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THE IMPACT OF EXECUTIVE TEAM COMPETENCY-SHARING DEGREE ON FIRM INNOVATION PERFORMANCE

Yueting SHAO[1], Liang QU[1], Pengzhen LIU[2]✉, Ling DING[1]

[1]*School of Business Administration, Zhejiang Gongshang University, Hangzhou, China*
[2]*School of Economics, Jinan University, Guangzhou, China*

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Abstract. In China's high-quality development context, the key role of executive teams in corporate innovation is increasingly prominent. However, effectively utilizing the synergistic effect of competencies within these teams to boost innovation performance remains a crucial research issue. A sample of 2,350 companies in Shanghai and Shenzhen A-shares from 2010 to 2022 was used to examine the impact of the executive team's capability-sharing degree on firm innovation performance. The study indicates that the degree of managerial competence sharing, entrepreneurial competence sharing, and technological competence sharing within the executive team positively impacts firm innovation performance. These findings remain robust in the face of variations in dependent variable measures, lagged independent variables, and the propensity score matching method. Environmental dynamism is identified as playing a positive moderating role in the relationship between the influence of managerial, entrepreneurial, and technological capability-sharing degrees and firm innovation performance. Further analysis of heterogeneity reveals that the impact of the executive team's capability-sharing degree on firms' innovation performance varies based on the nature of property rights, firm size, and industry competitiveness. This study, grounded in top-level ladder theory, offers a framework for enhancing team capabilities and overcoming growth obstacles through executive team competence sharing.

Keywords: executive team, competency-sharing degree, innovation performance, environmental dynamism, top-level ladder theory, team capabilities.

JEL Classification: C30, L25, M10.

✉Corresponding author. E-mail: ***liu_pengzhen@163.com***

1. Introduction

In the context of a contracting global market, Chinese enterprises confront the significant challenge of achieving high-quality, high-efficiency, and competitive development. The strategic discernment and execution of the top management team play a pivotal role in determining the future trajectory of the enterprise. Successful enterprises often attribute their accomplishments to robust top management teams, exemplified by entities like the "Tencent Five Tiger Generals," and "Baidu Seven Musketeers." Based on the top-level ladder theory, scholars have directed their attention toward the comprehensive qualities of the executive team. They emphasize the critical role that executive team capabilities play in propelling strategic breakthroughs within firms and facilitating innovative development (Lazar et al.,

2020). Although executive teams play a pivotal role in shaping firm strategy, the process of building these teams often presents companies with multiple challenges. Issues such as team synergy (Chen et al., 2021), competency distribution (Huynh et al., 2022), and the ambiguity of strategic direction (Ma et al., 2022) are commonly encountered. The distribution of competencies within the executive team directly influences the effectiveness of team integration, consequently exerting a significant impact on the firm's decision-making and execution. However, despite a wealth of literature delving into the detailed examination of individual executive competencies, there remains a relative lack of exploration regarding the competency structure of the executive team. Particularly in research on optimizing the competency structure of the executive team to foster innovative enterprise development, there exists a notable research gap.

Centering on the sharing of professional competencies among members of the executive team during the decision-making and execution phases, the top-level ladder theory unveils potential mechanisms for driving strategic breakthroughs and realizing innovative development. Within this theoretical framework, achieving excellence in the executive team necessitates that individual executives not only possess superior leadership skills but also actively share and integrate their specialized competencies within the team. Executive team competency sharing is specifically defined as the distribution of team members within an executive team at distinct competency levels (Reese et al., 2021). This distribution can manifest in a decentralized manner, where individual team members possess different expertise in various domains or aspects (Knudsen & Srikanth, 2014), or in a concentrated manner, where team members share similar expertise in a specific domain or aspect (Chandler & Jansen, 1992). This statistic measures the degree to which team members differ in overall competency and is critical for understanding team synergistic efficacy and performance on specific tasks or goals. The ability of an executive team to synergize a specific competency depends on the type of competency. Building upon the research of Chandler and Jansen (1992) and Reese et al. (2021), this study classifies executive team competency sharing into three key dimensions: managerial competency sharing, entrepreneurial competency sharing, and technological competency sharing. This categorization model is crafted to address the primary challenges faced by firms amid uncertainty, emphasizing the necessity for diversified competencies to enhance the likelihood of survival and success in a competitive environment. An in-depth exploration of these three dimensions facilitates a more precise understanding of how various competencies within the executive team interact with one another and their distinctive contributions to driving the firm's innovation performance.

