CEO Industry Experience and Environmental Performance in Emerging Asian Economies: Mediating Role of Organizational Ambidexterity

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Abstract

This study investigates how a CEO's industry expertise affects the environmental performance of multinational corporations, with the mediating role of organizational ambidexterity. We use a dynamic panel data approach, specifically system GMM estimates based on the Blundell-Bond specification, and we also include fixed effects models to reduce endogeneity concerns. Our research used a matched sample of 8,880 firm-year observations from 592 multinational corporations in three emerging Asian countries during a 15-year longitudinal panel from 2010 to 2024. The findings indicate that CEO industry experience is positively associated with environmental performance. The results further suggest that stakeholder pressure significantly affects the relationship between CEO experience and exploration ambidexterity, as well as the association between CEO experience and exploitation ambidexterity. Moreover, exploration and exploitation ambidexterity functions as a mediator between CEO industry expertise and environmental performance. The study contributes by linking upper echelons theory with stakeholder and dynamic capability perspectives in the context of emerging Asian economies. The study shows that the way a firm manages its environment may be altered by the features of its managers. Policy can influence these attributes through rules on CEO pay and governance.

Keywords: CEO industry experience, environmental performance, organizational ambidexterity, stakeholder pressure, emerging Asian economies, dynamic panel data, multinational enterprises

Introduction

One of the biggest problems for multinational companies today is the growing damage to the environment in developing Asia (Asif, 2024; Nuţă, 2024). Environmental degradation occurs in several forms, such as the concentration of industry and ecosystem deterioration resulting from deforestation and intensified agriculture (Nuţă, 2024). At the same time, efforts by stakeholders are becoming more intense. Regulators are making environmental requirements tighter, and institutional investors are asking for performance benchmarks in environmental, social, and governance (ESG) sectors (Liu et al., 2024). Multinational enterprises that do business in these

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areas are being asked to make extraordinary environmental commitments by global investors and businesses (Li et al., 2024). At present, studies on business environmental management mostly concentrate on firms in developed markets characterised by powerful regulatory frameworks and stringent enforcement mechanisms (Li et al., 2024; Nuță, 2024; Shafique et al., 2021). It is essential to do an empirical study on the impact of senior executives' personal characteristics, especially the industrial expertise acquired by CEOs during their careers, on environmental performance (ENV-PRFM) (Jaaffar et al., 2024; Khan et al., 2020). The choices taken by the CEO are what really decide whether a firm goes for revolutionary environmental innovation that includes changes to technology and the way the organization works, or if it goes with a strategy that focuses on compliance (Liu et al., 2024; ul Abidin et al., 2025).

Emerging Asian economies have a unique institutional framework that profoundly influences the development of business environmental strategies (Asif, 2024). China, the world's biggest producer of goods and the biggest emitter of greenhouse gases, has put in place stricter environmental rules for factories (Hou & Zhang, 2025). China's economic context is characterised by considerable state ownership, widespread political influence in regulatory practices, and centralized environmental directives prioritizing ecological preservation (Balkrishan et al., 2025; Hou & Zhang, 2025). Conversely, India's institutional framework presents a unique scenario. The nation's rapid industrial growth, urbanization, and resource exhaustion have significantly impacted the environment (Balkrishan et al., 2025). Nevertheless, implementation varies considerably across different states and sectors, thereby underscoring the decentralized structure of India's governance (Nayak et al., 2022). Consequently, this institutional divergence presents genuine strategic uncertainty for global managers concerning the anticipated environmental regulations and the likelihood of their enforcement (Ciasullo et al., 2020; Khan et al., 2022).

Pakistan, as the third-largest economy, faces substantial institutional limitations (Shehzad et al., 2023). This developing economy, characterized by its relatively low wealth, grapples with considerable environmental issues, including some of the most severe urban air pollution worldwide (Alauddin, 2023; Shehzad et al., 2023). Despite these challenges, Pakistan's institutional capacity for environmental governance is notably restricted (Asif, 2024). While Pakistan has enacted formal environmental legislation, corporate environmental practices are largely influenced by reputational concerns stemming from global stakeholders and directives issued by multinational corporations, rather than by legislative mandates (Lee, 2025). This comparative institutional disparity facilitates an investigation into the impact of institutional context on the

relationships between CEO attributes and environmental outcomes (Khan et al., 2020; Tran & Pham, 2020).

Despite a considerable volume of studies concerning corporate environmental performance (ENV-PRFM), significant theoretical and empirical shortcomings persist. Existing work has examined CEO attributes and sustainability outcomes, yet has not clearly specified the organizational mechanism through which industry experience is translated into environmental performance in institutionally heterogeneous emerging markets. A notable gap exists regarding the ambiguous empirical association between a CEO's industrial experience in emerging markets (CEO-IND-EXP) and a firm's environmental performance (ENV-PRFM) (Liu et al., 2024; ul Abidin et al., 2025). While the Upper Echelons Theory suggests that CEO attributes significantly shape organizational strategy and performance, most empirical investigations have prioritized financial success metrics over sustainability and environmental performance indicators (Abatecola & Cristofaro, 2020; Neely Jr et al., 2020). Thus, we do not possess definitive empirical information addressing the correlation between CEO-IND-EXP and enhanced ENV-PRFM in emerging Asian countries. Most empirical research focuses on developed economies. This significant geographic bias is important because new Asian economies have unique institutional structures, stakeholder pressure (STKLD-PRSUR) dynamics, regulatory diversity, limited governance capacity, and development challenges (Hsu et al., 2013; Khan et al., 2022; Luo & Rui, 2009).

The main goal is to find out whether CEO-IND-EXP has a statistically significant and economically important beneficial effect on corporate ENV-PRFM in multinational companies that do business in emerging Asian nations (China, India, and Pakistan). The second aim examines whether STKLD-PRSUR significantly moderates the association between CEO-IND-EXP and exploratory ambidexterity (EXP-AMBXTY). The third aim investigates whether STKLD-PRSUR similarly influences the association between CEO-IND-EXP and exploitation ambidexterity (EXPLT-AMBXTY). The fourth goal, which has two parts, investigates the direct effect of EXP-AMBXTY on ENV-PRFM and the indirect mediating route. The fifth objective, encompassing two elements, assesses the direct influence of EXPLT-AMBXTY. These aims, taken together, construct a thorough empirical model; this theoretical framework, in turn, clarifies how this executive characteristic might function through different organizational processes within various institutional settings.

This investigation utilises robust dynamic panel data methodologies, specifically formulated to mitigate endogeneity issues inherent in the analysis of the connections between executive characteristics and organizational performance. The research incorporates the Blundell-Bond system GMM approach, in

conjunction with fixed effects dynamic panel models (Blundell et al., 2001; Bond et al., 2001). The System GMM methodology presents significant benefits for ENV-PRFM investigations, as it facilitates the simultaneous estimation of equations in both differenced and level forms (Blundell et al., 2001; Roodman, 2009). The model's appropriateness is confirmed through various diagnostic evaluations, including Arellano-Bond serial correlation tests to assess instrument validity, Hansen-Sargan tests to evaluate instrument exogeneity, and Hausman tests to determine the relative advantages of fixed effects versus random effects specifications (Arellano & Bond, 1991; Arellano & Honoré, 2001).

