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RESEARCH ARTICLE

How Does ESG Performance Shape Firm Value through Stakeholder Cognition and Attention?Evidence from China's A-Share Listed Firms

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ABSTRACT

Against the background of China's accelerated green transition and the increasing institutionalization of ESG disclosure under the dual-carbon goals, sustainability information has become a salient cue in capital market evaluation while still operating under conditions of information asymmetry. Within this context, this study examines how ESG performance shapes firm value through stakeholder cognition and attention by incorporating insights from environmental psychology. Using an unbalanced panel of non-financial A-share listed firms from 2011 to 2024 (31,198 firm-year observations), fixed-effects regressions show that ESG performance is positively associated with Tobin's Q. Consistent with environmental psychology, ESG engagement enhances stakeholders' environmental cognition by increasing the salience and interpretability of sustainability signals, which in turn influences evaluative judgments and market responses. Mediation results indicate that ESG significantly strengthens green innovation cognition (LnGreen_inn), and this cognition is positively priced by the market; introducing cognition attenuates the direct ESG effect, indicating partial mediation. Overall, the findings suggest that ESG creates value not mechanically but by shaping stakeholders' cognitive processing and attention allocation toward firms' environmental responsibility and long-term growth quality in China's emerging capital market.

Keywords: ESG performance; firm value; AMO model; stakeholder theory; sustainable development; China

1. Introduction

Rapid global economic expansion has generated profound environmental and social challenges, including climate change, ecological degradation, and growing socioeconomic uncertainty. Accelerated ice melting, rising carbon emissions, and persistent industrial pollution have intensified climate-related risks, while inflationary pressures and employment instability have heightened social vulnerability[1]. These developments have increasingly exposed the limitations of the traditional growth paradigm, which prioritizes short-term financial performance and GDP expansion while externalizing environmental and social costs. In this context, conventional financial indicators alone are no longer sufficient to capture firms' long-term

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competitiveness, resilience, or social legitimacy[2].

Against this backdrop, environmental, social, and governance (ESG) considerations have moved from peripheral ethical concerns to central elements of corporate evaluation and capital market decision-making. Beyond reflecting firms' sustainability practices, ESG performance has become an important informational signal through which stakeholders interpret corporate intentions, assess risk, and form expectations about future performance[3]. As ESG-related disclosure expands and ESG-oriented investment grows, market participants increasingly rely on ESG information to guide attention allocation, judgment, and behavioral responses. Consequently, ESG performance no longer functions merely as a normative label, but as a mechanism that shapes stakeholder cognition and influences market outcomes.From a stakeholder-oriented and social-psychological perspective, the economic consequences of ESG performance depend not only on firms' objective sustainability actions, but also on how these actions are perceived, interpreted, and attended to by key stakeholder groups, including investors, employees, consumers, regulators, and information intermediaries[4]. Environmental initiatives such as emission reduction and green innovation may enhance stakeholders' environmental cognition and risk perceptions; social responsibility practices may affect trust, identification, and reputational judgments; and governance quality may influence perceptions of transparency, fairness, and managerial credibility. Through these psychological and cognitive channels, ESG performance can shape stakeholders' willingness to allocate resources, support innovation, provide financing, and engage in external monitoring, thereby influencing firm value.

China provides a particularly salient emerging-market context for examining these processes. As the world's second-largest economy, China has pursued rapid economic growth alongside an accelerating transition toward green and low-carbon development. Since the announcement of the "dual-carbon" goals in 2020—peaking carbon emissions by 2030 and achieving carbon neutrality by 2060—sustainability and ESG governance have been increasingly embedded in national development strategies, regulatory frameworks, and capital market institutions[5]. Policy initiatives under the 14th Five-Year Plan, the expansion of green finance, and the progressive standardization of ESG disclosure have collectively transformed ESG from a largely voluntary practice into an increasingly institutionalized expectation for listed firms.Importantly, this institutional evolution has substantially enhanced the visibility and comparability of ESG information in China's capital market. By the early 2020s, nearly all Chinese A-share listed firms had been incorporated into third-party ESG rating systems, enabling stakeholders to systematically observe, compare, and evaluate firms' sustainability performance[7]. This increased transparency has amplified the role of ESG as a cognitive and attentional cue, shaping how investors, analysts, and the media allocate attention and form evaluations in the market.

Despite the growing prominence of ESG, empirical evidence on its relationship with firm value remains inconclusive, particularly in emerging markets. Existing studies report mixed findings and often focus on direct associations, while paying limited attention to the psychological and behavioral mechanisms through which ESG performance is translated into economic outcomes. Specifically, how ESG performance influences firm value by shaping stakeholder cognition, attention, and subsequent market responses remains insufficiently understood[8]. Addressing this gap is especially important in the Chinese context, where rapid institutional change and expanding ESG disclosure provide a unique setting to observe the interaction between sustainability signals, stakeholder psychology, and market valuation.

Building on stakeholder theory and insights from social and environmental psychology, this study examines how ESG performance affects firm value through stakeholder cognition and attention. By focusing on mechanisms such as green cognition, innovation-related behavioral responses, financing constraints, and

media attention, this research aims to clarify the psychological transmission pathways linking ESG performance to firm value in an emerging-market setting. In doing so, it contributes to a more nuanced understanding of ESG not only as a governance framework, but also as a social signal that shapes stakeholder perceptions, attention allocation, and economic behavior.

Against this backdrop, this study selects non-financial A-share listed firms in China from 2011 to 2024 as the research sample and constructs an unbalanced panel dataset comprising 31,198 firm-year observations to systematically analyze the relationship between ESG performance and firm value. Descriptive statistics show that the average ESG score of sample firms is 73.70, with a standard deviation of 4.50, indicating a certain degree of cross-sectional variation. Further decomposition across the three ESG pillars reveals that the governance (G) dimension exhibits the highest average score (79.6, standard deviation 5.90), followed by the social (S) dimension (75.2, standard deviation 7.90), while the environmental (E) dimension scores significantly lower (61.5, standard deviation 7.10). This "pillar imbalance" suggests that Chinese listed firms have developed relatively stable and institutionalized practices in governance and social responsibility, whereas environmental performance remains subject to greater constraints and leaves substantial room for improvement. **Figure 1** visually presents the mean values and dispersion of overall ESG scores and the three pillars, providing empirical motivation for subsequent pillar-level analyses of ESG's value effects.