In addition to performing an in-depth investigation of the relationship between executive team capability sharing and firm innovation performance, this study dives into the moderating processes that influence this relationship. Environmental dynamism, defined as the unpredictability and instability of factors such as customers, competitors, industry development, and technological innovation (Wang et al., 2023), is critical in determining the impact of executive team capability sharing on firm innovation performance. Aligning the level of executive team skill sharing with environmental dynamism is critical in improving organizations' innovation performance. As environmental dynamism intensifies, firms grapple with increasingly complex and volatile challenges, making it more difficult to predict aspects such as market demand, new products, and industry policies (Do et al., 2022; Kim & Lee, 2022), leading to heightened competition. In this setting, strengthening the executive team's competence sharing becomes more important. Identifying environmental dangers and opportunities, as well as offering appropriate solutions and legislative initiatives, has become critical for improving

the business innovation performance process. Therefore, using the top-level ladder theory, this study selects Chinese Shanghai and Shenzhen A-share listed firms from 2010 to 2022 as the research sample, aiming to explore in depth the complex relationship between executive team capabilities and firms' innovation performance. Specifically, this study will focus on the degree of sharing of executive team capabilities, with particular attention to the degree of sharing of managerial, entrepreneurial, and technological capabilities, and how they affect firms' innovation performance. At the same time, given that differences in the emergence of opportunities and competitive characteristics in different industries may have an impact on firms' innovation performance, environmental dynamics is introduced as a moderating factor to reflect the degree of turbulence in the external industrial environment, and the moderating effect of environmental dynamics in the degree of competence sharing of the executive team-innovation performance is further examined for a more comprehensive understanding of the mechanism of this complex relationship.

This study contributes to research in three key aspects: First, it contributes to the existing literature on how executive team capabilities influence firm innovation performance by conducting a thorough investigation into the degree of sharing of executive team capabilities, with a particular emphasis on managerial, entrepreneurial, and technological capabilities. In the face of a shrinking global market, building strong executive teams is critical to company success. This study not only emphasizes the importance of top management teams but also provides more particular characteristics to better understand their impact on business innovation success. Second, the study uses the idea of environmental dynamism to examine the relationship between the level of executive team capability sharing and business innovation performance. Environmental dynamism is found to have a favorable impact on business innovation performance via the executive team's capability-sharing degree. By accounting for the external environment's instability and unpredictability, the study demonstrates how the executive team's capability-sharing degree can more successfully enhance company innovation performance in the face of complicated and shifting market conditions. Third, this study introduces the top-level ladder theory, which provides a new perspective on examining executive teams. The idea emphasizes the need to share professional competencies across executive team members during the decision-making and execution stages, revealing their potential mechanisms for driving corporate strategic breakthroughs and achieving innovative development.

The subsequent sections are organized as follows: Section 2 presents derivations based on relevant theoretical studies and formulates research hypotheses. Section 3 discusses sample data sources and variable measurements. Section 4 reports empirical results, including descriptive statistics, baseline regression results, and robustness and endogeneity tests. Section 5 conducts further analyses, including moderating effects analysis and heterogeneity analysis. Section 6 conducts a discussion to explore theoretical significance and practical insights. The final section concludes the study and discusses its shortcomings.

2. Literature review and research hypotheses

2.1. Executive team competency-sharing and firm innovation performance

The capabilities of the executive team are defined as the collective knowledge, skills, and experience possessed by members of the management team. This definition also encompasses their ability to synergize, collaborate, and communicate effectively (Marvel et al., 2016). This

structural configuration of capabilities plays a pivotal role in optimizing resources, fostering innovation, exploring new business opportunities, and influencing strategy formulation and execution. Consequently, it inevitably impacts firms' innovation performance.

Synergies are heightened when team members actively share management competencies by exchanging knowledge, abilities, and experiences in leadership and management, integrating these aspects, and applying them collectively. First, shared management capabilities play a crucial role in dismantling information silos, enabling swift responses to external changes, expediting the decision-making process, and fostering innovative thinking. Given that executive members face constraints due to limited rationality (Jia et al., 2021), there is a potential for issues related to a narrow vision in information acquisition, processing, and integration. Nevertheless, the potential drawbacks stemming from individual limitations and short-sightedness can be effectively mitigated through the sufficient sharing of managerial competencies. Actively exchanging information both within and outside the firm by the executive team mitigates information asymmetry (Menshawy et al., 2023) and systematically enhances the decision-making process. This collaborative team effort enables firms to exhibit greater flexibility in responding to external changes and enhances their ability to innovate, ultimately resulting in a sustained advantage in profitability. Second, shared management capabilities suggest that team members can amalgamate their unique management experiences and insights. On one hand, team members draw inspiration from their management practices, propelling the team beyond traditional thinking frameworks to discover distinctive solutions and innovation opportunities (Georgakakis et al., 2022). On the other hand, through the sharing of insights in the management field, team members gain a more comprehensive understanding of industry trends and market dynamics (Marion & Fixson, 2021), providing a broader perspective on firm innovation. Tencent, one of China's largest Internet companies, prioritizes sharing management capabilities within its executive team. Regular management training, team-building activities, and internal forums facilitate this exchange of knowledge and experiences. This approach has been crucial in sustaining innovation and maintaining competitiveness in the dynamic Internet industry. In essence, shared management capabilities serve not only as a mechanism for synergy within a team but also as a pivotal engine for problem-solving and innovation, aiding firms in achieving profitability.

