Asia Pacific Academy of Science Pte. Ltd.

Sustainable Social Development 2026, 4(2), 8516.
https://doi.org/10.23812/ssd8516

Article

ESG and firm performance in China: Direct effects and the moderating effect of internal control quality in capital-intensive sectors

Shaoyu Han , Yengwai Lau* , Saidatunur Fauzi Saidin

School of Business and Economics, Universiti Putra Malaysia, Selangor 43400, Malaysia
*** Corresponding author:** Yengwai Lau, wai_ly@upm.edu.my

CITATION

Han SY, Lau YW, Saidin SF. ESG and firm performance in China: Direct effects and the moderating effect of internal control quality in capital-intensive sectors. Sustainable Social Development. 2026; 4(2): 8516.
https://doi.org/10.23812/ssd8516

ARTICLE INFO

Received: 9 April 2026
Revised: 21 April 2026
Accepted: 21 April 2026
Available online: 30 April 2026

Abstract: This study examines the relationship between ESG practices and corporate performance in China's capital-intensive industries and evaluates whether internal control quality moderates these associations. Drawing on stakeholder theory, agency theory, and institution theory, the analysis distinguishes between an external perspective and an internal perspective in understanding ESG-related performance patterns. Under the external perspective, performance is assessed using ROA and Tobin's Q, while under the internal perspective, the analysis focuses on firm-level implementation and operational transformation, captured through employee productivity, with internal control quality reflecting governance and execution capacity. Using a balanced panel of 1718 A-share listed firms in manufacturing, construction, and transportation from 2020 to 2023, ESG scores are obtained from the HuaZheng database, firm performance and control variables from CSMAR, and internal control quality from the DIB database. Two-way fixed effects regressions are used to estimate baseline ESG-performance associations, and interaction models with simple-slope analyses are used to examine moderating patterns. The results show that ESG practices are negatively associated with ROA and Tobin's Q, while the association between ESG practices and employee productivity is not statistically significant in the baseline model. Internal control quality positively moderates the ESG relationships with ROA and employee productivity, but not with Tobin's Q. Overall, the findings highlight the importance of governance capacity and implementation credibility in shaping how ESG commitments are translated into performance outcomes in capital-intensive industries.

Keywords: ESG practices; corporate financial performance; employee productivity; internal control; China capital-intensive industries

1. Introduction

Although ESG is widely incorporated into firms' strategic management and attracts sustained attention from both capital markets and regulators, empirical evidence remains inconclusive whether ESG can be translated into observable corporate performance. On one hand, a substantial body of studies suggests that sound ESG practices generate multiple benefits. These benefits include improving firms' financial conditions and reducing financing costs [1], enhancing firm value [2], and producing more visible returns at the level of external stakeholders, such as stronger corporate reputation and greater market share [3,4]. Conversely, the application of ESG practices is also associated with agency issues and increased costs, especially in the settings that are more characterized by a higher transformation and compliance costs and managerial preferences imbalance, thus having a negative impact on the firm performance [5–7]. In general, previous research has mostly adopted external approach to the interpretation of the economic implications of ESG. On the one hand,

ESG functions mainly due to capital market pricing and response of external stakeholders, and its results are mainly reflected in outward and visible returns, including corporate reputation, market share, and market value [2–4]. Yet, it is not only based on the external perspective that one can consider the inherent heterogeneity of ESG economic outcomes to be enough. In particular, the external perspective provides limited explanatory power in accounting for why similar ESG practices lead to differentiated performance results across firms, and how ESG becomes institutionalized within organizations and is further transformed into sustainable operational and managerial outcomes [8,9]. Therefore, identifying the key boundary conditions and internal mechanisms through which ESG influences corporate performance carries important theoretical and practical significance.

The Chinese context is especially appropriate for examining these issues. China combines rapidly expanding ESG attention with substantial variation in disclosure quality, governance maturity, regulatory enforcement, and industry-level transition pressure. These features are particularly salient in manufacturing, construction, and transportation, where firms face high fixed-asset intensity, stronger environmental scrutiny, and greater adjustment costs when incorporating ESG requirements into production, reporting, and investment decisions. In such a setting, it becomes analytically important to distinguish between externally visible ESG signaling and the internal organizational capacity required to convert ESG commitments into sustainable performance outcomes.

This study offers an internal perspective of the relationship between ESG and corporate performance. In this study, the term internal perspective refers to an analytical view that explains ESG-performance linkages through firms' internal governance arrangements, implementation quality, and operational transformation processes, rather than relying mainly on external valuation signals such as investor response, reputation, or market legitimacy. The distinction is important because much of the prior ESG literature has emphasized externally observable outcomes, while offering more limited explanation of how ESG commitments are translated into daily organizational routines, resource allocation decisions, and employee-level operational outcomes. By introducing internal control quality and employee productivity into the same framework, this study extends existing ESG research from an outcome-centered external logic to a process-centered internal logic. In this way, the paper contributes a supplementary interpretive mechanism that helps explain why similar ESG practices may produce heterogeneous performance consequences across firms, especially in settings where disclosure institutions are still evolving and implementation quality varies substantially. Existing research adopting the external perspective is relatively well developed and mainly focuses on the externally visible returns generated by ESG practices, such as corporate reputation, market share, and capital market reactions [2–4]. In comparison, internal perspective gives more attention to the implementation of ESG in firms, internal containment and governance of ESG, and internal operational processes of firms [8,10]. The internal perspective is particularly critical in the Chinese context. ESG practices in China are still at an early stage, where legal and institutional arrangements that govern and standardize ESG disclosures and implementations are underdeveloped [11]. In addition, ESG disclosure among Chinese listed firms is mostly voluntary, with substantial institutional heterogeneity across firms [12].

Against this background, firms are more likely to respond to ESG requirements in a disclosure-oriented or policy-driven manner. Whether ESG can generate substantive and sustained performance outcomes is dependent on firms' internal governance structures and execution capabilities [13,14].

To shed light on the internal perspective, this study conceptualizes internal control quality as an important institutional foundation of firms' internal governance and execution capability. Internal control quality not only affects the consistency of ESG implementation and the reliability of related information, but also determines whether ESG practices can be embedded into firms' routine financial planning and major transaction decisions [15,16]. Meanwhile, this study examines employee productivity for a better understanding of whether ESG practices can enhance operational efficiency and output per employee by improving organizational processes, the working environment, and the allocation of human capital [17,18]. Internal control quality and employee productivity shed light on firms' internal governance, execution capability and internal operational outcomes for a better understanding of whether ESG practices can move beyond disclosure and commitment and be further translated into sustained managerial actions.

Given that prior studies have reported inconsistent conclusions regarding the performance consequences of ESG, the literature has called for the introduction of a moderating perspective to identify the underlying mechanisms and boundary conditions [19]. Consistent with the logic of the internal perspective adopted in this study, internal control quality captures differences in firms' internal governance and execution capability. Therefore, more appropriately treated as a conditional variable shaping the relationship between ESG and corporate performance rather than merely as a direct determinant. However, existing research has predominantly examined internal control as a direct influencing factor, with a primary focus on its effects on outcomes such as financial reporting quality and corporate performance [20,21], while relatively few studies have systematically embedded internal control within an ESG and corporate performance framework to test its moderating role. Boulhaga et al. [9] found in a sample of French listed firms that the quality of internal control enhances the economic implications of ESG, but the one-country sample of the study limits external validity of other countries. In the Chinese context, existing studies have largely concentrated on the direct effects of ESG on financial performance or on selected industries, and empirical evidence on how internal control alters the strength of the relationship between ESG and performance remains very limited, constituting a salient and critical research gap in capital intensive industries [22].

Meanwhile, China's manufacturing, construction, and transportation industries are subject to more intense regulatory scrutiny as well as more pronounced ESG risks [23]. Firms' internal governance and execution capability as reflected in internal control and employee productivity offer a better understanding of why ESG exhibits differentiated performance effects in capital-intensive industries. This study further examines how externally observable financial performance varies across firms at different levels of internal control.

The sample of this study consists of listed firms in China's capital-intensive industries, namely manufacturing, construction, and transportation. First, this study examines the relationship between firms' ESG practices and corporate performance,

where performance includes both externally observable financial performance, measured by ROA and Tobin's Q, and non-financial performance at the level of internal operations, measured by employee productivity. Second, building on this baseline relationship, the study introduces internal control quality as a moderating factor to investigate its conditional role in the relationship between ESG practices and corporate performance across both financial and non-financial dimensions, thereby characterizing the heterogeneity of ESG impact pathways under different levels of internal control.

The remainder of this paper is organized as follows. The next section reviews the relevant literature and develops the research hypotheses. Section 3 describes the research design, including sample selection, variable definitions, data sources, and empirical models. Section 4 presents and discusses the empirical findings. The final section concludes the study and outlines its implications and recommendations.

2. Hypothesis of study and literature review

2.1. The ESG and firm financial performance

Many studies show that high-quality and long-term ESG practices are usually correlated with better financial performance, including the expansion of market share, better profitability and overall financial performance, improved corporate image, and decreased operating costs [2,4,24–26]. Within the framework of the stakeholder theory, ESG practices ensure that firms address the demands of various stakeholder groups- such as customers, shareholders, employees, communities and regulators- which means that the relational capital is built by the firm through a variety of channels. These positive relationships are not functioning in terms of one direct effect but they are formed by a complex of interconnected mechanisms. At the demand level, ESG practices can enhance the trustworthiness of the outside and consumer loyalty, enhance customer judgments concerning products and services and, as a result, raise revenues and the attainment of price premiums [27,28]. Good ESGs practices can also play a reputational buffering role as companies become entangled in controversies as long-term environmental and social investments can help recover stakeholder confidence and reduce the negative impact of negative stories on revenues and costs [29,30]. Investments in the social responsibility activities concerning employee safety, training, and development can increase employee satisfaction and commitment to the organization at the level of internal operations. Thus, indirectly contributing to financial performance in terms of increased labor productivity and increased operational stability, which is consistent with the perception of employees as the critical internal stakeholders [31,32].

At the capital markets and risk management level, ESG is becoming a key indicator of long-term risks and opportunities of firms, and a company with a higher ESG performance has a higher probability of both equity and debt funding at a decreased cost of capital [33]. Companies that integrate sustainability in their operations are more likely to be more efficient in the utilization of energy and optimization of processes, thus creating a competitive edge and cost reductions [34].

From the perspective of the institutional environment and market access, credible ESG commitments enhance firms' external legitimacy, facilitating regulatory

forbearance, government support, and access to public projects, which in turn expands market opportunities [35]. In addition, high-quality ESG disclosure improves governance transparency and information availability, strengthens investors' assessments of corporate compliance and going-concern capacity, and enables firms to obtain external financing more easily while reducing financing costs and enhancing valuation stability [36–38]. Generally, these results validate the fundamental assumption of the stakeholder theory, with systematic reaction to the interests of various stakeholder groups, ESG practices have the capacity to collaboratively facilitate financial performance in the form of revenue, cost, and capital market. In the meantime, the research, which takes the cost point of view and the agency point of view, contends that the ESG practices do not always result in financial betterment. The literature is based on traditional neoclassical economics, according to which, ESG activities imply the increase of compliance and change costs.

