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Environmental Commitments in M&A Announcements and Market Performance: Evidence from China

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Abstract

Environmental commitments disclosed in merger and acquisition (M&A) announcements have become an important channel through which firms signal their green governance intentions. However, systematic empirical evidence remains limited regarding whether and how capital markets respond to such commitments. Using a sample of M&A events involving Chinese A-share listed firms from 2010 to 2023, this study develops a multidimensional framework to measure environmental commitment quality and examines its association with market performance while exploring potential channels through which capital markets respond to such disclosures. The results show that: (1) high-quality environmental commitments are associated with significant short-term and long-term abnormal returns, suggesting that investors respond positively to such disclosures. (2) Increased public attention and enhanced green innovation emerge as key channels linking environmental commitments to market performance. (3) More importantly, firms issuing high-quality commitments subsequently exhibit improvements in long-term financial, environmental, market, investment, and governance performance, suggesting that these commitments may function as credible signals rather than mere "greenwashing" rhetoric. (4) These observed patterns are structurally heterogeneous and more pronounced in firms with abundant resource endowments and stronger executive environmental awareness. Overall, this study provides new evidence on how event-driven environmental disclosures are associated with firms' resource acquisition processes and offers insights for policies aimed at improving disclosure regulation and guiding capital toward green transformation.

Keywords: environmental commitments; market performance; credible signal; mergers and acquisitions; greenwashing

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1. Introduction

According to the Bloomberg 2024 Global ESG Outlook Report, the global ESG market is projected to surpass USD 40 trillion by 2030, reflecting the continued momentum of economic green transformation and sustainable finance development. However, this process has been accompanied by a structural contradiction characterized by "high demand yet low trust": on one hand, investors' demand for green asset allocation continues to rise; on the other hand, frequent greenwashing incidents, difficulties in observing environmental practices, and lags in information disclosure have contributed to market uncertainty regarding corporate environmental information, making it difficult for investors to effectively distinguish substantive environmental governance from symbolic rhetoric [1,2]. This trust dilemma not only may prevent genuinely green-oriented firms from being fairly valued,

but also raises the question of "how firms can attract capital through credible environmental commitments" as a central issue in sustainability research. Prior research has examined how targets' social and environmental performance [3] or CSR ratings [4] relate to acquirer gains and announcement returns. These studies typically rely on historical CSR or SRI ratings that summarize firms' past environmental and social performance. However, while such information can contribute to shaping long-term corporate images, its routine nature and weak binding force may limit its capacity to serve as strong signals at specific capital operation junctures. In contrast, environmental commitment language (ECS) in M&A announcements reflects real-time, event-driven disclosure embedded in a specific strategic transaction, and is often associated with contractual arrangements and post-merger integration plans. As such, it can provide incremental information to investors beyond conventional CSR/SRI metrics.

The core value of environmental commitments derives from their role as "event-driven governance tools" deeply embedded in major investment decisions, rather than standalone environmental communications. This fundamental positioning results in three key distinctions from routine ESG disclosures. First, such commitments can exhibit strong binding force and verifiability. The content of these commitments is often associated with valuation arrangements, consideration payments, and integration plans in M&A transactions, forming formal arrangements with legal and financial binding force. This can enhance information credibility and help reduce uncertainty surrounding environmental risks [5]. Second, the signal release is characterized by notable timeliness and focal intensity. Leveraging the high-profile disclosure timing of M&A announcements, environmental commitments can be promptly communicated and interpreted during windows of concentrated market attention, potentially overcoming the fragmentation and lag inherent in routine environmental disclosures. This may better align with investors' risk assessment needs prior to major decisions [6]. Third, the fulfillment of commitments may be subject to multiple institutionalized monitoring mechanisms. The implementation of such commitments is typically closely tied to post-transaction compliance reviews, performance-based adjustments, and asset valuation revisions, while attracting ongoing scrutiny from transaction counterparts, regulatory authorities, and capital markets. This can help curtail the scope for "greenwashing" rhetoric and moral hazard [7]. These distinctive features suggest that environmental commitments in M&A may function as high-intensity environmental signals with clear relevance for market valuation. Nevertheless, whether and how capital markets respond to such event-driven environmental signals, and through which pathways they may be linked to firm value, remain to be systematically examined empirically.

China's capital market offers a representative institutional setting for observing the informational role of environmental commitments in the M&A context. First, in contrast to the relatively mature ESG disclosure frameworks in developed countries, China is currently in a transitional phase where environmental information disclosure is evolving from voluntary to mandatory. Against this backdrop, the question of whether voluntary environmental commitments in M&A announcements attract market attention and whether they are accompanied by subsequent genuine actions provides a distinctive context for examining the interpretation mechanisms of corporate signals in an institutionally underdeveloped environment. Second, China's M&A market is characterized by high transaction activity yet pronounced information asymmetry, with considerable uncertainty surrounding post-merger integration. In such a high-risk decision-making environment, investors often rely on governance and strategic signals embedded in announcements to assess transaction quality; thus, whether environmental commitments can fulfill a signal-screening function remains an empirical question. Third, although ESG investment in China has grown

rapidly, it remains in an early stage of development. Within this market context, capital markets' capacity to discern environmental commitments of varying quality, as well as their reaction patterns to potential "greenwashing" information, offer valuable perspectives for observing the transmission process of green information in emerging markets. Taken together, this institutional and market backdrop provides an ideal research setting for systematically examining how environmental commitments in M&A announcements are interpreted by capital markets in an emerging market context, and for exploring how event-driven environmental signals may be valued by capital markets under conditions of high information asymmetry.

To systematically examine the above issues, this study takes M&A events involving A-share listed companies in Shanghai and Shenzhen from 2010 to 2023 as the research sample. A multidimensional text analysis framework is constructed to precisely measure environmental commitments in M&A announcements and to investigate their association with capital market responses and potential underlying channels. The findings suggest that high-quality environmental commitments are associated with significant short-term and long-term abnormal returns—an association that may operate through attracting public attention and promoting green innovation. The observed patterns exhibit structural heterogeneity and are more pronounced in firms with ample cash flow and stronger executive environmental awareness. Further ex post performance examination shows that environmental commitments are followed by substantive improvements across firms' financial, environmental, market, investment, and governance dimensions, providing suggestive evidence on the operational fundamentals that may underpin their relation to long-term performance.

This paper makes at least three contributions. First, this study offers an analytical perspective in the field of green M&A research that differs from the traditional "asset attribute" paradigm, shifting the research focus from the static determination of "whether a firm is green" to the dynamic governance logic of "how green information can be credibly transmitted." Existing studies have long adhered to the asset attribute paradigm, identifying "green M&A" based on the industry attributes or business scope of target firms [8,9], implicitly assuming that "green assets necessarily generate green value." Yet this approach may not fully capture why the same green assets can be associated with vastly different outcomes across firms—variation that may stem from differences in how credibly firms signal their green intentions. Addressing this limitation, this study takes environmental commitments in M&A announcements as the analytical entry point, conceptualizing them as event-driven signals embedded in major investment decisions and characterized by both verifiability and contractual force. This perspective shifts analytical focus from "whether firms possess green assets" to "how firms credibly communicate their green governance intentions," offering a lens through which to examine the value relevance of green signals themselves. By doing so, it provides a novel analytical framework for understanding the association between environmental commitments and observed market responses.

Second, this study develops a multidimensional text analysis framework to conduct a fine-grained measurement of environmental commitments in the M&A context, offering an operable tool for assessing the quality of green commitments. Existing studies predominantly employ binary variables such as "whether disclosed" or "whether belonging to a green industry" to characterize corporate environmental behavior [8,10,11]. This approach may struggle to capture substantive differences in commitments regarding content depth, implementation intensity, and temporal constraints, nor can it effectively address the information noise generated by greenwashing practices. In contrast, this study systematically quantifies environmental commitments across four dimensions—domain coverage, measure specificity, target concreteness, and temporal binding—transforming

the multidimensional concept of "commitment quality" into comparable and replicable empirical indicators, thereby enhancing the capacity to identify potential heterogeneity in the associations between environmental commitments and market outcomes.

Third, this study systematically examines the potential channels and boundary conditions through which high-credibility environmental commitments may be associated with firms' subsequent performance patterns in the M&A context, providing evidence relevant to the twin dilemmas of identifying greenwashing and verifying value-relevant outcomes. While existing research has confirmed associations between green information disclosure and firm performance [12,13], such studies have primarily been conducted within routine disclosure contexts, with limited attention to the role of green commitments under specific, high-intensity decision-making scenarios. This study extends this line of inquiry by documenting patterns consistent with two potential pathways—internal capability building and external signaling feedback—while identifying potential dual boundary conditions of corporate financial flexibility and managerial cognitive characteristics. These findings may provide practical implications for policymakers seeking to refine event-oriented environmental information disclosure regimes and channel financial resources toward green transformation, and for firms aiming to design more credible environmental governance commitments.

2. Literature Review and Hypothesis Research

2.1. Literature Review

How corporate environmental commitments—as core environmental governance practices—may influence sustainable development and value creation is a central focus in the fields of environmental management and sustainable finance. Existing literature has primarily developed along two directions: the composition and expression dimensions of commitments, and the multilevel consequences associated with these dimensions. Regarding the composition dimension, the type of commitment-making entity is frequently incorporated as a key analytical dimension to differentiate the motivations and manifestations of various actors, including managers [14], employees [15,16], consumers [17], financial institutions [18], and government entities [19,20]. The nature and depth of commitments constitute another core analytical dimension, based upon which studies distinguish between symbolic commitments and substantive commitments [21–23]. The former focuses on image cultivation and discursive expression, while the latter involves specific resource allocation, verifiable targets, and systematic management transformation. The antecedents or drivers of commitments represent a further critical dimension. Research has systematically examined both contextual factors—such as socio-cultural norms [24], and market incentives [25,26]—and agentic factors—including organizational strategic orientation [27], managerial characteristics [28,29], and employee psychology [30]—in shaping the formation and deepening of commitments.

Subsequent research has further delved into the broad-ranging consequences associated with commitments. At the external market and financial level, studies have empirically examined associations between commitments and firm market value [31,32], changes in operational performance [33], as well as market relationships and brand reputation [34]. At the internal operational and environmental performance level, a substantial body of literature has investigated whether commitments are followed by tangible resource and environmental benefits [35], while also examining their associations with operational efficiency and green innovation patterns [36,37]. At the internal organizational and behavioral level, scholars have focused on the role of commitments in enhancing employee organizational identification and engagement [38], extending their inquiry to examine spillover effects on public environmental behavior and social demonstration effects [39,40]. Collec-

tively, these findings suggest that credible environmental commitments may be associated with more favorable green reputation, greater stakeholder support, and the development of intangible resources relevant to corporate transformation.

However, when situated within the framework of corporate green transformation and sustainable development capabilities, the aforementioned research traditions also reveal certain limitations and areas warranting further exploration. On one hand, existing green M&A research has long been dominated by the "asset attribute paradigm" [8,9,41]. While this paradigm offers operational convenience, its underlying assumption is that green assets necessarily generate green performance. Yet assets themselves are merely inputs to production; the realization of their environmental benefits may depend heavily on post-acquisition integration and management. If the acquiring firm lacks green operational capabilities or commitment, green assets may be reduced to mere props for "greenwashing." This paradigmatic limitation reveals a fundamental question that remains to be addressed: How do firms demonstrate to the market, through proactive strategic declarations, that they are willing and able to manage green assets effectively? On the other hand, most existing research on environmental commitments has treated such commitments as a form of continuous, diffuse strategic background noise, with their economic and social benefits assumed to manifest over the long term and in comprehensive ways [42]. This has led to the persistent neglect of a distinctive, high-intensity signaling context: when environmental commitments are deeply embedded in major, one-off strategic decisions such as M&A, do their information content, credibility, and associations with market perceptions differ from those of routine disclosures? How are such "event-driven governance signals" associated with market expectations and patterns of corporate resource acquisition? These questions remain theoretically underdeveloped and empirically untested, thereby motivating this study.

2.2. The Impact of Environmental Commitments in M&A Announcements on Market Performance

The value creation logic of environmental commitments in M&A differs fundamentally from the "asset attribute paradigm" upon which traditional green M&A research has relied. The theoretical divergence between these two perspectives can be understood through three distinct dimensions. First, their sources of value differ. The value of green assets derives directly from their expected cash flows, which investors can discount based on industry benchmarks. By contrast, the value of green commitments originates from their informational content—by signaling to the market management's emphasis on environmental governance and strategic determination to integrate green assets, such commitments may lead investors to update their expectations regarding firms' future cash flows [43,44]. Second, their verifiability differs. Asset attributes are determined once at the completion of M&A transactions, making their environmental benefits difficult to hold accountable ex post. Commitments, however, are typically accompanied by clear objectives, timelines, and binding consideration, and their fulfillment can be continuously observed and verified, thereby endowing them with stronger signal credibility and greater resilience to "greenwashing" concerns [45,46]. Finally, their integration effects differ. Acquiring green assets merely addresses the question of "whether" a firm possesses such assets, whereas making green commitments signals that the firm is likely to undertake systematic resource reconfiguration and capability building around these commitments. The commitment itself thus constitutes an integration governance mechanism capable of reducing post-acquisition coordination costs and potentially enhancing the operational efficiency of green assets [18]. These three dimensions collectively suggest the incremental value of environmental commitments in M&A that operates independently of target asset attributes. How, then, is this logic reflected in market performance? The following sections draw on signaling theory

and the resource-based view to discuss their short-term information transmission effects and potential long-term value creation pathways.