Despite the continuous influx of business opportunities in the external environment, executive teams exhibit significant differences in their recognition of opportunities in potential areas. During a company's crucial developmental stage, effectively seizing opportunities becomes a fundamental determinant of its growth, and high-quality business opportunities possess the potential to propel the company toward a qualitative leap forward (Sternad & Mödritscher, 2022). Gruber et al. (2015) note that executive teams with entrepreneurial competencies share a common set of characteristics, with the core being an entrepreneurial mindset that pursues business opportunities with the greatest potential. Individuals possessing entrepreneurial competencies tend to offer distinct insights into value propositions, customer needs, and target markets (Baron & Ensley, 2006; Rindova & Courtney, 2020). The value derived from entrepreneurial competencies is contingent upon the frequency of communication and interaction among executives with entrepreneurial capabilities. The sharing of entrepreneurial competencies ensures that executives' paradigms of thinking and insights are productive and creative (Del Giudice et al., 2021), drawing upon a richer set of information and perceiving the value within that information. In conclusion, the sharing of entrepreneurial abilities is not just a communication medium, but also a critical driver

of collaborative creativity and joint identification and capitalization of business prospects among team members. This contact allows the executive team to respond more swiftly to changing market demand and raise sensitivity to business prospects, so more effectively supporting the firm's excellent performance in innovation.

As pivotal figures in firm innovation investment and decision-making, technology members within executive teams are recognized as one of the most innovative groups (Sun et al., 2022). The study highlights that tech entrepreneurs, whether working independently or collaboratively, often excel due to their profound technical understanding of the business foundation. This understanding enables them to discern how new technologies can be effectively applied to the business environment. In the actual R&D process, tech founders instinctively engage in innovative activities and demonstrate superior innovation performance, given their dual roles in both R&D and management (Jiang et al., 2021). Moreover, firms led by technologically oriented founders tend to showcase better innovation performance by coordinating IT teams, establishing communication environments for customer interaction, and potentially initiating technological upgrades in response to changes in user value attributes. As a key player in China's search engine and AI sector, Baidu's executive team has strong technical backgrounds. Co-founder Robin Li exemplifies this with his expertise in AI. Baidu emphasizes sharing technical skills and promoting innovation through institutions like the Baidu Research Institute, which organizes technical salons and forums for collaboration. Consequently, when founders with a technical background are involved in entrepreneurial activities, their intellectual capabilities and technical skills can be transformed into intangible assets continuously utilized and updated during the entrepreneurial process. This facilitates the provision of high-quality solutions to the problems addressed by the firm's innovations (Marvel et al., 2020). Similarly, Yeganegi et al. (2021) affirm that when information is more readily available, potential technological entrepreneurs enjoy an advantage, resulting in higher technological entrepreneurship. Li et al. (2023) found that skilled entrepreneurs perform better in both profitable and uncertain industries, but non-skilled entrepreneurs flourish only in profitable ones. To summarize, sharing technology competency among executive teams enables more effective exploitation of their technological skills and inventive thinking. This enables efficient team structure and administration, the identification of market prospects, and the ongoing pursuit of technological innovation. Based on the above analysis, the following hypotheses are proposed:

H1: The degree of competence sharing of the executive team contributes to firms' innovation performance.

H1a: The degree of managerial competence sharing of executive teams contributes to firms' innovation performance.

H1b: The degree of entrepreneurial competence sharing of executive teams contributes to firms' innovation performance.

H1c: The degree of technological competence sharing of executive teams contributes to firms' innovation performance.

2.2. The moderating role of environmental dynamism

Organizational adaptation theory emphasizes that in the context of a changing external environment, firms should have the flexibility to adapt their structures and strategies to new challenges and opportunities on time. This theoretical perspective highlights the significant

differences between firms in different industries, with environmental dynamism as a key feature that influences firms' strategic behavior (Chaudhuri et al., 2023).