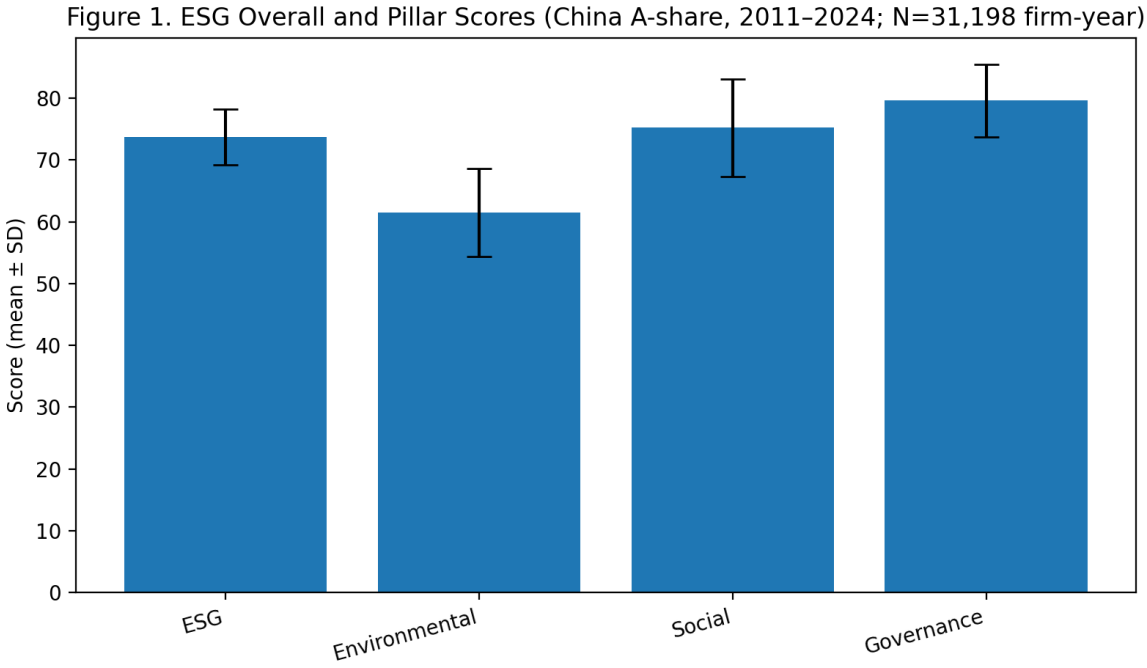

Figure 1. ESG Overall and Pillar Scores

At the firm value level, the mean Tobin's Q of the sample firms is 1.98, with a standard deviation of 1.177, a minimum value of 0.831, and a maximum value of 7.961, indicating substantial heterogeneity in market valuation across firms. This variation provides sufficient dispersion to identify the economic significance of ESG performance in explaining firm value. Correlation analysis further reveals a statistically significant positive association between the overall ESG score and Tobin's Q (correlation coefficient = 0.1433, significant at the 1% level), offering preliminary statistical evidence of the value relevance of ESG.More importantly, ESG exhibits consistent directional relationships with the four stakeholder-oriented mediating variables specified in this study. ESG is significantly positively correlated with green cognition and the accumulation of green innovation (LnGreen_inn; 0.1520), R&D intensity (RD Int; 0.2051), and

media attention (Media; 0.1302), while it is significantly negatively correlated with financing constraints (FC; −0.0779)[9]. Correspondingly, these mediating variables also display correlation patterns with firm value that are consistent with theoretical expectations. **Figure 2** summarizes the correlations among ESG, the key mediating variables, and Tobin's Q, providing intuitive empirical support for the subsequent mechanism tests.

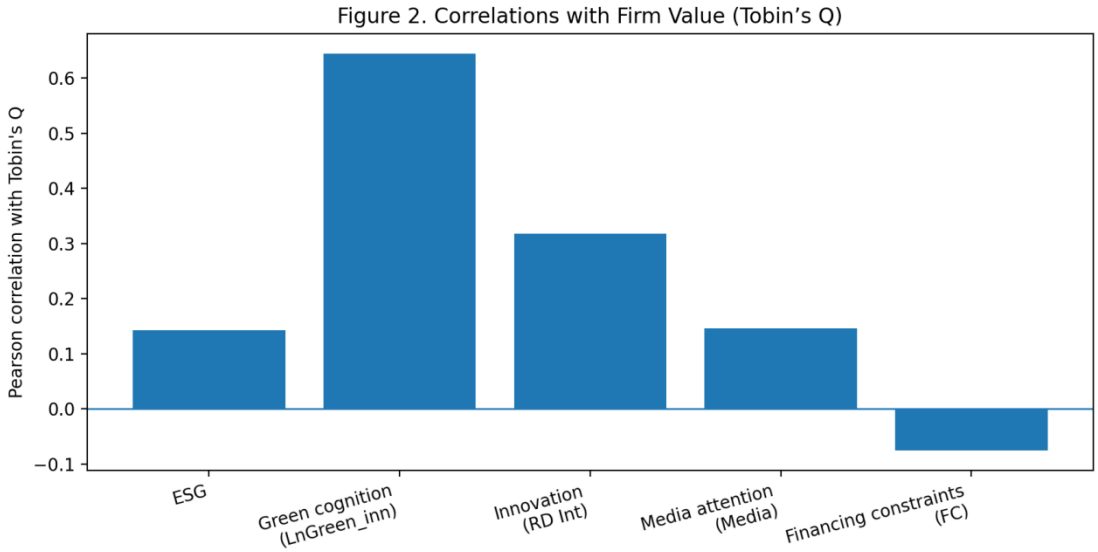

Figure 2. Correlations with Tobin's Q

Based on the institutional background and data characteristics discussed above, this study argues that China's A-share market has entered a stage in which ESG performance carries substantive economic meaning. However, its value effects do not arise automatically or uniformly; rather, they depend on firms' internal capability configurations, the external institutional environment, and the response mechanisms of stakeholders[10]. Accordingly, merely testing whether ESG affects firm value is insufficient to explain observed heterogeneity in outcomes. It is more important to address through which channels ESG influences firm value and under what conditions such effects become more pronounced.

In light of this reasoning, this study takes firm value as the core outcome variable and, within a macro–micro analytical framework grounded in sustainable development theory and stakeholder theory, introduces the Ability–Motivation–Opportunity (AMO) theory to characterize the foundations of ESG performance formation. It further examines the mechanisms through which ESG affects firm value via four stakeholder-oriented mediating pathways—green cognition, innovation investment, financing constraints, and media attention—thereby systematically uncovering the value-conversion logic of ESG performance in an emerging-market context.

From the perspective of environmental psychology, the economic consequences of ESG performance are not mechanically generated by sustainability actions themselves, but are socially constructed through a perception–attitude–behavior transmission chain. In this chain, green cognition should be understood not as a purely statistical mediator, but as a psychologically grounded cognitive state reflecting how stakeholders perceive, encode, and interpret a firm's environmental signals. ESG disclosure, third-party ESG ratings, and visible environmental initiatives function as salient environmental cues that increase the accessibility of sustainability-related information, shape stakeholders' risk–responsibility perceptions, and structure what stakeholders believe is environmentally relevant about the firm[11]. In other words, ESG performance first operates at the perception stage, where it influences attention allocation and environmental meaning-making:

stakeholders detect and process ESG cues, update beliefs about environmental impact, regulatory exposure, and transition risk, and form a cognitive representation of "how green" and "how credible" the firm appears.

These perceptions then translate into the attitude stage, where stakeholders develop relatively stable evaluative orientations toward the firm, including environmental approval, trust, moral legitimacy, and identification. When ESG signals are interpreted as credible and consistent (rather than symbolic), stakeholders are more likely to form positive environmental attitudes and normative expectations regarding the firm's responsibility and future orientation. This attitudinal formation is critical because it links cognition to subsequent action: green cognition is not merely "knowing that the firm is green," but a process through which perceived environmental information becomes evaluative judgment, shaping stakeholders' willingness to support the firm, tolerate uncertainty, and attribute long-term value to sustainability-oriented strategies.

Finally, these attitudes manifest in the behavior stage through observable stakeholder responses that are economically consequential. Investors may adjust valuation and resource allocation, analysts and information intermediaries may intensify coverage and dissemination, creditors may alter the pricing and availability of capital, and regulators and the public may increase or reduce scrutiny. Within the firm, managerial responses—such as green innovation investment—can also be interpreted as a behavioral manifestation of external expectations and internalized environmental orientation. Therefore, ESG performance affects firm value by activating an environmental psychological mechanism in which perceived ESG cues (perception) foster environmental evaluations and legitimacy judgments (attitude), which subsequently drive resource allocation and strategic responses (behavior) in both markets and organizations[12].

