Original Paper

Research on the Influence of the Stability of Top Management Team on the Sustainable Innovation Ability of Enterprises

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Abstract

Sustained innovation ability is related to the success or failure of an enterprise, and the stability of the executive team is regarded as the weathervane of the development status of the enterprise. In this regard, based on the data of A-share listed companies in Shenzhen and Shanghai from 2008 to 2023, the study takes the stability of the executive team as the starting point, and the sustained innovation ability of the enterprise as the starting point, constructs the fixed effect model and the intermediary mechanism model, and explores the complex impact of the stability of the executive team on the sustained innovation ability of the enterprise. It is found that: firstly, executive team stability can directly have a significant promotion effect on the sustained innovation capability of enterprises, and this conclusion still holds after endogeneity treatment and a series of robustness tests; secondly, executive team stability can enhance the sustained innovation capability of enterprises by increasing the proportion of management shareholding and the proportion of R&D personnel; thirdly, this effect will have heterogeneous effects in different types of enterprises . This study provides certain reference value and useful policy implication for enterprises to optimise the structure of executive team and enhance the sustainable innovation capability.

Keywords

executive team stability, sustained innovation capability, management shareholding ratio, R&D personnel ratio, heterogeneity effect

1. Introduction

The Global Innovation Index 2024 released by the World Intellectual Property Organisation shows that the global investment in science and innovation reverses in 2023, with a significant decline (Note 1), a trend that has triggered deep concerns about the sustainability of innovation in various countries. In

response, the Chinese government has proposed in the 14th Five-Year Plan for the Development of the Digital Economy that the added value of the core industries of the digital economy should account for 10 per cent of GDP by 2025 (Note 2). Innovation is the first driving force to lead development, and continuous innovation is the embodiment of higher-level innovation capability, the power source to achieve technological breakthroughs and maintain competitive advantages (Ling & Zhang, 2024). In the dynamic competitive environment of enterprises, the continuous innovation ability of enterprises is a key element to maintain long-term advantages (Antonioli & Montresor, 2021), the importance of which is not only reflected in the support of the development of enterprises, but also concerns the stability and prosperity of the entire industry and even the national innovation ecosystem. Especially in the era of knowledge economy, innovation activities have evolved from the traditional single-point breakthrough mode to a systematic and long-term continuous process, which makes how to build and maintain an efficient innovation system become the focus of attention of both academics and industry. However, the dilemma of "innovation is important to be sustained, but it is also difficult to be sustained" prevails. At present, enterprises' sustained innovation is still constrained by weak information infrastructure, immature technology exchange platform, and the lack of industry standards (Zheng & Wu, 2024), which seriously impede the enhancement of enterprises' sustained innovation capability, and more likely to trigger the vicious circle of the innovation ecosystem. These bottlenecks seriously hinder the improvement of enterprises' sustainable innovation capability, and may even trigger a vicious cycle of innovation ecology. Therefore, it is urgent to promote the high-quality development of enterprises' continuous innovation.

In the current global economic downturn, the long-term prosperity and stable development are not only the development goal that the country is pursuing, but also the key demand of enterprises to survive and develop in the fierce market competition (Liang et al., 2023). As the core body of corporate strategic decision-making, the executive team is responsible for corporate strategic design, daily operation and risk management, and the quality of its decision-making is closely linked to the stability of the team (Agarwal et al., 2020; Liu et al., 2024). Collective shocks in the executive team may lead to oscillations in the strategic direction, reduce the efficiency of resource allocation, and then weaken the innovation drive of the firm; whereas moderate stability helps to form a consistent vision of innovation and promotes the accumulation of knowledge and teamwork. In recent years, the phenomenon of "bloodletting" in the executive team of listed companies in China has become commonplace, and in the case of SMIC in 2022-2023, for example, eight core executives, including the sixth-generation head of SMIC, who has been in office for less than two years, have left the company one after another. This phenomenon seriously impacts the continuity of corporate strategy and consistency of execution, adding uncertainty to corporate operations. The importance of a stable executive team is self-evident as it is an important guarantee for firms to achieve sustainable development and maintain competitive advantage, reduces the risk of default (Liao et al., 2024) and enhances the performance of social responsibility (Zheng & Lin, 2021; Huang et al., 2022), and has a far-reaching impact on the continuity