First, environmental dynamism has a significant impact on managers' strategic decisions and model adjustments. In a relatively stable environment, the management team can operate the firm in a step-by-step manner and focus on the original direction of development. And, in environments with a lower degree of dynamism, customer demand is relatively stable and technology turnover cycles are shorter (Stieglitz et al., 2016). In such contexts, capability sharing can contribute to innovation performance to some extent, but its impact is relatively limited. However, with elevated environmental dynamism, firms' executive teams need to be more focused on sharing managerial and entrepreneurial experiences and actively discovering the value of resources and new ways of connecting them to adapt to changing market conditions (Zahra et al., 2006). Secondly, environmental dynamism is seen as a key indicator of the "dangers" and "opportunities" of the environment in which a firm operates. On the one hand, firms face great challenges in a volatile environment where the rate of technological change in the industry is unstable and the rate of product renewal and obsolescence is fast (Yuan et al., 2021). Studies have shown that to achieve higher performance in highly volatile industrial environments, firms must rapidly switch between different innovation activities to capitalize on opportunities (Kotter, 2012). On the other hand, the turbulent environment has given rise to a large number of niche markets that hold great potential. This has also forced executive teams to share technological capabilities to create entirely new products and technologies to meet the needs of emerging markets. By sharing new capabilities resulting from technological competencies (Kim & Lee, 2022; Pitelis & Wagner, 2019), firms can offer more disruptive products and services that bring new competitive advantages to the organization and create over-performance. Such shared new capabilities not only help respond to market changes but also provide a solid foundation for firms to remain innovative and flexible in a turbulent competitive environment. In conclusion, environmental dynamism not only emphasizes the far-reaching impact of the external environment on corporate strategy but also highlights that the executive team should flexibly adjust the degree of sharing in different environmental contexts in order to better optimize firm innovation performance. Based on the above analysis, the following hypotheses are proposed:

H2: Environmental dynamism positively moderates the relationship between the degree of competence sharing of the executive team and firms' innovation performance.

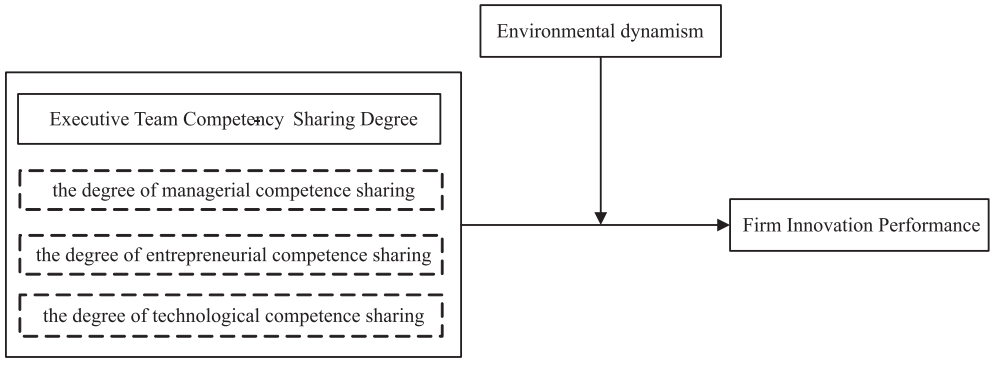

Figure 1. Theoretical model diagram

H2a: Environmental dynamism positively moderates the relationship between the degree of managerial competence sharing of executive teams and firms' innovation performance.

H2b: Environmental dynamism positively moderates the relationship between the degree of entrepreneurial competence sharing of executive teams and firms' innovation performance.

H2c: Environmental dynamism positively moderates the relationship between the degree of technological competence sharing of executive teams and firms' innovation performance.

The theoretical framework diagram of this study is shown in Figure 1.

3. Research design

3.1. Sample and data sources

In this study, A-share listed companies in Shanghai and Shenzhen for the years 2010–2022 are selected as samples, and all the data come from the China Stock Market and Accounting Research Database (Sarfraz et al., 2021), while the data on the competence sharing degree of the executive team come from the annual reports of the companies. The sample selection follows the following criteria: (1) financial companies are excluded; (2) ST and *ST companies are excluded; (3) samples with serious missing data are excluded; and (4) to minimize the extreme values, all continuous variables are shrink-tailed by 1% and 99%. Finally, the study obtained 2350 sample firms with a total of 23629 sample observations.

3.2. Variable measurement

1. Executive Team Competency-Sharing Degree. Referring to the study of Reese et al. (2021) and considering the localized context of China for measurement. Determine the types of competencies possessed by executives based on their current positions. 1) The job titles of executives with Managerial Competencies (MCS) include keywords such as "director, president/vice president, project manager, executive management, strategic planner, and sales director". 2) Entrepreneurial Competence (ECS) is measured based on two points: whether the title of the executive with entrepreneurial competence includes keywords such as "investing, exploring new businesses/markets, developing new products"; and whether the senior executive is one of the founders of the company or has had previous entrepreneurial experience. 3) The job titles of executives with Technical Competence (TCS) include keywords such as "Technician, Technical Engineer/Minister, Researcher, Quality Engineer, and General Director". On this basis, the formula for calculating the competency-sharing degree of the executive team is the sharing degree of a sub-competency = the number of executives with this competency / the total number of executives in the executive team.
2. Firm innovation performance (INNO). Recognizing that enterprise innovation activities extend beyond patent numbers, authorized patent applications serve as a useful indicator reflecting knowledge accumulation and innovation efforts. This readily accessible variable offers a practical measure to assess changes in enterprise innovation performance. Therefore, this study uses the number of authorized invention patents in a year as a proxy for enterprise innovation performance.
3. Environmental dynamism (ED). Environmental dynamism was measured through the coefficient of variation of sales revenue by regressing industry sales revenue on a time variable and then dividing the standard deviation of the regression coefficient by the industry mean (Boyd & Runkle, 1993).