CEO-IND-EXP has a statistically significant and economically meaningful favourable effect on ENV-PRFM. Both EXP-AMBXTY and EXPLT-AMBXTY show that STKLD-PRSUR has a strong, favourable effect on them. This research suggests that mobilizing stakeholders increases the CEO's power when outside groups aggressively ask for ENV-PRFM (Lee, 2025). Moreover, EXP-AMBXTY partly mediates the association between CEO experience and environment, demonstrating that experienced CEOs improve ENV-PRFM. EXPLT-AMBXTY directly improves ecological performance, especially in areas that focus on efficiency, such as cutting down on energy use and waste (Jaaffar et al., 2024; Nuţă, 2024). EXPLT-AMBXTY also acts as a middleman between the CEO's experience and the environment, although the effects are not as strong as they are with exploratory paths. The research reveals considerable variation across the three developing countries concerning the importance of different routes. In China, the exploration of avenues is clearly of utmost importance. The central government prioritises environmental innovation and the development of clean technologies (Balkrishan et al., 2025; Hou & Zhang, 2025). Conversely, in India, the pathways for exploration and exploitation hold comparable significance, suggesting a more balanced development of organizational capabilities (Balkrishan et al., 2025; Nayak et al., 2022). In Pakistan, institutional limitations encourage exploitative avenues, and enhancing existing practices is more practical than introducing radical innovations within restrictive institutional settings. This divergence enhances comprehension by illustrating that the mechanisms connecting executive characteristics to ENV-PRFM are significantly shaped by the prevailing institutional context.

This study makes significant theoretical, empirical, methodological, and practical contributions to the existing body of knowledge concerning corporate sustainability, strategic management, and emerging markets. It notably extends Upper Echelons Theory, stakeholder theory, and dynamic capabilities theory (Bleady et al., 2018; Freeman et al., 2010; Hambrick, 2007). Furthermore, the research offers new empirical evidence regarding the environmental

performance (ENV-PRFM) implications of CEO-industry experience (CEO-IND-EXP) within expanding Asian economies (Ciasullo et al., 2020; Khan et al., 2020). Methodologically, the study enhances panel data analysis techniques within the context of ENV-PRFM research. The research effectively addresses significant endogeneity concerns, serial correlation challenges, and reverse causality issues through the application of system Generalized Method of Moments (GMM) estimation techniques (Blundell et al., 2001; Bond et al., 2001). This research elucidates the organizational mechanisms through which the attributes of Chief Executive Officers (CEOs) impact environmental activities. The study provides suggestions for multinational corporations overseeing ENV-PRFM within developing markets. The findings reveal that the selection of subsidiary CEOs, professional development initiatives, and investments in capabilities exert a considerable influence on ENV-PRFM for multinational firms. Furthermore, the paper provides empirically substantiated data for the formulation of environmental policy in developing economies.

The rest of the paper is organized as follows: Section 2 explains the literature review, theoretical background, and empirical background. Section 3 presents data, sample, methods, and variable descriptions. Section 4 provides the analysis and results of the study. Section 5 discusses conclusions, implications, limitations, and future directions.

Literature Review

Theoretical Background

This research builds an integrated framework on three different but related theoretical points of view. The Upper Echelons Theory explains the basic idea behind how the traits of a CEO affect strategic decision-making (Hambrick, 2007). This idea asserts that discernible CEO attributes, like age, educational attainment, professional experience, and industry exposure, affect their conduct (Abatecola & Cristofaro, 2020). Experienced CEOs possess a superior comprehension of the alignment between ENV-PRFM and industrial competitiveness, hence increasing their likelihood of earning the confidence of environmental authorities and stakeholders (Liu et al., 2024; Tang et al., 2024).

Stakeholder theory discusses the factors that determine the extent of a CEO's influence (Freeman et al., 2010). This framework suggests a multifaceted web of relationships linking a firm's activities with numerous stakeholders who possess valid claims on its conduct (Freeman et al., 2010; Laplume et al., 2008). These stakeholders encompass regulators, institutional investors, employees, customers, local communities, and civil society organizations (Friedman & Miles, 2002). Consequently, this theory offers significant understanding of how STKLD-PRSUR elevates the significance of environmental

considerations within the context of executive decision-making. Therefore, we suggest that STKLD-PRSUR limits CEO power and indicates when executive expertise is crucial for implementing environmental policies. The third approach, the dynamic capacity theory, explains how managerial characteristics affect environmental results through organizational processes (Bleady et al., 2018; Kuuluvainen, 2012). Competitive advantage is defined as an organization's ability to identify opportunities and challenges, use resources to take advantage of these opportunities, and adapt its business model to changing environmental conditions (Gremme & Wohlgemuth, 2017; Teece, 2016).

Taken together, the three theories explain a common mechanism. Upper echelons theory suggests that CEOs interpret strategic problems through the lens of their prior experience. In the present context, industry experience equips CEOs with issue-specific knowledge about technological options, regulatory expectations, and competitive responses relevant to environmental strategy. This perspective underscores that sustained competitive advantage hinges on ongoing adaptation and learning, rather than solely on operational efficiency. It clarifies how a CEO's industry experience, as influenced by STKLD-PRSUR, contributes to organizational ambidexterity, which subsequently enhances ENV-PRFM. This theoretical synthesis provides a robust framework for analysing corporate environmental performance within diverse institutional settings, spanning from China's advanced environmental regulatory framework to Pakistan's comparatively weaker governance structures.

Hypothesis Development

CEO Industry Experience and Environmental Performance

The traits of a chief executive officer (CEO) exert a considerable influence on organizational performance, especially within volatile and uncertain contexts (Jaaffar et al., 2024; Lin et al., 2016). A broad range of industry experience provides CEOs with sector-specific expertise, a strategic outlook, and operational proficiency. Consequently, they are better positioned to make well-informed decisions, foresee evolving trends, and maximize the effective allocation of resources (Khan et al., 2020; Rehman et al., 2024). These qualities contribute to the enhancement of a firm's dynamic capabilities, particularly in emerging markets where institutional deficiencies and rapid transformations are prevalent, thereby underscoring the need for experienced and well-connected leadership (Hou & Zhang, 2025; Li et al., 2024).

CEOs who are both experienced in their respective industries and adept at interpersonal communication tend to demonstrate greater creativity, superior financial performance, and enhanced adaptability relative to their counterparts (You et al., 2023). The industry-specific

expertise of a CEO facilitates a company's capacity to manage adversity, seize opportunities, and attain success (ul Abidin et al., 2025). Furthermore, CEOs typically possess a comprehensive understanding of market dynamics, competitive strategies, and regulatory environments (Khan et al., 2020). Their expertise helps them make strategic choices that are more accurate, timely, and effective, which in turn affects how well the firm does (Sarfraz et al., 2020). CEOs who know a lot about their field can better read environmental signals, spot key times in their field, and match their company's capabilities to what the market needs (Jaaffar et al., 2024; Lee, 2025).