Based on signaling theory, environmental commitments in M&A announcements represent strategic signals released by firms to capital markets, with their core value residing in the short-term information effect [47]. In the context of the "dual carbon" goals and the widespread adoption of ESG investment philosophy, investors' attention to corporate environmental risks has increased significantly [48]. Importantly, prior research suggests that the salience of disclosures shapes investor behavior: even subtle changes in the prominence of risk-related information can significantly influence investment flows [49]. M&A announcements, as high-salience disclosure events that attract concentrated market attention, thereby amplify the visibility and interpretability of environmental commitment information. When firms proactively disclose binding environmental commitments, they effectively signal to the market their capacity and strategic determination to address environmental challenges through explicit emission reduction targets, specific technological solutions, or resource management plans [50]. From the perspective of information economics, such commitments can be viewed as high-intensity, verifiable signals. Their signal intensity is reflected in several features: the specificity of commitment content enables investors to form predictable benchmarks for evaluation; the deep integration of commitments with core contractual provisions of M&A transactions—such as performance compensation and binding consideration—significantly raises the costs of default; and the fulfillment of commitments remains continuously exposed to periodic reporting and regulatory scrutiny throughout the M&A integration period, thereby helping to ensure ex post accountability [7,47]. These features render environmental commitments in M&A distinctly different from generalized CSR statements in annual reports. Specifically, quantified environmental targets enhance the credibility of information disclosure, while clear timelines elevate expectations regarding commitment executability, thereby effectively alleviating investor concerns about "greenwashing" practices [51]. Simultaneously, the strategic transformation intent embedded in such commitments enables investors to reassess the synergy potential and risk exposure of M&A transactions [33]. These signals not only reduce investors' costs of collecting and screening environmental information but also directly lower their expectations regarding potential environmental liabilities and transition risks, and thereby contribute to more favorable stock price reactions within the short-term window of M&A announcements. Therefore, higher-quality environmental commitments are likely to be associated with stronger short-term market performance.

Based on the resource-based view, a firm's sustained competitive advantage derives from the accumulation of heterogeneous, difficult-to-imitate strategic resources and capabilities. The long-term role of environmental commitments in shaping market performance can be understood through this theoretical logic. First, environmental commitments can serve as strategic signals that facilitate firms' access to scarce green resources—such as pollution control technology R&D and green certifications [47]. Such resources are characterized by time compression diseconomies, rendering them difficult for competitors to replicate in the short term. This can help establish differentiated green competitive barriers and reinforce investor expectations regarding long-term sustainable profitability [52]. Second, the disclosure of commitments signals that firms have established "green transition" as a core objective during the integration phase, potentially guiding the systematic green reconfiguration of capital, technology, and human resources through cross-organizational synergies in M&A integration. This process can create new value growth points through technological complementarity and organizational learning [53,54]. Third, the sustained fulfillment of commitments enables the accumulation of reputation capital characterized by path dependence and causal ambiguity, which may attracting continued investment

from green-themed funds and ESG institutional investors while enhancing core customer loyalty and supply chain partners' willingness to cooperate [34,55]. Once formed, these green resources, integration capabilities, and reputation capital constitute core elements of sustainable competitive advantage that resist competitor imitation, thereby contributing to sustained abnormal market returns. Taken together, this logic suggests that environmental commitments exert a significant positive influence on long-term market performance. Based on the above analysis, this study proposes the following hypothesis:

H1: *Environmental commitments in M&A transactions are positively associated with both short-term and long-term market performance.*

2.3. The Mediating Role of Public Attention

According to the attention-based view, investors' and the public's limited attentional resources are preferentially allocated to information with signaling value. As a form of high-cost, high-visibility information disclosure, environmental commitments in M&A announcements are more effective in capturing the attention of market participants. When firms make specific environmental commitments in M&A transactions, these commitments are transmitted to capital markets through announcement texts, attracting widespread attention from investors, analysts, and media, thereby shaping their judgments regarding firms' future value and subsequent investment decisions.

First, from the perspective of signaling and information processing, environmental commitments in M&A announcements can possess stronger signal credibility and distinctiveness due to their event-bundled nature [47]. According to signaling theory, the effectiveness of high-quality signals depends on the extent to which they are captured and correctly interpreted by potential receivers. Unlike routine disclosures that are often submerged in information-overloaded environments, M&A events themselves naturally focus investor attention. Environmental commitments embedded in this context are no longer isolated CSR declarations, but rather strategic information directly linked to transaction value, which can help them penetrate investors' attention thresholds. High-quality environmental commitments entail higher signaling costs, enabling effective differentiation between "sincere commitments" and "strategic greenwashing": specific, verifiable commitment content provides investors with a material basis for information processing, encouraging market participants to move beyond superficial declarations and systematically assess commitment feasibility, synergy with transaction targets, and potential contributions to long-term firm value [45,46]. As public attention increases, this information processing is further deepened: analysts may issue interpretive reports, financial media may conduct feature coverage, and social media may engage in discussions, creating multiplier effects in information diffusion and reprocessing [56,57]. Ultimately, if commitments are judged by the market as credible and value-creating, they elevate investor expectations regarding firms' future cash flows and reputational capital, thereby contributing to cumulative abnormal returns following M&A announcements [58]. Conversely, if commitments are hollow or disconnected from transaction substance, even if they attract short-term attention, they are unlikely to withstand the scrutiny of deep market information processing and may even trigger negative reactions due to anticipated inconsistencies between words and deeds. Thus, public attention plays a dual role in this process as both a signal amplifier and an information interpreter: it expands the audience reach of commitment signals while enhancing the market's capacity to discern commitment quality through collective information processing mechanisms [57].

Second, from the perspective of social scrutiny and reputation binding, environmental commitments in M&A announcements face heightened external scrutiny pressure due to their public nature, traceability, and transaction relevance. Unlike routine CSR disclosures,

M&A commitments are often implicitly or explicitly tied to transaction integration and performance-based adjustments, which contribute to greater fulfillment rigidity [51]. Once environmental commitments enter the public sphere through M&A announcements, a wide range of social actors may incorporate them into their respective scrutiny agendas [59]. Elevated public attention suggests that commitment content is placed under multiple layers of scrutiny: media may track firms' subsequent environmental investments and emission reduction outcomes, analysts may incorporate commitment fulfillment risk into earnings outlooks, and regulators may include commitment implementation in information disclosure compliance reviews [60,61]. This multi-actor, multi-level scrutiny network effectively can bind corporate social reputation with capital market performance: if commitments are fulfilled as promised, firms not only achieve environmental performance improvements but also accumulate reputational capital for "walking the talk," further consolidating investor confidence and market valuation. If commitments are questioned as "greenwashing" or proven unfulfilled during subsequent integration, public attention may amplify the impact of negative information [62]. Furthermore, commitment fulfillment directly can affect the realization of transaction synergies: if commitments reduce compliance costs of target assets through green technology upgrades, fulfillment itself generates tangible value; if commitments remain merely on paper, not only is reputation damaged, but anticipated transaction synergy goals may also fail to materialize. In this sense, public attention serves not only as a channel for information transmission but also as a mobilization mechanism for social scrutiny forces and a foundation for reputational capital formation [61]. By enhancing the ex-post verifiability of commitments and the costs of default, it can exert pressure on firms to treat environmental commitments seriously during M&A integration, ultimately contributing to market judgments regarding firms' long-term value [63]. Based on the above analysis, this study proposes the following hypothesis:

H2: *Public attention mediates the relationship between environmental commitments in M&A and corporate market performance*.

2.4. The Mediating Role of Green Innovation

The value realization of environmental commitments may depend not only on the immediate transmission of external signals and investor recognition. It also hinges on whether such commitments can genuinely catalyze internal green transformation, thereby translating strategic intent into sustainable competitive advantage. In this process linking internal and external dynamics, green innovation can play a pivotal mediating role—representing both a substantive corporate response to commitment fulfillment, providing observable evidence for the market to assess signal reliability—and a core pathway through which firms may internalize environmental strategy into core capabilities, contributing to long-term performance.

First, green innovation can serve as a "verifiable signal" of commitment reliability. According to signaling theory, in markets characterized by information asymmetry, the credibility of high-cost signals derives from their resistance to imitation by low-quality firms [64]. Green innovation activities—requiring substantial resource investment, deep technological accumulation, and producing verifiable outcomes—can function as ideal "high-cost signals" that reflect firms' genuine willingness and capacity to fulfill environmental commitments [65,66]. Unlike rhetorical pledges that may remain unsubstantiated, green innovation provides tangible, observable evidence that environmental promises are being translated into concrete organizational actions [67]. This evidentiary role is particularly important during the post-M&A period, as it helps establish foundational credibility with investors whose support is critical for realizing anticipated synergies. When firms demonstrate through green innovation that their commitments are backed

by genuine resource allocation, this can be interpreted by the market as distinguishing them from potential "greenwashing" counterparts [68]. This signaling function may operate through two interrelated channels: first, it directly reduces information asymmetry by making commitment fulfillment observable; second, it indirectly enhances market confidence by revealing firms' underlying environmental management capabilities. From a resource dependence perspective, enhanced green innovation capacity further signals that firms may gain preferential access to green financing, policy support, and supply chain partnerships [69,70]. Through this dual signaling mechanism, green innovation fulfills its role as a credible verification tool that supports market recognition of environmental commitments.

Second, green innovation can serve as the "capability cornerstone" for sustainable competitive advantage. Examined through the resource-based view and dynamic capabilities theory, green innovation can be viewed not only as a verification tool but also as a potential pathway for building long-term organizational capabilities during the M&A integration process [71]. Through sustained investment in green technology R&D and environmental process improvements, firms can systematically reduce energy consumption and emission levels while simultaneously achieving operational efficiency gains [72,73]. These efficiency improvements, characterized by path dependence and causal ambiguity, can enable firms to construct difficult-to-imitate green competitive advantages. Beyond operational enhancements, green innovation activities themselves can contribute to a process of organizational learning and capability accumulation. Firms' continued engagement in green technology helps build dynamic capabilities to perceive environmental changes, integrate internal and external resources, and reconfigure operational models [74]. These capabilities can enhance organizational adaptability and resilience when facing increasingly stringent environmental regulations or unforeseen environmental incidents. Furthermore, the cumulative effects of green innovation may be amplified through reputation spillovers: sustained green technology output signals market leadership in environmental governance, attracting long-term ESG-oriented investors, enhancing stock liquidity, and optimizing investor structure [74,75]. This innovation-backed reputational capital can serve as an important buffer against market competition and environmental uncertainty. Collectively, these mechanisms converge to support stable long-term cash flow growth and sustain abnormal market returns over extended post-M&A windows. Based on the above analysis, this study proposes the following hypothesis:

H3: *Green innovation mediates the relationship between environmental commitments in M&A and corporate market performance*.

3. Research Design

3.1. Sample and Date

This study selects M&A events involving Chinese A-share listed companies from 2010 to 2023 as the initial sample. The starting point of this time interval is based on dual considerations of institutional evolution and data availability: In 2010, the former Ministry of Environmental Protection issued the Guidelines for Environmental Information Disclosure by Listed Companies, which for the first time provided systematic regulations on environmental information disclosure for heavily polluting industries. Although this document did not formally take effect, it marked the entry of corporate environmental information disclosure into an institutionalized trajectory. Thereafter, the expression paradigms of environmental commitments in M&A announcements gradually became more unified, providing an operable observational foundation for quantitative text research.

Sample screening followed the steps below: (1) excluding listed companies in the financial and real estate industries; (2) retaining M&A events where listed companies acted as acquirers; (3) retaining major M&A types including asset acquisitions, mergers and absorptions, and tender offers; (4) retaining only the largest-scale event when the same firm initiated multiple M&A events within the same year, to mitigate interference among events; and (5) excluding samples under ST or *ST status, as well as those with incomplete data. The final sample comprises 8377 M&A events initiated by 2160 listed companies from 2010 to 2023.

This study focuses on environmental commitments disclosed during corporate M&A processes and therefore only includes announcements related to major asset restructurings and M&A transactions released by Chinese listed companies. Announcement texts were primarily obtained from the CNINFO website and the Wind Database, supplemented by cross-verification with corporate official website announcements. Financial and corporate governance data were sourced from the CSMAR database, while M&A transaction data were obtained from the Wind Database.

3.2. Definition of Variables

3.2.1. Environmental Commitment Score

This study focuses on environmental commitments disclosed in corporate M&A announcements, constructing the core explanatory variable through multidimensional text analysis. Drawing on environmental strategic management research [45,52,76,77], environmental commitments are delineated into four dimensions with clear theoretical foundations: domain coverage, measure specificity, target concreteness, and temporal binding. These four dimensions capture commitment quality from the perspectives of strategic breadth, implementation depth, information verifiability, and fulfillment binding force, respectively.

This study employs a four-level progressive scoring system ranging from 0 to 3. The selection of this scoring system is based on the following considerations: A four-level structure effectively captures gradient differences in signal intensity, responding to the methodological demands of identifying "greenwashing." According to signaling theory, the credibility of high-cost signals derives from their resistance to imitation by low-quality firms. Binary variables (0–1) can only identify the presence or absence of commitments [43,78]. While three-level structures (0–2) distinguish between presence and partial quantification [79–81], they remain insufficient for capturing substantive differences in dimensions such as target concreteness and measure specificity. By establishing higher thresholds within high-score intervals (e.g., quantified indicators, clear timelines, specific technological pathways), the four-level scoring enables the index to more sensitively identify high-quality commitments with implementation foundations, effectively separating "high-intensity commitments with clear fulfillment constraints" from general quantified commitments. This approach aligns closely with this study's core focus on "high-credibility environmental signals."

Domain Coverage measures the breadth of environmental management areas addressed by environmental commitments, reflecting the extent to which corporate environmental strategy is systematically embedded. Commitments spanning multiple domains indicate that firms integrate environmental governance across production, operations, and supply chains, helping to avoid localized and fragmented governance strategies [82,83]. If a commitment involves only a single issue (e.g., energy conservation or emission reduction), it is assigned 1 point. If it involves two or more environmental management domains (e.g., energy structure optimization, emission control, green supply chains), it is assigned escalating scores up to 3 points based on the scope of coverage. Commitments that do not address specific environmental domains are assigned 0 points.

Measure Specificity reflects the degree of operability of action plans embedded in commitments [84]. According to the theory of planned behavior, specific technological pathways and resource allocation arrangements enhance the certainty of behavioral intentions, thereby improving commitment credibility and avoiding "slogan-based commitments" [51,85]. If a commitment contains only principled statements or value declarations, it is assigned 1 point. If it discloses specific action directions but lacks implementation details, it is assigned 2 points. If it explicitly specifies technological pathways, resource allocation arrangements, or implementation steps, it is assigned 3 points. Commitments that disclose no measures whatsoever are assigned 0 points.