4. Control variables. This study controls the team level and firm level, respectively. The team level controls for executive team size (MS), average team age (MA), and average education (ME), while the firm level controls for firm age (FA) and firm size (FS).

4. Empirical results

4.1. Descriptive statistics

Table 1 shows descriptive statistics for all variables. The mean firm innovation performance is 5.461, with a standard deviation of 1.397, indicating significant variation among Chinese enterprises. The mean MCS is 0.867, with a standard deviation of 0.117; the mean ECS is 0.189, with a standard deviation of 0.296; and the mean TCS is 0.364, with a standard deviation of 0.226.

Table 1. Descriptive statistics

Variables	N	Mean	Standard deviation	Min	Max
INNO	23629	5.461	1.397	0	12.793
MCS	23629	0.867	0.117	0.101	0.997
ECS	23629	0.189	0.296	0	0.424
TCS	23629	0.364	0.226	0	0.654
ED	23629	0.323	0.164	0	0.639
MS	23629	6.259	3.871	1	47
MA	23629	48.745	4.982	32	69
ME	23629	2.879	1.734	0	5
FA	23629	3.125	1.009	0	4.325
FS	23629	23.027	1.479	18.772	27.084

4.2. Benchmark regression results

From Model 2, Model 3, and Model 4 in Table 2, the linear estimated coefficients of managerial competence sharing degree, entrepreneurial competence sharing degree, and technological competence sharing degree with firms' innovation performance are 0.391, 0.459, and 0.412, respectively, with a significant level of 1%. This indicates that managerial capability sharing degree, entrepreneurial capability sharing degree, and technological capability sharing degree have a significant positive effect on firms' innovation performance, thus H1a, H1b, and H1c are confirmed.

Table 2. Main effects test of dependent variables

	INNO1			
	Model 1	Model 2	Model 3	Model 4
MCS		0.391*** (4.771)		
ECS			0.459*** (5.857)	

End of Table 2

	INNO1			
	Model 1	Model 2	Model 3	Model 4
TCS				0.412*** (4.109)
MS	0.016** (1.994)	–0.311 (–1.128)	0.239* (1.731)	0.429* (1.699)
MA	0.490*** (6.972)	0.297* (1.906)	0.211*** (5.673)	0.145** (2.135)
ME	0.201 (1.402)	–0.105* (–1.718)	–0.001*** (–7.601)	0.119* (1.712)
FA	0.067* (1.832)	–0.021 (–0.091)	0.117 (1.214)	–0.199 (–0.644)
FS	–0.009 (–0.014)	0.112** (1.999)	0.018* (1.688)	0.259* (1.712)
_cons	17.882*** (13.981)	16.911*** (7.712)	15.024*** (9.402)	15.217*** (9.983)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	23629	23629	23629	23629
Adj.R^2	0.245	0.347	0.298	0.313
F	156.349	139.027	133.286	141.801

Note: ***p < 0.01, **p < 0.05, *p < 0.1.

4.3. Robustness test and endogeneity test

1. Replacement of the dependent variable. To test the influence of the capability-sharing degree of the executive team on the innovation performance of enterprises, this study selects the number of patent applications as a measure of enterprise innovation performance indicators, and the results are shown in Table 3, Models 6–8, and the conclusions still hold.

Table 3. Replacement of dependent variables

	INNO2			
	Model 5	Model 6	Model 7	Model 8
MCS		0.279*** (8.114)		
ECS			0.158** (2.224)	
TCS				0.304** (2.011)
Controls	Yes	Yes	Yes	Yes
_cons	15.011*** (12.825)	13.407*** (5.011)	14.193*** (7.476)	14.163*** (6.189)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes

End of Table 3

	INNO2			
	Model 5	Model 6	Model 7	Model 8
N	23629	23629	23629	23629
Adj.R^2	0.197	0.401	0.276	0.328
F	172.606	124.908	135.211	176.099

Note: ***p < 0.01, **p < 0.05, *p < 0.1.

2. Lagged independent variable. In this study, the core independent variables are treated with a lag of one period, i.e., the current period of firm innovation performance is used to regress with the previous period of the executive team's managerial, entrepreneurial, and technological competence-sharing degree, and the results are shown in Table 4, Models 9–11, and the conclusions are consistent with the previous study.

3. Propensity score matching method. To solve the problems of omitted variables, and sample selection bias endogeneity, this study further adopts PSM, using the median of the sample data as the dividing line, the management, technology, and entrepreneurship competence sharing degree above the median as the experimental group, and below the median as the control group, with the control variables as the covariates, and 1:1 nearest-neighbor matching. The results, depicted in Table 4, Models 12–14, indicate improved matching, affirming that the conclusions remain robust even after considering endogeneity.