Experienced CEOs provide their organizations an advantage over their competitors since tacit knowledge is hard to codify and share (Khan et al., 2020; You et al., 2023). This experience improves decision-making, helps you see problems coming, and makes sure that your strategies are consistent (Hou & Zhang, 2025). Experienced CEOs are better at combining what they already do well with new opportunities, which helps them modify their strategies and stay in business for a long time (Tran & Pham, 2020). A CEO's reputation and ties with investors, regulators, and business partners are better when they have worked in the industry before. These assets improve reputation, lower risk, and make it easier to get resources (ul Abidin et al., 2025). Industry networks help CEOs deal with problems at their companies, make strategic collaborations, and learn about their competitors. Companies that had CEOs with expertise in their field were better able to weather economic downturns and take advantage of recoveries. So, the following hypothesis is put forward:

H1: *There is a positive and significant impact of CEO industry experience on environmental performance in emerging Asian economies.*

Moderating Role of Stakeholders' Pressure (Exploration Ambidexterity)

CEO industry experience can strengthen exploratory action because experienced executives are better able to recognize technological discontinuities, assess uncertainty, and judge which environmental initiatives merit experimentation. CEOs with a lot of experience in their field may see chances for new ideas and experiments because they can see how the field is changing (Tang et al., 2024). They encourage exploratory ambidexterity, which is the company's ability to test out new ideas, technologies, and markets (Lee, 2025). Different organizations have different views on whether industrial experience leads to experimental enterprises, and this relies on outside factors, especially STKLD-PRSUR. Stakeholder Theory

posits that stakeholders—such as customers, investors, employees, and society—impact strategic choices (Freeman et al., 2010; Laplume et al., 2008). High-stakes pressure makes companies more accountable to society, the environment, and technology (Lee, 2025). CEOs who knew a lot about their field were more inclined to try new things when the rules were quite rigid (Lee, 2025).

Financial stakeholders, such institutional investors and venture capitalists, make exploration more appealing (Agnihotri et al., 2024). CEOs with expertise in the industry may make risky projects seem good, which may enhance investor confidence (Khan et al., 2020). Stakeholder demand generates urgency and legitimacy for innovation, enhancing the positive effects of CEO industry experience on exploration ambidexterity (Tuan, 2016). STKLD-PRSUR mediates the relationship between CEO attributes and organizational ambidexterity, specifically EXP-AMBXTY and EXPLT-AMBXTY. In contexts characterized by increasing stakeholder expectations concerning sustainability and innovation, CEOs possessing substantial social capital tend to allocate resources more readily to both exploration and exploitation (O'Reilly III & Tushman, 2013; Shafique et al., 2021). Therefore, the following hypothesis is proposed

H2: *There is a positive and significant moderating role of stakeholders' pressure on the relationship between CEO industry experience and exploration ambidexterity in emerging Asian economies.*

Moderating role of Stakeholders' Pressure (Exploitation Ambidexterity)

The CEO's industry-specific knowledge cultivates exploitative ambidexterity, thereby improving performance through improved processes, more efficient resource allocation, and streamlined organizational practices (Lee, 2025). This accumulated experience allows CEOs to merge best practices from their respective industries with their firm's operational strategies; however, the efficacy of this integration is not uniform (Lin et al., 2016; You et al., 2023). This research indicates that STKLD-PRSUR amplifies the impact of CEOs' industry experience on exploitative ambidexterity, necessitating that organizations bolster their regulatory adherence and resource management capabilities. CEOs with expertise in regulated industries were better at making sure that operations followed the rules, which led to more exploitation (Liu et al., 2024; You et al., 2023). In businesses that are sensitive to stakeholders, like healthcare and banking, CEO experience made exploitative ambidexterity more likely, particularly when there was pressure from investors and regulators (Tran & Pham, 2020; Xu & Wang, 2025). Dynamic Capabilities Theory elucidates the influence of stakeholder

environments on organizational capacity. CEOs may turn intricate rules and demands from institutions into better operations (Hou & Zhang, 2025; Li et al., 2024). CEOs incorporate compliance into their fundamental operations, hence improving performance in highly regulated settings (Lin et al., 2016). Also, stakeholders expect businesses to be financially responsible and last. Also, experienced CEOs cut down on unnecessary tasks when investors were watching. Therefore, the following hypothesis is proposed:

H3: *There is a significant moderating role of stakeholders' pressure on the relationship between CEO industry experience and exploitation ambidexterity in emerging Asian economies.*

Mediating Role of Exploration Ambidexterity

Companies that concentrate on exploration are more likely to put money into making green goods, eco-innovations, and sustainable technology (Balkrishan et al., 2025). Exploration allows businesses to create sustainable energy applications, new ways of doing business, and circular economy projects in situations where there is a lot of uncertainty (Agnihotri et al., 2024; Balkrishan et al., 2025). Companies may get ahead of their competitors by looking for new opportunities in their surroundings (Lin & Ho, 2016). To address stakeholders' environmental concerns and come up with new strategies to lower carbon footprints, waste, and energy use, companies should make sustainability a part of their exploratory operations (Jansen et al., 2005; Tuan, 2016). Companies may do more than simply follow the rules by becoming leaders in sustainability by using environmental technology early on (Shafique et al., 2021). Companies that took the lead in coming up with new ways to protect the environment did better than their rivals at controlling pollution (Lin & Ho, 2016). Innovation and sustainability are intrinsically linked, suggesting that organizations should proactively engage with environmental concerns rather than merely reacting to them. Leadership is essential, supported by sector-specific experimentation and the sharing of knowledge (Delmas & Toffel, 2008; Lin & Ho, 2016; Shafique et al., 2021). By actively supporting environmental research initiatives, businesses can attract eco-investors, environmentally aware consumers, and favorable regulatory environments. Consequently, a supportive relationship between innovation and environmental responsibility is established (Fatima et al., 2023; Lee, 2025; Shafique et al., 2021). Therefore, the following hypothesis is proposed:

H4a: *There is a positive and significant impact of exploration ambidexterity on environmental performance in emerging Asian economies.*

The strategic growth of a company is substantially shaped by the CEO's industry-specific knowledge, especially concerning the attainment of a favorable balance between exploration and exploitation (Ciasullo et al., 2020; Hsu et al., 2013). Experienced CEOs can foster exploratory ambidexterity, which involves experimentation, by leveraging their comprehensive sectoral understanding, their ability to identify market trends, and their skill in evaluating risk (Khan et al., 2022; Shafique et al., 2021). Consequently, the relationship between CEO-industry experience and corporate success is mediated by exploratory ambidexterity. The CEO's industry-specific knowledge streamlines market entry, the integration of novel technologies, and the cultivation of innovation-driven organizational cultures (Ciasullo et al., 2020; You et al., 2023). This strategic orientation supports companies in enhancing profitability, expanding into new markets, and ensuring operational sustainability. CEO-IND-EXP directs firms toward heightened exploratory ambidexterity, which, in turn, mediates the positive impact of industry experience on the organization (Lee, 2025; You et al., 2023).