Target Concreteness measures the degree to which commitment goals are quantified and verifiable. Based on signaling theory, quantified targets possess stronger verifiability, helping to reduce information asymmetry and enhancing external investors' assessments of commitment authenticity and likelihood of realization [86,87]. If a commitment proposes only principled directions (e.g., "promoting green development"), it is assigned 1 point. If it proposes qualitative targets (e.g., "increasing the proportion of renewable energy") without quantification, it is assigned 2 points. If it explicitly discloses quantitative indicators (e.g., carbon emission reduction percentages, energy efficiency improvement rates), it is assigned 3 points. Commitments that set no targets are assigned 0 points.

Time constraint measures the degree of clarity regarding commitment fulfillment deadlines. According to contract theory, clear temporal milestones create binding constraints on fulfillment, helping to mitigate delayed implementation under information asymmetry [88]. If a commitment sets no temporal milestones, it is assigned 0 points. If it expresses only long-term visions or vague temporal expressions (e.g., "continuously advancing in the future"), it is assigned 1 point. If it sets interim targets or medium-term timelines, it is assigned 2 points. If it explicitly specifies clear completion deadlines or phased implementation schedules, it is assigned 3 points.

It should be noted that although all four dimensions employ the same interval scoring, their scoring logic exhibits structural differences. Measure specificity, target concreteness, and temporal binding primarily capture the vertical deepening of information disclosure, reflecting the progression of commitment content from vague to specific, from principled expressions to executable arrangements. The increasing scores correspond to a progressive logic of commitments evolving "from absence to presence, from presence to quality, and from quality to verifiability." Domain coverage, by contrast, emphasizes the horizontal expansion of environmental commitments across different governance domains, reflecting whether firms embed environmental responsibility into multiple value chain segments. The increasing scores correspond to a breadth expansion logic of commitments progressing "from no domain to a single domain, from a single domain to multi-domain coverage, and from multi-domain to systematic embedding." The former reflects the "implementation depth" of commitments, while the latter reflects their "strategic breadth." Together, these four dimensions constitute a multidimensional characterization of environmental commitment "intensity," representing parallel combinations of distinct constituent elements within a formative index framework.

The environmental commitment index constructed in this study is a formative indicator, with the four dimensions respectively capturing different structural attributes of commitments. These dimensions complement one another, collectively providing a comprehensive characterization of commitment intensity. Each dimension is theoretically equally important to commitment intensity and reflects distinct logical dimensions; therefore, employing equal-weight aggregation to form a composite score possesses theoretical validity. Subsequent analysis will empirically test and validate this scoring rule through single-dimension regressions and standardization procedures. The final composite environ-

mental commitment score is the sum of the four dimension scores. Detailed scoring criteria are presented in Table 1. To enhance the intuitive understanding of the environmental commitment, representative announcement excerpts for each score level across all four dimensions are provided in Table A1. Appendix B provides a detailed explanation of the coding process for the environmental commitment score in the merger announcement.

Table 1. Scoring Rules for Environmental Commitment Scores.

Dimension	Level	Score	Assessment Criteria
Domain coverage	Absence	0	No environmental commitments
	Single aspect	1	Covers one environmental domain
	Dual aspect	2	Covers two environmental domains
	Comprehensive	3	Spans three or more environmental domains
Measure specificity	Not specified	0	No implementation measures described
	Conceptual	1	General areas for improvement identified
	Methodological	2	Specifies technical or managerial methods
	Operational	3	Detailed technical specifications with quantifiable parameters
Target concreteness	Undefined	0	No measurable targets
	Qualitative	1	Directional targets without quantification
	Semi-quantified	2	Range-based or proportional targets
	Quantified	3	Precise numerical targets with units
Time constraint	Open-ended	0	No specified timeframe
	Indefinite	1	Vague temporal references
	Bounded	2	Defined completion period
	Fixed	3	Exact completion date specified

3.2.2. M&A Market Performance

Short-term M&A performance is measured using cumulative abnormal returns (CAR). Drawing on existing research [89], abnormal returns are estimated using the market model, with model parameters estimated over an estimation window from 150 to 30 trading days prior to the M&A announcement date. The market return is proxied by the value-weighted composite market return with cash dividend reinvestment provided by the CSMAR database. CAR is calculated as the cumulative sum of abnormal returns over the event window of [−2, +2] trading days surrounding the announcement date. Observations with trading suspensions during the event window are excluded to ensure that abnormal returns are calculated based on continuous trading days.

Long-term M&A performance is measured using the buy-and-hold abnormal return (BHAR). BHAR is calculated as the buy-and-hold return of the acquiring firm over the 24 months following the M&A announcement, minus the corresponding return of the market portfolio. The market portfolio is proxied by the value-weighted composite market return with cash dividend reinvestment provided by the CSMAR database. Observations with trading suspensions during the holding period are also excluded.

3.2.3. Mediating Variables

1. Change in public attention (ΔPA). Drawing on existing research [90], this study employs online search volume as a proxy indicator of public attention. When investors and the public access corporate information, online search behavior directly reflects their level of attention to specific events, offering greater timeliness and proactiveness compared to traditional media. The data are sourced from the CNRDS database, where the public attention indicator for each firm is constructed by aggregating daily search frequency using keywords such as stock codes, company abbreviations, and full company names. Based on this, the change in public attention (ΔPA) is defined

as the difference between search volume on the M&A announcement date and the average search volume over the two days prior to the announcement. A positive ΔPA indicates a significant increase in public attention on the announcement date, reflecting the market's immediate response to an active attention of environmental responsibility signals. Conversely, a negative ΔPA suggests a decrease or shift in public attention.

2. Change in green innovation (ΔGIN). Drawing on existing research [91,92], this study identifies invention patents related to environmental protection and pollution control based on patent classification codes from the China National Intellectual Property Administration (CNIPA). The number of green invention patents applied for by firms in a given year is aggregated and transformed using the natural logarithm after adding one to construct an annual green innovation indicator for each firm. ΔGIN is measured by the difference in the amount between the year following the M&A announcement (t + 1) and the announcement year (t). A positive ΔGIN indicates that environmental commitments in M&A have effectively stimulated corporate green innovation activities, promoting the transformation of environmental responsibility from commitment to action; a negative value reflects a slowdown in firms' innovation investments in green technology.

3.2.4. Control Variables

This study controls for a series of variables that may influence M&A performance, including asset-liability ratio (ALR), firm size (SIZE), firm age (AGE), ownership type (SOE), return on total assets (ROA), ownership concentration (TOP1), female director ratio (WD), revenue growth rate (RGR), net profit margin (NPM), and fixed asset ratio (FAR). Firm and year fixed effects are also controlled for. Detailed definitions of all variables are presented in Table 2.

Table 2. Variable definitions and measurement methods.

Type	Variables	Symbol	Measurement Methods
Dependent Variables	Short-term M&A market performance	CAR	Cumulative abnormal returns over the [−2, +2] trading-day window
	Long-term M&A market performance	BHAR	24-month buy-and-hold abnormal return
Independent Variable	Environmental commitment score	ECS	Composite score (0–12) from four dimensions: domain coverage (0–3), measure specificity (0–3), target concreteness (0–3), and time constraint (0–3)
Mediating Variables	Change in public attention	ΔPA	$\ln(\text{volume}_{\text{announcement}} + 1)$—$\ln(\text{volume}_{\text{pre2}} + 1)$
	Change in green invention	ΔGIN	$\ln(\text{amount}_{\text{post1}} + 1)$—$\ln(\text{amount}_{\text{announcement}} + 1)$
Control Variables	Asset-liability ratio	ALR	Total liabilities/Total assets
	Firm size	SIZE	Ln(Total assets)
	Firm age	AGE	Ln(1 + Listing age)
	Ownership nature	SOE	Dummy variable (1 = state-owned, 0 = otherwise)
	Return on assets	ROA	Net profit/Total assets
	Ownership concentration	TOP1	Percentage of shares held by the largest shareholder
	Proportion of female directors	WD	Number of female directors/Board size
	Revenue growth rate	RGR	(Current-year revenue—Prior-year revenue)/Prior-year revenue
	Net profit margin	NPM	Net profit/Revenue
	Fixed asset ratio	FAR	Net fixed assets/Total assets
	Firm fixed effects	Firm	Firm dummy variable
	Year fixed effects	Year	Year dummy variable

3.3. Model Specification

This study specifies Model (1) to examine the impact of environmental commitments in corporate M&A announcements on M&A market performance:

$$CAR_{it}/BHAR_{it} = \alpha_0 + \alpha_1 ECS_{it} + \alpha_n Control_{it} + Firm_i + Year_t + \varepsilon \quad (1)$$

where CAR_{it} represents short−term M&A market performance, $BHAR_{it}$ represents long-term M&A market performance, ECS_{it} denotes the environmental commitment score, $Control_{it}$ represents a vector of control variables, $Firm_i$ and $Year_t$ capture firm and year fixed effects respectively, and ε is the random error term.

This study specifies Models (2) and (3) to examine the potential mediating roles of public attention and green innovation levels:

$$\Delta PA_{it}/\Delta GIN_{it} = \gamma_0 + \gamma_1 ECS_{it} + \gamma_n Control_{it} + Firm_i + Year_t + \varepsilon \quad (2)$$

$$CAR_{it}/BHAR_{it} = \eta_0 + \eta_1 ECS_{it} + \eta_2 \Delta PA_{it}/\Delta GIN_{it} + \eta_n Control_{it} + Firm_i + Year_t + \varepsilon \quad (3)$$

where ΔPA_{it} represents the change in public attention, ΔGIN_{it} represents the change in green innovation levels, and all other variables are defined consistently with Model (1). In specifying the models, this study conducted Hausman tests for fixed effects versus random effects models. The Hausman test results for all models yielded $p < 0.01$, suggesting the adoption of fixed effects models.

4. Empirical Results and Analysis

4.1. Descriptive Statistics

Table 3 reports the descriptive statistics for the main variables. Regarding market performance indicators, the mean value of BHAR is −0.036, with a median of −0.095 and a standard deviation of 0.566. This distribution pattern indicates that, on average, firms experienced negative long-term abnormal returns during the sample period, suggesting that many firms underperformed the market benchmark, although substantial heterogeneity exists across firms, with some outperforming the benchmark. The mean value of CAR is 0.020, with a median of 0.003 and a standard deviation of 0.107, indicating that short-term market reactions are, on average, mildly positive, though returns are predominantly concentrated near zero with relatively limited volatility. The mean value of the environmental commitment score (ECS) is 0.466, with a median of 0 and a standard deviation of 1.431. The median of zero indicates that most firms either did not disclose environmental commitments in their M&A announcements or disclosed them at very low levels. Meanwhile, the marked disparity between the maximum value of 9 and the mean of 0.466 reflects pronounced variation in environmental commitment quality across firms. The mean of ΔPA is 0.315 and the median is 0.217, indicating a right-skewed distribution where most firms exhibit relatively low levels of carbon performance improvement, while only a minority achieve substantial improvements. The standard deviation is 0.619, with values ranging from −1.794 to 5.505, indicating substantial variation in carbon performance across firms after the announcement. The mean value of the change in green innovation (ΔGIN) is 0.119, with a median of 0 and a standard deviation of 0.787. The positive mean indicates that firms' green innovation levels generally increased during the sample period. The considerable range between the maximum and minimum values suggests substantial variation across firms in their green innovation dynamics, with some firms exhibiting substantial increases in green technology output while others experienced slower growth or even declines.

Table 3. Descriptive statistics of variables.

Variable	Sample	Min	Median	Max	Mean	SD
BHAR	8375	−1.235	−0.095	2.336	−0.036	0.566
CAR	8377	−0.253	0.003	0.353	0.020	0.107
ECS	8377	0.000	0.000	9.000	0.466	1.431
ΔPA	7490	−1.794	0.217	5.505	0.315	0.619
ΔGIN	8200	−4.277	0.000	4.804	0.119	0.787
ALR	8377	0.058	0.431	0.884	0.434	0.197
SIZE	8377	19.977	22.134	26.022	22.291	1.231
AGE	8377	0.000	2.303	3.332	2.198	0.757
SOE	8377	0.000	0.000	1.000	0.350	0.477
ROA	8377	−0.197	0.037	0.195	0.039	0.055
TOP1	8377	0.083	0.313	0.719	0.335	0.143
WD	8377	0.000	0.111	0.545	0.148	0.129
RGR	8377	−0.714	0.145	6.078	0.353	0.867
NPM	8377	−0.710	0.070	0.513	0.076	0.149
FAR	8377	0.004	0.180	0.685	0.213	0.154

4.2. Benchmark Regression

Table 4 presents the baseline regression results. The results show that, regardless of whether control variables are included, the coefficient of environmental commitment (ECS) on cumulative abnormal returns (CAR) is consistently 0.003 and remains significantly positive at the 1% level. The coefficients on buy-and-hold abnormal returns (BHAR) are 0.013 (Column 3) and 0.015 (Column 4), both significantly positive at the 5% level. These findings suggest that firms with higher-quality environmental commitments tend to exhibit better short-term and long-term market performance, thereby supporting Hypothesis 1. In terms of economic significance, drawing on existing research [93], a one-unit increase in ECS (from 0 to 2) is associated with an increase in CAR of 0.006, accounting for approximately 2.50% of the actual range of CAR ($0.006/(0.16 - (-0.08))$). Similarly, a one-unit increase in ECS is associated with an increase in BHAR of 0.03, representing approximately 2.51% of the actual range of BHAR ($0.03/(0.592 - (-0.604))$). Considering a one-standard-deviation increase in ECS, the coefficient of 0.003 for CAR implies that a one-standard-deviation increase in ECS (SD = 1.431) is associated with an increase in CAR of approximately 0.43 percentage points (0.003×1.431). For the average sample firm with a market capitalization of RMB 21.3 billion, this corresponds to an increase in shareholder value of approximately RMB 91.6 million. Similarly, a one-standard-deviation increase in ECS is associated with an increase in BHAR of approximately 2.15 percentage points (0.015×1.431).