Table 4. Other robustness test

	INNO1					
	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
MCS				0.366** (2.128)		
ECS					0.248* (1.774)	
TCS						0.311** (2.398)
L.MCS	0.188* (1.904)					
L.ECS		0.146* (1.733)				
L.TCS			0.305** (2.104)			
Controls	Yes	Yes	Yes	Yes	Yes	Yes
_cons	13.473*** (13.284)	12.907*** (7.385)	12.984*** (9.236)	10.836*** (8.943)	15.986*** (9.609)	14.832*** (9.745)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	19847	19847	19847	14634	14634	14634
Adj.R^2	0.323	0.389	0.286	0.294	0.318	0.302
F	125.832	113.498	136.827	126.492	116.208	122.382

Note: ***p < 0.01, **p < 0.05, *p < 0.1.

5. Further analysis

5.1. Analysis of the moderating effects of environmental dynamism

Table 5 presents the results of the moderating effect test for environmental dynamism. The findings indicate that the estimated coefficients on the interaction term between managerial competence sharing and environmental dynamism are significantly positive (β = 0.099, p < 0.01), the estimated coefficient on the interaction term between entrepreneurial competence sharing and environmental dynamism is significantly positive (β = 0.201, p < 0.01), and the estimated coefficient on the interaction term between technological competence sharing and environmental dynamism is significantly positive (β = 0.077, p < 0.1). This suggests that environmental dynamism strengthens the relationship between the degree of managerial competence sharing, entrepreneurial competence sharing, and technological competence sharing, and firms' innovation performance. Therefore, H2a, H2b, and H2c are supported.

Table 5. Results of moderating effects

	INNO1		
	Model 15	Model 16	Model 17
MCS	0.107*** (6.892)		
ECS		0.232*** (4.934)	
TCS			0.079** (2.436)
ED	0.059** (2.004)	0.083*** (3.105)	0.048* (1.877)
MCS×ED	0.099*** (12.981)		
TCS×ED		0.201*** (7.625)	
ECS×ED			0.077* (1.883)
Controls	Yes	Yes	Yes
_cons	23.339*** (10.023)	22.991*** (15.208)	23.628*** (12.198)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	23629	23629	23629
Adj.R^2	0.332	0.378	0.305
F	134.748	113.902	122.355

Note: ***p < 0.01, **p < 0.05, *p < 0.1.

5.2. Heterogeneity analysis

1. Heterogeneity of property rights

By dividing the sample enterprises into state-owned enterprises (SOEs) and non-state-owned enterprises (non-SOEs), this study investigates the impact of executive team

competence sharing on enterprise innovation performance, as detailed in Table 6. The data indicate that non-SOEs experience a more significant impact on innovation performance through the sharing of managerial, entrepreneurial, and technological competencies within their executive teams. In contrast, the impact of entrepreneurial competence sharing on innovation performance in SOEs is not statistically significant. Non-SOEs are adept at promoting innovation performance by fostering flexibility, agility in market competition, and intra-team cooperation. They integrate diverse capabilities effectively, which contributes to their innovation success. In contrast, SOEs, with their focus on stable resource support and economies of scale, may prioritize stable resource utilization over entrepreneurial dynamism, leading to a less pronounced effect of entrepreneurial competence sharing on innovation performance.

Table 6. Heterogeneity of property rights

	INNO1					
	SOEs	non-SOEs	SOEs	non-SOEs	SOEs	non-SOEs
MCS	0.113* (1.754)	0.278** (2.398)				
ECS			0.087 (0.336)	0.462*** (4.915)		
TCS					0.342* (1.811)	0.116** (2.332)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
_cons	12.776*** (9.247)	9.384*** (5.467)	13.846*** (6.737)	10.785*** (8.757)	14.754*** (12.552)	10.992*** (8.345)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	12417	11212	12417	11212	12417	11212
Adj.R^2	0.311	0.432	0.126	0.422	0.308	0.392
F	132.348	123.028	125.233	120.249	162.837	133.284

Note: ***p < 0.01, **p < 0.05, *p < 0.1.

2. Firm size heterogeneity

Firm size significantly influences organizational characteristics, with the logarithm of a firm's ending assets used as a measure. The sample divides into large-scale and small-scale firms based on the median. Findings, detailed in Table 7, show that in large-scale firms, the executive team's managerial and technological capabilities have a stronger impact on innovation performance. This reflects their extensive management hierarchies, promoting information transfer and collaboration. Moreover, large-scale firms allocate more resources to technological R&D, enhancing innovation. Conversely, in small-scale firms, entrepreneurial capabilities notably affect innovation performance. These firms often foster an entrepreneurial culture, emphasizing participation and flexibility. This environment inspires employee innovation enthusiasm, contributing significantly to innovation performance compared to their larger counterparts.