Meanwhile, studies adopting a cost perspective and an agency perspective argue that ESG practices does not necessarily lead to financial improvement. Grounded in traditional neoclassical economics, part of the literature suggests that ESG activities entail additional compliance and transformation expenditures. These costs may compress profits and weaken short-term financial performance [26,39,40]. In developing industries where technological capabilities and institutional environments remain relatively weak, investments in environmental facilities and process upgrading are often costly. Without effective policy incentives and market jackpots, environmental spending will have more chances to be seen as a pure cost center, which leads to the decline of profits and even the termination of related programs [41]. According to the agency theory, separation of ownership and control with inadequate monitoring can lead to managers working towards excessive high ESG ratings in a bid to gain personal reputation or satisfy their conscience. Such an act may cause sustainability investment to surpass the magnitude to maximize shareholder value, hence, destroying the firm value [5]. The ESG initiatives can also be perceived as symbolic or instrumental in a setting where the corporate governance is weak, and the compliance history is low. Managers can also indulge in window dressing to distract the attention of the population and shareholders towards the operational issues. Nonetheless, such a practice will not be actively followed by the actual trust accumulation, as the lack of substantive improvement can result in increased stakeholder distrust, which will hurt the company in the end [42–44].

Furthermore, there are also studies that do not identify the significant relationship between ESG and financial performance [45,46]. On the one hand, financial returns to ESG investment may be associated with a rather long time lag. The positive financial impacts can last a number of years to become evident, whereas evaluation cycles and investment preference in the capital market are so short-term oriented that it is not easy to find statistically significant effects within generally adopted observation windows [47]. Conversely, over ESG practices remain immature in the developing economies in general. Companies usually do not have a systematic approach to ESG, are not very willing to report sustainability practices, and experience constraints associated with the quality of data, financing conditions, and costs of implementation, which undermine their chances of converting ESG practices into financial performance [11,45]. Combined, the literature available gives a picture of co-existing positive,

negative, and insignificant findings between countries and states of development.

This pattern reflects, on the one hand, that stakeholder-oriented, long-term, and multi-channel value creation has not yet fully materialized in all contexts. On the other hand, that agency conflicts, implementation costs, and symbolic compliance can attenuate the financial effects of ESG practices.

Accordingly, given that existing studies report positive, negative, and insignificant findings regarding the relationship between ESG and financial performance. This study does not impose a priori directional expectation and therefore proposes the following two-tailed hypothesis:

H1: ESG practices are significantly associated with corporate financial performance.

2.2. The ESG and Firm non-financial performance

Within a multidimensional framework of corporate performance, non-financial performance has increasingly been examined alongside traditional financial indicators, with employee productivity serving as a representative measure of operational efficiency and resource utilization [48,49]. As ESG principles become embedded in corporate strategy, the literature has begun to explore whether, and through what mechanisms, ESG practices influence non-financial outcomes such as employee productivity via human capital channels [6,50].

Employee productivity is used in this study not merely as an auxiliary non-financial indicator, but as a theoretically meaningful proxy for the internal operational translation of ESG. Compared with market-based and accounting-based outcomes, employee productivity is closer to day-to-day organizational functioning because it reflects whether ESG-related commitments are absorbed into work processes, coordination routines, labor utilization, and human capital efficiency. This makes it particularly suitable for the internal perspective advanced in this paper. In capital-intensive sectors, ESG implementation often requires process redesign, compliance adaptation, safety upgrading, and cross-departmental coordination. These adjustments may not immediately improve profitability or market valuation, but they can reshape internal efficiency conditions that are more directly observable through productivity-related outcomes. For this reason, employee productivity helps capture a distinct pathway through which ESG may influence firm performance beyond the conventional external valuation channels.

Numerous research suggests that well-structured and sustained ESG practices are generally conducive to enhancing employee productivity. This effect mainly operates through three mechanisms. First, at the level of employee care, corporate investments in occupational safety and health, training and development, and work life balance can improve employees' work attitudes and organizational commitment. These investments are used to minimize injuries, absenteeism and turnover at work. They also reduce the replacement and training expenses and hence boost labor productivity [31,32]. Second, socially, motivating employees to engage in community and public welfare programs enhances relationships with local communities and suppliers. This assists in the development of a high trust and low friction working environment. Thus, the cost of coordination and the threat of conflicts decrease, and the threat of outbreaks

of processes, including protests and work stoppages, is less, which gives a more stable external environment in which production activities occur [31,51,52]. Third, on the level of the governance and process management, the institutionalization of the ESG requirements into the organizational routines can help to define the rules and responsibilities. It minimizes operational mistakes and rework, minimizes response time, enhances the process conformity and operational effectiveness. The eventual result of these improvements is an increase in the output per employee [53–55]. In general, the evidence suggests that in the event that the needs of the major stakeholders like employees and local societies are well addressed. The increased productivity of employees through the ESG practices can be achieved by improving the working conditions and governance processes.

In the meantime, there are also certain empirical studies to show that the correlation between ESG and employee productivity is not always a positive one because agency issues and resource limitations can undermine or even contradict its possible advantages. Agency theoretically Agency focuses on the situation that occurs when a company is under pressure on profitability and cash flow. In this scenario, the managers have to allocate scarce resources to the projects that have fast financial payoff, in other words the projects that will provide profits or even the profit-oriented projects. The trend contributes to the allocation of resources improperly due to the short-term assessment of capital markets [56–58].

Under such circumstances, some firms curtail investments in human capital development and employee welfare, and may even transfer cost pressures to employees by reducing benefits or increasing workloads, which leads to lower job satisfaction and impaired productivity [59–61]. In capital-intensive and highly polluting industries, environmental management requirements may also reallocate labor away from productive tasks toward environmental compliance activities and divert capital from productive investment toward environmental spending. This shift increases non-productive operational burdens and can depress productivity in the short run [62]. Barrymore and Sampson [6] further argue that when external ESG pressure is high, managers may seek to deliver visible sustainability outcomes by crowding capital, labor, and managerial attention out of core production activities and into ESG projects. In the short term, this reduces the resources available for employees' day-to-day productive work and undermines productivity, which is consistent with agency-based arguments concerning managerial self-interest and symbolic compliance.

Overall, the literature suggests that ESG practices can enhance employee productivity through mechanisms such as employee care, social capital, and governance processes. At the same time, under conditions dominated by short-termism and resource constraints, ESG practices may induce resource crowding out and additional execution burdens, thereby weakening or even offsetting its potential benefits.

Accordingly, given the ongoing debate in the literature regarding the relationship between ESG and non-financial performance, this study does not impose a directional assumption and proposes the following two-tailed hypothesis:

H2: ESG practices are significantly associated with corporate non-financial performance.

2.3. Firm performance, internal control and ESG relationship

Numerous studies show that the quality of internal control is greatly linked to the better performance of the ESG [63]. Regarding the institution theory approach, companies aim to preserve and increase the legitimacy by internalizing the external regulations into the organizational rules and routines, and the internal control is the specific mechanism of such internalization process. The internal control offers an institutional basis of compliance and accountability to the sustained application of ESG practices by integrating the external requirements in formal procedures and accountability systems [64,65]. Through information and compliance channels, the COSO framework focuses on proper distribution of roles, duties and records of review that are generally considered as important tools that enhance the quality of ESG disclosures. The readily applicable guidance also emphasizes that, based on the current internal control systems, the collection, preparation and disclosure of sustainability information can be integrated into the single processes to guarantee the consistency and traceability of ESG-related data [16]. The empirical data of Chinese A shares listed companies demonstrates that excellent quality ESG reporting can decrease stock price synchronicity and mitigate the lack of financing, in turn, enhancing the corporate financial performance [66,67]. At the same time, internal control quality is an extremely essential condition to increase disclosure credibility and reduce the information asymmetry [68]. On the same note, an excellent internal control environment leads to a just and open working environment, enhances views on organizational justice and organizational engagement, and the subsequent effect is an increase in operational efficiency and employee productivity [69,70].Along the execution and process pathway, internal control enhances the precision and efficiency of ESG resource allocation by embedding sustainability objectives into budgeting, investment decisions, and operational processes. IFRS S1 requires firms to disclose the governance processes and control procedures used to monitor and manage sustainability related risks and opportunities, and to explain how these processes are incorporated into financial planning and significant decision making [71]. COSO guidance on sustainability information reporting similarly emphasizes that, by adapting control activities within existing financial reporting internal control systems, the collection, monitoring, and reporting of ESG data can be integrated into a continuous performance management loop [72]. Evidence from Chinese A share listed firms shows that higher internal control quality is associated with more accurate allocation of funds in ESG investments such as environmental initiatives and smaller deviations in budget execution. Making it easier for sustainability objectives to be deeply embedded in routine financial planning and major transaction decisions [15,73]. Studies based on emerging market firms further indicate that robust internal control systems support continuous feedback and corrective mechanisms. Through cross departmental coordination, these systems enable timely correction of execution deviations, thereby strengthening positive effects on non-financial performance indicators such as operational efficiency and employee productivity [74,75].

Along the risk governance pathway, internal control helps firms manage environmental risks through systematic processes of risk identification, assessment, and response. These processes allow firms to control environmental risks at different

stages before, during, and after polluting activities. So, environmental performance is improved and the likelihood of violations and accidents is reduced [76]. Empirical studies further show that firms' risk taking is significantly negatively associated with environmental performance. High quality internal control can effectively restrain excessive risk taking and thereby improve environmental performance overall [77,78]. Improvements in environmental performance help reduce fines and remediation costs and lower reputational risk. These benefits are ultimately reflected in better financial performance [79,80]. At the same time, stronger environmental performance enhances employees' identification with the firm as a responsible organization. Through environment related management training, employees' skills and teamwork are improved, which in turn raises non-financial outcomes such as labor productivity [81].

Accordingly, the following hypotheses are made regarding ESG practices, internal controls, and corporate performance:

H3: High-quality internal control positively moderates the relationship between ESG practices and corporate financial performance.

H4: High-quality internal control positively moderates the relationship between ESG practices and corporate non-financial performance.

The research model, which summarizes the hypothesized relationships, is shown in **Figure 1**.

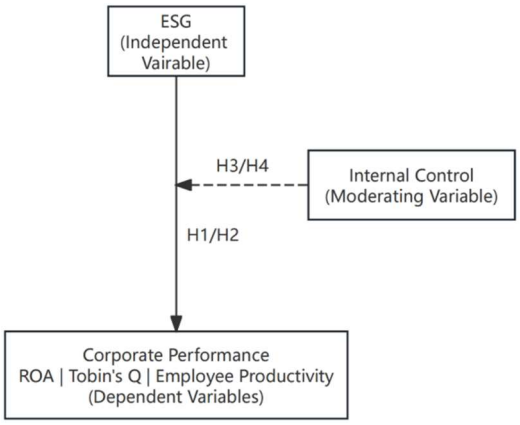

Figure 1. Research framework.

3. Data and methodology

3.1. Sample selection and data sources

This study examines the association between ESG practices and corporate financial and non-financial performance and further evaluates whether internal control quality conditions these relationships. The sample comprises 1718 Chinese A-share listed firms in manufacturing, construction, and transportation from 2020 to 2023. During sample screening, ST and *ST firms, financial firms, firms newly listed in 2020, and firms with key variables missing for more than two years within the observation period were excluded. These filters were applied to improve data comparability and reduce noise arising from unstable reporting histories and incomplete observations, although they may also introduce sample-selection bias by underrepresenting younger firms and firms with weaker disclosure continuity. All

variables were winsorized at the 1% and 99% levels. The final sample includes 1718 firms and 6872 firm-year observations. ESG data are obtained from the HuaZheng and Wind rating systems, firm-level financial and non-financial data are sourced from CSMAR, and internal control data are obtained from the DIB database. Because the sample period is relatively short, the empirical design is better suited to identifying short-run associations than long-run ESG value realization. In addition, although lagged ESG variables, firm fixed effects, year fixed effects, and clustered standard errors reduce some concerns related to simultaneity and unobserved heterogeneity, they do not fully eliminate potential endogeneity arising from reverse causality or omitted time-varying factors. The results should therefore be interpreted as robust conditional associations rather than definitive causal effects.