Dynamic Capabilities Theory supports the mediating role of exploratory ambidexterity (Gremme & Wohlgemuth, 2017). Chief Executive Officers with substantial industry experience encourage flexibility and continuous learning to maintain long-term competitiveness (Jaaffar et al., 2024). CEO-IND-EXP effectively predicts a company's ability to balance exploration and exploitation strategies, highlighting the importance of EXP-AMBXTY for a company's success. Furthermore, CEOs with industry knowledge are more likely to embrace radical innovations and changes in business models (Lin et al., 2016). In technology-driven industries, where innovation is crucial for survival, EXP-AMBXTY is especially important. CEOs who actively explored innovation showed better performance. CEO-IND-EXP helped organizations that value EXP-AMBXTY improve their operational efficiency (Khan et al., 2020). Strategies that focus on exploration help organizations deal with uncertainty (Balkrishan et al., 2025; Shoaib et al., 2025). Exploratory ambidexterity is expected to mediate this relationship because environmental improvement in emerging markets often depends on experimentation with cleaner technologies, novel routines, and innovation-oriented problem solving. CEO industry experience supplies the judgment needed to identify such opportunities. Therefore, organizations could lose the expertise of experienced CEOs if they don't explore different operational methods. Therefore, the following hypothesis is proposed:

H4b: *There is a positive and significant mediating role of exploration ambidexterity between CEO industry experience and environmental performance in emerging Asian economies.*

Mediating Role of Exploitation Ambidexterity

Exploitation helps businesses use their resources better, cut down on waste, and become more eco-friendly by using process control and environmental compliance systems (Balkrishan et al., 2025). Exploitation allows businesses quickly meet the needs of the environment and their stakeholders (Lee, 2025). Companies that use environmental management systems usually see a reduction in dangerous emissions (Lee, 2025). Exploitation empirically enhances the ecosystem, and companies that used operational eco-innovation more effectively adhered to environmental standards (Shafique et al., 2021; Tuan, 2016). Exploitation works best in firms that are heavily regulated and need to follow rules, use resources wisely, and do the same things repeatedly (O'Reilly III & Tushman, 2013). Exploitation makes the environment more sustainable without raising costs by using less input and making waste management more consistent. Exploitation makes the environment more valuable. Regulators, customers, and institutional investors reward companies that consistently follow ENV-PRFM via established procedures. This encourages companies to use exploitative methods that help them follow the rules and be more environmentally friendly. Therefore, the following hypothesis is proposed:

H5a: *There is a positive and significant impact of exploitation ambidexterity on environmental performance in emerging Asian economies.*

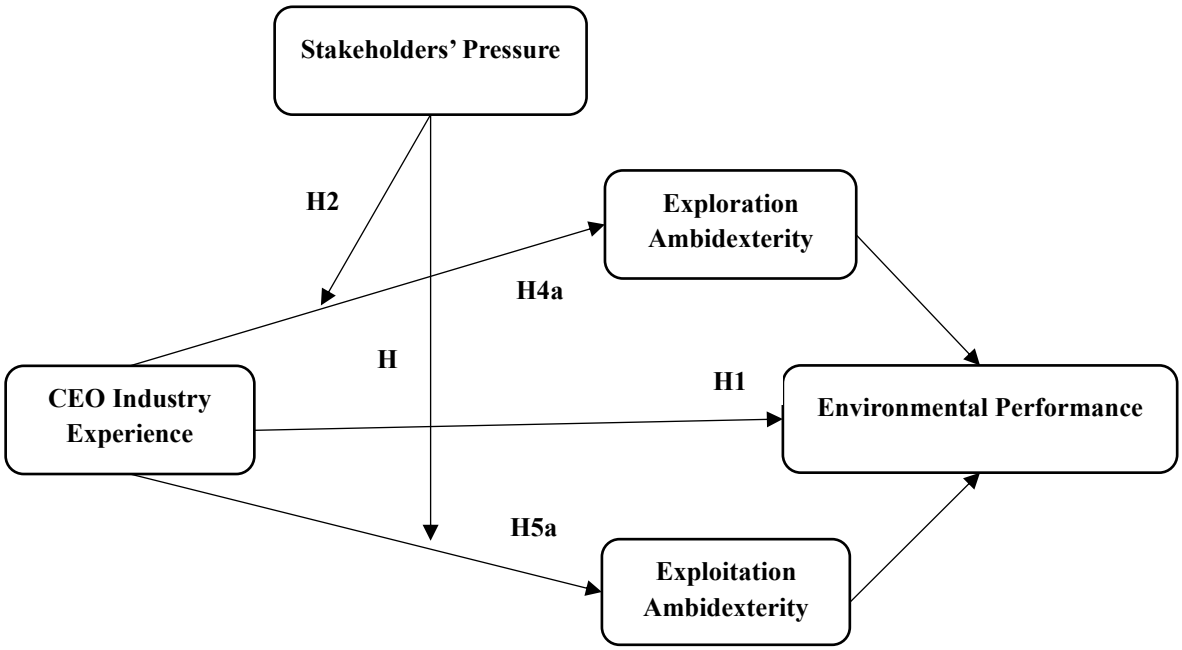
CEOs having substantial sector-specific expertise can potentially improve operational procedures, streamline resource allocation, and boost organizational effectiveness by remaining cognizant of industry trends, regulatory frameworks, and established best practices (Lin et al., 2016; You et al., 2023). However, the direct impact of a CEO's industry experience on a firm's performance is not always evident (Khan et al., 2020; Tran & Pham, 2020). The link between CEO-IND-EXP and organizational outcomes is mediated by EXPLT-AMBXTY's ability to leverage resources, enhance operational efficiency, and refine business models (Balkrishan et al., 2025). A strategy focused on exploitation serves to maximize asset value while simultaneously ensuring profitability (Agnihotri et al., 2024). Consequently, proficient CEOs who refine processes, retain knowledge, and optimize efficiency contribute to the cultivation of dynamic enterprises (Khan et al., 2020; Tran & Pham, 2020). CEOs who have worked in the business can make sure that firms follow the rules and work well (Lee, 2025; Sarfraz et al., 2020). CEOs with expertise in the industry used compliance-driven strategies to make the most of company resources and improve performance in businesses that are subject to rules.