Guided by this environmental-psychological logic, this study theorizes that ESG performance becomes value-relevant to the extent that it strengthens stakeholders' green cognition and systematically converts environmental perceptions into attitudinal support and behavioral engagement. Accordingly, we examine four stakeholder-oriented behavioral channels through which ESG performance may be translated into firm value in China's A-share market: (i) green cognition as the proximal cognitive-perceptual foundation, (ii) innovation-related behavioral responses as strategic actions consistent with attitudinal expectations, (iii) financing constraints as market-based resource allocation behavior, and (iv) media attention as an attentional and informational behavior reflecting social amplification mechanisms. This framework clarifies why ESG may generate heterogeneous valuation outcomes across firms and contexts: ESG matters when it is psychologically processed, evaluatively endorsed, and behaviorally enacted by stakeholders.

2.Theoretical foundations

Recent scholarship has increasingly examined the relationship between ESG performance and firm value as sustainability considerations become embedded in capital-market evaluation, particularly under China's dual-carbon transition and tightening disclosure environment. A growing body of evidence suggests that ESG is not merely a reporting label, but a multidimensional governance and information construct that influences corporate behavior through environmental management, social responsibility, and internal control arrangements. Firm value, in turn, reflects investors' forward-looking assessments of expected cash flows, growth opportunities, and risk exposure[13]. Importantly, the linkage between ESG performance and firm value is increasingly mediated by how ESG-related information is cognitively processed, attended to, and acted upon by market participants rather than by firms' sustainability actions alone.

Despite rapid growth in the literature, existing research remains conceptually and empirically fragmented. One major stream focuses on the determinants of ESG engagement, emphasizing regulatory pressure, governance structures, market monitoring, and resource endowments. Another stream examines the

economic consequences of ESG, documenting its associations with valuation, risk, cost of capital, and performance outcomes. A third stream seeks to open the "black box" by exploring transmission mechanisms through which ESG performance may affect firm value. However, these mechanism-oriented studies often isolate single channels—such as financing constraints, innovation investment, or media coverage—without embedding them into a unified explanatory framework centered on stakeholder cognition and attention. As a result, the literature still lacks integrated evidence that simultaneously explains (i) why firms exhibit heterogeneous ESG performance within a shared institutional environment and (ii) how ESG performance is translated into firm value through stakeholder-oriented psychological and informational processes, particularly in emerging markets where disclosure regimes, information intermediaries, and institutional constraints co-evolve[15].A second unresolved issue concerns measurement and inference. ESG ratings have become the dominant empirical infrastructure in this field, yet substantial divergence across rating providers has been widely documented. Such divergence arises from differences in indicator selection, data sources, weighting schemes, and aggregation rules rather than from purely random measurement error. These inconsistencies complicate cross-study comparability and contribute to mixed empirical findings on the ESG–firm value relationship. In a single-country setting such as China's A-share market, the use of a widely adopted domestic ESG rating can enhance within-market comparability. However, doing so also requires explicit theoretical clarification regarding what ESG scores represent—whether substantive sustainability practices, disclosure quality, or a combination of both—and how such scores function as cognitive and attentional signals in capital markets.

A third limitation of the existing literature is that the ESG–value relationship appears context-dependent rather than uniform. Empirical evidence points to heterogeneous effects across firm size, ownership structure, industry pollution intensity, and information environments. These patterns suggest that ESG payoffs depend not only on what firms do, but also on whether and how stakeholders recognize, interpret, and attend to ESG-related information. In other words, ESG performance can affect firm value only when it enters stakeholders' cognitive frames, attracts sustained attention from investors, analysts, and the media, and triggers behavioral responses such as investment reallocation, enhanced monitoring, or reputational reassessment. This perspective highlights the need to explicitly incorporate stakeholder cognition and attention into the analysis of ESG valuation effects.Against this backdrop, the purpose of this chapter is to synthesize prior research in a manner that directly motivates the integrated framework developed in the subsequent section. Specifically, the review organizes existing findings around three interrelated questions: what drives ESG performance, how firm value is conceptualized and measured in empirical studies, and through which stakeholder cognition- and attention-based channels ESG performance influences market valuation. This organization is intended to bridge previously compartmentalized strands of research and to establish the theoretical logic underpinning the dissertation's empirical strategy[16]. By treating ESG performance simultaneously as a governance outcome and an informational signal, and by conceptualizing firm value as a forward-looking market response shaped by stakeholder perceptions and attention allocation, the review sets the stage for a coherent causal chain linking ESG antecedents, ESG performance, and valuation consequences[17].

Building on this synthesis, the paper anchors its theoretical foundations in sustainable development theory, stakeholder theory, and the AMO (ability–motivation–opportunity) framework, which together provide complementary explanatory power for ESG behavior and its valuation implications. Sustainable development theory offers a macro-level value logic by framing corporate success as long-term value creation under ecological constraints and social welfare considerations[18]. From this perspective, ESG performance represents firms' strategic responses to climate-transition pressures and sustainability expectations that are increasingly internalized into policy regimes and market pricing[19]. Firms that

effectively manage environmental risks, improve resource efficiency, and institutionalize responsible practices are better positioned to stabilize future cash flows and reduce downside risk, thereby enhancing long-term valuation potential[20].Stakeholder theory provides the micro-level transmission logic by explaining how ESG performance affects firm value through stakeholders' cognitive evaluations, attention allocation, and resource-allocation decisions. Firms operate within complex networks of investors, creditors, regulators, employees, customers, supply-chain partners, communities, and information intermediaries. ESG practices and disclosures shape stakeholders' beliefs about firm reliability, risk management quality, and long-term orientation. When ESG performance is credible and salient, it can reduce information asymmetry, strengthen legitimacy, and intensify external monitoring by investors, analysts, and the media, thereby easing capital-market frictions and improving access to strategic resources[21]. This stakeholder-centered view also explains why ESG valuation effects are heterogeneous: outcomes depend on which stakeholders dominate the information environment and how strongly their attention and responses are activated[22].

To account for systematic variation in ESG performance across firms facing the same broad institutional backdrop, this study further incorporates the AMO framework[23]. AMO posits that performance-related outcomes are jointly determined by ability, motivation, and opportunity, emphasizing complementarities among these elements. Applied to ESG, ability reflects firms' resource endowments, managerial capacity, and implementation capabilities; motivation captures incentive structures and governance arrangements that encourage long-term sustainability engagement; and opportunity represents external conditions such as regulatory pressure, policy support, market scrutiny, and regional green-development levels[24]. By structuring ESG antecedents within the AMO logic, the framework offers an integrative explanation for ESG heterogeneity and supports a staged empirical approach in which AMO conditions shape ESG performance before ESG performance influences firm value through stakeholder cognition and attention[25].