Accordingly, the present empirical design supports interpretation in terms of conditional association rather than definitive causality, and stronger identification strategies such as instrumental-variable designs, dynamic panel estimators, or quasi-natural experiments remain important directions for future research.

3.2. Variables and measurement

3.2.1. Independent variable

To measure ESG performance, this study adopts the ESG rating system developed by HuaZheng. This system provides comprehensive assessments of ESG performance and risk for A-share and Hong Kong listed firms, with updates on a quarterly or monthly basis. ESG performance is classified into nine grades ranging from AAA to C, while risk assessments are categorized as low risk, watch, warning, and severe warning, with higher scores indicating better ESG performance [82]. To mitigate potential endogeneity concerns and account for the lagged effects of ESG, the ESG variable is lagged by one period. Specifically, ESG data from 2019 to 2022 are used to predict financial and non-financial performance from 2020 to 2023 [2,83,84]. For robustness checks, and consistent with prior studies, the Wind ESG rating is employed as an alternative measure to verify the stability of the results [85].

3.2.2. Dependent variable

Corporate financial performance in this study is measured using both an accounting-based indicator, ROA, and a market-based indicator, Tobin's Q, while non-financial performance is captured by employee productivity. Specifically, ROA is one of the most widely used accounting-based measures of financial performance and reflects a firm's profitability relative to its total assets [2]. It is calculated as net income divided by total assets, with a higher ROA indicating stronger financial performance [11,86]. Because accounting-based indicators are often affected by earnings management decisions, prior studies commonly complement them with market-based measures to obtain a more comprehensive assessment of firm performance [2]. Tobin's Q is defined as the ratio of a firm's market value to the replacement cost of its assets [87]. In the case of Q being greater than 1, the market value of the firm exceeds the replacement value of its assets, which is typically associated with stronger growth opportunities and better performance [88]. Because the true replacement cost of assets is difficult to observe directly in firm-level panel data, this study follows the common empirical approximation used in the literature and

measures Tobin's Q as the market value of equity plus the book value of liabilities divided by total assets, as reported in Table 1. In alignment with the Balanced Scorecard (BSC) framework proposed by Kaplan and Norton [89], this study selects employee productivity as a proxy for non-financial performance under the internal processes dimension. Employee productivity is measured as operating revenue per employee, which reflects operational efficiency and effectiveness in resource utilization and is therefore an appropriate indicator of internal process performance in the non-financial dimension [49].

3.2.3. Moderating variable

The study uses the internal control index as the means of measurement of internal control adopted by the DIB database, which is one of the most common in studies of internal control governance in China [90,91]. The DIB index is used to give systematic evaluation of the quality of internal control and risk management of the firms, where higher the score, the greater is the internal control effectiveness. As its well-established evaluation framework and high credibility, this measure has been widely adopted by both regulatory authorities and the academic literature [92].

3.2.4. Control variables

Drawing on prior empirical studies [2,45,84], this study follows the existing literature and includes ten control variables, namely Size, Age, Leverage, Operating Revenue Growth, Operating Cash Flow Ratio, Capex to Total Assets Ratio, Ind Director Ratio, Cash Assets Ratio, Concentration of Ownership, and Fixed Asset Ratio. All the variables are defined in detail, data sources are reported, and calculation formulas in **Table 1**. **Table 1** shows the definition of the independent, dependent, moderating, and control variables and their data sources as well as measurement formulas applied in the empirical analysis.

Table 1. Variable definitions, data sources, and measurement formulas.

Variable type	Variable	Abbreviation	Definition / measurement formula	Data source
Independent variable	ESG performance	ESG Rating	ESG rating score issued by HuaZheng; higher values indicate better ESG performance	HuaZheng ESG database
Dependent variable	Return on assets	ROA	Net profit / total assets	CSMAR
Dependent variable	Firm value	Tobin's Q	Market value of equity plus book value of liabilities, divided by total assets	CSMAR
Dependent variable	Employee productivity	Employee Productivity	Operating revenue / number of employees	CSMAR
Moderating variable	Internal control quality	Internal Control Rating	Internal control index / rating; higher values indicate stronger internal control quality	DIB Internal Control and Risk Management database
Control variable	Firm size	Size	Natural logarithm of total assets	CSMAR
Control variable	Firm age	Age	Natural logarithm of firm age since establishment	CSMAR
Control variable	Leverage	Leverage	Total liabilities / total assets	CSMAR
Control variable	Operating revenue growth	Operating Revenue Growth	(Current-year operating revenue − prior-year operating revenue) / prior-year operating revenue	CSMAR

Table 1. *(Continued)*.

Variable type	Variable	Abbreviation	Definition / measurement formula	Data source
Control variable	Operating cash flow ratio	Operating Cash Flow Ratio	Net cash flow from operating activities / total assets	CSMAR
Control variable	Capital expenditure intensity	Capex to Total Assets Ratio	Cash paid for acquisition and construction of fixed assets, intangible assets, and other long-term assets / total assets	CSMAR
Control variable	Board independence	Ind Director Ratio	Number of independent directors / total number of directors	CSMAR
Control variable	Cash holding level	Cash Assets Ratio	Cash and cash equivalents / total assets	CSMAR
Control variable	Ownership concentration	Concentration of Ownership	Shareholding ratio of the largest shareholder	CSMAR
Control variable	Asset structure	Fixed Asset Ratio	Fixed assets / total assets	CSMAR

3.3. Model construction

This study constructs four regression models to examine the relationship between ESG practices and corporate performance in China's construction, manufacturing, and transportation industries, as well as the moderating role of internal control. All models control for firm fixed effects and year fixed effects, and standard errors are clustered at the firm level. Considering the lagged nature of ESG impacts on corporate performance and the potential for reverse causality, lagged ESG variables are employed in all models to mitigate potential endogeneity concerns [2,83,84]. Accordingly, firm i's financial and non-financial performance at time t is related to its ESG performance at time t-1 in order to assess the effects of ESG practices. The regression models are specified as follows:

Model 1: Examines the impact of ESG practices on corporate financial performance.

$ROA_{it} = \alpha + \beta 1 ESG\ Score_{it-1} + \beta 2 Control\ Variables_{it} + \mu_i + \lambda_t + \varepsilon_{it}$;

$Tobin's\ Q_{it} = \alpha + \beta 1 ESG\ Score_{it-1} + \beta 2 Control\ Variables_{it} + \mu_i + \lambda_t + \varepsilon_{it}$

Where:

ROA_{it} comprises the returns on assets of corporations i at the time t;

Tobin's Q_{it} presents the market-based measurement of financial performance of corporations i at time t;

$ESG\ Score_{it-1}$ in all the models above represents overall ESG performance score of corporations i at the time $t-1$;

μ_i presents firm fixed effects;

λ_t presents year fixed effects;

ε_{it} indicates the error term in the regression model.

Model 2: Examines the impact of ESG practices on corporate non-financial performance:

$Employee\ Productivity_{it} = \alpha + \sigma 1 ESG\ Score_{it-1} + \sigma 2 Control\ Variables_{it} + \mu_i + \lambda_t + \varepsilon_{it}$

Where:

$Employee\ Productivity_{it}$ presents the employee productivity of non-financial performance of corporations i at time t.

Model 3: Examines the moderating effect of internal control on the impact of ESG practices on financial performance.

$ROA_{it} = \alpha + \sigma 1 ESG\ Score\ centered_{,it-1} + \sigma 2 Internal\ Control\ centered_{,it} + \sigma 3 (ESG\ Score\ centered_{,it-1} \times Internal Control centered_{,it}) + \sigma 4\ Control\ Variables_{it} + \mu_i + \lambda_t + \varepsilon_{it}$;

Tobin's Q it= α+σ1ESG Score centered,it−1 +σ2Internal Control centered,it+σ3(ESG Score centered,it−1×InternalControlcentered,it)+σ4 Control Variablesit + μi+λt + εit

Where:

ESG Score centered,it−1= ESG Score it−1− $\underline{ESG\ Score}$

Internal Control centered,it= Internal Controlit− $\underline{Internal\ Control}$

Model 4: Examines the moderating effect of internal controls on the impact of ESG practices on non- financial performance.

Employee Productivityit = α+σ1ESG Score centered,it−1 +σ2Internal Control centered, it+σ3(ESG Score centered,it−1×InternalControlcentered,it)+σ4 Control Variablesit + μi+λt + εit;

4. Empirical results and discussion

4.1. Descriptive statistics

The panel data used in this study cover China's manufacturing, construction, and transportation industries from 2020 to 2023. The analysis includes variables related to ESG practices, financial performance, non-financial performance, and internal control. The final sample consists of 1718 listed firms, yielding a total of 6872 firm-year observations. **Table 2** reports the descriptive statistics for all variables.

Table 2. Description statistics.

Variables	Obs	Mean	Std. Dev.	Min	Max	Skew.	Kurt.
ESGRating	6872	73.57	4.661	59.84	84.57	-.227	3.365
ROA	6872	.039	.059	-.172	.217	-.385	5.407
TobinQ A	6872	2.102	1.341	.826	8.633	2.544	10.83
Employeeproductivity	6872	1470000	1160000	339000	6720000	2.316	9.123
InternalControlRat~g	6872	645.662	71.858	311.02	808.63	-1.673	9.228
Size	6872	22.491	1.26	20.266	26.456	.853	3.721
Age	6872	11.907	7.32	2	29	.743	2.426
Leverage	6872	.418	.18	.075	.846	.152	2.339
OperatingRevenueGr~h	6872	.166	.397	-.584	2.057	2.067	9.604
OperatingNetCashFl~o	6872	.114	.126	-.165	.576	.957	4.791
CapextoTotalAssets~o	6872	.048	.041	.001	.199	1.451	5.068
IndDirectorRatio	6872	.38	.055	.333	.571	1.127	4.098
CashAssetsRatio	6872	.151	.103	.016	.512	1.258	4.443
ConcentrationofOwn~p	6872	.502	.147	.191	.869	.209	2.581
FixedAssetRatio	6872	.207	.121	.014	.567	.722	3.085

The descriptive statistics indicate that ESG Ratings exhibit relatively low dispersion, with a mean of 73.57 and a standard deviation of 4.66, suggesting that ESG scores are relatively concentrated across sample firms. By contrast, performance variables have more variance. The mean of ROA is 0.039 and the range is between negative and relatively high levels of profitability (-0.172 to 0.217), therefore showing a significant heterogeneity in the profitability of firms. Both Tobin Q and Employee

productivity exhibit high kurtosis and high skewness to the right. The trend indicates the concentration of observations at lower ranges, with long ranges of distribution, which indicates that there exist significant differences in performance among firms. The Internal Control Rating is skewed left, by comparison, which means that the majority of the firms have relatively high standards of the internal control quality, yet a few of them have even significantly lower internal control standards.

4.2. Correlation matrix & VIF checks

The correlation analysis outcome of the variables in this research is provided in **Table 3**.