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and effectiveness of innovation activities. In view of this, exploring the impact of executive team stability on a firm's sustained innovation capability will provide important theoretical value and practical guidance for optimising the corporate governance structure, as well as formulating more adaptive innovation strategies in a complex economic environment.

Based on the above analyses, this paper takes the panel data of A-share listed companies in China's Shenzhen and Shanghai from 2008 to 2023 as the research sample to explore how the influence of executive team stability on affecting the sustained innovation capability of enterprises arises and the mediating mechanism between the two. The study is mainly devoted to answering the following three questions: how executive team stability affects firms' sustained innovation capability; what is the specific mechanism of action between the two; and if the answer is affirmative, whether this effect is characterised by heterogeneity across different types of firms.

2. Literature Review

2.1 Research on the Stability of Executive Team

Current academic research on executive team stability focuses on its economic consequences, mainly from the perspectives of corporate innovation, debt structure and risk management:

(i) Corporate innovation perspective. Zhang et al. (2018) showed that there is a positive correlation between the stability of the executive team and the performance of corporate technological innovation. Cao and Yu (2023) suggested that the stability of the top management team promotes substantial corporate innovation by enhancing the chairman's implicit human capital. Luo et al. (2023a) emphasised that top management team stability has a significant positive effect on firms' innovation investment, and this effect is more significant in firms with a high proportion of executive shareholding and non-state-owned enterprises. Lu et al. (2024) analysed from the perspective of attention, and found that the social network of a firm's top management team plays a key role in promoting firms' digital innovation, and that the relationship between internal TMT stability and digital innovation shows an inverted U-shaped relationship.

(ii) Debt structure perspective. Based on the creditor's perspective, Luo et al. (2023b) find that good executive team stability of a firm can reduce the cost of debt financing, and further show that external creditors have a preference for firms whose executive teams remain stable. Yao et al. (2024) suggest that higher executive team stability leads to a lower concentration of a firm's debt structure, which is due to the fact that stable executive teams are able to effectively inhibit the risk of coordination failures and the corresponding costs with the This is because a stable executive team can effectively curb the risk of coordination failure with creditors and the corresponding costs, which in turn reduces the transaction costs of firms in maintaining a diversified debt structure, making firms tend to choose a lower debt concentration.

(iii) Risk Management perspective. Bu et al. (2024) proposed that a stable executive team is the cornerstone for reducing a company's litigation risks. This role is achieved by alleviating agency

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problems, strengthening internal control, and cultivating enterprise-specific human capital, which positively affects the company's risk management. Liao et al. (2024) proposed that the stability of the executive team significantly reduces the default risk of enterprises. The intensification of industry competition and the weakening of strategic deviations respectively have significant positive and negative impacts on this inhibitory effect. Liu et al. (2024) pointed out that the stronger the stability of the executive team, the lower the risk of a company's stock price crashing. Deng et al. (2025) found that the stability of senior management teams significantly reduces the risk of stock price crashes by lowering business risks, agency costs, and enhancing information quality.