Regarding short-term market reactions (CAR), the observed pattern is consistent with signaling theory. As high-intensity, verifiable signals embedded in M&A announcements, environmental commitments can alleviate investor concerns about environmental risks and potential greenwashing during information-asymmetric M&A windows, reducing screening costs and expected risk premiums, thereby contributing positive short-term abnormal returns. This suggests that capital markets are increasingly capable of identifying credible green commitments as ESG preferences shape short-term pricing. Regarding long-term abnormal returns (BHAR), their persistence is consistent with the resource-based view. The green transformation that follows environmental commitments may require an extended period to unlock value, helping to explain the multi-year abnormal returns. Moreover, sustained positive long-term returns are consistent with the mitigation of greenwashing concerns, as purely symbolic commitments—lacking substantive actions—are unlikely to generate persistent outperformance over extended horizons. Furthermore,

the simultaneous presence of positive short-term and long-term returns is consistent with a dynamic information updating process: while CAR captures the market's initial valuation of commitment credibility at the announcement, the persistent BHAR suggests that this initial expectation is subsequently aligned with the gradual realization of promised actions.

Table 4. Benchmark regression results.

Variables	(1)	(2)	(3)	(4)
	CAR	CAR	BHAR	BHAR
ECS	0.003 ***	0.003 ***	0.013 **	0.015 **
	(0.001)	(0.001)	(0.006)	(0.006)
ALR		0.026 *		0.301 ***
		(0.015)		(0.076)
SIZE		−0.025 ***		−0.312 ***
		(0.004)		(0.019)
AGE		0.001		−0.026
		(0.006)		(0.033)
SOE		−0.003		−0.191 ***
		(0.010)		(0.055)
ROA		0.050 **		0.360 ***
		(0.022)		(0.120)
TOP1		0.003		0.681 ***
		(0.024)		(0.122)
WD		0.029 *		0.139 *
		(0.016)		(0.082)
RGR		0.000 *		0.000
		(0.000)		(0.000)
NPM		0.000		0.001
		(0.000)		(0.001)
FAR		0.045 **		0.490 ***
		(0.020)		(0.099)
Constant	0.018 ***	0.555 ***	−0.041 ***	6.549 ***
	(0.001)	(0.085)	(0.007)	(0.417)
N	8377	8377	8375	8375
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
R^2	0.325	0.334	0.292	0.350

The values in parentheses are standard errors clustered by firm; ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The same applies below.

4.3. Mechanism Analysis

Table 5 presents the results of channel tests examining the potential channels through which environmental commitments are associated with market performance. Columns (1) and (2) report the associations between environmental commitments and the potential mediating variables. The results show that the coefficient of ECS on the change in online search volume (ΔPA) is 0.033 ($p < 0.01$), and the coefficient on the change in green innovation (ΔGIN) is 0.018 ($p < 0.10$), suggesting that firms with higher-quality environmental commitments tend to experience greater increases in public attention and green innovation activity during the announcement period. These findings are consistent with theoretical expectations: high-credibility environmental commitments, as positive governance signals, may attract immediate public attention, as indicated by increased online search activity; simultaneously, the resource allocation and strategic adjustments undertaken in the context of commitment fulfillment may be associated with greater accumulation of green technology. Columns (2) tests the potential mediating effects using short-term market performance (CAR) as the dependent variable. The coefficient of ΔPA is 0.029 ($p < 0.01$), suggesting that

public attention may serve as channels through which environmental commitments are associated with short-term market performance. Specifically, firms with higher-quality commitments tend to receive greater investor attention around the announcement, which in turn is positively associated with CAR. This pattern is consistent with the notion that online search activity may capture the immediate market recognition of commitment signals. Columns (4) presents results using long-term market performance (BHAR) as the dependent variable, further supporting the above findings. The coefficient of ΔGIN is 0.015 ($p < 0.10$). Notably, while public attention (ΔPA) is more strongly associated with short-term market reactions, green innovation (ΔGIN) exhibits a more sustained association with long-term market performance. This pattern provides suggestive evidence consistent with the credibility of commitment signals: high-quality commitments not only are associated with immediate attention but also are followed by tangible innovation outcomes that may be associated with long-term performance.

Table 5. Mechanism analysis results.

Variables	(1)	(2)	(4)	(5)
	ΔPA	**CAR**	**ΔGIN**	**BHAR**
ECS	0.033 ***	0.003 **	0.018 *	0.014 **
	(0.007)	(0.001)	(0.010)	(0.006)
ΔPA		0.029 ***		
		(0.002)		
ΔGIN				0.015 *
				(0.009)
ALR	0.061	0.030 *	−0.102	0.312 ***
	(0.091)	(0.016)	(0.107)	(0.078)
SIZE	−0.109 ***	−0.023 ***	−0.049 *	−0.316 ***
	(0.022)	(0.004)	(0.027)	(0.019)
AGE	0.077 *	0.001	0.031	−0.027
	(0.042)	(0.006)	(0.048)	(0.034)
SOE	0.046	0.001	−0.074	−0.200 ***
	(0.061)	(0.011)	(0.088)	(0.057)
ROA	0.002	0.040 *	0.275	0.361 ***
	(0.143)	(0.022)	(0.174)	(0.122)
TOP1	0.001	0.000	0.001	0.007 ***
	(0.001)	(0.000)	(0.002)	(0.001)
WD	−0.037	0.036 **	0.063	0.138
	(0.100)	(0.016)	(0.122)	(0.085)
RGR	−0.000 ***	0.000 ***	0.000 **	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
NPM	−0.001	0.000 *	−0.002 *	0.001
	(0.001)	(0.000)	(0.001)	(0.001)
FAR	−0.061	0.047 **	−0.080	0.513 ***
	(0.120)	(0.022)	(0.142)	(0.103)
Constant	2.497 ***	0.492 ***	1.174 **	6.603 ***
	(0.486)	(0.092)	(0.586)	(0.427)
N	7388	7388	8163	8161
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
R^2	0.330	0.367	0.210	0.354

4.4. Endogeneity Tests

4.4.1. Heckman Test

The disclosure of environmental commitments may involve potential self-selection concerns. For instance, firms with better environmental performance may be more likely to disclose such commitments, which could potentially bias the estimation results. To address this concern, this study employs the Heckman two-stage method. In the first stage, a Probit model is constructed with a dummy variable indicating whether environmental commitments are disclosed (ECS_Dummy) as the dependent variable. Factors that may be associated with disclosure decisions—including firm leverage, age, and size—are included as explanatory variables, while year, industry, and region fixed effects are controlled for. The inverse Mills ratio (λ) is then calculated. In the second stage, λ is incorporated as a control variable into the baseline regression. Table 6 reports the results of the Heckman two-stage test. After controlling for potential sample selection bias, the coefficient of ECS on CAR remains 0.003 ($p < 0.01$), and the coefficient on BHAR is 0.012 ($p < 0.05$), both remaining similar to the baseline regression results. This suggests that the positive association between environmental commitments and M&A performance is unlikely to be driven by sample self-selection issues, and the core findings are robust.

Table 6. Heckman test results.

Variables	(1)	(2)	(3)
	ECS_Dummy	CAR	BHAR
ECS		0.003 ***	0.012 **
		(0.001)	(0.006)
ALR	0.203	0.025	0.262 ***
	(0.166)	(0.018)	(0.088)
SIZE	0.078 ***	−0.030 ***	−0.341 ***
	(0.025)	(0.005)	(0.024)
AGE	−0.014	−0.003	−0.047
	(0.044)	(0.007)	(0.042)
SOE	−0.259 ***	0.007	−0.157 **
	(0.077)	(0.011)	(0.064)
ROA	−0.345	0.054 *	0.324 *
	(0.315)	(0.028)	(0.166)
TOP1	−0.003	0.000	0.007 ***
	(0.002)	(0.000)	(0.001)
WD	−0.186	0.024	0.127
	(0.205)	(0.018)	(0.097)
RGR	0.001	0.001 ***	0.004 ***
	(0.001)	(0.000)	(0.001)
NPM	−0.056	0.004	0.059
	(0.057)	(0.007)	(0.044)
FAR	0.360 *	0.045 *	0.520 ***
	(0.199)	(0.025)	(0.125)
λ		−0.017 *	−0.038
		(0.010)	(0.035)
Constant	−3.426 ***	0.705 ***	7.305 ***
	(0.954)	(0.106)	(0.546)
N	7062	8375	8375
Firm	No	Yes	Yes
Year	Yes	Yes	Yes
City	Yes	No	No
Industry	Yes	No	No
R^2	0.211	0.292	0.350

4.4.2. PSM Test

To address concerns that observable differences in firm or deal characteristics may drive our results, we conduct a propensity score matching (PSM) analysis. A treatment indicator is defined as equal to one for observations with non-zero environmental commitment scores (ECS > 0). The propensity score is estimated using a logit model that includes all firm-level controls from the baseline specification, as well as deal-level characteristics that may influence both commitment disclosure and investor responses: relative deal size, indicators for related-party transactions, major restructurings, horizontal or vertical integration, cross-city deals, and deals involving intellectual property. One-to-one nearest neighbor matching without replacement is then performed. Table 7 reports the PSM test results. In the cross-sectional matching, the coefficients of ECS on CAR and BHAR are 0.005 ($p < 0.10$) and 0.024 ($p < 0.10$). In the year-by-year matching, the coefficients of ECS on CAR and BHAR are 0.005 ($p < 0.10$) and 0.027 ($p < 0.05$), respectively, consistent with the main findings. The association remains robust after controlling for observable firm and deal characteristics, suggesting that the positive market reaction is unlikely to be explained solely by observable differences in firm or deal type.

Table 7. PSM test results.

Variables	(1)	(2)	(3)	(4)
	Cross-Sectional Matching		Period-by-Period Matching	
	CAR	BHAR	CAR	BHAR
ECS	0.005 *	0.024 *	0.005 *	0.027 **
	(0.003)	(0.014)	(0.003)	(0.014)
ALR	0.239	0.087	0.368	0.239
	(0.249)	(0.063)	(0.257)	(0.249)
SIZE	−0.262 ***	−0.035 **	−0.245 ***	−0.262 ***
	(0.067)	(0.015)	(0.067)	(0.067)
AGE	0.115	−0.070 ***	0.214 *	0.115
	(0.123)	(0.026)	(0.130)	(0.123)
SOE	−0.166	−0.025	−0.143	−0.166
	(0.132)	(0.033)	(0.125)	(0.132)
ROA	0.434	0.164	−0.027	0.434
	(0.524)	(0.115)	(0.466)	(0.524)
TOP1	0.011 ***	−0.000	0.013 ***	0.011 ***
	(0.003)	(0.001)	(0.004)	(0.003)
WD	0.098	−0.048	−0.024	0.098
	(0.360)	(0.059)	(0.369)	(0.360)
RGR	−0.003	0.002	0.028 ***	−0.003
	(0.002)	(0.004)	(0.010)	(0.002)
NPM	0.002	−0.008	0.040	0.002
	(0.047)	(0.013)	(0.046)	(0.047)
FAR	1.106 ***	0.068	1.177 ***	1.106 ***
	(0.271)	(0.057)	(0.273)	(0.271)
Constant	0.912 ***	4.814 ***	0.921 ***	4.049 ***
	(0.321)	(1.503)	(0.326)	(1.540)
N	894	894	853	853
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
R^2	0.464	0.530	0.447	0.554

4.4.3. Placebo Test

A placebo test is conducted to examine whether reverse causality may explain the observed association between environmental commitments and market performance. Specifically, whether firms with better historical performance are more likely to make high-quality environmental commitments in subsequent M&A announcements. Current ECS is regressed on one-year-lagged CAR/BHAR and firm characteristics. As shown in Table 8, the coefficients on lagged CAR and BHAR are statistically insignificant (−0.000, $p > 0.10$ and 0.008, $p > 0.10$). These results suggest that the positive association documented in the main analysis is unlikely to be driven by pre-existing firm performance or characteristics, providing further support for the interpretation that environmental commitments themselves may convey value-relevant information.

Table 8. Placebo test results.

Variables	(1)	(2)
	L.CAR	L.BHAR
ECS	−0.000	0.008
	(0.001)	(0.005)
L.ALR	0.000	0.024 *
	(0.001)	(0.014)
L.SIZE	0.000	0.001
	(0.000)	(0.002)
L.AGE	−0.001	−0.000
	(0.004)	(0.025)
L.SOE	−0.001	0.049
	(0.006)	(0.039)
L.ROA	0.001	0.063 *
	(0.003)	(0.038)
L.TOP1	−0.000 *	−0.001
	(0.000)	(0.001)
L.WD	−0.007	−0.024
	(0.012)	(0.069)
L.RGR	−0.000	−0.000
	(0.000)	(0.000)
L.NPM	0.000	−0.003
	(0.000)	(0.002)
L.FAR	0.016	0.024
	(0.014)	(0.078)
Constant	0.010	−0.012
	(0.007)	(0.044)
N	5933	5933
Firm	Yes	Yes
Year	Yes	Yes
R^2	0.274	0.302

4.5. Robustness Test

4.5.1. Instrumental Variable Specification

To examine the robustness of the baseline findings, this study employs an instrumental-variable specification using the mean environmental commitment score of other firms in the same industry and region as an instrument and conducts two-stage least squares (2SLS) estimation. The intuition behind this instrument is that firms located in the same industry and region are exposed to similar institutional and competitive environments—such as regional emission reduction targets, industry-specific environmental standards, and supply chain green certification requirements. These shared conditions may generate

industry–region level disclosure patterns and influence firms' environmental commitment strategies through imitation or normative adjustment. Consequently, the industry–region average commitment score is expected to be correlated with the focal firm's environmental commitments, satisfying the relevance condition of the instrumental variable.

To mitigate potential reflection problems, industry and region fixed effects are introduced in the first-stage regression. Table 9 reports the instrumental-variable estimation results. In the first stage, the coefficient of the instrumental variable is 0.289 ($p < 0.01$), indicating strong explanatory power for environmental commitments. The Kleibergen–Paap rk LM statistics are 15.858 and 71.380 ($p < 0.01$), rejecting the null hypothesis of underidentification. In addition, both the Cragg–Donald Wald F statistics (167.765, 969.063) and the Kleibergen–Paap rk Wald F statistics (20.198, 205.719) exceed the Stock–Yogo 10% critical value of 16.38, suggesting that weak instrument concerns are unlikely to be severe. The second-stage results show that the coefficients of the instrumented environmental commitment score on CAR and BHAR are 0.030 ($p < 0.01$) and 0.024 ($p < 0.05$), respectively. The signs and significance of these estimates remain consistent with the baseline regression results. Overall, the instrumental-variable specification yields qualitatively similar findings, providing additional evidence that the positive relationship between environmental commitments and M&A performance is robust across alternative empirical specifications.

