the validity of instruments.

It is particularly important to test the robustness or the stability of results in order to ensure that the reported findings are robust and not sensitive to different specifications. The results are provided in Table 3 below. Similar to the main findings presented in Table 2, Table 3 has three columns. In the first column, this research only includes ESG and the ESG squared variables. In column 2, the paper includes firm level variable similar to the main findings. Finally, the paper includes macroeconomic variable such as economic growth measured in terms of GDP growth and the financial development measured as private credit to domestic sector as a percentage of GDP.

More specifically, following three equations are estimated for the findings reported in Table 3. In this robustness test, the paper uses the alternate measure of firm performance—Return on Assets (ROA). Though ROA is also a performance measure and frequently used as a profitability proxy similar to Tobins Q, it is not sensitive to the non-fundamental values of the firm.

$$ROA_{i,t} = \alpha_0 + \beta_1 ROA_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 (ESG_{i,t-1})^2 + \varepsilon_{i,t} \quad (7)$$

Table 3. Robustness tests.

	(1)	(2)	(3)
ROA_{t-1}	0.191***	0.033*	0.018***
	(0.006)	(0.091)	(0.000)
ESG	0.006**	0.002***	0.022*
	(0.019)	(0.000)	(0.010)
ESG^2	−0.067***	−0.001**	−0.287***
	(0.000)	(0.021)	(0.000)
Size		0.001**	0.017*
		(0.049)	(0.070)
Sales growth		0.016**	−0.000**
		(0.039)	(0.041)
Leverage		0.282***	0.098***
		(0.000)	(0.000)
Economic growth			0.000**
			(0.039)
Financial development			0.021***
			(0.000)
Constant	0.003***	0.073***	0.023***
	(0.000)	(0.000)	(0.000)
AR (1/2)	0.29/0.46	0.09/0.83	0.19/0.33
Sargan/Hansen (*p*-val)	0.99/0.36	0.73/0.58	0.11/0.85

p-values in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.
Source: authors.

$$ROA_{i,t} = \alpha_0 + \beta_1 ROA_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 (ESG_{i,t-1})^2 + \beta_4 X_{i,t-1} + \varepsilon_{i,t} \tag{8}$$

$$ROA_{i,t} = \alpha_0 + \beta_1 ROA_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 (ESG_{i,t-1})^2 + \beta_4 X_{i,t-1} + \beta_4 Z_{i,t-1} + \varepsilon_{i,t} \tag{9}$$

In other words, the main advantage of using ROA is that it is not subject to speculation. Therefore, it might be more reflective of firm performance. However, it is important to acknowledge that a book measure such as ROA is subject to manipulation internally and its use may be discouraged in certain cases. The results of Eqs. (7), (8), and (9) are presented in column 1, 2 and 3 of Table 3 below. The findings indicate that the ROA are positively affected by the ESG activities. Moreover, the squared term of ESG activities is significant and negative, hence indicating an inverse U-shaped relationship between ESG activities and firm performance measured as ROA. These findings are similar to the ones presented in Table 2. The results indicate that the reported findings are similar irrespective of whether the market measure (Tobins Q) is used or a book measure (ROA) is used. As far as the diagnostics are concerned, all the tests pass the diagnostic test.

As an additional robustness test, the paper utilizes the Fixed effect models. In these models, the coefficients or the parameters are not random. The fixed effect models allow the unobserved effects to be created with the observed variables. The Fixed effect model can be represented in an equation form as follows:

$$Y_{it} = \beta_i X_{it} + \rho_i + \mu_{it} \tag{10}$$

In Eq. (10) above, Y is the dependent variable whereas X is a series of independent variables. In the above equation is considered to be the unobserved fixed effects. In

Table 4. Robustness test.

	(1)	(2)	(3)
Tobin's Q_{t-1}	0.029**	0.298***	0.006***
	(0.043)	(0.001)	(0.000)
ESG	0.067*	0.033*	0.045*
	(0.098)	(0.075)	(0.010)
ESG^2	−0.028**	−0.049***	−0.769***
	(0.029)	(0.000)	(0.000)
Size		0.017***	0.087***
		(0.000)	(0.000)
Sales growth		0.981***	0.054***
		(0.000)	(0.001)
Leverage		0.008***	0.017***
		(0.000)	(0.000)
Economic growth			0.037*
			(0.091)
Financial development			0.029***
			(0.001)
Constant	0.033***	0.031***	0.007***
	(0.000)	(0.000)	(0.000)
R-squared	0.14	0.26	0.36
Adj. R-squared	0.09	0.11	0.15

p-values in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.
Source: authors.

the above equation, ρ is the unobservable fixed effect which is different for each firm but fixed across time. As these are unobservable fixed effects, they cannot be controlled for and hence such estimations suffer from omitted variable bias.