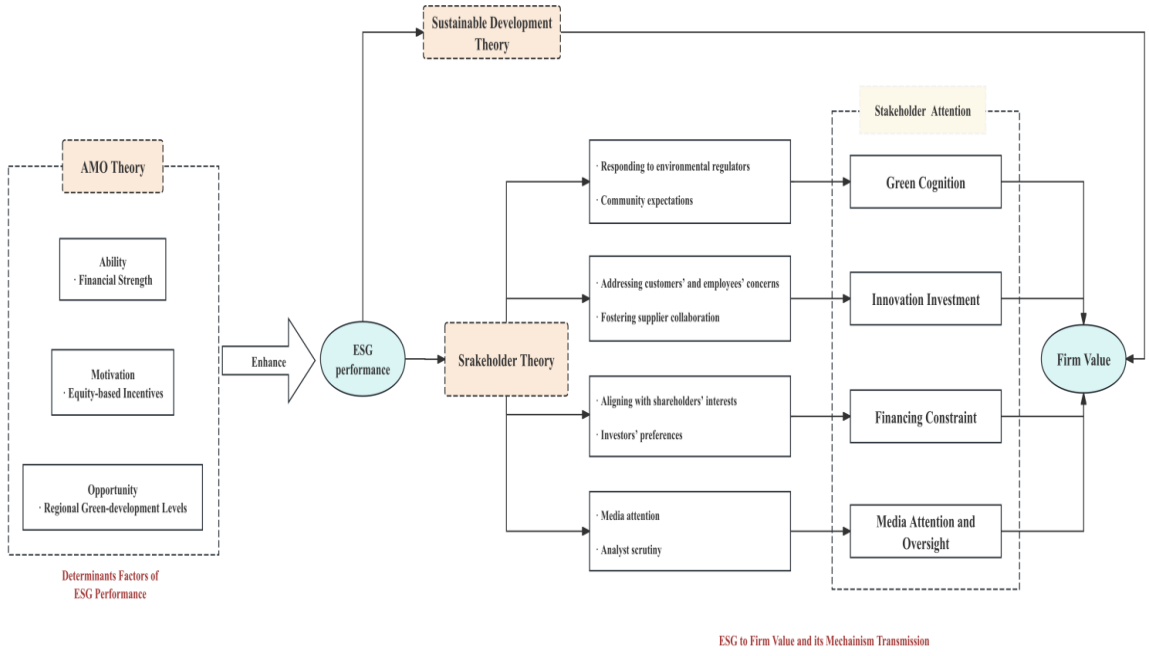

Figure 3. Theoretical frameworks of ESG to Firm value

Figure 3 presents the integrated theoretical framework developed in this study, illustrating how ESG performance is shaped by internal and external determinants and how it is subsequently translated into firm

value through stakeholder-mediated mechanisms[26]. The framework synthesizes insights from AMO theory, sustainable development theory, and stakeholder theory into a coherent causal structure that links ESG antecedents, ESG performance, and valuation outcomes.

On the left-hand side, the framework conceptualizes ESG performance as an outcome jointly determined by the three core dimensions of AMO theory: ability, motivation, and opportunity. Ability is represented by firms' financial strength, capturing whether sufficient resources and operational capacity exist to undertake ESG-related investments and maintain stable disclosure practices. Motivation is reflected by equity-based incentives, which align managerial interests with long-term value creation and encourage commitment to ESG initiatives that may involve short-term costs. Opportunity is proxied by regional green-development levels, representing the external institutional and market environment that enables, rewards, or pressures firms to engage in ESG activities[27]. Together, these AMO factors enhance ESG performance, emphasizing that ESG improvement requires the alignment of internal resources, incentive structures, and supportive external conditions rather than reliance on a single driver.At the top of the framework, sustainable development theory provides the overarching normative and strategic logic[28]. It frames ESG performance as a firm-level response to ecological constraints, climate-transition risks, and social expectations, and it establishes long-term value creation as the ultimate objective. Under this perspective, ESG is not treated as a symbolic or purely compliance-oriented practice, but as a mechanism through which firms internalize environmental and social externalities and align their strategies with sustainable development goals.At the center of the framework, stakeholder theory functions as the key transmission logic linking ESG performance to firm value. ESG performance affects how firms interact with and respond to different stakeholder groups, including regulators, communities, customers, employees, investors, suppliers, analysts, and the media. These stakeholder responses generate changes in attention, monitoring, resource provision, and legitimacy, which then translate ESG performance into economic consequences.

Specifically, the framework identifies four stakeholder-mediated channels through which ESG performance influences firm value. First, ESG engagement in response to environmental regulation and community expectations fosters green cognition, reflecting firms' recognition of environmental responsibility and their strategic commitment to green innovation[29]. Second, by addressing customers' and employees' concerns and strengthening supplier collaboration, ESG performance encourages higher innovation investment, which enhances long-term growth opportunities and competitive advantage. Third, alignment with shareholders' interests and investors' preferences reduces information asymmetry and perceived risk, thereby alleviating financing constraints and improving access to external capital. Fourth, increased media attention and analyst scrutiny function as external governance mechanisms that amplify information transparency and oversight, strengthening the credibility and market visibility of ESG practices.

TThis study develops an integrated analytical framework to explain how ESG performance shapes firm value through stakeholder cognition and attention, grounded in sustainable development theory, stakeholder theory, and the AMO (ability–motivation–opportunity) framework. As illustrated in Figure 3, the framework conceptualizes ESG performance as both an outcome of firm-level strategic conditions and a social signal that triggers stakeholder cognitive and attentional processes, which subsequently translate into market valuation effects[30]. By explicitly linking ESG antecedents, ESG performance, stakeholder-oriented psychological mechanisms, and firm value within a unified causal chain, the framework addresses both why firms differ in ESG performance and how ESG performance is converted into economic value in an emerging-market context.

At the formation stage of ESG performance, the framework draws on the AMO theory to explain cross-firm heterogeneity under a shared institutional environment. Ability reflects firms' internal resource endowments and implementation capacity, captured by financial strength and organizational capability to support ESG-related investments and disclosure routines. Motivation refers to the incentives and governance arrangements that encourage managerial commitment to ESG, such as equity-based incentives that align decision makers' interests with long-term value creation rather than short-term earnings. Opportunity represents the external conditions that enable or constrain ESG engagement, including regional green-development levels and policy environments that reward sustainability-oriented behavior. By emphasizing the complementarity among ability, motivation, and opportunity, the AMO framework provides a parsimonious explanation for why some firms are better positioned to achieve higher ESG performance than others, even within the same regulatory and market setting[31].

Building on sustainable development theory, the framework interprets ESG performance as firms' strategic response to long-term ecological constraints and social expectations that are increasingly internalized into economic systems. Sustainable development theory frames corporate success not as short-term profit maximization, but as the capacity to generate enduring value while managing environmental risks and fulfilling social responsibilities. Within this perspective, ESG performance reflects firms' adaptive alignment with climate-transition pressures, regulatory requirements, and evolving societal norms. Firms that proactively integrate environmental protection, social responsibility, and sound governance into their strategies are expected to enhance long-term resilience and reduce downside risk, thereby laying the structural foundation for higher firm value over time[32].

The core contribution of the framework lies in its explicit articulation of stakeholder cognition and attention as the key transmission mechanisms linking ESG performance to firm value. Anchored in stakeholder theory, the framework posits that ESG performance does not affect market valuation automatically or mechanically. Instead, its economic consequences depend on how ESG-related information is perceived, interpreted, and attended to by salient stakeholders, including investors, employees, customers, regulators, and information intermediaries such as analysts and the media. ESG performance functions as an informational signal that shapes stakeholders' beliefs about firms' environmental responsibility, social reliability, governance quality, and long-term orientation.