Table 9. Instrumental variable regression results.

Variables	(1)	(2)	(3)
	The First Stage	The Second Stage	
	CAR	CAR	BHAR
ECS_IV	0.289 ***		
	(0.095)		
ECS		0.030 ***	0.024 **
		(0.010)	(0.010)
ALR	−0.304	0.036 **	0.270 ***
	(0.196)	(0.018)	(0.088)
SIZE	0.050	−0.027 ***	−0.336 ***
	(0.050)	(0.004)	(0.024)
AGE	−0.022	0.002	−0.043
	(0.089)	(0.006)	(0.041)
SOE	−0.021	0.004	−0.194 ***
	(0.130)	(0.010)	(0.066)
ROA	0.010	0.045	0.098
	(0.293)	(0.034)	(0.221)
TOP1	0.001	0.000	0.007 ***
	(0.003)	(0.000)	(0.001)
WD	0.091	0.019	0.125
	(0.192)	(0.017)	(0.094)
RGR	0.000	0.000	0.000 **
	(0.000)	(0.000)	(0.000)
NPM	−0.065	0.006	0.091 *
	(0.041)	(0.008)	(0.055)
FAR	0.375	0.062 ***	0.518 ***
	(0.291)	(0.022)	(0.126)
Constant	−0.670	0.567 ***	7.112 ***
	(1.102)	(0.095)	(0.531)

Table 9. *Cont.*

Variables	(1)	(2)	(3)
	The First Stage	The Second Stage	
	CAR	CAR	BHAR
N	7710	7712	7710
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
City	Yes	No	No
Industry	Yes	No	No
R^2	0.325	0.334	0.292
Kleibergen-Paap rk LM statistic		15.858 (p = 0.000)	71.380 (p = 0.000)
Cragg-Donald Wald F statistic		167.765	969.063
Kleibergen-Paap rk Wald F statistic		20.198	205.719

4.5.2. Alternative Event Windows

To examine the sensitivity of the core findings to event window specifications, this study adjusts the calculation window for CAR to [−3, 3] and extends the BHAR window to 36 months post-M&A, re-estimating the baseline model. Table 10 reports the results. In Column (1), the coefficient of ECS is 0.004 ($p < 0.05$), indicating that environmental commitments are positively associated with short-term cumulative abnormal returns within a broader event window, consistent with the stability of their signaling effect. In Column (2), the coefficient of ECS is 0.018 ($p < 0.05$), suggesting that the positive association between environmental commitments and long-term performance persists over the 36-month window, providing support for the robustness of the long-term pattern, consistent with the view that firms may realize performance improvements through green transformation.

Table 10. Robustness test for adjusted time window.

Variables	(1)	(2)
	CAR	BHAR
ECS	0.004 **	0.018 **
	(0.001)	(0.009)
ALR	0.034 *	0.293 **
	(0.019)	(0.127)
SIZE	−0.030 ***	−0.507 ***
	(0.005)	(0.033)
AGE	−0.000	−0.127 **
	(0.007)	(0.057)
SOE	−0.006	−0.107
	(0.013)	(0.077)
ROA	0.067 **	0.185
	(0.027)	(0.214)
TOP1	0.000	0.010 ***
	(0.000)	(0.002)
WD	0.028	0.175
	(0.019)	(0.138)
RGR	0.000 *	0.000
	(0.000)	(0.000)
NPM	0.000	0.001
	(0.000)	(0.002)

Table 10. *Cont.*

Variables	(1)	(2)
	CAR	**BHAR**
FAR	0.054 **	0.755 ***
	(0.025)	(0.158)
Constant	0.664 ***	10.836 ***
	(0.103)	(0.759)
N	8335	7635
Firm	Yes	Yes
Year	Yes	Yes
R^2	0.334	0.402

4.5.3. Extensive vs. Intensive Margin of Environmental Commitments

As shown in Table 3, the distribution of ECS is highly skewed, with a median of zero and only a small fraction of announcements containing environmental commitment language. This highlights an important distinction between the extensive margin—whether any environmental commitment is disclosed—and the intensive margin—the quality of commitments conditional on disclosure. To disentangle these two effects, additional analyses are conducted examining both margins separately.

First, ECS is replaced with a disclosure dummy (ECS_Dummy) that equals one if the M&A announcement contains any environmental commitment language. Table 11 reports the results. The coefficient of ECS_Dummy on CAR is 0.010 ($p < 0.05$), and the coefficient on BHAR is 0.035 ($p < 0.10$). Compared with the main regression results, the larger coefficients suggest that the market may more directly respond to the categorical signal of "whether commitments are disclosed." Given the relatively low proportion of firms disclosing environmental commitments, the scarcity of such signals may enhance their distinctiveness in the market, and may be associated with more pronounced value adjustments.

Table 11. Alternative measurement of the explanatory variable.

Variables	(1)	(2)	(3)	(4)
	CAR	**BHAR**	**CAR**	**BHAR**
ECS_Dummy	0.010 **	0.035 *		
	(0.004)	(0.021)		
ECS			0.006 *	0.036 **
			(0.003)	(0.016)
ALR	0.025 *	0.299 ***	0.084	0.370
	(0.015)	(0.076)	(0.068)	(0.281)
SIZE	−0.025 ***	−0.312 ***	−0.037 **	−0.261 ***
	(0.004)	(0.019)	(0.016)	(0.070)
AGE	0.001	−0.026	−0.072 ***	0.163
	(0.006)	(0.033)	(0.026)	(0.135)
SOE	−0.004	−0.191 ***	−0.017	−0.162
	(0.010)	(0.055)	(0.039)	(0.145)
ROA	0.050 **	0.358 ***	0.072	0.060
	(0.022)	(0.120)	(0.127)	(0.494)
TOP1	0.000	0.007 ***	−0.001	0.013 ***
	(0.000)	(0.001)	(0.001)	(0.004)
WD	0.030 *	0.140 *	−0.059	0.036
	(0.016)	(0.082)	(0.064)	(0.405)

Table 11. *Cont.*

Variables	(1)	(2)	(3)	(4)
	CAR	**BHAR**	**CAR**	**BHAR**
RGR	0.000 *	0.000	0.001	0.009
	(0.000)	(0.000)	(0.003)	(0.012)
NPM	0.000	0.001	0.000	0.059
	(0.000)	(0.001)	(0.014)	(0.044)
FAR	0.045 **	0.488 ***	0.068	1.156 ***
	(0.020)	(0.099)	(0.057)	(0.276)
Constant	0.554 ***	6.540 ***	0.966 ***	4.478 ***
	(0.085)	(0.418)	(0.349)	(1.604)
N	8377	8375	749	749
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
R^2	0.334	0.349	0.458	0.562

Second, the sample is restricted to announcements containing environmental commitment language (ECS > 0) and the baseline regression is re-estimated. As shown in Table 11, the coefficient of ECS on CAR is 0.006 ($p < 0.10$), and the coefficient on BHAR is 0.036 ($p < 0.05$). These results suggest that, conditional on disclosure, the quality of environmental commitments continues to be associated with incremental information for investors. The textual characteristics of commitment language thus provide informative signals regarding firms' environmental intentions and governance orientation.

Taken together, the results suggest that capital markets respond to environmental commitments along both the extensive margin (whether commitments are disclosed) and the intensive margin (the quality of commitments).

4.5.4. Alternative Indicator Construction

To address potential concerns about subjectivity arising from equal-weight aggregation, this study standardizes the scores of the four dimensions separately and reconstructs a composite indicator based on the standardized scores (Z_ECS). Table 12 show that the coefficient of Z_ECS on CAR is 0.001 ($p < 0.05$), and the coefficient on BHAR is 0.006 ($p < 0.05$), consistent with the baseline regression results in both sign and significance. This suggests that the core findings are not sensitive to specific weighting schemes, and the indicator construction is robust.

Table 12. Results using the standardized indicator.

Variables	(1)	(2)
	CAR	**BHAR**
Z_ECS	0.001 **	0.006 **
	(0.001)	(0.002)
ALR	0.025 *	0.300 ***
	(0.015)	(0.076)
SIZE	−0.025 ***	−0.312 ***
	(0.004)	(0.019)
AGE	0.001	−0.026
	(0.006)	(0.033)
SOE	−0.003	−0.191 ***
	(0.010)	(0.055)
ROA	0.050 **	0.359 ***
	(0.022)	(0.120)

Table 12. *Cont.*

Variables	(1)	(2)
	CAR	**BHAR**
TOP1	0.000	0.007 ***
	(0.000)	(0.001)
WD	0.030 *	0.140 *
	(0.016)	(0.082)
RGR	0.000 *	0.000
	(0.000)	(0.000)
NPM	0.000	0.001
	(0.000)	(0.001)
FAR	0.045 **	0.489 ***
	(0.020)	(0.100)
Constant	0.050 **	0.359 ***
	(0.022)	(0.120)
N	8377	8375
Firm	Yes	Yes
Year	Yes	Yes
R^2	0.334	0.350

4.5.5. Additional Control Variables

M&A transactions exhibit significant heterogeneity in scale and nature, which may influence investor value assessments. To ensure that our main findings are not driven by observable deal characteristics, we further control for a set of transaction-level attributes. These include acquirer relative deal size (DealSize), type of M&A (Type), related-party transaction (Related), major restructuring (Major), cross-city deals (Cross), and deals involving intellectual property (IPDeal), as well as industry relatedness between the acquirer and target and the method of payment. Table 13 reports the results. After controlling for these transaction characteristics, the coefficients of ECS on CAR and BHAR remain 0.002 ($p < 0.05$) and 0.011 ($p < 0.05$), respectively, consistent with the baseline regressions. The stability of these estimates suggests that the positive association between environmental commitments and market performance is unlikely to be driven by deal size, transaction type, or other observable deal attributes, and is more plausibly related to the informational content of the commitments themselves. The core findings remain robust.

Table 13. Robustness test for additional control variables.

Variables	(1)	(2)
	CAR	**BHAR**
ECS	0.002 **	0.011 **
	(0.001)	(0.005)
ALR	0.015	0.293 ***
	(0.015)	(0.076)
SIZE	−0.016 ***	−0.301 ***
	(0.004)	(0.019)
AGE	−0.006	−0.020
	(0.006)	(0.033)
SOE	−0.001	−0.181 ***
	(0.010)	(0.055)
ROA	0.047 **	0.332 ***
	(0.021)	(0.120)

Table 13. *Cont.*

Variables	(1)	(2)
	CAR	**BHAR**
TOP1	0.000	0.007 ***
	(0.000)	(0.001)
WD	0.030 **	0.139 *
	(0.015)	(0.082)
RGR	0.000 *	0.000
	(0.000)	(0.000)
NPM	0.000	0.001
	(0.000)	(0.001)
FAR	0.042 **	0.468 ***
	(0.020)	(0.099)
DealSize	0.009 ***	−0.006
	(0.003)	(0.010)
Type	0.012 **	−0.072 **
	(0.005)	(0.030)
Related	0.119 ***	0.249 ***
	(0.012)	(0.067)
Major	−0.004	0.007
	(0.004)	(0.029)
Cross	0.017 ***	0.036
	(0.005)	(0.032)
IPDeal	−0.029	0.361 *
	(0.025)	(0.205)
Constant	0.351 ***	6.273 ***
	(0.084)	(0.426)
N	8377	8375
Firm	Yes	Yes
Year	Yes	Yes
R^2	0.368	0.354

4.5.6. Addressing Extreme Values

To address the potential influence of extreme values on the estimation results, this study winsorizes continuous variables at the 1% and 5% levels, respectively, and re-estimates the baseline model. Table 14 reports the results. After winsorizing at 1% and 5% levels, the coefficients of ECS on CAR remain 0.003 ($p < 0.01$); the coefficients on BHAR are 0.014 ($p < 0.05$) and 0.009 ($p < 0.10$), respectively. These findings suggest that the positive association between environmental commitments and M&A performance remains robust after addressing the influence of extreme values.

Table 14. Robustness test for extreme values.

Variables	(1)	(2)	(3)	(4)
	1% Winsorization		**5% Winsorization**	
	CAR	**BHAR**	**CAR**	**BHAR**
ECS	0.003 ***	0.014 **	0.003 ***	0.009 *
	(0.001)	(0.006)	(0.001)	(0.004)
ALR	0.019	0.333 ***	0.011	0.239 ***
	(0.016)	(0.076)	(0.014)	(0.063)
SIZE	−0.027 ***	−0.331 ***	−0.022 ***	−0.261 ***
	(0.004)	(0.019)	(0.004)	(0.016)

Table 14. *Cont.*

Variables	(1)	(2)	(3)	(4)
	1% Winsorization		5% Winsorization	
	CAR	BHAR	CAR	BHAR
AGE	0.002	−0.021	−0.001	−0.000
	(0.006)	(0.033)	(0.006)	(0.029)
SOE	−0.003	−0.191 ***	−0.001	−0.154 ***
	(0.010)	(0.054)	(0.009)	(0.042)
ROA	−0.077	−0.886 ***	−0.143 *	−1.067 ***
	(0.064)	(0.310)	(0.079)	(0.357)
TOP1	−0.000	0.007 ***	−0.000	0.006 ***
	(0.000)	(0.001)	(0.000)	(0.001)
WD	0.029 *	0.138 *	0.032 **	0.100
	(0.016)	(0.082)	(0.014)	(0.068)
RGR	0.011 ***	0.043 ***	0.011 ***	0.064 ***
	(0.002)	(0.011)	(0.004)	(0.015)
NPM	0.053 **	0.487 ***	0.073 **	0.513 ***
	(0.023)	(0.112)	(0.036)	(0.164)
FAR	0.051 **	0.504 ***	0.046 **	0.381 ***
	(0.021)	(0.100)	(0.019)	(0.086)
Constant	0.600 ***	6.932 ***	0.487 ***	5.412 ***
	(0.086)	(0.429)	(0.077)	(0.350)
N	8377	8375	8377	8375
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
R^2	0.338	0.353	0.338	0.347

4.5.7. Controlling for Multi-Dimensional Fixed Effects

To address potential concerns about disturbance arising from regional characteristics, industry characteristics, and their interaction, this study sequentially controls for region fixed effects, industry fixed effects, and industry-region interaction fixed effects based on the baseline model, then re-estimates the regressions. Table 15 reports the results. After controlling for different dimensions of fixed effects, the coefficients of ECS on CAR remain 0.003 ($p < 0.01$), and the coefficients on BHAR remain 0.014 ($p < 0.05$), consistent with the baseline regression results. These findings suggest that the core findings remain robust after accounting for multi-dimensional heterogeneity.