In the fixed effect modelling, the unobserved firm characteristics are removed by demeaning each variable. Equation (10) is transformed by demeaning as shown below:

$$Y_{it} - \overline{Y_i} = \beta_i\left(X_{it} - \overline{X_i}\right) + \left(\rho_i - \overline{\rho_i}\right) + \left(\mu_{it} - \overline{\mu_i}\right) \tag{11}$$

The final equation can be written as follows:

$$\ddot{Y}_{it} = \beta_i \ddot{X}_{it} + \ddot{\mu}_{it} \tag{12}$$

As the series is now demeaned and the unobserved heterogeneity is removed, the above equation (Eq. (12)) can be estimated by employing Ordinary Least Squares (OLS).

The analysis reported in Table 4 below is same as in Eqs. (4)–(6). The only difference between the results reported in Tables 2 and 4 is that of econometric approach. More precisely, the results reported in Table 2 are based on the System GMM whereas the results provided in Table 4 are based on the analysis of Fixed effect modelling. Not surprisingly, the results reported in table are similar to the ones presented in Table 2. The signs and the significance of coefficients are similar to that of Table 2.

5. Conclusion

Milton Freidman once famously said that '*there is one and only one social responsibility of business—to increase its profits*'. The statement can be considered highly

contentious as documented empirical evidences do indicate the positive effect of ESG on firm performance. Although it is not a settled issue as to whether ESG activities translate into better firm performance or not but there is considerable evidence in literature to nullify Freidman's statement.

In the recent years, there has been a surge in more sustainable approaches towards investing. This trend signifies a noteworthy movement towards sustainability investing, especially in the wake of Covid-19 pandemic. There is a strong push not just from the institutional investors but also from retail investors to include sustainability filter as a key screening criterion to build portfolios. One of the most important subsets of sustainability investing is ESG investing. The segment of ESG is adopted globally with certain varying degrees of filters. The ESG criterion uses a best of class approach to screen the stocks and debt instruments globally. A heightened interest in ESG investing has led policymakers at the global level to draft policies around the ESG filters. Most countries in the world are now moving towards mandating disclosures, especially for listed firms. In that sense, China has made considerable efforts to establish reporting guidelines for ESG disclosures and activities. As one of the most polluted countries in the world, China has made it mandatory for listed firms to disclose their environmental activities. The country has been planting trees to increase the forest cover in order to tackle the growing issue of CO2 emission in the country.

In this paper, the debate on ESG and firm performance is revisited. More precisely, the current investigation poses the following question—'Do ESG activities matter?' As mentioned above, the question has been investigated before but the findings, though slightly tilted towards the positive effect of ESG on performance, are not so clear and equivocal. In other words, the evidence on the effect of ESG on firm performance is not a settled issue. There could be several reasons for these conflicting results. One potential issue could be the wrong modelling and econometric specifications. In this paper, the extant literature is extended by modelling the non-linear relationship between ESG activities and firm performance. Moreover, the paper also addresses the long-standing criticism of endogeneity that a corporate governance literature suffers from.

To contribute to the existing body literature on the subject, the paper models the relationship between ESG activities and firm performance. The findings reveal a number of interesting insights. First, ESG activities are found to positively influence firm performance. This is in line with a number of past studies literature and a strong piece of evidence against Freidman's claim.

Second and more importantly, a key insight of this paper is that the relationship between ESG activities and the firm performance is non-linear. In other words, the findings indicate that the ESG activities are rewarding only up to a point and start to affect the performance negatively after that. In other words, the relationship between ESG activities and firm performance is inverse U-shaped. These findings indicate that stakeholders consider ESG activities after a point as something which is unnecessary or something which can be avoided. This is viewed by stakeholders as a cost. As the resources that are diverted to ESG activities can be used for research and development, and enhancement of products and services. The key takeaway from this research is that the firms have to find their thresholds so as to limit their ESG

activities at that point. Moreover, firms have to find more cost effective ESG activities so as to avoid any negative shock to their profitability.

There are several limitations of the present research. First, in this research, the paper only explores nonlinear modelling without paying attention to the specific dimensions of ESG investing. Future researchers should explore the individual dimensions of ESG filters. This is necessary as there could potentially be a case that only a specific dimension of ESG filter has positive effect whereas other dimensions may be either insignificant or even negative. The assessment of specific dimensions could reveal the source of impact. For instance, as China is batting with unprecedented levels of pollution, it may be possible that only environmental factors amongst the ESG filters have a positive effect whereas social and governance dimensions are either insignificant or negatively related to firm performance.

Disclosure statement

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