Specifically, the framework identifies four interrelated stakeholder-oriented pathways through which ESG performance influences firm value. First, ESG engagement in environmental compliance and community responsiveness enhances stakeholders' green cognition by shaping their awareness, evaluation, and interpretation of firms' environmental responsibility and sustainability commitment. Strong green cognition increases stakeholders' confidence in firms' capacity to manage environmental risks and adapt to regulatory transitions, thereby positively influencing valuation. Second, ESG practices addressing employee welfare, customer responsibility, and supply-chain collaboration foster innovation-oriented behavioral responses[33]. By strengthening trust and cooperation among stakeholders, ESG performance facilitates innovation investment, which enhances firms' growth prospects and long-term value. Third, ESG performance aligned with investors' preferences and stakeholder interests can alleviate financing constraints. Credible ESG signals reduce perceived risk and information asymmetry, improving access to external capital and lowering financing costs. Fourth, ESG visibility attracts media attention and analyst scrutiny, intensifying external monitoring and oversight. While increased attention may expose firms to greater scrutiny, it also enhances transparency and discipline, reinforcing market confidence and contributing to valuation efficiency.

Importantly, stakeholder attention operates as a moderating and amplifying force across these mechanisms. Attention determines whether ESG information enters stakeholders' cognitive frames and whether ESG signals are transformed into concrete behavioral responses. In information-rich but attention-scarce capital markets, ESG performance can influence firm value only when it captures sustained attention from investors, analysts, and the media. Thus, attention is not merely an outcome of ESG performance but a critical condition for its valuation effects to materialize.Finally, the framework integrates these cognitive and attentional mechanisms to explain firm value as a forward-looking market outcome. Firm value reflects the aggregated expectations of stakeholders regarding future cash flows, growth opportunities, and risk exposure. By shaping stakeholder cognition, directing attention, and influencing resource allocation, ESG performance affects these expectations and is ultimately capitalized into market valuation[34]. The framework is particularly suited to the Chinese A-share market, where rapid institutional change, expanding ESG disclosure, and evolving information intermediaries create a dynamic environment in which ESG signals, stakeholder psychology, and market responses interact closely.

Taken together, this framework advances existing ESG research by moving beyond direct-effect models and explicitly theorizing the psychological and attentional transmission processes through which ESG performance shapes firm value. It offers a coherent theoretical foundation for the subsequent empirical analysis and contributes to a deeper understanding of ESG as both a governance practice and a social signal in emerging capital markets.

3. Materials and methods

This study adopts a theory-driven quantitative research design to examine how corporate ESG performance is formed and how it is translated into firm value in China's capital market under the dual-carbon transition and the broader sustainability agenda. The methodological logic follows a deductive structure that moves from integrated theory construction to hypothesis development and then to empirical testing using panel-data econometrics[35]. Rather than treating ESG as an exogenous attribute or a purely symbolic disclosure outcome, this research explicitly distinguishes and reconnects the antecedents of ESG performance and its valuation consequences within a unified analytical framework. This design allows us to address not only whether ESG affects firm value, but also why firms differ in ESG performance and through which stakeholder-mediated mechanisms ESG becomes economically meaningful.

At the conceptual level, the research framework integrates sustainable development theory, stakeholder theory, and the AMO (ability–motivation–opportunity) perspective. Sustainable development theory provides the macro-level rationale by redefining firm value as a long-term construct shaped by ecological constraints, climate risk, and social responsibility, rather than short-term financial returns alone. Building on this logic, stakeholder theory offers micro-foundations by explaining ESG engagement as firms' strategic responses to heterogeneous stakeholder expectations, including those of regulators and communities, employees and customers, investors, and information intermediaries such as the media and analysts. To explain why firms exhibit substantial heterogeneity in ESG performance under similar institutional conditions, the study incorporates the AMO framework. Ability captures firms' resource capacity to absorb the uncertain costs of ESG investment, motivation reflects whether managerial incentives are aligned with long-term sustainable value, and opportunity refers to whether the external institutional and policy environment provides supportive conditions for ESG implementation. Integrating AMO with stakeholder theory allows us to separate ESG formation mechanisms from ESG valuation effects, while maintaining a coherent causal chain that links organizational conditions, ESG performance, stakeholder responses, and firm value.

Empirically, the analysis is based on an unbalanced panel of Chinese A-share listed firms covering the period from 2011 to 2024. This time window spans China's transition from early-stage CSR disclosure to more institutionalized ESG evaluation and captures the intensification of environmental governance following the announcement of the dual-carbon goals[36]. Financial firms and real estate firms are excluded due to their distinct regulatory regimes and valuation mechanisms, which could compromise comparability. After standard data cleaning procedures, including the removal of abnormal observations and the alignment of firm-year identifiers across databases, the final sample consists of 4,457 listed firms and 31,198 firm-year observations. ESG performance is measured using the annual composite score from the Huazheng ESG rating system, which provides broad coverage and standardized assessment for A-share firms. Firm-level financial and governance variables are primarily obtained from the CSMAR database, while green patent indicators and media-related variables are sourced from CNRDS. This multi-source data strategy enhances measurement reliability and reduces single-database bias.

In terms of variable measurement, firm value is the main dependent variable and is primarily captured by Tobin's Q, which reflects market-based valuation and forward-looking expectations. The key explanatory variable is ESG performance, measured by Huazheng's annual composite ESG score, with higher values indicating better environmental, social, and governance performance. Consistent with the research framework, four stakeholder-mediated channels are specified as mechanisms through which ESG may affect firm value. Green cognition is proxied by the number of green invention patents, measured as the logarithm of one plus green patent counts, reflecting firms' internalization of environmental and regulatory expectations. Innovation investment is measured by R&D intensity, defined as R&D expenditure relative to operating revenue, capturing firms' sustained commitment to capability building. Financing constraints are measured using the SA index, which is widely applied in the Chinese context and reflects capital market frictions[37]. Media attention and oversight are constructed using the Janis–Fadner coefficient based on media coverage tone and volume, capturing external monitoring by information intermediaries. A standard set of firm-level control variables is included, covering firm size, age, leverage, growth, cash holdings, asset tangibility, board characteristics, and ownership concentration, alongside year, industry, and firm fixed effects.

Methodologically, the empirical analysis proceeds in a structured, multi-stage sequence aligned with the theoretical framework. First, panel regressions are estimated to examine how AMO factors influence ESG performance, establishing that ESG engagement is systematically related to organizational capacity, incentives, and opportunity conditions rather than being a random rating outcome. Second, baseline fixed-effects models estimate the association between ESG performance and firm value, providing the benchmark for subsequent analysis. Third, a series of robustness checks are conducted, including alternative outcome measures, sample adjustments, and additional fixed effects, to verify the stability of the results. Fourth, heterogeneity analyses explore whether ESG value effects vary across firm size, ownership type, industry characteristics, and pollution intensity, thereby identifying boundary conditions. To address endogeneity concerns, the study applies both propensity score matching and the Heckman two-stage procedure, targeting selection bias from different perspectives and strengthening causal interpretation.

Finally, mediation analysis is conducted to test the stakeholder-based transmission mechanisms. For each mediator, we estimate regressions linking ESG performance to the mediator and then include the mediator in the firm-value equation. Bootstrap methods are used to evaluate the statistical significance of indirect effects, as they provide robust confidence intervals without relying on normality assumptions. This approach allows us to quantify how ESG performance contributes to firm value through green cognition, innovation investment, financing constraints, and media oversight, and to compare their relative importance.

Overall, this research design integrates theoretical grounding, transparent measurement, and a rigorous econometric strategy into a coherent methodological framework. By explicitly linking AMO-driven ESG formation to stakeholder-mediated valuation mechanisms, the study provides a systematic and empirically testable account of how ESG engagement becomes economically relevant in China's A-share market.