CEOs with expertise in the field liked digital transformation projects that made processes more efficient, and decisions based on data (Lee, 2025; Xu & Wang, 2025). Companies used their CEO's knowledge to add cutting-edge technology to their operations, which improved EXPLT-AMBXTY and, in the end, ENV-PRFM (Hou & Zhang, 2025; Lee, 2025). A lot of cost leadership techniques know that you need to be able to exploit and be ambidextrous. CEOs with expertise in the industry save money while keeping quality and customer satisfaction high (Jaaffar et al., 2024; Sarfraz et al., 2020). Their results indicate that CEO industry competency cannot directly influence firm success without ambidexterity. Therefore, the following hypothesis is proposed:

H5b: *There is a positive and significant mediating role of exploitation ambidexterity between CEO industry experience and environmental performance in emerging Asian economies*

Framework of the Study

The framework recognizes aspects to ensure analytical robustness and validity. This theoretical framework draws from several sources, including Upper Echelons Theory (Hambrick & Mason, 1984), Stakeholder Theory (Freeman et al., 2010), and Dynamic Capabilities Theory (Bleady et al., 2018), among others, to explain the relationship between leadership and performance outcomes through the medium of ambidextrous capabilities.



Moderation Effect

H2-CEO Industry Experience*Stakeholders' pressure → Exploration Ambidexterity

H3-CEO Industry Experience*Stakeholders' pressure → Exploitation Ambidexterity

Mediation Effect

H4a-CEO Industry Experience→ Exploration Ambidexterity→ Environmental Performance

H5b-CEO Industry Experience→ Exploitation Ambidexterity→ Environmental Performance

Figure 1: Framework of the Study

Research Methodology

Data and Sample Selection

The research utilized longitudinal data to analyze CEO-IND-EXP, organizational ambidexterity (EXP-AMBXTY and EXPLT-AMBXTY), and ENV-PRFM in emerging Asian countries. The availability of data and the theoretical requirements are in equilibrium. This study used a robust 15-year longitudinal panel spanning from 2010 to 2024. This lengthier frame makes sure that CEO-IND-EXP, (EXP-AMBXTY and EXPLT-AMBXTY), and ENV-PRFM are quite

different over time in China, India, and Pakistan, which are three crucial Asian emerging economies.

Between 2010 and 2024, Asian enterprises underwent a notable shift in their operational practices, regulatory adherence to ESG standards, and overall management strategies. Beginning in 2010, companies began utilizing ESG frameworks to standardize CEO disclosures and disseminate corporate reports via online platforms. These developments enabled the identification and comparative analysis of secondary statistics, specifically concerning CEO-level and strategic investment variables, across the three countries. This fifteen-year span provides a robust framework for investigating time-lagged relationships.

The secondary data analysis draws upon a diverse array of reputable sources. This collection encompasses financial databases, corporate reports, CEO profile repositories, and sustainability rating systems, thereby establishing a comprehensive and dependable data source. The integration of these data sources strengthens measurement validity and minimizes the potential for error. Furthermore, this study concentrates on India, Pakistan, and China, informed by both theoretical and empirical considerations.

Data Description and Variables Measurement

The research depends on variable measurement to accurately convert theoretical ideas into quantitative metrics. This study employs secondary data; hence, accurate and well-defined measurement criteria are essential to guarantee the reliability and validity of the findings. The study employs archival databases, corporate reports, and financial records to investigate the attributes of Chief Executive Officers, organizational ambidexterity (EXP-AMBXTY and EXPLT-AMBXTY), stakeholder pressure (STKLD-PRSUR), and corporate performance. Each variable is derived from existing literature to maintain alignment with established strategic management and corporate governance principles. This segment elucidates the stringent and widely accepted empirical standards utilized to evaluate CEO characteristics, EXP-AMBXTY and EXPLT-AMBXTY, STKLD-PRSUR, and corporate success.

Table 1: Data Source and Variables Measurement

Variable	Measurement	Symbol	Data Source
Environmental Performance	ESG Rating Score (Environmental Ratings)	ENV-PRFM_it	MSCI ESG, Thomson Reuters ESG, ORBIS

CEO Industry Experience	Number of years the CEO has worked in the same industry before the current role	CEOExp_it	ExecuComp, LinkedIn, Corporate Filings
Exploration Ambidexterity	R&D Intensity (R&D Expenditure / Total Sales)	ExplorAmb_it	Compustat, Company Financial Reports
	Number of patents filed by the firm annually	Patents_it	USPTO, Google Patents
Exploitation Ambidexterity	Capital Expenditure to Total Assets Ratio	ExploitAmb_it	Compustat, ORBIS
	Operational efficiency (Cost-to-Revenue, Inventory Turnover)	Eff_it	Company Financial Reports
STKLD-PRSUR	ESG Rating Score (Environmental, Social, and Governance Ratings)	ESG_it	MSCI ESG, Thomson Reuters ESG
	Regulatory fines, government penalties for non-compliance	RegFine_it	SEC Filings, Corporate Compliance Reports

Stakeholder pressure is conceptually distinct from environmental performance. The former captures the external intensity of monitoring, expectations, and sanctions faced by the firm, while the latter captures the firm's environmental outcome level. To reduce conceptual overlap, environmental performance is measured using the environmental pillar only, whereas stakeholder pressure combines external evaluative pressure and regulatory sanction exposure. In this study, exploration and exploitation are modeled as distinct but complementary dimensions of ambidextrous capability, following work that treats ambidexterity as the joint presence of exploratory and exploitative activities rather than as a single observed item. Because the two dimensions may have different environmental implications, they are estimated separately in the baseline models.

Model Specification and Data Analysis Techniques

This research looks at the attributes of CEOs (such as their expertise in the business), ENV-PRFM, organizational ambidexterity (the ability to explore and exploit), and STKLD-PRSUR as a moderator. The study uses longitudinal regression models to analyze firm-specific effects and trends using panel data. The research utilizes panel data regression, using fixed- and random-effects models, in addition to mediation and moderation studies. Hypothesis testing with hierarchical regression models demonstrates robustness. This section analyzes analytical methodologies, model specifications, and diagnostic assessments for empirical validation. The research employed Fixed Effects and Random Effects models to evaluate CEO-IND-EXP, ambidexterity, and organizational success from the outset. The Hausman test assesses the estimator's consistency, facilitating the choice between fixed effects and random effects models. These models account for unobservable, time-invariant organizational elements that may distort expected outcomes. The research used a two-step System GMM estimator to improve causal inference and mitigate endogeneity, particularly with CEO attributes and organizational performance (Blundell & Bond, 1998; Blundell et al., 2001). This dynamic panel approach utilizes lagged levels and variations of the endogenous variable as instruments to get more robust and consistent results for models displaying autoregressive elements and simultaneity. The Fixed Effects (FE), Random Effects (RE), and Generalized Method of Moments (GMM) are used for panel data that has unobserved heterogeneity, dynamic connections, and possible endogeneity (Arellano & Bond, 1991; Arellano & Honoré, 2001).