2.2 Research on Firms' Continuous Innovation Capability

The concept of sustained innovation capability of firms emerged in 1990, and its core focuses on the assessment of the gradual accumulation of knowledge elements in the technological innovation activities of firms and the dynamic continuation of the level of technological trajectory (Geroski et al., 1997). The scope of research on firms' sustained innovation capability lies mainly in antecedent causation, covering the following three aspects:

(i) In terms of internal factors. Wu et al. (2022) suggest that operational redundancy management has a significant U-shaped effect on organisational resilience, and point out that firms' sustained innovation capability can positively modulate this relationship. The knowledge search and reconstruction model constructed by Wang et al. (2020), moderated by IT governance, significantly enhances sustained corporate innovation. Lv Chao-lin et al. (2021) found that dual learning and its complementary effects can positively promote the enhancement of sustained innovation capability, and found that dual learning and its complementarity positively affect sustained innovation capability and enhance sustainability performance through mediation. Duan Haiyan (2017) found that firm size is positively related to continuous innovation through multidimensional measures, while profitability, debt financing level and some factors of equity structure have insignificant effects, and executive incentives are positively related in the short term and limited in the long term. Jia et al. (2021), on the other hand, suggest that regional diversity and opportunity exploitation heuristic rules can enhance innovation persistence, and regional dispersion has an inverted U-shaped relationship with innovation persistence.

(ii) In terms of policy intervention. Ling and Zhang (2024) conclude that digital transformation causes a significant increase in firms' sustained innovation capability through innovation incentives, talent attraction, and co-innovation effects, and has a more significant impact on the sustained innovation of state-controlled and listed companies in the central and western regions. Zheng and Wu (2024) and Zheng et al. (2024) find that information-based policy tools and "administrative reform" significantly enhance SMEs' sustained innovation capacity by facilitating resource pooling. Cao and Chen (2024) find that the implementation of employee share ownership plans promotes sustained innovation, and that the upgrading of human capital skills and education structure as a key mechanism has a more significant effect in market-oriented high and non-state-owned firms. Hu and Qi (2025) pointed out that digital finance can enhance the sustained innovation ability of enterprises, but there is a marginal

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diminution in the long term, and it is necessary to strengthen the construction of the business environment to alleviate this problem.

(iii) In terms of strategic evolution.Varadarajan (2017) highlights that as stakeholders within organisations become increasingly concerned about environmental sustainability, innovation to achieve sustainability will become increasingly important in terms of organisational legitimacy, reputation and performance, which in turn affects competitive advantage and market positioning. Ghobakhloo et al. (2021) use explanatory structural modelling to reveal that Industry 4.0 technology promotes sustainable innovation through 11 functions that enhance inter-firm collaboration, knowledge base and organisational capabilities, ultimately enhancing green process innovation and economic competitiveness of eco-friendly products. Yao and Wang (2025) suggest that ESG performance significantly promotes sustainable innovation and enables firms to promote technological innovation by alleviating financing constraints and correcting investment and financing maturity mismatches.

2.3 Research Review

Existing research in the field of the organisational outcome effect of executive team stability and the driving mechanism of firms' sustained innovation capability has formed a more complete theoretical system, and has achieved more fruitful results. However, there is a relative lack of research on how the dynamic characteristic of executive team stability affects firms' ability to sustain innovation. Although a few studies have begun to notice the association between the frequency of executive turnover and firms' innovation performance, they have not yet formed a systematic theoretical framework, especially lacking in in-depth analyses of the impact of executive team stability on firms' sustained innovation capability. In addition, the current studies have not yet formed a unified standard for the measurement of sustained innovation capability from a single dimension.

Therefore, unlike previous studies, the marginal contribution of this paper may lie in the following three points: (i) in terms of research theme, this study tries to test the complex influence effect between executive team stability and strengthening continuous innovation capability based on the top echelon theory, principal-agent theory and human capital theory; (ii) in terms of research design, quantitative and statistical analysis methods are employed, and empirical analysis is conducted with the aid of software such as Stata. The issue of how to enhance the continuous innovation ability of enterprises is explored from the dual perspectives of "input" and "output", that is, the continuous innovation ability of enterprises is characterized from the two aspects of continuous innovation input and continuous innovation output. (iii) In terms of research expansion, mechanism variables are included to explore the specific transmission chain, uncovering the mechanism "black box" between the stability of the executive team and the enterprise's continuous innovation ability, further making up for the deficiencies of existing literature. This study also conducts an in-depth analysis of the impact of heterogeneity, with the aim of providing theoretical support for enhancing the stability of the executive team and improving the continuous innovation capacity of enterprises, and offering beneficial experiences for the personnel reform of Chinese enterprises and promoting continuous innovative

development.