Table 3. Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) ESGRating	1.000														
(2) ROA	0.203***	1.000													
	(0.000)														
(3) TobinQ_A	0.035***	0.352***	1.000												
	(0.003)	(0.000)													
(4) Employeeproduc~y	0.053***	0.131***	-0.112***	1.000											
	(0.000)	(0.000)	(0.000)												
(5) InternalContro~g	0.214***	0.329***	0.107***	0.208***	1.000										
	(0.000)	(0.000)	(0.000)	(0.000)											
(6) Size	0.213***	0.070***	-0.254***	0.439***	0.236***	1.000									
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)										
(7) Age	-0.054***	-0.068***	-0.189***	0.226***	0.039***	0.429***	1.000								
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)									
(8) Leverage	-0.071***	-0.369***	-0.294***	0.244***	0.019	0.446***	0.191***	1.000							
	(0.000)	(0.000)	(0.000)	(0.000)	(0.118)	(0.000)	(0.000)								
(9) OperatingReven~h	-0.021*	-0.044***	0.008	-0.036***	0.009	-0.045***	-0.010	0.051***	1.000						
	(0.080)	(0.000)	(0.483)	(0.003)	(0.461)	(0.000)	(0.399)	(0.000)							
(10) OperatingNetC~o	0.091***	0.431***	0.123***	0.043***	0.159***	0.153***	0.043***	-0.149***	-0.131***	1.000					
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)						
(11) CapextoTotalA~o	0.060***	0.125***	0.104***	-0.074***	0.049***	0.040***	-0.193***	0.016	-0.116***	0.243***	1.000				
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.186)	(0.000)	(0.000)					

Table 3. *(Continued)*.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(12) IndDirectorRa~o	0.064***	-0.040***	0.010	0.010	0.012	0.021*	-0.056***	0.048***	-0.013	-0.017	0.017	1.000			
	(0.000)	(0.001)	(0.389)	(0.429)	(0.324)	(0.076)	(0.000)	(0.000)	(0.265)	(0.161)	(0.161)				
(13) CashAssetsRatio	0.126***	0.251***	0.200***	0.007	0.105***	-0.073***	0.011	-0.319***	0.029**	0.081***	-0.129***	-0.028**	1.000		
	(0.000)	(0.000)	(0.000)	(0.563)	(0.000)	(0.000)	(0.372)	(0.000)	(0.015)	(0.000)	(0.000)	(0.020)			
(14) Concentration~p	0.152***	0.207***	0.070***	0.105***	0.173***	0.167***	-0.178***	-0.001	0.004	0.150***	0.043***	0.050***	0.081***	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.922)	(0.765)	(0.000)	(0.000)	(0.000)	(0.000)		
(15) FixedAssetRatio	-0.049***	-0.047***	-0.095***	-0.107***	-0.049***	0.012	0.034***	0.007	-0.158***	0.370***	0.338***	-0.009	-0.280***	0.013	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.315)	(0.005)	(0.580)	(0.000)	(0.000)	(0.000)	(0.471)	(0.000)	(0.268)	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The correlation table shows that there are a number of statistically significant relationships between the variables. The correlation between ESG Rating and ROA, Tobin, and Employee Productivity has a positive and significant correlation, whose correlation coefficients amount to 0.203, 0.035, and 0.053, respectively (all the *p*-values are below 0.01). Since correlation analysis fails to consider firm-specific heterogeneity and time effects, further analyses consider a two-way fixed effects model to determine the net effects and test the underlying mechanisms. In the meantime, Internal Control Rating has a positive correlation with ESG Rating and all measures of performance to give partial statistical evidence to add internal control quality as a moderating factor further on. In comparison, capital structure and life cycle variables are more stable. A negative correlation exists between leverage and financial performance measures and between Age and the ROA and the Q of Tobin that suggests that performance of firms can be related to financial constraints and firms' development. Moreover, Size also demonstrates a stronger positive correlation with Employee productivity implying that the firm scale and productivity may move in the same direction.

According to the results of the Variance Inflation Factor (VIF), all the variables have a VIF value that is significantly lower than the standard threshold of 10, meaning that there is no severe multicollinearity among the explanatory variables in the model. This finding implies that high correlations between the independent variables do not stand a chance of derailing regression estimates and hence stability and interpretability of the coefficient estimates. In this respect, the regression results that follow are more probable to capture the true relationships between ESG practices, the quality of internal control and corporate performance and not spurious relationships caused by overlapping of variables or due to a statistical correlation. The VIF results are reported in **Table 4**.

Table 4. VIF test.

Variable	VIF	1/VIF
Size	1.89	0.5280
Leverage	1.51	0.6607
FixedAssetRatio	1.44	0.6942
Age	1.47	0.6813
OperatingNetCashFlowRatio	1.37	0.7311
CashAssetsRatio	1.29	0.7779
CapextoTotalAssetsRatio	1.24	0.8033
ConcentrationofOwnership	1.17	0.8576
ESGRating	1.16	0.8622
InternalControlRating	1.14	0.8790
OperatingRevenueGrowth	1.04	0.9587
IndDirectorRatio	1.01	0.9872
Mean VIF	1.33	

4.3. Regression results

4.3.1. ESG→ Financial and non-financial performance

Table 5 shows the impact of ESG practices on financial and non-financial performance.

Table 5. Benchmark regression result.

	(1)	(2)	(3)
	ROA	TobinQ_A	Employeeproductivity
ESGRating	-0.000352**	-0.00950***	-896.8
	(-2.23)	(-3.25)	(-0.54)
Size	0.0308***	-1.395***	519311.0***
	(6.87)	(-13.60)	(8.17)
Age	-0.0129***	-0.0563	-137613.6***
	(-2.81)	(-1.21)	(-3.67)
Leverage	-0.147***	1.037***	-163786.4
	(-10.69)	(4.57)	(-1.33)
OperatingRevenueGrowth	0.00909***	0.00892	-61624.5*
	(4.10)	(0.25)	(-1.88)
OperatingNetCashFlowRatio	0.124***	0.521***	734491.0***
	(16.35)	(4.63)	(8.24)
CapextoTotalAssetsRatio	-0.0108	2.035***	-1034487.9***
	(-0.47)	(4.64)	(-3.59)
IndDirectorRatio	-0.00309	0.0910	51468.5
	(-0.14)	(0.27)	(0.22)

Table 5. *(Continued)*.

	(1)	(2)	(3)
	ROA	**TobinQ_A**	**Employeeproductivity**
CashAssetsRatio	-0.0201*	0.0920	50088.2
	(-1.76)	(0.39)	(0.42)
ConcentrationofOwnership	0.0293	-0.554	311071.8
	(1.61)	(-1.36)	(1.53)
FixedAssetRatio	-0.111***	-0.618**	-686582.6***
	(-7.16)	(-2.08)	(-3.88)
_cons	-0.416***	34.60***	-8506531.9***
	(-3.70)	(14.12)	(-5.89)
Control	Yes	Yes	Yes
Company	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	6872	6872	6872
F	45.127***	20.288***	14.282***
p	0.000	0.000	0.000
r2	0.741	0.825	0.931
r2_a	0.653	0.766	0.907

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The benchmark regression results show that ESG practices are negatively associated with both ROA and Tobin's Q in the sample firms. This pattern suggests that, within the present observation window, ESG implementation is linked with short-run cost pressure in China's capital-intensive industries. A plausible explanation is that compliance, disclosure, governance adaptation, and transition-related expenditures may be recognized earlier than operational or reputational benefits. By contrast, ESG practices are not significantly associated with employee productivity in the baseline specification, implying that the internal efficiency benefits of ESG may not be immediately observable at the workforce-output level during the sample period. The control variables generally behave in expected directions, with firm size and operating cash flow showing positive associations with performance, whereas age and fixed-asset intensity are associated with weaker outcomes. Accordingly, H1 is supported in terms of a statistically significant association, whereas H2 is not supported in the baseline model.

Although the present study does not implement a formal mediation or channel-identification model, the short-run negative association between ESG and financial performance can be interpreted through two plausible mechanisms grounded in the literature. First, a cost-channel explanation suggests that ESG adoption in capital-intensive sectors may require substantial near-term spending on compliance systems, environmental upgrading, disclosure processes, and governance restructuring before economic returns fully materialize. Second, a resource-crowding-out explanation

suggests that managerial attention, capital expenditure, and operational resources may be temporarily diverted from core production and profitability-oriented activities toward ESG-related adjustment efforts. In this sense, the negative short-run financial association observed in the benchmark model should be understood as consistent with transition-cost and implementation-burden arguments rather than as evidence that ESG is inherently value-destroying over the longer term. Although these channels are not directly identified through a separate mediation model in the present study, they provide a theoretically grounded explanation for why ESG may be associated with weaker short-run financial outcomes in capital-intensive sectors. Future research should formally test these channels by incorporating mediating variables related to compliance expenditure, environmental investment, organizational adjustment cost, and resource reallocation.

4.3.2. Moderating role of internal control in ESG practices and firm performance

To test whether internal control quality moderates the relationship between ESG performance and corporate performance. In this study, the moderation models have been estimated following a two-way specification of fixed effects, that is, firm fixed effects and year fixed effects. The models are developed based on mean centered cESGRating, mean centered cInternalControlRating and their interaction term ESGICc. Separate models are estimated using ROA, TobinQ and Employee Productivity to be the dependent variable.

Table 6 reports that in the ROA model the interaction term ESG_IC_c has a positive value which is marginally significant at 10 per cent level implying that internal control positively moderates the relationship between ESG practices and profitability. In comparison **Table 7** indicates that the interaction term is not significant in the Tobin Q model indicating internal control does not have a significant impact on the relationship between ESG and market valuation. Under the Employee Productivity, **Table 8** indicates that the ESG IC c is positive, and significant at the 5 percent mark, which means that ESG practices also have a positive moderating effect on employee productivity through internal control. On the results of these findings, there is a partial support of H3 and a supported H4.

Table 6. Moderating effect of internal control on ESG and ROA.

	(1)	**(2)**
	ROA	**ROA**
c_ESGRating	-0.000319**	-0.000297*
	(-2.06)	(-1.94)
c_InternalControlRating	0.000120***	0.000122***
	(12.81)	(13.00)
ESG_IC_c		0.00000279*
		(1.69)
Size	0.0313***	0.0311***
	(7.07)	(6.98)
Age	-0.0131***	-0.0130***

Table 6. *(Continued)*.

	(1)	(2)
	ROA	**ROA**
	(-2.82)	(-2.78)
Leverage	-0.152***	-0.152***
	(-10.96)	(-10.99)
OperatingRevenueGrowth	0.00823***	0.00832***
	(3.78)	(3.82)
OperatingNetCashFlowRatio	0.115***	0.115***
	(15.42)	(15.41)
CapextoTotalAssetsRatio	-0.00726	-0.00681
	(-0.32)	(-0.30)
IndDirectorRatio	-0.000581	-0.00121
	(-0.03)	(-0.06)
CashAssetsRatio	-0.0233**	-0.0231**
	(-2.09)	(-2.07)
ConcentrationofOwnership	0.0226	0.0227
	(1.27)	(1.27)
FixedAssetRatio	-0.101***	-0.101***
	(-6.70)	(-6.66)
Company	Yes	Yes
Year	Yes	Yes
N	6872	6872
F	56.78	52.57
p	0.000	0.000
r2	0.751	0.752

t statistics in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Table 7. Moderating effect of internal control on ESG and Tobin's Q.

	(1)	(2)
	TobinQ_A	**TobinQ_A**
c_ESGRating	-0.00927***	-0.00908***
	(-3.19)	(-3.05)
c_InternalControlRating	0.000818***	0.000833***
	(5.13)	(5.30)
ESG_IC_c		0.0000238
		(0.92)
Size	-1.392***	-1.393***
	(-13.71)	(-13.72)
Age	-0.0577	-0.0566
	(-1.22)	(-1.19)
Leverage	1.008***	1.007***

Table 7. *(Continued)*.

	(1)	(2)
	TobinQ_A	**TobinQ_A**
	(4.48)	(4.47)
OperatingRevenueGrowth	0.00308	0.00383
	(0.09)	(0.11)
OperatingNetCashFlowRatio	0.457***	0.455***
	(3.98)	(3.98)
CapextoTotalAssetsRatio	2.059***	2.063***
	(4.73)	(4.74)
IndDirectorRatio	0.108	0.103
	(0.33)	(0.31)
CashAssetsRatio	0.0703	0.0720
	(0.30)	(0.31)
ConcentrationofOwnership	-0.599	-0.599
	(-1.48)	(-1.48)
FixedAssetRatio	-0.550*	-0.546*
	(-1.87)	(-1.85)
Company	Yes	Yes
Year	Yes	Yes
N	6872	6872
F	21.92	20.82
p	0.000	0.000
r2	0.826	0.826

t statistics in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Table 8. Moderating effect of internal control on ESG and employee productivity.