The FE model implies that time-invariant traits are firm-specific and should not be linked with explanatory factors. The generic fixed-effects model is:

$$\begin{aligned} \mathrm{ENV-PRFM_{it}} = {} & \beta_0 + \beta_1 \mathrm{CEO-IND-EXPit} \\ & + \beta_2 \mathrm{O}ORG\ (EXP\ \&\ EXPLT) - AMBXTY\mathrm{it} \\ & + \beta_3 (CEO - IND - EXP\ X\ STKLD - PRSUR) \\ & + \mu_i + \varepsilon_{it} \end{aligned}$$

However, the Random Effects Model (RE) implies that unobserved firm-specific effects are uncorrelated with independent variables. In the RE model, firm-specific heterogeneity is believed to be randomly distributed across businesses and does not skew coefficient estimates. General random-effects model:

$$\begin{aligned}\mathrm{ENV-PRFM_{it}} &= \beta_0 + \beta_1 \mathrm{CEO-IND-EXPit} \\ &+ \beta_2 ORG\ (EXP\ \&\ EXPLT) - AMBXTY\mathrm{it} \\ &+ \beta_3 (CEO - IND - EXP\ X\ STKLD - PRSUR) \\ &+ \mu_i + \varepsilon_{it}\end{aligned}$$

When dealing with panel data, one standard econometric tool is the Generalized Method of Moments (GMM), which can help overcome problems such as autocorrelation, endogeneity, and heteroskedasticity.

Generalized method of moments (GMM) estimators, such as the Arellano-Bond (1991) and Blundell-Bond (1998) models, as well as Difference GMM and System GMM, can provide unbiased parameter estimates. Lagged dependent variables are employed in a dynamic panel model to capture the persistence of firm performance. Baseline GMM Equation:

$$\begin{aligned}\mathrm{ENV-PRFM_{it}} &= \alpha ENV - PRFMit - 1 + \beta_1 CEO - IND - EXPit \\ &+ \beta_2\ ORG\ (EXP\ \&\ EXPLT) - AMBXTY_{it} \\ &+ \beta_3 (CEO - IND - EXP\ X\ STKLD - PRSUR) \\ &+ \varepsilon_{it}\end{aligned}$$

To address endogeneity and control for unobserved firm-specific effects, the Arellano-Bond (1991) Difference GMM technique is employed. First differencing, which eliminates firm-specific components that are time-invariant, transforms the model in this way:

$$\begin{aligned}\mathrm{ENV-PRFM_{it}} &= \alpha \Delta ENV - PRFMit - 1 + \beta_1 \Delta CEO - IND \\ &- EXPit + \beta_2 \Delta ORG\ (EXP\ \&\ EXPLT) - AMBXTY_{it} \\ &+ \beta_3 \Delta (CEO - IND - EXP\ X\ STKLD - PRSUR) \\ &+ \Delta\varepsilon_{it}\end{aligned}$$

Data Source and Description

Our study's final sample was selected using the Propensity Score Matching (PSM) approach. To improve comparability between multinational enterprises and domestic firms, we employed propensity score matching before panel estimation. The treatment condition was firm internationalization status, coded 1 for multinational enterprises and 0 for comparable local listed firms. The primary sample dataset was selected based on the availability of reports. Firms' annual reports were used to finalise the data. We focused only on firms that published their annual financial statements and reports each year. Additionally, we did not include financial firms due to issues with reporting, confidentiality, and constraints imposed by rules and regulations. These firms may have different disclosure

criteria from non-financial firms, biasing outcomes. Leaving them out maintained the consistency and value of our sample for the investigation. Since we focused on MNEs, we established a PSM-matched sample of local enterprises with similar characteristics. We used matched-sample criteria to select similar-sized firms from one sector and country. We employ 80% to 120% of MNEs' assets to match them with local listed firms for size-matching.

Table 2 presents the overall and matched-sample distributions of treatment and control groups for MNEs and local firms across multiple years. The "Matched" column indicates the adjusted sample with balanced treatment and control groups, whereas the "Unmatched" column shows the sample size before matching. For better comparisons, the matching procedure equalises MNEs and local entities across treatment and control groups. Because matched samples minimize bias and reinforce causal inferences, they yield more reliable results. We removed firms with fewer than 5 years of data to avoid erroneous or biased estimates arising from incomplete time series. Panel estimates work because of enough and reliable data. From 2010 to 2024, the main study uses a matched sample of 8880 firm years.

Table 2: Data Source and Description

	Overall Sample (Unmatched)			**Matched Sample**		
Year	Total	Treatment	Control	Total	Treatment	Control
		MNEs	Local		MNEs	Local
2010	955	601	354	312	207	105
2011	993	604	389	326	226	100
2012	993	604	389	369	245	124
2013	957	564	393	496	264	232
2014	969	584	385	533	283	250
2015	981	603	378	563	302	261
2016	987	601	386	593	321	272
2017	969	584	385	616	340	276
2018	981	603	378	653	359	294

2019	987	601	386	683	378	305
2020	1068	690	378	713	397	316
2021	1092	706	386	743	416	327
2022	1107	722	385	721	435	286
2023	1116	738	378	721	454	267
2024	1140	754	386	838	478	360
Total	15295	9559	5736	8880	5105	3775

Analysis and Results

Direct and Moderation Results

The diagnostic results in Table 3 below confirm that the GMM estimate models used to test the direct and moderation hypotheses (H1, H2, H3) are statistically reliable and internally valid. First, the Arellano–Bond AR(1) test is significant for all models ($p < .01$). This means that the first-differenced residuals have the predicted first-order autocorrelation, which is common in dynamic panel models. The AR(2) test, on the other hand, is not significant in any of the models ($p > .10$), which means that the error component does not have any second-order serial correlation. This is an important prerequisite for GMM consistency (Arellano & Bond, 1991). The significant Sargan statistics warrant caution because they may indicate instrument invalidity or instrument proliferation (Sargan stat = 0.324–0.378, $p = 0.000$), demonstrating the combined validity of instruments included in the model. The p-values may suggest careful interpretation given probable instrument proliferation. However, the Difference-in-Hansen tests and the robust Wald χ^2 statistics (all significant at $p < .01$) offer further validation of the overall explanatory capacity and collective importance of the included regressors. Adding fixed effects for specific years, industries, countries, and COVID-19 help reduce omitted variable bias even further, making the results more reliable. These diagnostics show that the GMM estimators are strong and accurate in finding dynamic associations between CEO-IND-EXP, EXP-AMBXTY, EXPLT-AMBXTY, and ENV-PRFM ($\beta = 0.156$, $p < .05$), which confirms H1. This indicates that CEOs with longer tenures are in moderate circumstances.

The analysis demonstrates that CEO-IND-EXP exerts a positive and substantial influence on ENV-PRFM (β = 0.156, p < .05), hence validating H1. This study implies that chief executive officers possessing considerable industry experience and prolonged tenures are more adept at navigating regulatory requirements, stakeholder demands, and technological advancements pertinent to ENV-PRFM. These results align with the upper echelon theory (Abatecola & Cristofaro, 2020; Hambrick & Mason, 1984), which asserts that leaders past experiences substantially shape their strategic choices. CEO-IND-EXP demonstrate enhanced capabilities in executing environmental policies conducive to sustained success (Khan et al., 2020; Lee, 2025). Their accumulated knowledge allows them to harmonize short-term business goals with long-term environmental objectives. This interplay is particularly crucial in Asian emerging economies, which are marked by swift industrial expansion and escalating environmental challenges.