Table 15. Robustness test for multi-dimensional fixed effects.

Variables	(1)	(2)	(3)	(4)
	CAR	BHAR	CAR	BHAR
ECS	0.003 ***	0.014 **	0.003 ***	0.014 **
	(0.001)	(0.006)	(0.001)	(0.006)
ALR	0.021	0.289 ***	0.024	0.314 ***
	(0.016)	(0.080)	(0.018)	(0.089)
SIZE	−0.023 ***	−0.327 ***	−0.022 ***	−0.371 ***
	(0.004)	(0.021)	(0.005)	(0.025)
AGE	−0.001	−0.028	0.003	−0.069
	(0.006)	(0.036)	(0.007)	(0.042)
SOE	−0.003	−0.172 ***	0.001	−0.198 ***
	(0.011)	(0.058)	(0.012)	(0.064)
ROA	0.050 **	0.344 ***	0.039	−0.158
	(0.023)	(0.126)	(0.039)	(0.193)

Table 15. *Cont.*

Variables	(1)	(2)	(3)	(4)
	CAR	**BHAR**	**CAR**	**BHAR**
TOP1	0.000	0.006 ***	0.000	0.007 ***
	(0.000)	(0.001)	(0.000)	(0.002)
WD	0.028 *	0.177 **	0.018	0.187 **
	(0.016)	(0.087)	(0.018)	(0.095)
RGR	0.000 *	0.000	0.000 *	0.000 **
	(0.000)	(0.000)	(0.000)	(0.000)
NPM	0.000	0.001	0.006	0.118 **
	(0.000)	(0.001)	(0.009)	(0.053)
FAR	0.052 **	0.459 ***	0.063 ***	0.548 ***
	(0.021)	(0.107)	(0.024)	(0.126)
Constant	0.510 ***	6.890 ***	0.469 ***	7.966 ***
	(0.090)	(0.463)	(0.103)	(0.559)
N	8312	8310	7678	7676
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
City	Yes	Yes	No	No
Industry	Yes	Yes	No	No
Industry#City	No	No	Yes	Yes
R^2	0.364	0.381	0.387	0.416

4.5.8. Firms with Frequent M&A Activities

The baseline specification with firm fixed effects exploits within-firm variation in environmental commitments across M&A deals. However, firms with only one acquisition contribute not within-firm variation and thus provide limited identifying power. To strengthen the within-firm comparison, this study restricts the sample to firms that conducted at least four M&A transactions during the sample period. This subsample offers a cleaner setting for examining the information content of commitment language. Frequent acquirers provide multiple observations per firm, allowing us to trace how the same firm's market performance varies with commitment quality across its different deals. In this design, firm fixed effects absorb stable firm characteristics, allowing the remaining variation in ECS to better capture differences in disclosure choices across multiple transactions undertaken by the same firm.

As reported in Table 16, this study finds that the coefficients on ECS remain positive and significant (CAR: 0.003, $p < 0.05$; BHAR: 0.014, $p < 0.05$). These results indicate that the positive association between environmental commitments and market performance holds even when identification relies primarily on within-firm variation across multiple deals. This finding suggests that environmental commitments themselves carry information that investors respond to, rather than simply reflecting stable firm attributes that happen to correlate with such disclosures.

Table 16. Subsample analysis results.

Variables	(1)	(2)
	CAR	**BHAR**
ECS	0.003 **	0.014 **
	(0.001)	(0.006)
ALR	0.018	0.295 ***
	(0.017)	(0.088)

Table 16. *Cont.*

Variables	(1)	(2)
	CAR	**BHAR**
SIZE	−0.022 ***	−0.334 ***
	(0.004)	(0.022)
AGE	0.003	−0.043
	(0.007)	(0.039)
SOE	−0.001	−0.201 ***
	(0.011)	(0.061)
ROA	0.058 **	0.179
	(0.027)	(0.159)
TOP1	−0.000	0.006 ***
	(0.000)	(0.001)
WD	0.016	0.106
	(0.017)	(0.091)
RGR	0.001 ***	0.002
	(0.000)	(0.002)
NPM	−0.003	0.114 ***
	(0.007)	(0.043)
FAR	0.045 **	0.419 ***
	(0.023)	(0.116)
Constant	0.498 ***	7.167 ***
	(0.097)	(0.497)
N	5886	5886
Firm	Yes	Yes
Year	Yes	Yes
R^2	0.256	0.293

4.5.9. Exclusion of Confounding Events

To better isolate market reactions to environmental commitments within the event window [−2, +2], potential confounding events were identified and excluded. Specifically, events that may affect stock prices were identified, including financial reports, earnings forecasts, shareholding changes by major shareholders, major contract signings, and regulatory penalties. Announcement dates were obtained from the CSMAR database and cross-checked using Cninfo and PKULaw. Observations with any of the aforementioned announcements falling within the [−2, +2] window were excluded. Table 17 reports the test results: after excluding observations with confounding events, the coefficients of ECS on CAR and BHAR are 0.003 ($p < 0.01$) and 0.013 ($p < 0.05$), respectively, which remain consistent with the main regression results. These findings suggest that other significant announcements during the same period do not materially affect the core findings, supporting the robustness of the conclusions.

Table 17. Exclusion of confounding events results.

Variables	(1)	(2)
	CAR	**BHAR**
ECS	0.003 ***	0.013 **
	(0.001)	(0.006)
ALR	0.032 **	0.289 ***
	(0.016)	(0.080)
SIZE	−0.028 ***	−0.302 ***
	(0.004)	(0.020)

Table 17. *Cont.*

Variables	(1)	(2)
	CAR	**BHAR**
AGE	−0.001	−0.005
	(0.006)	(0.035)
SOE	−0.005	−0.193 ***
	(0.011)	(0.056)
ROA	0.035	0.383 ***
	(0.022)	(0.124)
TOP1	0.000	0.007 ***
	(0.000)	(0.001)
WD	0.027 *	0.079
	(0.016)	(0.086)
RGR	0.000 *	0.000 ***
	(0.000)	(0.000)
NPM	0.000	0.001
	(0.000)	(0.001)
FAR	0.060 ***	0.515 ***
	(0.022)	(0.107)
Constant	0.613 ***	6.289 ***
	(0.091)	(0.443)
N	7573	7571
Firm	Yes	Yes
Year	7573	7571
R^2	0.345	0.355

4.5.10. Calendar-Time Portfolio Approach

To address potential concerns regarding cross-sectional dependence and benchmark sensitivity in BHAR estimates, the calendar-time portfolio approach is employed as a supplementary test. Specifically, for each calendar month t, a long-short portfolio is constructed by buying firms that issued M&A announcements within the prior 24 months and whose ECS exceeds the annual industry median, while selling firms with ECS below the median, with positions held for one month. The monthly excess returns of this portfolio are then regressed on the Fama-French three-factor model using time-series regression.

Table 18 reports the regression results. The intercept term α is 0.0023 (t = 3.57), significant at the 1% level, indicating that firms with high environmental commitments generate risk-adjusted excess returns of 0.23% per month relative to low-commitment firms—equivalent to an annualized return of approximately 2.83%. The market factor coefficient is insignificant, suggesting no systematic market exposure for the portfolio. The coefficients on SMB and HML are significantly negative ($p < 0.05$) but small in magnitude (−0.037 and −0.062, respectively), suggesting a modest tilt toward large-cap growth styles among high-ECS firms. More importantly, the model's R^2 is only 0.045, indicating that the three factors explain little of the long-short portfolio's return variation. These results are consistent with the view that the long-term abnormal returns associated with high-quality environmental commitments reflect a pattern not fully captured by known risk factors, providing further support for the BHAR findings. Taken together, they are consistent with the temporal sequence of "announcement information—immediate market response—long-term realization," suggesting that environmental commitments may contribute to sustained value creation.

Table 18. Calendar-time portfolio result.

Variables	Coef.	t-Stat
α	0.0023 ***	(3.57)
MKT	0.0000	(0.00)
SMB	−0.0369 **	(−2.16)
HML	−0.0624 **	(−2.57)
N	180	
R^2	0.045	

5. Further Analysis

5.1. Extension Analysis

The preceding analysis provides evidence that environmental commitments in M&A are associated with positive market reactions. However, a core question remains to be addressed directly: does this reaction reflect rational pricing of firms' genuine green governance capabilities, or is it merely symbolic hype driven by the "green" label? If the latter were true, the observed increases in short-term CAR and long-term BHAR would lack fundamental support, thereby challenging the core logic of this study. To address this concern directly, this section examines the "value realization" of environmental commitments along five dimensions: expenditure, financial, environmental, market, and investors. Specifically, this study employs changes in environmental capital expenditure (ΔGI, i.e., Δln(environmental capital expenditure + 1)) to measure green investment intensity, changes in return on equity (ΔROE) to measure financial performance improvement, changes in carbon performance (ΔCP, i.e., Δoperating revenue/carbon emissions) to reflect environmental performance improvement, changes in the natural logarithm of sales to the top five customers (ΔMS, i.e., Δln(sales to top five customers)) to capture market competitive position, and changes in the number of green investors (ΔGIV, i.e., Δln(green investors + 1)) to reflect external professional investors' recognition and oversight. Green investor information is obtained from the CSMAR database. By linking the "Fund Profile Table" and the "Equity Investment Detail Table" from the Fund Market Series, a list of funds with holdings in listed firms is compiled. Each fund's investment objective and scope are manually checked for environmental keywords (including "environmental," "ecology," "green," "low-carbon," and "sustainable"). Funds containing these terms are designated as green investors, and the count of green investors is tabulated for each firm.

Empirical results are presented in Table 19. In Column (1), the coefficient of ECS on ΔGI is 0.078 ($p < 0.10$), suggesting that firms with high-quality environmental commitments tend to increase environmental capital expenditures post-announcement, consistent with the view that promises are followed by tangible actions that may lay the resource foundation for subsequent environmental performance improvements. In Column (2), the coefficient of ECS on ΔROE is 0.005 ($p < 0.10$), suggesting that environmental commitments are followed by improvements in financial performance, thereby providing profitability support for short-term market reactions and helping to address concerns about purely sentiment-driven effects. In Column (3), the coefficient of ECS on ΔCP is 0.006 ($p < 0.05$), indicating that the fulfillment of environmental commitments is accompanied by enhanced carbon efficiency, consistent with genuine improvements in environmental performance and offering evidence against "greenwashing" interpretations. In Column (4), the coefficient of ECS on ΔMS is 0.014 ($p < 0.05$), suggesting that environmental commitments may strengthen corporate social responsibility images and enhance customer identification, thereby contributing to market competitive advantages and providing evidence of substantive effects. In Column (5), the coefficient of ECS on ΔGIV is 0.025 ($p < 0.01$), indicating that high-quality environmental commitments are associated with greater green investor

ownership. Their continued attention and oversight may further encourage firms to fulfill their environmental promises, potentially providing long-term support for stock prices. These five dimensions form a mutually reinforcing chain: environmental commitments not only are associated with positive market reactions but also are followed by improvements in investment, financial, environmental, market, and external oversight recognition following M&A announcements. This pattern is consistent with the view that such commitments represent 'authentic signals with follow-up actions' rather than symbolic "greenwashing rhetoric," helping to mitigate concerns about announcement credibility.

Table 19. Extension analysis results.

Variables	(1)	(2)	(3)	(4)	(5)
	ΔGI	ΔROE	ΔCP	ΔMS	ΔGIV
ECS	0.078 *	0.005 *	0.006 **	0.014 **	0.025 ***
	(0.045)	(0.003)	(0.003)	(0.007)	(0.009)
ALR	1.027 **	0.007	0.003	0.264 **	0.321 ***
	(0.499)	(0.120)	(0.053)	(0.112)	(0.101)
SIZE	0.110	−0.076 **	0.011	−0.030	−0.260 ***
	(0.139)	(0.030)	(0.025)	(0.033)	(0.027)
AGE	−0.505 **	0.080 ***	0.010	0.287 ***	0.030
	(0.243)	(0.020)	(0.037)	(0.039)	(0.043)
SOE	−0.392	−0.195	0.091 **	−0.112	−0.158 *
	(0.312)	(0.152)	(0.046)	(0.073)	(0.085)
ROA	−0.901	0.080	0.125	1.757 ***	0.589 ***
	(0.581)	(0.169)	(0.161)	(0.152)	(0.143)
TOP1	0.006	−0.000	0.000	0.003 *	0.005 ***
	(0.010)	(0.001)	(0.001)	(0.002)	(0.002)
WD	−0.042	0.189 *	0.130 *	0.152	0.032
	(0.645)	(0.115)	(0.068)	(0.105)	(0.113)
RGR	−0.000 *	−0.000	0.001	0.000 ***	0.000
	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)
NPM	0.005 *	0.032	0.025	−0.012	−0.003 ***
	(0.003)	(0.030)	(0.052)	(0.011)	(0.001)
FAR	−0.873	0.106 *	0.155	0.145	0.232 *
	(0.822)	(0.064)	(0.157)	(0.141)	(0.135)
Constant	−1.285	1.482 **	−0.201	0.074	5.416 ***
	(3.077)	(0.601)	(0.550)	(0.716)	(0.582)
N	6935	8069	5743	8168	6935
Firm	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
R^2	0.292	0.305	0.748	0.424	0.371

To visually illustrate the institutional constraint characteristics of the commitments, this study conducts a qualitative observation using the case of CFCO (000151.SZ) acquiring equity in CECIC Jiangsu Clean Energy Co., Ltd. (Changzhou, China). In this transaction, the acquirer positioned the acquisition as an important initiative to "implement green development strategy" and explicitly disclosed its strategic intent to transition from engineering contracting to an integrated "investment–construction–operation" model by entering the commercial and industrial energy storage sector. Unlike routine environmental information disclosure, this commitment was accompanied by threefold institutional constraints. First, performance commitment—the transaction counterpart made quantified agreements regarding the target company's net profits for 2025–2028, with cash compensation provisions for underperformance. Second, regulatory inquiry—during deliberations, the M&A Committee of the Shenzhen Stock Exchange conducted on-site inquiries regarding the

achievability of the performance commitment and requested supplementary verification. Third, integration commitment—the listed company detailed multi-dimensional integration plans covering operations, assets, finance, personnel, and organizational structure, while committing to establishing regular business synergy mechanisms. These contractual arrangements contributed to the verifiability and binding force of the commitment, demonstrating that, in the Chinese M&A context, high-quality environmental commitments reflect institutional endorsement and strategic intent, and provide credible signals for investors to identify corporate green governance objectives. This qualitative observation supports the core findings of this study.