	(1)	(2)
	Employeeproductivity	**Employeeproductivity**
c_ESGRating	-685.2	-410.1
	(-0.42)	(-0.24)
c_InternalControlRating	769.7***	790.9***
	(7.99)	(8.21)
ESG_IC_c		33.68**
		(2.02)
Size	522,129.6***	520,016.2***
	(8.28)	(8.25)
Age	-138,937.6***	-137,372.3***
	(-3.67)	(-3.57)
Leverage	-191,058.4	-192,549.9
	(-1.56)	(-1.57)
OperatingRevenueGrowth	-67,119.5**	-66,051.6**

Table 8. *(Continued)*.

	(1)	(2)
	Employeeproductivity	**Employeeproductivity**
	(-2.05)	(-2.02)
OperatingNetCashFlowRatio	673,912.9***	672,009.1***
	(7.76)	(7.75)
CapextoTotalAssetsRatio	-1,011,636.0***	-1,006,309.4***
	(-3.51)	(-3.49)
IndDirectorRatio	67,569.8	59,914.0
	(0.29)	(0.26)
CashAssetsRatio	29,614.2	31,992.3
	(0.25)	(0.27)
ConcentrationofOwnership	268,454.2	269,514.8
	(1.32)	(1.33)
FixedAssetRatio	-622,964.8***	-616,374.7***
	(-3.59)	(-3.55)
Company	Yes	Yes
Year	Yes	Yes
N	6872	6872
F	16.34	15.09
p	0.000	0.000
r2	0.932	0.932

t statistics in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

4.3.3. Simple-slope / conditional effects

Based on the interaction model estimations as presented in Tables 6 through 8, this paper will further use the simple slope pick a point method in order to indicate the conditional effects of ESG at various stages of internal control quality. Particularly, the mean centered cInternalControlRating at minus one standard deviation and plus one standard deviation, that is, -71.86 and +71.86, is assumed to be representative levels and is replaced into the regression equations with terms of interaction to calculate the marginal effects of ESG on every performance indicator.

Following the ROA path, Table 9 reports the results of the simple slope that indicate that at the cInternalControlRating = -71.86, the marginal effect of ESG on ROA = -0.00050. In the case of cInternalControlRating = +71.86, the marginal effect = -0.00010. These findings show that the negative marginal impact of ESG on ROA is significantly diluted as the quality of internal control is increased. To further find the zero crossing point at which the marginal effect becomes negative to positive, marginal effect is set to the same, resulting in the equation of -0.000297 + 0.00000279x cInternalControlRating = 0. The solution of this expression implies that the marginal impact of ESG on ROA is equal to zero, in the case when c Internal ControlRating equals 106.45, which means that the original Internal Control Rating equals 752.11. The implication of this finding would imply that under the estimated model conditions, as internal control quality increases to higher levels, the net

marginal effect of ESG on ROA moves towards a negative and a directional turning point.

Table 9. Denotes the conditional marginal effect of ESG on ROA at low and high level of internal control quality together with the turning point that is estimated to be zero.

Table 9. Conditional effect of ESG on ROA at different levels of internal control quality.

Internal control level	Centered internal control value	Marginal effect of ESG on ROA
Low internal control (Mean − 1 SD)	-71.86	-0.00050
High internal control (Mean + 1 SD)	71.86	-0.00010
Zero-crossing point	106.45	0.00000

Note: The turning point corresponds to an original Internal Control Rating of approximately 752.11.

The interaction term that was reported in **Table 7** is not statistically significant along the Tobin Q path. On this basis, the evidence is not enough to prove a moderating effect of internal control in the connection between ESG and the market valuation. Thus, no additional simple slope calculations and graphical representations are performed. This is done to have the same level of consistency in inference, and to prevent overinterpretation of the effects of conditioning when there are no statistically significant results on the effects of interaction.

The simple slope results in **Table 10** along the Employee Productivity path indicate more vivid differences between internal control levels. At c/InternalControlRating = -71.86 the marginal effect of ESG = -2830.34. When c_InternalControlRating equals +71.86, the marginal effect becomes +2010.14, indicating that the direction of ESG's effect shifts from negative to positive as internal control quality improves. Accordingly, setting the marginal effect equal to zero yields the equation -410.1 + 33.68 × c_InternalControlRating = 0. Solving this equation gives c_InternalControlRating of approximately 12, which corresponds to an original Internal Control Rating of about 658. This result indicates that once internal control quality rises slightly above the sample mean (646), the net marginal effect of ESG on employee productivity turns from negative to zero and then becomes positive. **Table 10** shows the conditional marginal effect of ESG on the productivity of employees at low and high levels of quality of internal control and the estimated point at which the marginal effect becomes negative.

Table 10. Conditional effect of ESG on employee productivity at different levels of internal control quality.

Internal control level	Centered internal control value	Marginal effect of ESG on employee productivity
Low internal control (Mean − 1 SD)	-71.86	-2830.34
High internal control (Mean + 1 SD)	71.86	2010.14
Zero-crossing point	12.00	0.00

Note: The turning point corresponds to an original Internal Control Rating of approximately 658, which is slightly above the sample mean.

Figure 2 presents the simple-slope trend of the ESG-ROA association at the various levels of internal control quality indicating that the negative margin effect of ESG on ROA decreases as internal control quality rises.

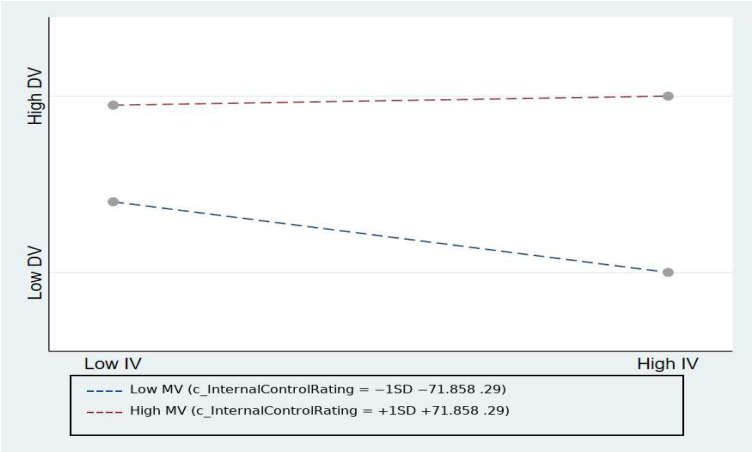

Figure 2. ESG → ROA: Simple slopes at different levels of internal control quality.

The simple- slope pattern of the ESG employee productivity relationship presented in **Figure 3** reveals that although the marginal effect of ESG is negative, with the improvement of internal control quality, it changes to positive.

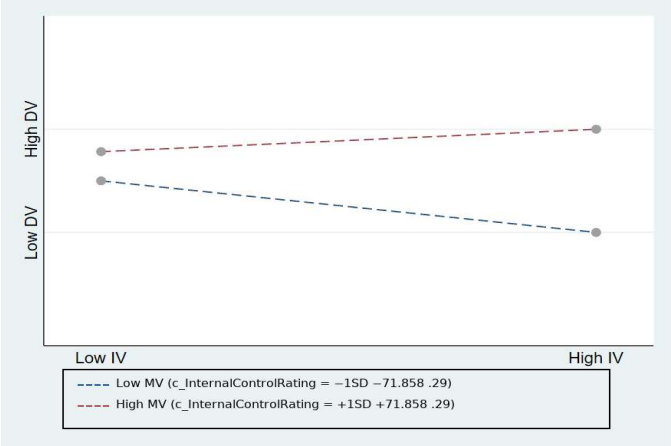

Figure 3. ESG → employee productivity: Simple slopes at different levels of internal control quality.

The existing literature generally holds that high quality internal control strengthens the translation of ESG performance into profitability. Firms with stronger internal control mechanisms, the operational improvements and risk management associated with ESG practices are more likely to translate into higher ROA. Using a sample of Chinese A share listed firms, Wu et al. [93] find that the interaction term ESG × ICQ is significantly positive in ROA models. Jiang [94] also shows, through high and low group regressions, that the positive returns to ESG mainly arise in firms with stronger internal control. Related studies further emphasize the role of internal control in enhancing financial performance through channels such as agency constraint, information transparency, and cash flow quality [95–97]. Consistent with this evidence, the present study also observes a positive moderating role of internal

control in the manufacturing, construction, and transportation sectors. When internal control quality is low, the marginal effect of ESG on ROA is negative, but this negative effect weakens markedly as internal control improves. The analysis of zero-crossing points also points to the indication that in capital intensive industries in which ESG investment intensity is high, ESG should or should not be able to provide visible financial payoff is highly dependent on whether firms have significantly stronger internal governance and execution capacity.

The research, which investigates the ESG to employee productivity relationship directly and adds an inter-relationship term of internal control, is still rather scarce in the Employee Productivity dimension. In order to promote comparability, this study uses research frameworks in the context of total factor productivity (TFP). Guo and Hong evidence [98] confirms that the interaction term ESG x Internal Control is highly positive in TFP models indicating that internal control can help to augment the transmission of ESG on productivity enhancement by raising the credibility and consistency of ESG information and implementation. In line with this perspective, the findings of this research suggest that an upward trend towards the internal control quality, as the quality increases, the negative impact of ESG on employee productivity gets diluted, and a directional finding takes place. The net marginal impact of ESG changes to a positive value when internal control rating is about 658 which is slightly higher than the mean of the sample (646). This trend shows that internal control integrates ESG requirements into daily practices that can be executed due to the standardization of processes and the constant observation. It improves the consistency and traceability of execution. As a result, ESG practices are more likely to translate into process optimization, fewer risk events, and higher coordination efficiency, ultimately improving employee productivity [31,63,99].

Although some prior studies find that internal control can strengthen the positive effect of ESG on Tobin's Q [9,100], no significant moderating effect is observed in the present sample. Several explanations may account for this result. First, capital markets may price internal control information primarily through identifiable signals related to the disclosure of control deficiencies. Valuation reactions tend to be more pronounced only when internal control weaknesses are explicitly disclosed [101,102]. Consistent with the characteristics of the current sample, the Internal Control Rating is markedly left skewed and concentrated at relatively high levels, with few firms exhibiting low scores. So, the market may be more capable of identifying and penalizing firms with clearly weak internal control, while having limited ability to distinguish subtle differences among high scoring firms. This pattern can weaken the statistical significance of the interaction term and is consistent with evidence that capital markets respond more sensitively to negative internal control information than to positive signals [103,104].

Second, Tobin's Q is more sensitive to short-term sentiment and external signals, whereas the economic effects of internal control and ESG tend to materialize over the medium to long term. So, within a relatively short observation window, the valuation amplifying role of internal control on ESG may not yet be fully reflected [105,106]. Existing studies also indicate that the value of internal control is primarily manifested through reducing the risk of future major losses and improving operational efficiency. These benefits usually take time to be gradually recognized by capital markets

[107,108].

Lastly, on industry context grounds, the valuation mechanism in capital intensive industries is more asset efficient and scale expansion based. Internal control will more likely in these industries serve as a compliance and risk constraint tool and will not produce clear short-term expectations of valuation upgrades [109,110]. Moreover, the effectiveness of internal control depends on human execution, which varies across industries. This heterogeneity can weaken the extent to which internal control amplifies ESG value signals, making such effects relatively less pronounced in capital intensive industries compared with labor intensive industries [111,112].