Table 3: Direct and Moderating Effect

Variables	**ENV-PRFM**		**EXP-AMBXTY**		**EXPLT-AMBXTY**	
	Model 1		**Model 2**		**Model 3**	
	β	**t-stat**	**β**	**t-stat**	**β**	**t-stat**
ENV-PRFM (t-1)	0.611***	4.443	----------	----------	----------	----------
EXP-AMBXTY (t-1)			0.546***	4.727	----------	----------
EXPLT-AMBXTY (t-1)	----------	----------	----------	----------	0.496***	4.151
CEO-IND-EXP (H1)	0.156**	2.512				
CEO-IND-EXP			0.152**	2.194		
CEO-IND-EXP					0.110**	2.270
Moderation Variable						
STKLD-PRSUR	----------	----------	0.141**	2.175	-0.120**	2.764
Interaction Term						

CEO-IND-EXP*STKLD-PRSUR (H2)		------- ---	0.197***	5.325		
CEO-IND-EXP*STKLD-PRSUR (H3)					-0.078*	2.047
CEO level controls						
CEO_DUAL	0.046**	2.543	0.041**	2.653	0.045**	2.453
CEO_GNDR	0.063**	2.476	0.062**	2.578	0.069**	2.652
CEO_TNR	0.013*	2.124	0.014*	2.097	0.015*	2.114
Governance control						
BOD_IND	0.119**	2.663	0.114**	2.896	0.121**	2.768
BOD_GD	0.211***	4.642	0.202***	4.865	0.242***	5.575
Financial Control						
F_LEV	0.054**	2.558	0.063**	2.547	0.072**	2.675
LOSS_CF	0.085***	4.642	0.091***	4.365	0.092***	4.877
FOR_INCOME	0.070*	2.053	0.076*	2.032	0.078*	2.012
DIV-PAYR	0.022**	2.342	0.020**	2.642	0.024**	2.764
F_SIZE	-0.043***	5.468	-0.042***	5.768	-0.042***	5.986
MTB	0.034**	2.643	0.037**	2.254	0.040**	2.545
CASH_FLW	0.038**	2.256	0.0317**	2.332	0.032**	2.564
ASSET_TANG	0.109**	3.124	0.104**	3.321	0.112**	3.232
IFRS_ADOPTION	0.027**	2.986	0.031**	2.879	0.037**	2.785
Specific Effects						
Year effects	Yes		Yes		Yes	
Industry effect	Yes		Yes		Yes	
Country effect	Yes		Yes		Yes	
COVID-19	Yes		Yes		Yes	

Weighted Diagnostics			
Sargan test stat	0.324	0.350	0.378
AR (1)	2.942***	6.820***	5.224***
AR (2)	0.226	0.243	0.251
Hansen Test	0.280	0.268	0.255
Difference-in-Hansen	0.435	0.587	0.556
Wald Test (χ2)	833.15***	797.731***	746.633***

AR (1) and AR (2) represent the Arellano–Bond test for zero autocorrelation in first-differenced errors. χ2= chi-square statistics. *p < .10. **p < .05. ***p < .01.

The interaction term for CEO-IND-EXP*STKLD-PRSUR considerably moderates the relationship between CEO-IND-EXP and EXP-AMBXTY (β = 0.197, p < .01), therefore confirming H2. This finding emphasizes that external pressures from regulatory bodies, non-governmental organizations, consumers, and international collaborators can stimulate innovative endeavours, particularly when chief executive officers (CEOs) possess pertinent industry expertise. This observation is consistent with research suggesting that when senior executives are adept at interpreting and addressing stakeholder concerns, they contribute to the enhancement of their organizations' environmental initiatives (Liu et al., 2022; Tang et al., 2024).

Conversely, STKLD-PRSUR negatively influences the relationship between CEO-IND-EXP and EXPLT-AMBXTY (β = -0.078, p < .10), thereby supporting H3. This negative correlation may imply that in high-pressure contexts, experienced CEOs redirect their attention from incremental efficiency gains (EXPLT-AMBXTY) towards more transformative, inventive (exploratory) sustainability endeavours.

Several control variables, such as CEO_DUAL, CEO_GNDR, CEO_TNR, and financial indicators, were shown to be significant. This suggests that leadership and governance elements have greater impacts on ENV-PRFM. Factors like foreign income, loss carry-forward, and dividend payment have a favourable effect on green performance. This might mean that the availability of cash flow and the push of globalization on sustainability initiatives are important.

Mediation Analysis Results (H4a, b and H5a, b)

The diagnostic results in Table 4 confirm the reliability of the GMM models employed to investigate the mediation hypotheses (H4b and H5b) via exploration and EXPLT-AMBXTY. As expected, the AR(1) test is significant for all model specifications (p < .01), while the AR(2) test is not significant (p > .10). This means that the model

residuals do not have second-order autocorrelation, which confirms the model specification (Roodman, 2009). The Sargan and Hansen test statistics (Sargan stat = 0.378–0.426; p = 0.000) validate the instruments' significance, although the zero p-values indicate a need for care about instrument count. The Difference-in-Hansen statistics seem to support the validity of the instrument subsets because they don't go against them. The Wald chi-square values are significant in all mediation models, which shows that both predictors and controls are statistically significant. These diagnostics, along with controls for firm-level governance, finances, year, nation, industry, and the impacts of COVID-19, show that the mediation models are statistically sound and valid within themselves. The findings indicate that the mediating functions of EXP-AMBXTY and EXPLT-AMBXTY within the CEO-IND-EXP and ENV-PRFM relationships are both statistically significant and derived from robust econometric methodologies.

The findings indicate that both EXP-AMBXTY (H4a) and EXPLT-AMBXTY (H5a) exert substantial favourable influences on ENV-PRFM ($\beta = 0.218$, $p < .05$ and $\beta = 0.091$, $p < .10$, respectively). This dual effect supports the idea that organizations using organizational ambidexterity—the ability to pursue both radical innovation and operational improvements—achieve better sustainability results. Previous research supports this, showing that exploration encourages green innovation, while exploitation improves resource efficiency and regulatory compliance (Bocken et al., 2014).