3. Heterogeneity in industry competitiveness

To assess the variability in industry competition, this study employs the Herfindahl Index (HHI). The HHI is calculated as the sum of the squares of the ratio of each company's operating revenues to the total operating revenues of the industry. A smaller HHI value indicates

Table 7. Heterogeneity in firm size

	INNO1					
	Large-scale	Small-scale	Large-scale	Small-scale	Large-scale	Small-scale
MCS	0.201** (2.018)	0.193* (1.699)				
ECS			0.213* (1.842)	0.402*** (6.335)		
TCS					0.029*** (7.235)	0.283** (2.146)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
_cons	32.284*** (15.383)	23.826*** (10.271)	13.529*** (8.276)	17.848*** (10.388)	14.384*** (9.283)	17.238*** (6.284)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	12734	10895	12734	10895	12734	10895
Adj.R^2	0.336	0.238	0.373	0.421	0.342	0.384
F	132.859	123.118	127.748	112.377	127.397	118.899

Note: ***p < 0.01, **p < 0.05, *p < 0.1.

Table 8. Heterogeneity of industry competitiveness

	INNO1					
	Weak	Strong	Weak	Strong	Weak	Strong
MCS	0.362* (1.665)	0.437** (3.839)				
ECS			0.013* (1.729)	0.239** (4.283)		
TCS					0.298** (2.165)	0.372** (2.763)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
_cons	12.299*** (11.027)	13.753*** (8.553)	14.676*** (10.766)	12.843*** (11.682)	13.628*** (10.439)	12.483*** (9.384)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	10891	12738	10891	12738	10891	12738
Adj.R^2	0.382	0.399	0.254	0.332	0.219	0.389
F	128.028	140.004	117.659	116.549	136.037	132.938

Note: ***p < 0.01, **p < 0.05, *p < 0.1.

a more competitive industry. Using the annual median HHI as a grouping criterion, industries with an HHI higher than the median are categorized as having lower competition, while those with an HHI lower than the median are considered more competitive. The regression results, presented in Table 8, reveal that in more competitive industries, the executive team's sharing of managerial, entrepreneurial, and technological capabilities has a more significant impact on enhancing the firm's innovation performance.

6. Discussion

Studying the influence of executive team competence sharing on firm innovation performance is crucial. This research deepens understanding of internal management mechanisms and provides valuable insights for enterprises aiming to enhance innovation competitiveness. The study's theoretical contributions are notable in several key aspects. First, the study centers on the antecedent factor of the executive team's capability-sharing degree, emphasizing the importance of knowledge and experience sharing, as well as the frequency of interactive exchanges among executive team members, in influencing firms' innovation performance. Facilitating the swift transfer of critical information, especially tacit and diverse new knowledge, effectively reduces hidden costs associated with business opportunity conversion. An executive team with a high degree of competence sharing is more adept at managing and operating within a competitive market, thereby enhancing the firm's innovation performance. This assertion fills a void in current research by examining how capability sharing within executive teams specifically impacts innovation performance, particularly within the framework of Chinese corporate culture and market dynamics, a departure from the findings of Reese et al. (2021). Chinese cultural norms underscore collectivism, teamwork, and the ethos of mutual trust and sharing among team members. Within this cultural milieu, executive team competency sharing fosters cooperation and collaboration, thereby propelling corporate innovation initiatives forward. Moreover, the rapid pace of change and intense competition in the Chinese market necessitate companies to swiftly adapt and innovate. In such an environment, executive team capability sharing facilitates the timely identification of market opportunities and industry trends, enabling companies to adjust strategies and innovation direction promptly, thereby sustaining competitive advantages. Conversely, foreign firms may operate within more stable and mature markets, where the impetus for innovation might not be as pressing as in Chinese firms. Consequently, they may exhibit tendencies towards conservatism and inertia, diminishing the potential impact of executive team competency-sharing on innovation performance.

Second, this study not only explores the direct effect of "executive team competency-sharing – firm innovation performance", but also introduces the contextual variable of environmental dynamism and analyzes its impact on firm innovation performance in depth. In relatively static environments, firms may prioritize internal stability and experience accumulation, resulting in a relatively limited impact of capability sharing on innovation performance. However, in highly dynamic markets, firms need to be more adaptable in adjusting team sharing to respond to rapidly changing external conditions, making the sharing of managerial, entrepreneurial, and technological competencies a crucial factor for adaptation and success (Chaudhuri et al., 2023; Kafetzopoulos, 2023). The incorporation of environmental dynamism offers new perspectives on how firms can effectively leverage the capability contribution of their executive teams to enhance innovation performance in turbulent and evolving market environments. This study fills a research gap in the existing literature on how environmental dynamism moderates the relationship between the degree of competency sharing and innovation performance of executive teams.