4.4. Robustness tests

To assess the stability of the baseline findings, this study conducts a robustness test by replacing the baseline HuaZheng ESG measure with the Wind ESG rating while retaining the same model specification, control variables, firm fixed effects, and year fixed effects [2,84,85]. This procedure is consistent with prior ESG-performance research that uses alternative ESG rating systems to address potential measurement sensitivity arising from differences in rating coverage, scoring logic, indicator construction, and disclosure weighting [2,84,85]. Given that ESG ratings may vary across providers, the use of an alternative ESG database helps examine whether the observed relationships are specific to one rating architecture or remain stable across different measurement frameworks [84,85]. As reported in **Table 11**, the signs and significance levels of the main coefficients remain broadly consistent with the baseline results, supporting the robustness of the reported associations.

Table 11. Robustness test using alternative ESG measurement (Wind ESG rating).

	(1)	(2)	(3)
	ROA	**TobinQ_A**	**Employeeproductivity**
ESGRating	-0.00221*	-0.108***	7526.9
	(-1.83)	(-4.23)	(0.60)
Size	0.0317***	-1.412***	501,507.8***
	(7.13)	(-13.60)	(7.88)
Age	-0.000488	-0.335***	-47069.8
	(-0.13)	(-4.68)	(-1.34)
Leverage	-0.148***	1.040***	-150,811.9
	(-10.73)	(4.55)	(-1.20)
OperatingRevenueGrowth	0.00938***	0.00902	-62,532.2*
	(4.20)	(0.25)	(-1.89)
OperatingNetCashFlowRatio	0.123***	0.524***	706,812.3***
	(16.09)	(4.62)	(8.31)
CapextoTotalAssetsRatio	-0.0174	2.126***	-1,065,799.7***
	(-0.75)	(4.79)	(-3.64)

Table 11. *(Continued)*.

	(1)	(2)	(3)
	ROA	**TobinQ_A**	**Employeeproductivity**
IndDirectorRatio	-0.0118	-0.0396	16766.8
	(-0.56)	(-0.12)	(0.07)
CashAssetsRatio	-0.0250**	0.142	43,098.6
	(-2.27)	(0.60)	(0.35)
ConcentrationofOwnership	0.0320*	-0.447	330,377.0
	(1.77)	(-1.09)	(1.62)
FixedAssetRatio	-0.113***	-0.601**	-695,973.0***
	(-7.42)	(-1.98)	(-3.87)
_cons	-0.592***	38.30***	-9,288,937.6***
	(-5.46)	(14.57)	(-6.44)
Control	Yes	Yes	Yes
Company	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	6788	6788	6788
F	43.414***	21.383***	13.463***
p	0.000	0.000	0.000
r2	0.741	0.827	0.932
r2_a	0.654	0.769	0.909

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5. Conclusions and suggestions

This study focuses on listed firms in China's capital-intensive industries, namely manufacturing, construction, and transportation, and examines the relationship between ESG practices and corporate financial and non-financial performance within a unified empirical framework. It further introduces internal control quality as a key moderator to evaluate how governance capacity conditions these relationships. The findings reflect differentiated ESG-performance patterns across externally observable returns and internal operational transformation. First, at the level of baseline associations, ESG practices are negatively associated with financial performance during the sample period. This pattern suggests that, in the short run, firms in capital-intensive industries may experience higher compliance, transition, and governance-adjustment costs before longer-term benefits become visible. By contrast, ESG practices are not significantly associated with employee productivity in the baseline specification, indicating that internal operational benefits may require more time, stronger implementation quality, or both. Second, at the level of conditional relationships, internal control quality materially alters the strength of ESG-performance associations. As internal control quality improves, the negative

association between ESG and performance becomes weaker, particularly for ROA and employee productivity. This pattern highlights internal control as a governance infrastructure that can reduce implementation deviation, strengthen execution consistency, and improve the credibility and usability of ESG-related information.

According to these findings, the managerial implication of the present study is that companies must not consider ESG as a disclosure requirement or image building exercise. Rather, ESG ought to be incorporated into the corporate governance and operating system, and more effective organizational implementation can be applied to minimize cost spillovers and efficiency losses in implementation. On the internal front, the companies are advised to integrate ESG-related goals and significant risks in budgets, investment decisions, and day-to-day operations management. One of the ways that this can be done is by defining the points of responsibility, by ensuring that all processes are documented in a similar manner, and by enhancing internal review and continuous improvement processes. Such arrangements will improve the consistency in execution and transparency in supervision of the execution of the ESG, and therefore minimize agency motivated project fragmentation, resource waste, and deviation of execution.

At the same time, given that non-financial performance has not shown stable improvement, firms should place greater emphasis on complementary internal management mechanisms when advancing ESG initiatives. This includes refining job responsibilities and process standards, aligning appropriate training and incentive schemes, and embedding ESG requirements into performance evaluation systems. Through these approaches, ESG expectations can be translated into employees' daily operations, collaboration patterns, and managerial behaviors, rather than remaining as purely formalized policies. At the same time, from an external perspective, firms need to strengthen the identifiability of the quality of their ESG investments for external stakeholders. This can be achieved through more verifiable information foundations and more consistent execution records. Such efforts help to avoid unnecessary market discounts arising from short-term cost pressures.

At the policy and market level, the findings suggest that, in the absence of the information environment underpinning the external perspective that is comparable and verifiable, markets may struggle to identify the true quality and potential returns of ESG investments in time. So, short-term cost pressures may be amplified and reflected in performance discounts. Accordingly, regulators and standard setting bodies could further enhance the comparability and enforceability of ESG disclosure rules. Greater emphasis on third party assurance and data quality governance would help reduce information asymmetry and improve the usability of ESG information. Meanwhile, from an internal perspective, firms could be encouraged to strengthen ESG related internal control and risk management systems, so that ESG implementation becomes more verifiable and traceable at the source, thereby reducing symbolic compliance and execution deviations. For investors and other stakeholders, the evaluation of corporate ESG performance should also consider firms' internal control and governance capacity. Reliance solely on disclosure narratives or rating outcomes may be misleading, as governance foundations ultimately determine whether ESG commitments can be consistently executed and gradually translated into operational improvements.

Recent evidence also supports this broader interpretation of the findings. For example, research in agribusiness shows that ESG disclosure can influence market value and investor behavior, reinforcing the importance of credible external ESG communication [113]. In parallel, evidence from Chinese firms indicates that stronger internal control can promote green innovation partly through environmental investment, suggesting that governance quality helps convert sustainability commitments into substantive organizational outcomes [114]. Related evidence from A-share listed firms further shows that ESG performance is associated with green innovation performance, which is consistent with the view that the benefits of ESG may emerge more clearly through longer-term innovation and process-improvement channels rather than only through short-term financial indicators [115].

This study has several limitations that should be acknowledged clearly. First, the sample period covers only 2020–2023, which is relatively short for evaluating ESG outcomes that may unfold gradually over time. As a result, the reported estimates are more informative about short-run associations than about long-run value creation. Second, the analysis is limited to Chinese A-share listed firms in manufacturing, construction, and transportation, which constrains external generalizability to other institutional settings, sectors, and ownership structures. Third, although lagged independent variables and two-way fixed effects improve the empirical design, they do not fully eliminate endogeneity concerns related to reverse causality and omitted time-varying firm characteristics. Fourth, the sample-selection criteria, including the exclusion of newly listed firms and firms with substantial missing data, improve comparability but may also underrepresent firms with more unstable ESG trajectories. Future research should therefore extend the time horizon, compare additional industries and countries, and apply stronger identification strategies such as instrumental-variable designs, dynamic panel estimators, or quasi-natural experiments where feasible.

Recent evidence from other institutional and sectoral settings further supports the need for caution in generalizing ESG-performance findings across contexts. For example, evidence from Saudi listed firms shows that governance characteristics and sustainability-related factors can shape firm performance and disclosure behavior in ways that differ from the Chinese setting [116,117]. Recent China-based sector studies also suggest that firm outcomes in construction, manufacturing, environmental governance, and industrial digital transformation are strongly conditioned by industry structure and transition dynamics [118–120]. These comparisons reinforce the importance of context-sensitive interpretation and motivate broader cross-country and cross-sector extensions in future ESG research.

Finally, future research could examine the dynamic evolution of ESG effects over a longer time horizon. This would help clarify the time structure between short term pressures and long-term benefits. It would also be useful to incorporate alternative measures and more robust identification strategies to enhance the external validity of the conclusions. Meanwhile, future studies may further specify key stages and implementation pathways of internal control, and examine which governance mechanisms are most effective in improving the quality of ESG execution and the efficiency of its performance transformation. Through this approach, research can more concretely address existing debates on the heterogeneity and context dependence

of ESG effects within a unified framework that integrates the internal perspective and the external perspective.

Author Contributions: Conceptualization, SH and YL; methodology, SH and YL; formal analysis, SH; data curation, SH; writing original draft preparation, SH; writing review and editing, SH, YL and SFS; supervision, YL and SFS. All authors have read and agreed to the published version of the manuscript.

Funding: None.

Ethical approval: Not applicable.

Informed consent statement: Not applicable.

Data Availability Statement: The data used in this study were obtained from the HuaZheng, Wind, CSMAR, and DIB databases. Due to database licensing restrictions, the raw data are not publicly available but can be accessed from the corresponding databases subject to institutional authorization.

Acknowledgments: The authors thank the editor and anonymous reviewers for their constructive comments, which helped improve the manuscript.

Conflict of interest: The authors declare no conflict of interest.

References

1. Piechocka-Kałużna A, Tłuczak A, Łopatka P. The impact of CSR/ESG on the cost of capital: A case study of US companies. 2021.
2. Velte P. Does ESG performance have an impact on financial performance? Evidence from Germany. Journal of Global Responsibility. 2017; 8(2): 169–178. doi: 10.1108/jgr-11-2016-0029
3. Maaloul A, Zéghal D, Ben Amar W, et al. The effect of environmental, social, and governance (ESG) performance and disclosure on cost of debt: The mediating effect of corporate reputation. Corporate Reputation Review. 2023; 26(1): 1–18. doi: 10.1057/s41299-021-00130-8
4. Zhou G, Liu L, Luo S. Sustainable development, ESG performance and company market value: Mediating effect of financial performance. Business Strategy and the Environment. 2022; 31(7): 3371–3387. doi: 10.1002/bse.3089
5. Barnea A, Rubin A. Corporate social responsibility as a conflict between shareholders. Journal of Business Ethics. 2010; 97: 71–86. doi: 10.1007/s10551-010-0496-z
6. Barrymore N, Sampson R C. ESG performance and labor productivity: Exploring whether and when ESG affects firm performance. Academy of Management Proceedings. Briarcliff Manor, NY 10510: Academy of Management. 2021; 1(1): 10510.
7. Andrey E. ESG as an innovative tool to improve the efficiency and financial stability of financial organizations. Procedia Computer Science. 2023; 221: 705–709. doi: 10.1016/j.procs.2023.08.041
8. Li S, Liu Y, Xu Y. Does ESG performance improve the quantity and quality of innovation? The mediating role of internal control effectiveness and analyst coverage. Sustainability. 2022; 15(1): 104.
9. Boulhaga M, Bouri A, Elamer AA, Ibrahim BA. Environmental, social and governance ratings and firm performance: The moderating role of internal control quality. Corporate Social Responsibility and Environmental Management. 2023; 30(1): 134–145.
10. Huang P, Jiao Y, Li S. Impact of internal control quality on the information content of social responsibility reports: A study based on text similarity—evidence from China. International Journal of Accounting Information Systems. 2022; 45: 100558. doi: 10.1016/j.accinf.2022.100558
11. Liu H, Wu K, Zhou Q. Whether and how ESG impacts on corporate financial performance in the Yangtze River Delta of China. Sustainability. 2022; 14(24): 16584. doi: 10.3390/su142416584