Table 4: Mediation Effect Results

	ENV-PRFM	**ENV-PRFM**	**ENV-PRFM**	**ENV-PRFM**	**ENV-PRFM**
CEO-IND-EXP	0.147**	----------	0.016	----------	0.082*
EXP-AMBXTY (H4b)	----------	0.218**	0.205**	----------	----------
EXPLT-AMBXTY (H5b)	----------	----------	----------	0.091*	0.077*
CEO level controls	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes
COVID-19	Yes	Yes	Yes	Yes	Yes

Weighted Diagnostics					
Sargan test stat					0.387
	0.415	0.426	0.378	0.395	
AR (1)					
	3.042***	3.242***	4.620***	5.842***	6.149***
AR (2)	0.243	0.254	0.364	0.378	0.272
Hansen Test					0.385
	0.365	0.374	0.397	0.431	
Difference-in-Hansen	0.253	0.376	0.356	0.432	0.457

AR (1) and AR (2) represent the Arellano–Bond test for zero autocorrelation in first-differenced errors. $\chi 2$= chi-square statistics. *p < .10. **p < .05. ***p < .01.

The Generalized Method of Moments (GMM) results suggest that EXP-AMBXTY completely mediates the relationship between CEO-IND-EXP and ENV-PRFM ($\beta = 0.205$, $p < .05$), thereby supporting H4b. This full mediation implies that experienced CEOs promote sustainability indirectly through the encouragement of exploratory initiatives, such as green research and development, novel product design, and disruptive ecological innovation. Consequently, the comprehensive mediation effect indicates that leadership attributes affect performance solely through organizational learning mechanisms (Hossain et al., 2024; Shoaib et al., 2025).

In addition, EXPLT-AMBXTY partially mediates the relationship between CEO-IND-EXP and ENV-PRFM ($\beta = 0.077$, $p < .10$), supporting H5b. This suggests that while minor process and system changes can have environmental benefits, these are less significant than the more impactful experimental approach. This distinction highlights the dynamic capability framework, which posits that ambidexterity allows organizations to refresh their competencies and adapt to environmental changes, especially in developing countries (Teece, 2007).

Discussion and Conclusion

This study undertakes a detailed analysis of how CEO industry experience (CEO-IND-EXP) affects environmental performance (ENV-PRFM) within developing Asian economies, elucidating the mediating role of organizational ambidexterity and the moderating effect of stakeholder pressure (STKLD-PRSUR). Our results contribute to the existing literature that connects micro-level leadership attributes with macro-level sustainability outcomes,

specifically from the standpoint of organizational learning (Liu et al., 2022). Initially, our analysis validates the positive influence of CEO-IND-EXP on ENV-PRFM, suggesting that leaders possessing industry-specific knowledge are equipped with the requisite contextual understanding and specialized expertise to strategically manage intricate environments. This observation is consistent with the upper echelon's theory (Hambrick & Mason, 1984), which asserts that the personal attributes of executives shape strategic outcomes. Furthermore, certain CEOs demonstrate a greater propensity to prioritize long-term sustainability over short-term financial constraints (Jaaffar et al., 2024; Sarfraz et al., 2020). The negative interaction for exploitation ambidexterity suggests that stakeholder pressure does not uniformly strengthen all capability pathways.

Furthermore, our research showed that STKLD-PRSUR considerably influenced the link between a CEO's experience and organizational ambivalence. This influence encouraged exploratory innovation but, conversely, hindered exploitative innovation. This moderating impact supports Smith and Lewis's (2011) idea of strategic uncertainty. They suggest that outside influences, particularly from stakeholders, push firms to prioritize disruptive innovation above smaller, incremental improvements. This finding further supports Delmas and Toffel's (2008) argument that when stakeholders are involved, companies must broaden their innovation strategies to meet external demands for legitimacy. Our mediation study reveals that EXP-AMBXTY completely mediates the link between CEO-IND-EXP and ENV-PRFM, but EXPLT-AMBXTY only partially mediates this association. The hierarchical analysis shows that while experienced chief executive officers have a direct influence, their indirect effect, notably through their learning abilities in exploratory innovation, is more important.

This aligns with the concept of dynamic capabilities (Teece, 2007), which suggests that ambivalence, encompassing both leadership and adaptive performance, functions as a mediating factor. Exploration seems to be a crucial approach for CEOs aiming to translate their knowledge into impactful environmental policies, as evidenced by prior studies (Bocken et al., 2014; O'Reilly III & Tushman, 2013). This research enriches the existing body of work on sustainable strategies by illustrating that leadership capital alone does not guarantee enhanced environmental performance; rather, it necessitates both leadership and stakeholder involvement. This triadic relationship is especially significant for businesses operating in emerging economies, where the challenge lies in harmonizing growth with sustainable development amidst changing environmental regulations.

Research Implications

The implications of our findings extend to theoretical, managerial, and policy domains. This research conceptually combines high-level leadership theory, organizational ambidexterity, and stakeholder theory to elucidate the impact of leadership characteristics on environmental results across multiple levels. We move beyond conventional performance metrics, highlighting that sustainability represents a strategic outcome shaped by CEO attributes. This study offers practitioners pertinent insights concerning the selection and development of CEOs. Consequently, boards in developing market nations should prioritize the appointment of a CEO possessing industry expertise, especially to improve their environmental, social, and governance (ESG) ratings.

Furthermore, establishing a culture of uncertainty through the balance of exploration and implementation should be a central strategic goal. This can be achieved through structural ambidexterity, cross-functional teams, and the necessary resources for innovation. Policymakers and regulators also need to be considered. The moderating influence of STKLD-PRSUR implies that enhanced environmental accountability frameworks and stakeholder empowerment mechanisms could indirectly encourage green innovation. Regulations should prioritize transparency, engagement, and accountability, especially in countries such as China, India, and Pakistan, where these frameworks are still developing.

Research Limitations

Like all empirical studies, this study has several problems. Even while using systematic GMM reduces endogeneity and firm-specific heterogeneity, it doesn't completely get rid of the chance of instrumental variable diffusion. The Hansen test and AR(2) test are all diagnostic tests that show the model is valid. However, optimizing the selection of instrumental variables might make the model more robust. Second, the CEO-IND-EXP score is statistically sound, but it may not fully capture subtle factors like leadership style, risk tolerance, and personal sustainability values. These unobservable qualities may affect or enable this connection in ways that have not been fully explored in our work. Third, our sample is limited to multinational businesses from three Asian economies: China, India, and Pakistan. The findings, while geographically comprehensive, may possess limited applicability for smaller corporations, private entities, or organizations from other institutional environments (e.g., Africa and Latin America).

Future Research Directions

Future research may proceed in several directions. First, qualitative case studies may be conducted to clarify the micro-

processes via which experienced CEOs promote environmental innovation, encompassing decision-making in uncertain contexts and collaboration with R&D teams. Second, future research might improve the model by adding the psychological and behavioural features of CEOs, such as their views on the environment, their morals, and their ability to think in sophisticated ways. This will improve our understanding of how and why experience affects the results of sustainable development.

Third, a cross-regional comparative study will evaluate whether the relationship between CEOs' dual competencies and performance is relevant to developed countries and diverse regulatory environments. Longitudinal data from Latin America, sub-Saharan Africa, and Southeast Asia provide substantial comparative insights. In the end, including institutional moderating factors like the strictness of environmental laws, ESG disclosure requirements, and pressure from investors would improve the model and make it easier to figure out the limitations of the associations that were found.

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