5.2. Dimension-Specific Analysis

The value creation of environmental commitments may not solely operate through their aggregate form; the structural characteristics of their internal components could exert heterogeneous effects on market performance. To identify the core elements driving market reactions, this study decomposes environmental commitments into four dimensions—domain coverage (DC), measure specificity (MS), target concreteness (TCS), and time constraint (TC)—and examines their independent effects on short-term (CAR) and long-term (BHAR) market performance. The results are presented in Tables 20 and 21.

Table 20. Dimension-specific test results for CAR.

Variables	(1)	(2)	(3)	(4)
	CAR	CAR	CAR	CAR
DC	0.010 **			
	(0.004)			
MS		0.007 ***		
		(0.002)		
TCS			0.013 ***	
			(0.005)	
TC				−0.008
				(0.011)
ALR	0.019	0.019	0.019	0.018
	(0.015)	(0.016)	(0.016)	(0.016)
SIZE	−0.027 ***	−0.027 ***	−0.028 ***	−0.027 ***
	(0.004)	(0.004)	(0.004)	(0.004)
AGE	0.002	0.002	0.002	0.002
	(0.006)	(0.006)	(0.006)	(0.006)
SOE	−0.003	−0.003	−0.003	−0.003
	(0.010)	(0.010)	(0.010)	(0.010)
ROA	−0.076	−0.077	−0.077	−0.076
	(0.064)	(0.064)	(0.064)	(0.064)
TOP1	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
WD	0.029 *	0.029 *	0.029 *	0.030 *
	(0.016)	(0.016)	(0.016)	(0.016)
RGR	0.011 ***	0.011 ***	0.011 ***	0.011 ***
	(0.002)	(0.002)	(0.002)	(0.002)
NPM	0.052 **	0.053 **	0.053 **	0.052 **
	(0.023)	(0.023)	(0.023)	(0.023)
FAR	0.051 **	0.051 **	0.052 **	0.052 **
	(0.021)	(0.021)	(0.021)	(0.021)
Constant	0.599 ***	0.600 ***	0.603 ***	0.598 ***
	(0.086)	(0.086)	(0.086)	(0.086)

Table 20. *Cont.*

Variables	(1)	(2)	(3)	(4)
	CAR	**CAR**	**CAR**	**CAR**
N	8377	8377	8377	8377
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
R^2	0.338	0.338	0.338	0.337

Table 21. Dimension-specific test results for BHAR.

Variables	(1)	(2)	(3)	(4)
	BHAR	**BHAR**	**BHAR**	**BHAR**
DC	0.052 **			
	(0.021)			
MS		0.024 **		
		(0.010)		
TCS			0.059 **	
			(0.024)	
TC				0.022
				(0.050)
ALR	0.334 ***	0.333 ***	0.333 ***	0.329 ***
	(0.076)	(0.076)	(0.076)	(0.076)
SIZE	−0.332 ***	−0.333 ***	−0.333 ***	−0.332 ***
	(0.019)	(0.019)	(0.020)	(0.020)
AGE	−0.021	−0.021	−0.022	−0.021
	(0.033)	(0.033)	(0.033)	(0.033)
SOE	−0.194 ***	−0.192 ***	−0.192 ***	−0.191 ***
	(0.054)	(0.054)	(0.054)	(0.054)
ROA	−0.881 ***	−0.885 ***	−0.884 ***	−0.877 ***
	(0.311)	(0.312)	(0.312)	(0.312)
TOP1	0.007 ***	0.007 ***	0.007 ***	0.007 ***
	(0.001)	(0.001)	(0.001)	(0.001)
WD	0.137 *	0.139 *	0.138 *	0.141 *
	(0.082)	(0.082)	(0.082)	(0.082)
RGR	0.044 ***	0.043 ***	0.044 ***	0.044 ***
	(0.011)	(0.011)	(0.011)	(0.011)
NPM	0.486 ***	0.488 ***	0.490 ***	0.486 ***
	(0.112)	(0.112)	(0.112)	(0.112)
FAR	0.507 ***	0.510 ***	0.512 ***	0.510 ***
	(0.101)	(0.101)	(0.101)	(0.101)
Constant	6.971 ***	6.973 ***	6.990 ***	6.959 ***
	(0.431)	(0.431)	(0.432)	(0.433)
N	8375	8375	8375	8375
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
R^2	0.353	0.353	0.353	0.353

Domain coverage (DC) exhibits coefficients of 0.010 ($p < 0.05$) on CAR and 0.052 ($p < 0.05$) on BHAR, suggesting that broad green domain coverage not only contributes to short-term market reactions by signaling commitment to environmental management, but also is associated with long-term performance through the coordinated advancement of diverse green practices, consistent with a dual short-term signal and long-term pattern. Measure specificity (MS) yields coefficients of 0.007 ($p < 0.01$) on CAR and 0.024 ($p < 0.05$) on BHAR, suggesting that clear implementation pathways can reduce short-term market uncertainty and boost investor confidence, while simultaneously enabling firms to ad-

vance green transformation steadily and accumulate long-term value through sustained commitment fulfillment. This dimension appears to serve as a key pillar for environmental commitments to achieve both short-term credibility and long-term feasibility." Target concreteness (TCS) shows coefficients of 0.013 ($p < 0.01$) on CAR and 0.059 ($p < 0.05$) on BHAR, implying that specific targets strengthen short-term market expectations regarding corporate green transformation while being associated with long-term value by guiding resource allocation and consistently achieving green milestones, thus potentially reflecting both a short-term anchor and a long-term engine. Time constraint (TC) does not exhibit significant effects on either short-term or long-term performance. This finding suggests that excessive emphasis on temporal constraints may raise market concerns about practical feasibility. The long-term effect of temporal binding may depend on supporting measures; merely highlighting deadlines without corresponding actions may not be sufficient to support long-term performance.

Notably, the dimension-specific tests suggest that no single dimension dominates the overall effect, nor do they alter the direction or significance of the composite index. This indicates that the dimensions operate synergistically rather than substitutivity in forming the aggregate signal. These results further support the theoretical conceptualization of the environmental commitment index as a formative construct: the constituent elements collectively constitute commitment quality, rather than being driven by a single latent factor. Consequently, employing equal-weight aggregation reflects both theoretical logic and empirical consistency.

5.3. Heterogeneity Analysis

The value realization of environmental commitments may exhibit heterogeneity depending on variations in firms' internal conditions. This study further examines heterogeneity along the dual dimensions of "resources and cognition," selecting free cash flow and executives' environmental awareness as moderating factors. Free cash flow reflects firms' discretionary resources, serving to test the moderating role of resource endowments in the relationship between environmental commitments and M&A performance, thereby providing insight into the material foundation necessary for commitment fulfillment. Executives' environmental awareness reflects managerial value orientations, enabling an analysis of how subjective initiative may influence the formulation and implementation of commitments, thereby shedding light on the cognitive impetus underlying commitment execution.

5.3.1. Corporate Cash Flow

The sample is divided into high and low groups based on the industry-year median of free cash flow to equity to examine the heterogeneous effects of resource endowments. The results in Table 22 show that in the high cash flow group, the coefficient of ECS on CAR is 0.004 ($p < 0.05$), and the coefficient on BHAR is 0.015 ($p < 0.10$)—both significantly positive. In contrast, in the low cash flow group, neither coefficient is significant. These findings suggest that free cash flow may play an important facilitating role in the process through which environmental commitments are associated with market performance. In the short term, ample cash flow can strengthen expectations regarding commitment executability, making investors more likely to perceive such commitments as credible signals, thereby contributing to positive market reactions [94]. In the long term, resource advantages can provide sustained support for green investments and organizational transformation, which enable environmental commitments to be associated with substantive performance improvements [95]. Conversely, under resource-constrained conditions, the market remains cautious regarding commitment fulfillment capacity, and environmental

commitments may be less likely to translate into long-term value. Thus, free cash flow represents an important "resource threshold" for the performance outcomes associated with environmental commitments.

Table 22. Heterogeneity analysis of corporate cash flow.

Variables	(1)	(2)	(3)	(4)
	High-FCF Group	Low-FCF Group	High-FCF Group	Low-FCF Group
	CAR	CAR	BHAR	BHAR
ECS	0.004 **	0.002	0.015 *	0.010
	(0.002)	(0.002)	(0.009)	(0.008)
ALR	0.007	0.047 *	0.405 ***	0.307 **
	(0.026)	(0.024)	(0.121)	(0.125)
SIZE	−0.033 ***	−0.021 ***	−0.373 ***	−0.322 ***
	(0.007)	(0.006)	(0.035)	(0.031)
AGE	−0.004	0.000	−0.008	−0.052
	(0.010)	(0.010)	(0.054)	(0.056)
SOE	0.019	−0.019	−0.183 **	−0.217 **
	(0.016)	(0.017)	(0.088)	(0.090)
ROA	−0.007	0.095 **	−0.269	0.724 ***
	(0.060)	(0.037)	(0.301)	(0.209)
TOP1	0.000	−0.000	0.005 **	0.004 **
	(0.000)	(0.000)	(0.002)	(0.002)
WD	0.041	0.041 *	0.050	0.176
	(0.025)	(0.024)	(0.133)	(0.132)
RGR	0.000 ***	0.001 ***	0.000 *	0.004 ***
	(0.000)	(0.000)	(0.000)	(0.001)
NPM	0.005	−0.000	0.088	−0.001
	(0.009)	(0.000)	(0.057)	(0.001)
FAR	0.102 ***	0.050	0.631 ***	0.481 ***
	(0.033)	(0.031)	(0.165)	(0.155)
Constant	0.719 ***	0.462 ***	7.750 ***	7.043 ***
	(0.148)	(0.132)	(0.774)	(0.697)
N	3588	3732	3586	3732
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
R^2	0.403	0.382	0.427	0.407

5.3.2. Executives' Environmental Awareness

This study constructs a measurement system for executives' environmental awareness based on indicators including corporate environmental philosophy systems, ISO 14000 certification, environmental education and training, and implementation of the "three simultaneities" policy [96]. The sample is divided into high and low groups according to the industry-year median to examine the heterogeneous effects on the relationship between environmental commitments and M&A performance. Table 23 reports the results. In the high environmental awareness group, the coefficients of ECS on CAR and BHAR are 0.004 ($p < 0.05$) and 0.030 ($p < 0.01$), respectively. In contrast, in the low environmental awareness group, neither coefficient is significant. These findings suggest that executives' environmental awareness may play a critical decision-driving role in the process through which environmental commitments are associated with market performance. In the short term, higher environmental awareness can help executives clearly communicate green strategic intentions in the M&A context and strengthen expectations regarding commitment executability through institutional arrangements, thereby contributing to immediate market reactions. In the long term, strong environmental awareness may facilitate the integration

of green values into corporate governance and operational practices, which helps environmental commitments be associated with sustained organizational transformation and competitive advantages [96]. Conversely, under conditions of weak environmental awareness, commitments are more likely to remain symbolic, making it difficult to establish stable performance outcomes. Thus, executives' environmental awareness represents an important "decision-making impetus threshold" for the outcomes associated with environmental commitments: when the decision-making layer possesses intrinsic value identification and systematic action capabilities, environmental commitments are more likely to be associated with strategic implementation and subsequent performance improvements.

Table 23. Heterogeneity analysis of executives' awareness.

Variables	(1)	(2)	(3)	(4)
	High-Awareness	Low-Awareness	High-Awareness	Low-Awareness
	CAR	CAR	BHAR	BHAR
ECS	0.004 **	0.002	0.030 ***	0.003
	(0.002)	(0.002)	(0.009)	(0.009)
ALR	0.044	0.019	0.487 ***	0.189 *
	(0.029)	(0.021)	(0.152)	(0.105)
SIZE	−0.018 **	−0.023 ***	−0.360 ***	−0.302 ***
	(0.008)	(0.006)	(0.042)	(0.026)
AGE	0.004	0.001	0.066	−0.037
	(0.010)	(0.009)	(0.068)	(0.047)
SOE	−0.024	0.010	−0.251 **	−0.151 *
	(0.017)	(0.014)	(0.103)	(0.081)
ROA	0.084	0.059 **	−0.905 **	0.401 ***
	(0.098)	(0.026)	(0.436)	(0.144)
TOP1	0.000	−0.000	0.006 **	0.005 ***
	(0.000)	(0.000)	(0.002)	(0.002)
WD	0.063 **	0.010	0.280 *	0.063
	(0.029)	(0.022)	(0.161)	(0.112)
RGR	−0.000	0.000 **	0.006 ***	0.000 ***
	(0.000)	(0.000)	(0.001)	(0.000)
NPM	−0.041	0.000	0.436 ***	0.000
	(0.033)	(0.000)	(0.138)	(0.001)
FAR	0.037	0.058 *	0.374 **	0.418 ***
	(0.034)	(0.030)	(0.179)	(0.140)
Constant	0.382 **	0.501 ***	7.571 ***	6.378 ***
	(0.170)	(0.121)	(0.958)	(0.572)
N	3003	4532	3003	4530
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
R^2	0.356	0.392	0.418	0.400

6. Conclusions and Recommendations

6.1. Conclusions

Against the backdrop of the "dual carbon" goals reshaping corporate environmental management from passive compliance toward more proactive engagement, environmental commitments in M&A announcements have emerged as a critical communication vehicle through which firms signal their determination for green transformation and seek market support. However, amid the prevailing "green trust crisis," markets may still question whether these commitments represent merely symbolic declarations rather than genuine governance actions. Addressing this core concern, this study systematically examines the

market value effects and credibility of environmental commitments in M&A transactions involving Chinese listed companies. The findings indicate that high-quality environmental commitments are positively associated with both short-term and long-term market performance following M&A transactions, consistent with the view that markets may be able to identify substantive environmental governance actions rather than being simply attracted by "green labels." Further analyses reveal that capital markets appear to respond to environmental commitments along two informational margins. On the one hand, the extensive margin—whether firms disclose any environmental commitment language in M&A announcements—already conveys a salient signal to investors and is associated with noticeable market reactions. On the other hand, conditional on disclosure, the intensive margin—the quality of commitments reflected in domain coverage, measure specificity, target concreteness, and time constraints—provides additional information that investors appear to incorporate into their evaluations. This evidence suggests that both the presence and the quality of environmental commitment language contribute to the informational role of M&A announcements.