4. Empirical results

Building on the institutional background and theoretical logic, this section reports the empirical evidence on whether ESG performance is translated into firm value in China's A-share market, and through which stakeholder-oriented mechanisms this translation occurs. Conceptually, sustainable development theory treats ESG as a strategic response to ecological constraints and long-term value creation, while stakeholder theory implies that ESG affects valuation through firms' interactions with regulators, communities, employees, customers, investors, and information intermediaries. Consistent with this logic, the empirical strategy follows a structured sequence from sample characterization and preliminary associations to fixed-effects identification, robustness checks, heterogeneity, endogeneity mitigation, and finally mediation verification. To ensure readability while retaining inferential completeness, the results are presented with a limited set of essential three-line tables, and interpretations are integrated in continuous academic prose.

Table 1. Descriptive statistics of the main variables

Variable	N	Mean	p50	SD	Min	Max
TobinQ	31198	1.980	1.602	1.177	0.831	7.961
ESG	31198	73.70	73.80	4.50	58.40	85.40
gov	31198	79.6	80.7	5.90	56.7	90.4
Soci	31198	75.2	75.9	7.90	49.6	95.1
Envi	31198	61.5	61.2	7.10	46.0	81.3
Size	31198	22.25	22.03	1.280	19.86	26.30
Lev	31198	0.395	0.385	0.197	0.0510	0.907
LnGreen_inn	31198	1.047	0.693	1.248	0	4.860
RD Int	31198	18.05	17.98	1.423	15.43	22.05
Media	31198	1.529	1.386	1.354	0	4.174
FC	31198	3.847	3.841	0.261	3.187	4.562
Growth	31198	0.151	0.103	0.331	-0.564	2
Age	31198	1.969	2.079	0.937	0	3.401
Cash ratio	31198	0.171	0.135	0.129	0.0110	0.634
Tang	31198	0.203	0.174	0.145	0.00200	0.678
Board	31198	2.111	2.197	0.195	1.609	2.639
Indep	31198	37.72	36.36	5.318	33.33	57.14
Top1	31198	0.341	0.320	0.147	0.0820	0.740
Risk	31198	5.041	3.340	5.418	-0.224	34.69
Cash	31198	0.194	0.158	0.132	0.0170	0.638

Variable	N	Mean	p50	SD	Min	Max
REP	31198	5.662	6	2.828	1	10
Carbon	31198	0.653	1	0.476	0	1
Incentive	31198	0.0630	0	0.242	0	1
AMO	31198	0.145	0.126	0.205	0	0.946

The descriptive profile indicates a large, well-powered panel with 31,198 firm-year observations, which is important for fixed-effects identification and for mechanism tests that rely on within-firm variation. The distribution of firm value (Tobin's Q) exhibits substantial dispersion: the mean is 1.980 with a standard deviation of 1.177, and the range extends from 0.831 to 7.961. This spread implies meaningful cross-sectional and intertemporal variation in market valuation, which provides the empirical "space" needed to identify valuation effects beyond firm fundamentals and macro shocks. The median (1.602) being below the mean suggests a right-skewed valuation distribution, consistent with the presence of high-growth firms or firms with pronounced intangible valuation premia.

The ESG distribution is comparatively tighter. The overall ESG score averages 73.70 with a standard deviation of 4.50, which implies that firms' ESG assessments cluster within a moderate band, but still exhibit enough heterogeneity for econometric identification. The pillar means reveal an economically meaningful imbalance: governance (79.6) and social (75.2) scores are considerably higher than the environmental score (61.5). This pattern is consistent with the interpretation that governance and social dimensions may be easier to institutionalize, disclose, and standardize in the A-share environment, while environmental performance—often requiring capital-intensive abatement, operational redesign, or emission-monitoring infrastructure—shows lower baseline performance. The relatively lower environmental mean also implies that, even if environmental improvements matter, they may appear as longer-horizon investments whose valuation effects are less immediate or less uniformly priced across sectors.The mediating variables further suggest strong firm-level heterogeneity in stakeholder-related transmission channels. Green cognition (LnGreen_inn) has a mean of 1.047 but a median of 0.693 and a maximum of 4.860, indicating that many firms display limited green innovation accumulation while a subset has developed substantial green knowledge stocks. Media attention also shows wide dispersion (mean 1.529, SD 1.354, min 0), implying heterogeneity in firms' information environments and external monitoring intensity. By contrast, financing constraints (FC) are relatively tightly distributed (SD 0.261), suggesting that although there are differences, the overall financing environment may be shaped by common institutional features, with incremental firm-level variation still sufficient to operate as a mediator.

The AMO-related drivers also show economically interpretable distributions. The opportunity proxy Carbon has a mean of 0.653, suggesting that a majority of observations fall into the "policy/opportunity present" condition, while Incentive has a mean of 0.063, indicating that equity-based incentive arrangements cover a small minority of firm-years. This low prevalence is analytically useful because it implies that when incentive mechanisms are present, they represent a meaningful governance and motivation "shock" rather than a ubiquitous baseline. Finally, the AMO composite index (mean 0.145, max 0.946) suggests sizable dispersion in the joint configuration of ability, motivation, and opportunity, which conceptually aligns with the expectation that ESG performance is systematically shaped by organizational and institutional conditions rather than being random noise.

Table 2. Regression analysis of ESG drivers

	(1) ESG	(2) ESG	(3) ESG	(4) ESG

Cash	0.0254*** (0.0031)			
Carbon		0.0034* (0.0019)		
Incentive			0.0021** (0.0009)	
AMO				0.0033*** (0.0011)
Size	0.0096*** (0.0012)	0.0097*** (0.0012)	0.0097*** (0.0012)	0.0097*** (0.0012)
REP	-0.0004 (0.0003)	-0.0006* (0.0003)	-0.0006* (0.0003)	-0.0006* (0.0003)
Risk	0.0004*** (0.0001)	0.0004*** (0.0001)	0.0004*** (0.0001)	0.0004*** (0.0001)
Constant	0.5181*** (0.0264)	0.5201*** (0.0265)	0.5215*** (0.0265)	0.5210*** (0.0265)
Observations	31,198	31,198	31,198	31,198
R-squared	0.5139	0.5122	0.5122	0.5122
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Company FE	Yes	Yes	Yes	Yes

*Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Table 2 provides structured evidence that ESG performance is not randomly distributed but is systematically associated with AMO-type organizational and institutional conditions. Interpreting the models as dimension-by-dimension tests, the "ability" proxy (Cash) is strongly positive and precisely estimated. The coefficient of 0.0254 ($p<0.01$) implies that firms with greater internal financial capacity are better positioned to absorb the fixed and variable costs of ESG engagement, such as compliance systems, reporting infrastructure, environmental process upgrades, or stakeholder communication. In a setting where ESG investment often competes with other resource demands, liquidity and slack resources can relax internal constraints and enable consistent implementation, which the empirical association supports.The "opportunity" proxy (Carbon) is positive but weaker in magnitude and only marginally significant (0.0034, $p<0.1$). This pattern is consistent with the interpretation that external opportunity structures—policy environment, regional green development foundations, or regulatory ecosystems—matter for ESG, but their observable impact is comparatively modest once firm fixed effects and other controls are included. One plausible explanation is that opportunity conditions may operate through longer-term institutional shaping (norms, enforcement regimes, industrial transition paths) and therefore display less short-run within-firm variation, which fixed effects absorb. Alternatively, opportunity may be more consequential in particular sectors, which may not be fully captured in a pooled specification.