3. Mechanism Analysis and Research Hypotheses

3.1 Direct Transmission Mechanism and Research Hypothesis

According to the theory of top echelon, (i) in the time dimension, team members working together for a long period of time can gradually develop a highly synergistic cognitive framework and innovation consensus through continuous interaction and collaboration (Agarwal et al., 2020), and this shared mind model effectively reduces the risk of strategic faults due to the mobility of key personnel and ensures the continuity of the enterprise's strategy. The stability of the executive team can further strengthen the sustained innovation ability of the enterprise and inject inexhaustible power for the long-term development of the enterprise. (ii) In terms of knowledge accumulation, a stable executive team structure is conducive to the formation of organisational memory and practices, and members deepen their understanding of the industry's technological trajectory and cultivate their acumen in identifying breakthrough innovation opportunities through continuous interaction (Wang et al., 2025), and long-term and stable partnerships enhance the internal social capital of the executive team, facilitate the transfer and reorganisation of tacit knowledge, and provide the necessary knowledge base for continuous innovation. (iii) In terms of mechanism guarantee, the stronger the stability of the executive team, the more able it is to establish an incentive mechanism that matches the organisation's innovation culture, and mitigate short-sightedness in the process of innovation through a long-term oriented performance evaluation system, and this stability also helps to improve the construction of the enterprise's internal control system, and enhances the effectiveness of governance so that it can flexibly adjust the direction of innovation while maintaining its strategic certainty (Hambrick et al. 2015). Therefore, compared with the frequently changing executive team, executive team stability is conducive to cultivating and enhancing the sustained innovation ability of enterprises.

Research hypothesis 1: Executive team stability has a significant contribution to the sustained innovation ability of enterprises.

3.2 Indirect Transmission Mechanism and Research Hypothesis

In terms of executive team stability and management shareholding ratio, a stable executive team can effectively reduce information asymmetry and opportunistic behaviours by forming a significant foundation of trust and social capital through long-term interactions, prompting enterprises to establish more incentive-compatible management shareholding (Liu et al., 2011). This kind of interest binding deeply links executives' personal wealth with long-term value creation of the enterprise, thus enhancing their strategic strength to tolerate the risk of innovation cycle and resist the pressure of short-term performance. In terms of management shareholding and firms' sustained innovation capability, the increase in management shareholding not only effectively alleviates the principal-agent problem (Jensen and Meckling, 1976; Zhao et al., 2025), but also reshapes executives' innovation decision-making preferences through the risk-sharing mechanism, which makes them more inclined to

support innovation projects with long-term value. This shift in decision-making preference promotes the cross-sectoral flow of tacit knowledge and the accumulation of organisational memory, which in turn promotes the formation of sustained innovation capability by optimising the allocation of innovation resources and enhancing strategic resilience.

Hypothesis 2a: Management shareholding can play a mediating role in the influence of executive team stability on the sustained innovation capability of enterprises.

According to human capital theory, from the perspective of the stability of the executive team and the proportion of R&D personnel, the stability of the executive team can help to form a long-term oriented strategic decision-making atmosphere and a stable organisational environment, which can not only enhance the willingness to invest in R&D human resources, but also promote the proportion of R&D personnel by reducing the risk of talent loss and maintaining the integrity of organisational knowledge. From the viewpoint of R&D personnel ratio and sustained innovation capability of enterprises, enterprises focus on innovation-driven economic development in the process of digital transformation, and R&D personnel, as the core carrier of knowledge creation and technological breakthroughs of enterprises, increase the ratio of their inputs directly expands the scale and depth of the innovation activities of enterprises, and at the same time, through the knowledge spillover effect and the reinforcement of cross-domain collaborative networks, further optimises the efficiency of innovation resource allocation, thus have a positive impact on the sustained innovation ability of enterprises (Li et al., 2024).