12. Shen H, Lin H, Han W, Wu H. ESG in China: A review of practice and research, and future research avenues. China Journal of Accounting Research. 2023; 16(4): 100325. doi: 10.1016/j.cjar.2023.100325
13. Feng X, Mohd Saleh N. Managerial ability and ESG risks: the moderating effect of internal control quality. Sustainability. 2024; 16(22): 9838. doi: 10.3390/su16229838
14. Zhang Y, Chen S, Li Y, Ramos DL. Does environmental protection law bring about greenwashing? Evidence from heavy-polluting firms in China. Sustainability. 2024; 16(5): 1782. doi: 10.3390/su16051782
15. Ma Q, Ju L, Zhang Z. Innovation input and firm value: Based on the moderating effect of internal control. Sustainability. 2022; 14(18): 11156. doi: 10.3390/su141811156
16. Deloitte Development LLC. Heads Up: Using the COSO Framework to Establish Internal Controls Over Sustainability Reporting (ICSR). Deloitte Development LLC; 2023.
17. Afshan N, Chakrabarti D, Balaji MS. Exploring the relevance of employee productivity-linked firm performance measures: An empirical study in India. Journal of Transnational Management. 2014; 19(1): 24–37. doi: 10.1080/15475778.2014.869462
18. APQC. Measuring productivity with revenue per employee. APQC; 2024.
19. Salem MR, Shahimi S, Alma'amun S. Does mediation matter in explaining the relationship between ESG and bank financial performance? A scoping review. Journal of Risk and Financial Management. 2024; 17(8): 350. doi: 10.3390/jrfm17080350
20. Cheng M, Dhaliwal D, Zhang Y. Does investment efficiency improve after the disclosure of material weaknesses in internal control over financial reporting? Journal of Accounting and Economics. 2013; 56(1): 1–18. doi: 10.1016/j.jacceco.2013.03.001
21. Sun Y. Internal control weakness disclosure and firm investment. Journal of Accounting, Auditing & Finance. 2016;31(2):277–307. doi:10.1177/0148558X15598027
22. Jung H. The impact of ESG performance on corporate value of Chinese companies. International Journal of Advanced Culture Technology (IJACT). 2023; 11(3): 33–38.
23. Asset Management Association of China, Institute of Finance, Development Research Center of the State Council. Research Report on the ESG Evaluation System of Chinese Listed Companies. Available online: https://www.amac.org.cn/hdjl/jjhywhjs/esg/202001/P020231126414991469856.pdf (accessed on 3 September 2020)
24. Zhao C, Guo Y, Yuan J, et al. ESG and corporate financial performance: empirical evidence from China's listed power generation companies. Sustainability. 2018; 10(8): 2607. doi:10.3390/su10082607
25. Qureshi MA, Akbar M, Akbar A, Poulova P. Do ESG endeavors assist firms in achieving superior financial performance? A case of 100 best corporate citizens. SAGE Open. 2021; 11(2): 21582440211021598. doi: 10.1177/21582440211021598
26. Han S, Lau YW, Saidin SF, Wei Y. ESG as one and as three: Comparative evidence on financial and non-financial performance with brand-image mediation in financial paths. Scientific Culture. 2026; 12(1.1): 1475–1503. doi: 10.5281/zenodo.11425208
27. Sweeney J, Swait J. The effects of brand credibility on customer loyalty. Journal of Retailing and Consumer Services. 2008; 15(3): 179–193. doi: 10.1016/j.jretconser.2007.04.001
28. Xu H, Li Y, Lin W, et al. ESG and customer stability: A perspective based on external and internal supervision and reputation mechanisms. Humanities and Social Sciences Communications. 2024; 11(1): 1–14. doi: 10.1057/s41599-024-03490-8
29. Lange D, Washburn NT. Understanding attributions of corporate social irresponsibility. Academy of Management Review. 2012; 37(2): 300–326. doi: 10.5465/amr.2010.0522
30. Park J, Lee H, Kim C. Corporate social responsibilities, consumer trust and corporate reputation: South Korean consumers' perspectives. Journal of Business Research. 2014; 67(3): 295–302. doi: 10.1016/j.jbusres.2013.05.016
31. Matos P. ESG and responsible institutional investing around the world: A critical review; 2020.
32. Chang CH, Lin HW, Tsai WH, et al. Employee satisfaction, corporate social responsibility and financial performance. Sustainability. 2021; 13(18): 9996. doi: 10.3390/su13189996
33. Zumente I, Bistrova J. ESG importance for long-term shareholder value creation: literature vs. practice. Zumente I, Bistrova J. ESG importance for long-term shareholder value creation: literature vs. practice. J Open Innov Technol Mark Complex. 2021; 7(2): 127. 2021;7(2): 127. doi: 10.3390/joitmc7020127
34. Longoni A, Cagliano R. Environmental and social sustainability priorities: Their integration in operations strategies. International Journal of Operations & Production Management. 2015; 35(2): 216–245.
35. Henisz WJ, Dorobantu S, Nartey LJ. Spinning gold: The financial returns to stakeholder engagement. Strategic Management Journal. 2014; 35(12): 1727–1748. doi: 10.1002/smj.2180

36. Yu M, Zhao R. Sustainability and firm valuation: an international investigation. International journal of accounting and information management. 2015; 23(3): 289–307. doi: 10.1108/ijaim-07-2014-0050
37. Jafar R, Basuki B, Windijarto W, et al. Environmental, social and governance disclosure and cost of equity: The moderating effects of board structures. Cogent Business & Management. 2024; 11(1): 2429794. doi: 10.1080/23311975.2024.2429794
38. Liang L, Ding T, Tan R, Song M. ESG performance evaluation and reporting. In: The ESG Systems in Chinese Enterprises: Theory and Practice. Springer Nature Singapore; 2025. pp. 213–242. doi: 10.1007/978-981-96-5459-8_8
39. Hassel L, Nilsson H, Nyquist S. The value relevance of environmental performance. European Accounting Review. 2005; 14(1): 41–61. doi: 10.1080/0963818042000279722
40. Semenova N, Hassel LG. Financial outcomes of environmental risk and opportunity for US companies. Sustainable Development. 2008; 16(3): 195–212. doi: 10.1002/sd.365
41. Duque-Grisales E, Aguilera-Caracuel J. Environmental, social and governance scores and financial performance of multilatinas: Moderating effects of geographic international diversification and financial slack. Journal of Business Ethics. 2021; 168(2): 315–334. doi: 10.1007/s10551-019-04177-w
42. Cuervo-Cazurra A. Multilatinas as sources of new research insights: The learning and escape drivers of international expansion. Journal of Business Research. 2016; 69(6): 1963–1972. doi: 10.1016/j.jbusres.2015.10.142
43. Fiaschi D, Giuliani E, Nieri F. Overcoming the liability of origin by doing no-harm: Emerging country firms' social irresponsibility as they go global. Journal of World Business. 2017; 52(4): 546–563. doi: 10.1016/j.jwb.2016.09.001
44. Peng LS, Isa M. Environmental, social and governance practices and performance in Shariah firms: Agency or stakeholder theory? Asian Academy of Management Journal of Accounting & Finance. 2020; 16(1).
45. Garcia AS, Mendes-Da-Silva W, Orsato RJ. Sensitive industries produce better ESG performance: evidence from emerging markets. Journal of Cleaner Production. 2017; 150: 135–147. doi: 10.1016/j.jclepro.2017.02.180
46. Kalia D, Aggarwal D. Examining impact of ESG score on financial performance of healthcare companies. Journal of Global Responsibility. 2023; 14(1): 155–176. doi: 10.1108/jgr-05-2022-0045
47. Eccles RG, Kastrapeli MD, Potter SJ. How to integrate ESG into investment decision-making: results of a global survey of institutional investors. Journal of Applied Corporate Finance. 2017; 29(4): 125–133. doi: 10.1111/jacf.12267
48. Abdallah WM, Alnamri M. Non-financial performance measures and the BSC of multinational companies with multi-cultural environment: An empirical investigation. Cross Cultural Management. 2015; 22(4): 594–607. doi:
49. Ishikawa A, Fujimoto S, Mizuno T. Statistical properties of labor productivity distributions. Frontiers in Physics. 2022; 10: 848193. doi: 10.3389/fphy.2022.848193
50. Song J. Corporate ESG performance and human capital investment efficiency. Finance Research Letters. 2024; 62: 105239. doi: 10.1016/j.frl.2024.105239
51. Kemp D, Owen JR. Community relations and mining: Core to business but not "core business." Resources Policy. 2013; 38(4): 523–531. doi: 10.1016/j.resourpol.2013.08.003
52. Becchetti L, Bobbio E, Prizia F, et al. Going deeper into the S of ESG: A relational approach to the definition of social responsibility. Sustainability. 2022; 14(15): 9668. doi: 10.3390/su14159668
53. Fung B. The demand and need for transparency and disclosure in corporate governance. Universal Journal of Management. 2014; 2(2): 72–80.
54. Fischer R, Ferreira MC, Van Meurs N, et al. Does organizational formalization facilitate voice and helping organizational citizenship behaviors? It depends on (national) uncertainty norms. Journal of International Business Studies. 2019; 50(1): 125–134. doi: 10.1057/s41267-017-0132-6
55. Koufopoulos D N, Gkliatis I P, Athanasiadis K, et al. The importance of board size. Available at SSRN 3788909, 2020.
56. Brochet F, Loumioti M, Serafeim G. Speaking of the short-term: disclosure horizon and managerial myopia. Review of Accounting Studies. 2015; 20(3): 1122–1163. doi: 10.1007/s11142-015-9329-8
57. Unruh G, Kiron D, Kruschwitz N, et al. Investing for a sustainable future: Investors care more about sustainability than many executives believe. MIT Sloan Management Review. 2016; 57(4).
58. Schoenmaker D, Schramade W. Investing for long-term value creation. Journal of Sustainable Finance & Investment. 2019; 9(4): 356–377. doi: 10.1080/20430795.2019.1625012
59. Gu R, He Z. Can environmental regulation improve labor allocation efficiency? Evidence from China's new environmental protection law. Sustainability. 2023; 15(7): 6058. doi: 10.3390/su15076058