The "motivation" proxy (Incentive) is positive and significant (0.0021, $p<0.05$), suggesting that equity-based incentives or governance arrangements that align managerial payoffs with longer-horizon performance can increase ESG engagement. This aligns with the idea that ESG is partly an intertemporal commitment: it can generate long-run reputational and risk-reduction gains while requiring up-front costs. Incentives therefore plausibly shift managerial attention toward sustained ESG effort. Importantly, because Incentive is a relatively rare condition in the sample (mean 0.063 in **Table 1.1**), the positive association is economically

meaningful: it indicates that when incentive schemes exist, they are associated with a discernible ESG improvement rather than merely reflecting common governance features.Model (4) summarizes the dimension-specific evidence through the AMO composite index, which is positive and highly significant (0.0033, $p<0.01$). The key interpretive contribution of this result lies in complementarity: ESG performance is highest when ability, motivation, and opportunity co-exist rather than when only one condition is present. In other words, internal resources facilitate execution, incentives facilitate commitment, and institutional opportunity facilitates legitimacy and payoff realization; the composite index captures the idea that ESG is a strategic and organizational outcome shaped by the joint configuration of these conditions.The control coefficients are also informative. Size is strongly positive across all models, consistent with the argument that larger firms face stronger stakeholder scrutiny, higher disclosure pressure, and greater reputational exposure, all of which raise the marginal benefit of ESG engagement. Risk is also positive and significant, suggesting that firms exposed to greater uncertainty may use ESG as a risk-management and legitimacy mechanism, potentially buffering stakeholder trust and lowering perceived downside risks. REP is weakly negative after fixed effects, which can be interpreted as a within-firm substitution pattern: conditional on a firm's time-invariant reputation baseline, incremental ESG improvements may be larger when reputation is relatively weaker, or when firms "compensate" by strengthening ESG disclosure during periods of reputational pressure. While the magnitude is small, the sign is consistent with the notion that ESG strategies may also be responsive to reputational dynamics within firms over time.

Table 3. Baseline regression: ESG and firm value

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ESG	0.2572* (0.1426)	0.7688*** (0.2077)	0.7669*** (0.2011)	0.7596*** (0.2081)			
Envi					0.0742 (0.1140)		
gov						0.3879*** (0.1214)	
Soci							0.1964** (0.0833)
Size	-0.2995*** (0.0067)	-0.3107*** (0.0158)	-0.3020*** (0.0162)	-0.5321*** (0.0306)	-0.5283*** (0.0307)	-0.5319*** (0.0305)	-0.5299*** (0.0306)
Lev	-0.8797*** (0.0399)	-0.7999*** (0.0884)	-0.5497*** (0.0821)	0.0319 (0.0941)	0.0172 (0.0938)	0.0480 (0.0943)	0.0166 (0.0938)
Growth	0.4709*** (0.0185)	0.4577*** (0.0249)	0.4277*** (0.0240)	0.2321*** (0.0182)	0.2313*** (0.0182)	0.2319*** (0.0182)	0.2305*** (0.0182)
Age	0.2853*** (0.0080)	0.2763*** (0.0160)	0.2640*** (0.0146)	0.6620*** (0.0273)	0.6589*** (0.0273)	0.6642*** (0.0273)	0.6585*** (0.0271)
Cash_ratio	0.5859*** (0.0557)	0.7474*** (0.1153)	0.4960*** (0.1052)	0.3541*** (0.0952)	0.3555*** (0.0952)	0.3496*** (0.0951)	0.3559*** (0.0952)
Tang	-0.4240*** (0.0455)	-0.4257*** (0.0789)	-0.3136*** (0.0939)	-0.2075* (0.1137)	-0.2113* (0.1139)	-0.2053* (0.1136)	-0.2077* (0.1138)
Board	0.0298 (0.0400)	0.0580 (0.0795)	0.0382 (0.0758)	0.0647 (0.0840)	0.0661 (0.0839)	0.0636 (0.0841)	0.0633 (0.0839)
Indep	0.0075*** (0.0014)	0.0075*** (0.0026)	0.0055** (0.0025)	0.0059** (0.0024)	0.0061** (0.0024)	0.0056** (0.0024)	0.0060** (0.0024)
Top1	-0.0938** (0.0431)	-0.0817 (0.0882)	0.1341 (0.0846)	-0.2094 (0.1352)	-0.2064 (0.1351)	-0.2144 (0.1353)	-0.2080 (0.1350)
Constant	7.8411*** (0.1661)	7.6089*** (0.3842)	7.4094*** (0.3864)	11.8922*** (0.7186)	12.0282*** (0.7150)	11.8465*** (0.7216)	11.9712*** (0.7153)
Observations	31,198	31,198	31,198	31,198	31,198	31,198	31,198

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
R-squared	0.1636	0.2426	0.2944	0.6670	0.6669	0.6671	0.6670
Year FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes	Yes	Yes	Yes
Company FE	No	No	No	Yes	Yes	Yes	Yes

Table 3. (*Continued*)

Notes: *Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Table 3 documents a stable positive association between ESG performance and firm value, with the coefficient remaining positive as the specification becomes increasingly stringent. The sequential inclusion of fixed effects and controls provides an internal credibility check. In Model (1), which is relatively parsimonious, ESG is weakly significant (0.2572, p<0.1), indicating that even before absorbing many sources of heterogeneity, ESG is directionally aligned with higher valuation. Once year fixed effects are added (Model 2) and industry fixed effects are introduced (Model 3), the ESG coefficient increases substantially (around 0.77) and becomes highly significant, suggesting that macro shocks and sectoral structures do not explain away the ESG–value relationship; instead, controlling for them reveals a stronger positive association.The most important estimate is Model (4), which includes year, industry, and firm fixed effects alongside the full controls. Here, the ESG coefficient remains large and highly significant (0.7596, p<0.01). Under a within-firm identification logic, this estimate indicates that when a given firm improves its ESG score relative to its own baseline, its market valuation tends to increase, net of common macro factors and time-invariant firm characteristics. In other words, the positive valuation premium is not merely a cross-sectional artifact driven by persistent firm quality differences; it is consistent with a dynamic interpretation in which ESG improvements are priced by capital markets as meaningful signals of lower risk, stronger governance discipline, or higher long-run growth quality.

The pillar decomposition provides an important nuance in interpretation. Governance (0.3879, p<0.01) and Social (0.1964, p<0.05) are positively priced, whereas the Environmental pillar (0.0742) is not statistically significant in the baseline pillar regressions. Substantively, this suggests that during the sample period, the A-share valuation mechanism is more immediately responsive to dimensions that directly affect agency costs, operational continuity, labor stability, and stakeholder trust. Governance quality can reduce information risk and agency frictions, which markets tend to price relatively quickly. Social performance can strengthen employee relations, customer loyalty, and supply-chain resilience, again feeding into expectations of stable cash flows. Environmental improvements, by contrast, can be more capital intensive and long-gestation, and their payoff may depend strongly on regulatory enforcement intensity, carbon pricing, or sector-specific transition risks. Therefore, the absence of a significant E coefficient should not be interpreted as evidence that environmental performance is irrelevant; rather, it suggests that its valuation effect is either mediated through other variables, realized over longer horizons, or varies substantially across contexts in a way that a pooled baseline regression cannot capture.