Research hypothesis 2b: The proportion of R&D personnel can play a mediating role in the influence of executive team stability on the sustained innovation capability of enterprises.

4. Research Design

4.1 Sample Selection and Data Source

All the data and patent information needed for this study come from the comprehensive intellectual property information service platform provided by the Cathay Pacific database and China's national intellectual property official website. The data of China's Shenzhen and Shanghai A-share listed companies from 2008 to 2023 is selected as the research sample, and to ensure the reliability and representativeness of the research data, this study adopts strict criteria in the sample selection process. Firstly, based on the calculation requirements of the management stability index, samples of companies with less than three years of listing time were excluded. Second, in order to avoid the interference of abnormal data on the research results, the following types of samples are further excluded: special treatment enterprises such as ST, PT, *ST; enterprises in the financial industry; and samples with missing data. In addition, for continuous variables, this study conducted Winsorize shrinkage treatment at 1% and 99% quantile points to reduce the impact of extreme values. After the above processing, 28,866 valid observations were finally obtained, providing a high-quality data base for subsequent analyses.

4.2 Definition of Variables

Explained variable: enterprise sustained innovation capacity, which is measured in two dimensions: innovation input and innovation output. Among them, innovation input is measured by R&D expenditure as a proxy variable, while innovation output is measured by the total number of patent applications. To avoid potential bias in the regression results arising from differences in R&D input intensity and patent protection needs between industries, this study draws on the methodological frameworks of Triguero and Córcoles (2013) and He and Zhang (2017) to quantify innovation persistence by using chained growth rates and combining them with the values of the scale of innovation inputs/outputs in the reporting period. Accordingly, the specific formulae for sustained innovation inputs and sustained innovation outputs are shown below:

$$IIP_t = \frac{IIN_t}{IIN_{t-1}} \times IIN_t \tag{1}$$

$$OIP_t = \frac{OIN_t}{OIN_{t-1}} \times OIN_t \tag{2}$$

Specifically, IIP_t and OIP_t characterise firms' continuous innovation inputs and outputs in observation period t, respectively. IIP_t and OIP_t correspond to the inter-period cumulative values of firms' innovation inputs and outputs in period t and period t-1, while IIN_{t-1}、 OIN_{t-1} refer to firms' aggregate innovation inputs and outputs in period *t-1* and period *t-2* , respectively.

Explanatory variable: executive team stability. This paper draws on Luo et al. (2023), Zhu and Zhang(2017). The specific calculation formula is as follows:

$$X_{jt} = E_{jt} \times T_t \times A_t = \frac{J_{jt}}{\sum J_{jt}} \times \frac{P_t}{\sum P_t} \times \sqrt{\frac{1}{\sum E_{jt}^2}} \tag{3}$$

$$STAB1 = \sum E_j^2 = \sum \left(\sum x_{jt} \right)^2 \tag{4}$$

Measurement model of the stability factor X : the factor consists of the product of the executive position weight (E_{jt}), the tenure time weight (T_t), and the position adjustment term (A_t), where *t* denotes the year, and *j* identifies a specific executive member of the team. Position assignment rules are as follows: if the executive holds the position of chairman, honorary chairman or vice-chairman, the position weight is 2 ($J_{jt}=2$); other positions are uniformly set at 1 ($J_{jt}=1$). It should be noted that for executives holding multiple positions, only the highest position is taken into account in the calculation.

Dynamic design of time weights: Given that the proximity of the point of departure of executives to the observation period has a differentiated impact on team stability (the closer the year *t* is, the more significant the impact is), this study introduces a three-year decay mechanism when constructing the time weights of : the values of for the three years ahead are assigned incrementally according to the distance in time (P_t= 1, 2, 3).