Turning to the mechanisms through which these associations may arise, environmental commitments appear to operate through two distinct pathways over different time horizons. In the short term, they operate through public attention—heightened media and investor scrutiny following announcements can amplify signal visibility, reduces information asymmetry, and contribute to immediate market reactions. In the long term, value creation may occur through green innovation—commitments drive sustained R&D investment in environmental technologies, transforming corporate responsibility into tangible process improvements and patent outputs. Multi-dimensional extension analysis provides evidence that, while being associated with positive capital market performance, environmental commitments are also followed by improvements in corporate financial performance, green investment, carbon performance, market share, and green investor recognition—a pattern consistent with a progression from "rhetorical commitment" to "concrete action." This evidence chain helps address greenwashing concerns, consistent with the view that environmental commitments may function as credible, realizable governance signals rather than symbolic declarations. Heterogeneity analysis indicates that these associations are more pronounced in firms with ample free cash flow and stronger executive environmental awareness, suggesting that resource foundations and managerial cognition may serve as critical boundary conditions for commitment implementation. Dimension-specific tests further suggest that domain coverage, measure specificity, and target concreteness may be core elements associated with market reactions, while temporal binding may require supporting measures to be effective; the dimensions synergistically constitute commitment quality, consistent with the theoretical conceptualization of formative indicators. In sum, substantive commitments characterized by clear targets, broad coverage, and specific measures are more likely to be associated with positive capital market feedback and may help attract critical transformation resources.

6.2. Recommendations

This study offers the following policy implications. For firms, high-quality environmental commitments should be integrated into the core of M&A strategy, accompanied by the establishment of systematic and standardized management systems. During the commitment formulation stage, emphasis should be placed on comprehensive domain coverage, clear measures, and specific targets, with explicit definitions of green R&D directions, responsible entities, emission reduction standards, and phased objectives. Vague expressions should be avoided to enhance operability and traceability. Throughout the implementation process, dedicated supervision mechanisms and third-party verification should

be established to support commitment fulfillment. Concurrently, resource guarantees should be allocated to green project investments, progress should be regularly disclosed, and sustained communication with investors should be maintained to strengthen market trust. Firms should prudently make commitments aligned with their resource foundations, avoiding empty declarations that exceed their capabilities. From a dynamic management perspective, a "commitment–performance" linkage tracking mechanism should be constructed, decomposing long-term goals into assessable phased tasks and establishing review and adjustment mechanisms. Furthermore, environmental commitment requirements can be extended to supply chain management, encouraging core suppliers to jointly build green commitment systems and form collaborative governance networks. Through the closed-loop management of "commitment–action–verification," overall environmental performance can be enhanced.

For investors, it is essential to move beyond traditional financial metrics and integrate the quality of environmental commitments in M&A announcements into investment decision-making frameworks. Investors should focus on core dimensions such as domain coverage, measure specificity, and target concreteness, developing a multi-dimensional evaluation system that encompasses content substantiality, implementation feasibility, and historical commitment credibility. Priority should be given to firms that establish quantitative targets accompanied by accountability mechanisms. In practice, caution is warranted toward commitments that merely emphasize temporal constraints without corresponding supporting measures. Simultaneously, investors should consider firms' resource endowments and governance characteristics, giving particular attention to entities with stable free cash flow and strong environmental awareness, helping to identify firms with foundational capacity for commitment fulfillment from the outset. Following investment, professional ESG tools can be employed to dynamically track commitment implementation progress, establish early warning mechanisms, and adjust portfolio allocations based on the substantive outcomes of green transformation. For firms that persistently fail to meet targets, post-investment management interventions or adjustments to holding weights should be initiated. Furthermore, a "reverse validation" mechanism can be applied to verify the alignment between environmental investments and commitments, as well as the consistency between non-financial indicators and stated objectives, thereby helping to reducing information asymmetry and better identify sustainable enterprises with long-term value.

For policymakers, it is essential to improve environmental information disclosure systems and facilitate the transformation of environmental commitments from "textual norms" to "practical implementation." It is recommended that special disclosure requirements for environmental commitments be incorporated into relevant regulations concerning mergers and acquisitions and restructuring, with clear specifications regarding the core elements that commitments should contain, thereby providing the market with a unified evaluation basis. A policy toolkit balancing "incentives and constraints" should be established, offering incentives such as preferential green credit interest rates and additional deductions for research and development expenses to firms with high-quality commitments and good fulfillment records. For firms that persistently fail to meet targets and demonstrate inadequate rectification, joint disciplinary measures should be implemented, with information on environmental credit breaches incorporated into the credit reporting system. Deep integration between environmental commitments and the green finance system should be promoted, with commitment quality and fulfillment performance incorporated into green credit approval, bond issuance, and ESG rating systems. Through market-based mechanisms, signals should be transmitted such that environmental performance is linked to corporate financing costs and market reputation. Third-party verification institutions

should be encouraged to develop commitment fulfillment tracking services, regularly issuing comparative reports to provide the market with independent, comparable information validation tools. Simultaneously, policy formulation should emphasize communication and collaboration with market participants, dynamically optimizing disclosure guidelines and incentive policies based on practical feedback, thereby supporting multi-stakeholder governance efforts and encouraging firms to transform commitments into substantive green actions.

6.3. Limitations and Future Research

This study has several limitations. First, regarding commitment measurement, the multidimensional text analysis framework involves certain subjective judgments in scoring dimensions such as "specificity" and "concreteness." Future research could employ more granular natural language processing techniques to enhance measurement reliability and validity. Second, concerning mechanism interpretation, this study primarily examines two pathways, but the process through which commitments may be linked to firm value may involve more complex dynamics. Future research could further analyze how commitments may influence corporate investment decisions, stakeholder interactions, and green innovation ecosystems, thereby helping to open the "black box" of commitment–behavior–performance linkages. Third, regarding endogeneity, environmental commitments in M&A announcements are inherently intertwined with deal terms and managerial disclosure strategies, making causal identification challenging. Despite our empirical efforts, we cannot fully rule out potential biases. Future research could leverage exogenous shocks that affect commitment decisions independently of deal characteristics to strengthen causal inference. Finally, regarding impact assessment, this study primarily examines short-term capital market reactions and does not yet track the long-term fulfillment and actual environmental benefits of commitments. Future research could extend observation windows to examine concrete actions taken post-commitment and genuine environmental performance, providing a more comprehensive evaluation of the sustainable value of such governance tools.

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Appendix A

Table A1. Examples of Environmental Commitment Score Dimensions.

Dimension	Level	Example	Source
Domain coverage	1	Strategic transformation and layout in the new energy materials industry	Tianjin Binhai Energy (000695)—22 May 2023
	2	Can effectively conserve coal resources, ..., and decrease pollutant emissions	Shaanxi Heimao (601015)—13 July 2015
	3	Committed to enhancing comprehensive resource utilization, promoting energy conservation and emission reduction, and developing circular economy	Inner Mongolia Dazhong Mining (001203)—15 May 2014
Measure specificity	1	Strengthen environmental protection governance of four enterprises in the company's Western Food Industrial Park	Shaanxi Heimao (601015)—20 April 2021
	2	Conduct technical renovation on existing sites and equipment of the precious metal recovery system and zinc recovery system	Yunnan Tin (000960)—17 April 2020
	3	Stabilization/solidification capacity of 45,000 tons/year, rigid landfill disposal capacity of 15,000 tons/year, totaling hazardous waste disposal capacity of 60,000 tons/year	Longking (600388)—07 April 2020
Target concreteness	1	Increase the proportion of clean energy	Shenzhen Energy (000027)—25 October 2013
	2	Complete the construction of 1000 MW to 2000 MW of installed capacity for clean energy projects	Tianshun Wind Energy (002531)—26 January 2015
	3	Achieve a major waste recycling rate of approximately 54.6%	Zhefu Holdings (002266)—26 March 2019
Time constraint	1	Continuously improve the operational level of the sewage treatment concession project in the future	Zhongmin Energy (600163)—05 April 2019
	2	Plan to add 6000 MW of gas power installed capacity during the "14th Five-Year Plan" period	Yue Electric A (000539)—08 October 2021
	3	Complete the construction of the hazardous waste disposal project by 31 December 2018	Dongjiang Environmental (002672)—26 September 2017

Appendix B

This appendix provides a detailed account of the coding process for environmental commitment scores in merger and acquisition announcements, including coder backgrounds, training and pre-testing, formal coding implementation, inter-coder reliability testing, rules for handling ambiguous cases, and data recording methods. This detailed description aims to enhance the transparency and replicability of the research methodology.

Appendix B.1. Coders

The environmental commitment scores were manually and independently assigned by two researchers (Zhuoxuan Yang and Pengcheng Ma). Both coders have a background in environmental management and corporate social responsibility research and have participated in studies related to corporate environmental information disclosure.

Appendix B.2. Training and Pre-Testing

To ensure a consistent understanding of the scoring criteria, systematic training was conducted before the formal coding began. The training included:

Studying the theoretical foundation of the scoring rules (domain coverage, specificity of measures, concreteness of goals, and time-bound nature), combined with relevant literature to deepen the understanding of each dimension.

A detailed interpretation of the scoring rules in Table 1, analyzing the typical textual characteristics corresponding to each score and clarifying boundaries using sample texts.

Discussing potentially confusing scenarios (e.g., distinguishing between "directional descriptions" and "method explanations," or defining "vague timelines" vs. "periodic timelines") to form a preliminary consensus on judgments and establish rules.

After the training, a random sample of merger announcements (approximately 400) was selected for pre-testing. The two coders independently assigned scores, calculated the preliminary consistency for each dimension, and discussed any discrepancies. Based on the discussion results, the scoring criteria were further refined, and a Coding Manual was developed. This manual includes a repository of typical phrasing for each score, principles for judging borderline cases, and answers to frequently asked questions, serving as a unified reference for formal coding.

Appendix B.3. Formal Coding Implementation

During the formal coding phase, the two coders independently read the full text of 8377 announcements, assigning scores (0–3) to each of the four dimensions based on the Coding Manual. The scores were then summed to obtain a composite score. All scoring results were entered into an Excel spreadsheet. After completion, the two coders exchanged data and cross-checked for input accuracy, correcting any obvious errors or omissions. Throughout the coding process, each coder independently recorded ambiguous entries and their preliminary judgments for subsequent discussion and verification.

Appendix B.4. Reliability Test Results

Reliability indicators were calculated based on relevant formulas. As each dimension was an ordered categorical variable, the weighted kappa coefficient was used to evaluate scoring consistency. For the composite score, the intraclass correlation coefficient (ICC(2,1)) was employed, based on a two-way random effects model and absolute agreement definition. The 95% confidence intervals for each indicator were also calculated. The results are shown in Table A2:

Table A2. Inter-coder reliability test results.

Dimension	Weighted Kappa	95% CI	Consistency Level
Domain Coverage	0.81	[0.78, 0.84]	High Agreement
Specificity of Measures	0.84	[0.81, 0.87]	High Agreement
Concreteness of Goals	0.88	[0.85, 0.91]	High Agreement
Time-Bound Nature	0.83	[0.80, 0.86]	High Agreement
Composite Score (ICC)	0.91	[0.89, 0.93]	Almost Perfect

The weighted kappa for each dimension exceeded 0.80, and the ICC for the composite score reached 0.91, indicating high consistency between the two coders and confirming that the scoring rules are reliable and operable.

Appendix B.5. Handling Ambiguous Cases

During the coding process, when encountering ambiguous phrasing or entries that were difficult to categorize directly, coders first made independent judgments based on the clear principles outlined in the Coding Manual. The rules are as Shown as Table A3.

Table A3. Coding principles for environmental commitment scores.

Principle	Description	Example/Scoring Guidance
Handling boilerplate statements	Handling boilerplate statements	Phrases like "actively promoting green development," "practicing green concepts," "attaching great importance to environmental protection" → score 1 for domain coverage.
Conservative scoring principle	Conservative scoring principle	Terms like "long-term," "continuous," "future," or "timely" → score 1 for time-bound nature.
Substance over form principle	Substance over form principle	Text mentioning technical pathways, equipment, or resource plans → score 2–3 for specificity of measures.
Contextual cross-validation principle	Contextual cross-validation principle	If a single sentence lacks full information, check other parts of the announcement for verification.

The above principles resolved most ambiguous cases. For entries not covered by these principles or where the two coders could not reach a consensus after independent judgment, a structured negotiation process was implemented, as summarized in Table A4.

Table A4. Coding quality control procedures.

Step	Description
Independent marking	Both coders recorded ambiguous entries, points of doubt, and the basis for their preliminary judgments.
Regular discussions	Regular coding meetings were held to compile all ambiguous entries, discuss each case in detail by referring to the original text and the Coding Manual, and strive to reach a consensus.
Third-party arbitration	If consensus could not be reached after discussion, another researcher with extensive experience in environmental management research was invited to arbitrate, with the majority opinion determining the final score.
Record keeping	The original text of all ambiguous entries, points of disagreement, discussion processes, and final decisions were meticulously documented to ensure full traceability.

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