Third, this study enhances the depth and scope of executive team research by introducing the top-level ladder theory. This theory underscores the interdependence and synergy of executive teams at both decision-making and implementation levels, emphasizing the crucial role of exchanging professional domain knowledge and experience in strategic decision-making and innovation practices (Sarfraz et al., 2021). The theory not only highlights synergy

among executive team members but also delves deeper into the transmission and sharing of specialized domain knowledge at the decision-making level, offering a clearer theoretical logic for understanding the driving force of executive teams on corporate innovation. The application of this theoretical framework offers a systematic and comprehensive lens through which to investigate the influence of executive teams on firms' innovation endeavors. It addresses the dearth of understanding regarding the role mechanisms of executive teams in prior research, thereby filling a crucial gap in the literature.

In light of our new period and journey, this study proposes the following recommendations to encourage capacity sharing and comprehensive innovation in organizations. First, advocate for a learning organizational culture. Enterprises can actively promote a culture of continuous learning and encourage individuals to share experiences to facilitate capacity sharing. It is advisable to implement extensive training programs, knowledge bases, and cross-departmental exchange methods to assist team members in continuously improving their capabilities and applying acquired knowledge to their work practices. Second, prioritize the multidimensional development of the executive team. In practice, organizations must prioritize the balanced growth of their executive teams in management, entrepreneurial, and technical skills. Regular performance reviews and competency assessments will ensure that the executive team achieves balanced development in different areas, better supporting the organization's overall innovation. Third, recognize that the changing external environment necessitates flexibility in adjusting the level of sharing among the executive team. Companies should continually assess market trends, the competitive landscape, and technological progress to quickly adjust the sharing of managerial, entrepreneurial, and technological resources. This will enable businesses to better adapt to the dynamic nature of the external environment, increasing corporate innovation flexibility, and allowing them to respond to challenges and seize opportunities more efficiently.

7. Conclusions

Building upon the top-level ladder theory and utilizing data from 2,350 listed companies in Shanghai and Shenzhen A-shares spanning from 2010 to 2022, this study conducts a comprehensive examination of the impact of the executive team's competence-sharing degree on the innovation performance of Chinese companies. The findings indicate, firstly, that the degree of shared managerial competencies among executive teams positively influences firms' innovation performance, enabling them to transcend the limitations of finite theory and focus on successful competition, consequently driving profitability. Secondly, the extensive sharing of entrepreneurial capabilities within the executive team positively impacts firm development by aiding in filtering quality information, identifying top-tier opportunities, and ultimately establishing a clear orientation towards opportunities that propel firms to grow. Thirdly, the widespread sharing of technological capabilities contributes to the elimination of information silos, integration of dispersed technological capabilities, and the creation of an innovation consensus, all of which positively impact firm development. These findings are substantiated by a robust set of analyses. Fourth, environmental dynamism exerts a positive moderating effect on the relationship between the degree of sharing of managerial, entrepreneurial, and technological capabilities and firm innovation performance. The constant changes in the environment can influence the impact of competence sharing on innovation performance, serving as an adjustment and optimization mechanism that enables firms to better adapt to external

environmental changes. Heterogeneity analysis reveals that variations in the role of executive team competence sharing on firms' innovation performance are associated with the nature of property rights, firm size, and the level of industry competition. Specifically, executive teams of non-SOEs exhibit a more significant effect on innovation performance concerning the sharing of management, entrepreneurial, and technological competencies. In contrast, executive teams of large-scale firms have a more substantial effect on innovation performance in terms of managerial and technological competencies, with entrepreneurial competencies playing a more significant role in innovation performance for small-scale firms. Moreover, the degree of sharing of managerial, entrepreneurial, and technological competencies is more likely to contribute to the innovative performance of firms in the case of intense industry competition.

Some limitations in this study need to be addressed in the future. First, due to data gathering restrictions, this study employed secondary data to indirectly quantify the degree of executive team competency sharing; however, future research could use more direct measures, such as scales and experimental design, to increase the measure's accuracy. Second, when designing the measure of executive team competency sharing in this study, there was an underlying assumption that top managers with the same functional competencies speak the same language, are more likely to form empathy, and can communicate effectively when analyzing and solving problems, making them more likely to synergize and share. Although research has verified this basic theory, and there is logic in assessing team competence by the percentage of executives with the same functional competency, there is still potential for improvement in this measure. Third, future studies might incorporate dynamic capabilities theory to investigate the mediating impacts of organizational capabilities. This will help to better understand the mechanism of the influence of executive team competence sharing degree on firm innovation performance and will strengthen the research conclusions.

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Author contributions

Yueting SHAO drafted the manuscript, Liang QU and Ling DING collected and processed the data, and Pengzhen LIU reviewed and critiqued the manuscript. All authors participated in the conception and design of the study, provided feedback on earlier versions of the manuscript, and approved the final version.

Disclosure statement

The authors declare that they have no competing interests.

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