Table 4. Mediation effect of stakeholder cognition in the ESG – firm value relationship

	(1) COGNITION	(2) FIRM VALUE	(3) FIRM VALUE
ESG	0.318*** (0.041)	0.742*** (0.182)	0.521*** (0.176)
COGNITION (LNGREEN_INN)			0.689*** (0.097)
CONTROLS	Yes	Yes	Yes
FIRM FE	Yes	Yes	Yes

	(1) COGNITION	(2) FIRM VALUE	(3) FIRM VALUE
YEAR FE	Yes	Yes	Yes
OBSERVATIONS	31,198	31,198	31,198
R-SQUARED	0.421	0.664	0.681

Table 4. (*Continued*)

Table 4 reports the mediation analysis examining whether stakeholder cognition constitutes a key transmission channel through which ESG performance shapes firm value in China's A-share market. Column (1) shows that ESG performance is positively and highly significantly associated with stakeholder cognition, proxied by firms' green innovation cognition (LnGreen_inn). The estimated coefficient indicates that improvements in ESG performance are accompanied by a substantial enhancement in firms' sustainability-oriented knowledge accumulation and innovation orientation, suggesting that ESG engagement strengthens cognitively salient signals that can be perceived and interpreted by external stakeholders.Column (2) documents a strong and statistically significant positive relationship between ESG performance and firm value under a specification that controls for firm and year fixed effects as well as a comprehensive set of covariates. This result implies that, within firms, improvements in ESG performance are systematically associated with higher market valuation, consistent with the view that capital markets in China increasingly incorporate sustainability-related information into pricing decisions.When stakeholder cognition is jointly introduced in Column (3), it exerts a large and positive effect on firm value, while the coefficient on ESG performance remains significant but declines in magnitude relative to Column (2). This attenuation provides clear evidence of a partial mediation effect. Taken together, these findings indicate that ESG performance enhances firm value not only through a direct valuation channel, but also indirectly by shaping stakeholders' cognitive assessments of firms' long-term sustainability orientation, innovative capacity, and strategic credibility. The results therefore support the central argument of this study that stakeholder cognition plays a critical micro-level role in translating ESG performance into firm value in the context of China's A-share listed firms.

The control variables also yield economically coherent signs. Size is consistently negative in the Tobin's Q regressions, which is common when Tobin's Q reflects growth option value and intangibles: smaller firms can exhibit higher Q if they are growth-intensive, while larger mature firms tend to have more stable but less "option-like" valuations. Growth and Age are positive in the fully saturated model, indicating that, conditional on fixed effects and other controls, improving growth prospects and greater operational maturity are associated with higher valuation. Liquidity (Cash_ratio) is positive, consistent with financial flexibility being valued by markets. Tangibility is weakly negative, suggesting that heavier asset structures reduce valuation flexibility, consistent with the idea that markets pay a premium for intangible-intensive or adaptable business models. Board independence is positive and significant, reinforcing that governance quality is valued in market pricing.

5. Conclusion

This study contributes to the ESG–firm value literature by offering an integrated explanation of why ESG is valued and through which channels it becomes value-relevant in an emerging-market context. Using Chinese non-financial A-share listed firms (2011–2024), we document a robust positive association between ESG performance and firm value that persists under stringent fixed-effects specifications and comprehensive controls, indicating that ESG contains incremental information beyond time-invariant firm attributes and macro trends. More importantly, the pillar-level evidence refines the conceptualization of ESG as a multi-

dimensional signal: governance and social pillars exhibit stronger valuation effects than the environmental pillar in baseline models. This asymmetry suggests that China's capital market more readily prices ESG components with clearer implications for agency-cost reduction, stakeholder trust, and operational stability, whereas environmental value may be more contingent on transition context, enforcement intensity, and longer payoff horizons.In addition, the study advances a formation-oriented perspective by showing that ESG performance is systematically shaped by AMO-type conditions, implying that ESG improvement reflects a configuration of resources and capabilities (ability), incentive alignment (motivation), and institutional/market opportunities (opportunity) rather than random reporting variation. Finally, mechanism evidence shows that ESG creates value primarily through easing financing constraints and promoting innovation, while media-based channels appear comparatively weaker. This pattern highlights a capability-and-resource logic of ESG valuation in China: ESG is priced not merely as reputational symbolism but as a signal associated with tangible economic channels that affect capital access and innovation capacity. The heterogeneity results—stronger effects among smaller firms, non-SOEs, and non-heavy-polluting industries—further underscore that ESG valuation depends on information frictions, market discipline, and compliance-cost constraints, which condition how stakeholders interpret and act on ESG information.

The findings generate actionable implications for firms, investors, and policymakers, especially under China's ongoing ESG institutionalization and dual-carbon transition. For corporate managers, the evidence implies that ESG should be implemented as a strategic capability-building program rather than a disclosure-oriented exercise. To enhance value conversion, firms should strengthen governance and social responsibility practices that improve transparency and stakeholder confidence, while designing environmental strategies that are closely connected to measurable operational improvements and innovation outcomes. Since financing constraints and innovation are the most salient channels, managerial priorities should include improving ESG-related disclosure quality, aligning incentives with sustainability targets, and embedding ESG into R&D planning, green technology adoption, and long-term investment decisions.For investors and information intermediaries, the results suggest that ESG information in China is economically meaningful but not uniformly priced across pillars or firm types. A mechanism-sensitive evaluation is therefore needed: greater attention should be paid to whether ESG improvement plausibly translates into reduced financing frictions, improved resource allocation, and sustained innovation capability, rather than relying solely on headline ESG scores.For policymakers, the findings imply that effective dual-carbon implementation benefits from policy instruments that facilitate the market translation of ESG into financing and innovation. Strengthening ESG disclosure comparability, encouraging third-party verification, and improving green finance mechanisms (e.g., sustainability-linked financing and more transparent risk pricing) can reduce information frictions and enhance the credibility of ESG signals. Because the media channel appears weaker, policy efforts that only increase publicity may be insufficient; greater impact is likely when institutions improve the auditability and enforceability of ESG information so that stakeholder attention is anchored in credible performance and can be converted into concrete market behaviors.

Several limitations suggest directions for future research. First, ESG scores rely on third-party ratings and public disclosures, which may not fully capture substantive environmental performance or potential greenwashing, and measurement differences across providers may affect inference. Future work could compare multiple ESG databases, incorporate more direct environmental indicators, and examine the conditions under which rating-based ESG diverges from real performance. Second, although the study conducts extensive robustness checks and selection correction, causal identification remains challenging in observational panel settings. Future studies could exploit quasi-natural experiments—such as regulatory changes in ESG disclosure requirements, region–industry variation in environmental enforcement, or

staggered rollout of green finance policies—to implement difference-in-differences or instrumental variable designs and strengthen causal claims.

Third, the relatively weaker media channel suggests that attention effects may be nonlinear, delayed, or contingent on credibility shocks; future research could explore dynamic mechanisms (e.g., event-based designs around ESG controversies, policy announcements, or rating revisions). Finally, to deepen the stakeholder micro-foundations, future studies may directly measure stakeholder perceptions—investor beliefs, analyst interpretations, or consumer trust—to better map the perception–attitude–behavior chain through which ESG signals are psychologically processed and behaviorally enacted in the market.

Author contributions

Z.J. contributed to conceptualization, methodology, data curation, formal analysis, and writing the original draft. B.S. contributed to supervision, validation, and reviewing/editing the manuscript. M.L. contributed to data validation, software support, and reviewing/editing the manuscript. All authors approved the final manuscript.

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Conflict of interest

The authors declare no conflict of interest

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