60. Piwowar-Sulej K, Malik S, Shobande OA, et al. A contribution to sustainable human resource development in the era of the COVID-19 pandemic. Journal of Business Ethics. 2024; 191(2): 337–355. doi: 10.1007/s10551-023-05456-3
61. Shahzadi G, John A, Qadeer F, et al. CSR beyond symbolism: The importance of substantive attributions for employee CSR engagement. Journal of Cleaner Production. 2024; 436: 140440. doi: 10.1016/j.jclepro.2023.140440
62. Lannelongue G, Gonzalez-Benito J, Quiroz I. Environmental management and labour productivity: the moderating role of capital intensity. Journal of Environmental Management. 2017; 190: 158–169. doi: 10.1016/j.jenvman.2016.11.051
63. Koo JE, Ki ES. Internal control personnel's experience, internal control weaknesses, and ESG rating. Sustainability. 2020; 12(20): 8645. doi:
64. Berrone P, Fosfuri A, Gelabert L. Does greenwashing pay off? Understanding the relationship between environmental actions and environmental legitimacy. Journal of Business Ethics. 2017; 144(2): 363–379. doi: 10.3390/su12208645
65. Yin Z, Zhang Z. Manager tenure, internal control and strategic differences. China Soft Science. 2016; 312: 132–143.
66. Ruan L, Li J, Huang S. News or noise? ESG disclosure and stock price synchronicity. International Review of Financial Analysis. 2024; 95: 103483. doi: 10.1016/j.irfa.2024.103483
67. Zhang H, Sun Y, Zhu P. The relationship between environmental accounting disclosure and financial performance and heterogeneity analysis: evidence from Chinese pharmaceutical manufacturing industry. International Journal of Accounting and Finance Reporting. 2025; 15(2): 47–68. doi: 10.5296/ijafr.v15i2.22875
68. Wang X, Zhang Z, Chun D. The influencing mechanism of internal control effectiveness on technological innovation: CSR as a mediator. Sustainability. 2021; 13(23): 13122. doi: 10.3390/su132313122
69. Haryanto H, Suharman H, Koeswayo PS, Umar H. Does internal control promote employee engagement drivers? A systematic literature review. Australasian Accounting, Business and Finance Journal. 2023; 17(4): 192–203. doi: 10.14453/aabfj.v17i4.12
70. Yoon I, Lee H, Choi D, et al. Quantitative and qualitative investments in internal control personnel and firm operational efficiency: Evidence from Korea. Investment Management & Financial Innovations. 2023; 20(3): 273. doi: 10.21511/imfi.20(3).2023.23
71. IFRS S. General requirements for disclosure of sustainability-related financial information. Sustainability Disclosure Standard. International Sustainability Standards Board; 2023.
72. Committee of Sponsoring Organizations of the Treadway Commission. Using the COSO Framework to Establish Internal Controls Over Sustainability Reporting (ICSR); 2023.
73. Yang L, Qin H, Gan Q, et al. Internal control quality, enterprise environmental protection investment and finance performance: An empirical study of China's A-share heavy pollution industry. International Journal of Environmental Research and Public Health. 2020; 17(17): 6082. doi: 10.3390/ijerph17176082
74. Hoai TT, Nguyen NP. Internal control systems and performance of emerging market firms: The moderating roles of leadership consistency and quality. SAGE Open. 2022; 12(3): 21582440221123509. doi: 10.1177/21582440221123509
75. Hajiani H, Afshari MH, Rezaei M. Identifying and evaluating a model for enhancing the assessment of internal controls and accounting systems. Business, Marketing, and Finance Open. 2024; 1(4): 14–24. doi:
76. Tao L, Wei X, Wang W. Does enterprise internal control improve environmental performance—empirical evidence from China. Sustainability. 2023; 15(13): 10199. doi: 10.3390/su151310199
77. Ning WU, Kao-dui LI, Guo-dong LI. Internal control, marketization process and corporate risk-taking. Commercial Research. 2015; 57(7): 144. doi:
78. Zhu D, Gao X, Luo Z, Xu W. Environmental performance and corporate risk-taking: Evidence from China. Evidence from China. Pacific-Basin Finance Journal. 2022; 74: 101811. doi: 10.1016/j.pacfin.2022.101811
79. Kroes J, Subramanian R, Subramanyam R. On the link between environmental and market performance under market-based environmental regulation. SSRN; 2008.
80. Gangi F, Daniele LM, Varrone N. How do corporate environmental policy and corporate reputation affect risk-adjusted financial performance? Business Strategy and the Environment. 2020; 29(5): 1975–1991. doi: 10.1002/bse.2482
81. Delmas MA, Pekovic S. Environmental standards and labor productivity: Understanding the mechanisms that sustain sustainability. Journal of Organizational Behavior. 2013; 34(2): 230–252. doi: 10.1002/job.1827
82. Shanghai Huazheng Index Information Service Co Ltd. ESG stock rating data. Available online: https://www.chindices.com/files/Sino-Securities+Index+ESG+Ratings+Methodology+V2.1.pdf (accessed on 18 March 2026)

83. Atan R, Alam MM, Said J, et al. The impacts of environmental, social, and governance factors on firm performance: Panel study of Malaysian companies. Management of Environmental Quality: An International Journal. 2018; 29(2): 182–194. doi: 10.1108/MEQ-03-2017-0033
84. Naeem N, Cankaya S, Bildik R. Does ESG performance affect the financial performance of environmentally sensitive industries? A comparison between emerging and developed markets. Borsa Istanbul Review. 2022; 22: S128–S140. doi: 10.1016/j.bir.2022.11.014
85. Fu T, Li J. An empirical analysis of the impact of ESG on financial performance: The moderating role of digital transformation. Frontiers in Environmental Science. 2023; 11: 1256052. doi: 10.3389/fenvs.2023.1256052
86. Aydoğmuş M, Gülay G, Ergun K. Impact of ESG performance on firm value and profitability. Borsa Istanbul Review. 2022; 22: S119–S127. doi: 10.1016/j.bir.2022.11.006
87. Tobin J. A general equilibrium approach to monetary theory. Journal of Money, Credit and Banking. 1969; 1(1): 15–29. doi: 10.2307/1991374
88. Singh S, Tabassum N, Darwish TK, et al. Corporate governance and Tobin's Q as a measure of organizational performance. British Journal of Management. 2018; 29(1): 171–190. doi: 10.1111/1467-8551.12237
89. Kaplan R S, Norton D P. The balanced scorecard: Measures that drive performance. Boston, MA, USA: Harvard Business Review; 2005.
90. Huang R, Huang Y. Does internal control contribute to a firm's green information disclosure? Evidence from China. Sustainability. 2020; 12(8): 3197. doi: 10.3390/su12083197
91. Chan KC, Chen Y, Liu B. The linear and non-linear effects of internal control and its five components on corporate innovation: Evidence from Chinese firms using the COSO framework. European Accounting Review. 2021; 30(4): 733–765. doi: 10.1080/09638180.2020.1776626
92. Wu X, Zeng S. R&D investment, internal control and enterprise performance—an empirical study based on the listed companies in China of the core industry of the digital economy. Sustainability. 2022; 14(24): 16700. doi: 10.3390/su142416700
93. Wu L, Zhai Z, Lv Y. A cross-cultural study of ESG impact on corporate performance and equity. *Accounting & Finance*. 2024; 64(5): 4771–4788. doi: 10.1111/acfi.13345
94. Jiang W. Corporate ESG performance, information transparency and financial performance. Finance. 2024; 14(3): 763–776. doi: 10.12677/fin.2024.143081
95. Acharya VV, Myers SC, Rajan RG. The internal governance of firms. The Journal of Finance. 2011; 66(3): 689–720. doi: 10.1111/j.1540-6261.2011.01649.x
96. Chen SS, Chen IJ. Corporate governance and capital allocations of diversified firms. Journal of Banking & Finance. 2012; 36(2): 395–409. doi: 10.1016/j.jbankfin.2011.07.013
97. Lin MF, Yu P. The association between earnings persistence and internal control quality: Evidence from China. Journal of Finance and Economics. 2015; 3(4): 38–68. doi: 10.12735/jfe.v3i4p38
98. Guo Y, Hong Y. How does ESG information disclosure affect corporate total factor productivity? Evidence from A-share listed companies (Chinese). Wuhan Finance. 2023; (7): 13–22. doi: 10.3969/j.issn.1009-3540.2023.07.002
Neyestani B. Effects of ISO 9001 standard on critical factors of project management in construction industry. 2017: 23–24. doi: 10.17758/URUAE.AE011750353
99. Li X, Liu Y, Saat MM. ESG and firm value: Unlocking thes= power of internal control. Journal of Contemporary Management Studies. 2025; 1(1): 34–45. doi: 10.11113/
100. Hammersley JS, Myers LA, Shakespeare C. Market reactions to the disclosure of internal control weaknesses and to the characteristics of those weaknesses under section 302 of the Sarbanes-Oxley Act of 2002. Review of Accounting Studies. 2008; 13(1): 141–165. doi: 10.1007/s11142-007-9046-z
101. Li Y, Yu J, Zhang Z, et al. The effect of internal control weakness on firm valuation: evidence from SOX Section 404 disclosures. Finance Research Letters. 2016; 17: 17–24. doi: 10.1016/j.frl.2016.01.001
102. Ashbaugh-Skaife H, Collins DW, Kinney WR Jr. The discovery and reporting of internal control deficiencies prior to SOX-mandated audits. Journal of Accounting and Economics. 2007; 44(1–2): 166–192.
103. Lobo G, Wang C, Yu X, et al. Material weakness in internal controls and stock price crash risk. Journal of Accounting, Auditing & Finance. 2020; 35(1): 106–138. doi: 10.1177/0148558X17696761

104. Vuong NB. Investor sentiment, corporate social responsibility, and financial performance: evidence from Japanese companies. *Borsa Istanbul Review*. 2022; 22(5): 911–924. doi: 10.1016/j.bir.2022.06.010
105. Fang L, Guo X. From responsibility to value: ESG and long-term corporate value. PLoS One. 2025; 20(4): e0322018. doi: 10.1371/journal.pone.0322018
106. Baugh M, Ege MS, Yust CG. Internal control quality and bank risk-taking and performance. Auditing: A Journal of Practice & Theory. 2021; 40(2): 49–84. doi: 10.2308/AJPT-19-037
107. Imdieke AJ, Li C, Zhou S. Does the presence of an internal control audit affect firm operational efficiency? Contemporary Accounting Research. 2023; 40(2): 952–980. doi: 10.1111/1911-3846.12839
108. Qiu D, Jiao Y, Yeoh W, et al. Proceedings of the 2022 International Conference on Bigdata Blockchain and Economy Management (ICBBEM 2022). Vol 5. Springer Nature; 2022.
109. Asare E, Owusu-Manu DG, Ayarkwa J, et al. Thematic literature review of working capital management in the construction industry: trends and research opportunities. Construction Innovation. 2023; 23(4): 775–791. doi: 10.1108/CI-09-2021-0177
110. Lutz J. Committee of sponsoring organizations of the treadway commission: Internal control; integrated framework mit besonderer berücksichtigung der änderungen in der neuauflage 2013. 2014.
111. Xiao-Lin H, Chen G. Internal control and corporate performance: industry clustering analysis and an empirical test based on Chinese listed companies. Huadong Shifan Daxue Xuebao Ziran Kexue Ban. 2017; 49(2): 173. doi: 10.16382/j.cnki.1000-5579.2017.02.018
112. Han S, Lau YW, Saidin SF. Corporate ESG disclosure in agribusiness: Effects on market value and investor behavior. Research on World Agricultural Economy. 2026; 7(1): 377–399. doi: 10.36956/rwae.v7i1.2631
113. Ma X, Ock YS, Wu F, Zhang Z. The effect of internal control on green innovation: Corporate environmental investment as a mediator. Sustainability. 2022; 14(3): 1755. doi: 10.3390/su14031755
114. Zhang J, Liu Z. Study on the impact of corporate ESG performance on green innovation performance—evidence from listed companies in China A-shares. Sustainability. 2023; 15(20): 14750. doi: 10.3390/su152014750
115. Alnor NHA. Corporate governance characteristics and environmental sustainability affect the business performance among listed Saudi company. Sustainability. 2024; 16(19): 8436. doi: 10.3390/su16198436
116. Abozaid EM, Shehab LS, Alnor NHA, et al. Do corporate risks and profitability affect sustainability disclosure? Evidence from the Saudi business environment. WSEAS Trans Bus Econ. 2025; 22: 1393–1404. doi: 10.37394/23207.2025.22.113
117. Peng Y, Zhang Q, Yan H, et al. Short-term relief or long-term risk? The impact of financial asset allocation on corporate risk in China's construction and manufacturing firms. Journal of Asian Architecture and Building Engineering. 2025: 1–14. doi: 10.1080/13467581.2025.2527978
118. Ma S, Yan H, Yang Y, et al. Does water pollution truly erode corporate ESG performance? Evidence from China. Evidence from China. Water Economics and Policy. 2026: 2650003. doi: 10.1142/S2382624X26500037
119. Ma S, Liu H, Zeng H, et al. From loom to algorithm: how digital technologies drive quality development in the textile sector. The Journal of The Textile Institute. 2026: 1–17. doi: 10.1080/00405000.2026.2622882