Calculation process of stability factor: based on formula (3), calculate the stability factor of the executive *j* in the *t* year. Substitute into formula (4) for the stability factor X_{jt} of the executive *j* in the past three years, and add X_j after squaring to obtain the overall stability index of the executive team.

The value of this indicator is in the interval of (0,1], and an increase in the value indicates an increase in the stability of the team.

Intermediary mechanism variables: management shareholding ratio and R&D personnel ratio. Specific management shareholding is measured by the ratio of the number of shares held by directors and supervisors to the total number of shares in the company, based on Zhang et al. (2025); R&D staff ratio is measured by the ratio of the number of R&D staff to the total number of employees, based on Xiao and Zeng (2023).

Control variables: referring to the studies of Xiao and Zeng (2023), Li et al. (2025), Yang et al. (2025), Zhang et al. (2020), Long et al. (2024), and Sha and Peng (2023), the size of the enterprise, the age of the enterprise, the net profit margin of total assets, the asset-liability ratio, the size of the supervisory board, the size of the board of directors, the number of employees, the combination of two positions, and the percentage of independent directors are selected as control variables. ratio as control variables.

In order to show more clearly the specific measurement of all variables and the correspondence between variable names and proxy abbreviations, this paper draws a variable abbreviation table, as shown in Table 1.

Table 1. Variable Description Table

Variable type	Variable name	Variable abbreviation	Variable measure
Explained Variables	The continuous innovation capacity of an enterprise	*CIP*	See Equations (1) - (2) for details.
Explanatory Variables	Executive payment gap	*EPG*	See Equations (3) - (4) for details.
Mechanism variable	Management shareholding ratio	*MH*	The number of shares held by directors, supervisors and senior management/the total number of shares
	The proportion of R&D personnel	*RDP*	The number of R&D personnel/the total number of employees
Control Variables	Enterprise Size	*Size*	Ln (Total Assets)
	Enterprise age	*Age*	Years of establishment in the current year
	Net profit margin on total assets	*ROA*	Net profit/balance of total assets
	Asset-liability ratio	*Lev*	Total liabilities/total assets
	The scale of the supervisory board	*SupSize*	Ln (Number of supervisory board members +1
	Board size	*Boardsize*	Ln (Board members +1)
	Number of employees	*StaffN*	Ln (Number of employees +1)
	Two positions combined	*Dual*	Whether the chairman and the general manager are the same person
	Proportion of independent directors	*Indep*	Number of independent directors/director size

4.3 Model Construction

This study adopts the data of China's Shenzhen and Shanghai A-share listed companies from 2008 to 2023 as the research sample to study the impact of executive team stability on the sustained innovation ability of enterprises, so the fixed effect model is selected for this study. The specific model setting is as follows :

$$OIP_{it}=\alpha_0+\alpha_1 STAB1_{it}+\delta X_{it}+\lambda_j+\mu_t+\varepsilon_{it} \quad\quad\quad (5)$$

$$IIP_{it}=\alpha_0+\alpha_1 STAB1_{it}+\delta X_{it}+\lambda_j+\mu_t+\varepsilon_{it} \quad\quad\quad (6)$$

In this study, in the process of researching the influence of executive team stability on the sustained innovation ability of enterprises, we explore the mechanism role of enterprise management shareholding ratio and R&D personnel ratio, combined with the above model, the mediating mechanism model is set as follows:

$$M_{it}=\alpha_0+\alpha_1 STAB1_{it}+\delta X_{it}+\lambda_j+\mu_t+\varepsilon_{it} \tag{7}$$

$$OIP_{it}=\alpha_0+\alpha_1 STAB1_{it}+M_{it}+\delta X_{it}+\lambda_j+\mu_t+\varepsilon_{it} \tag{8}$$

$$IIP_{it}=\alpha_0+\alpha_1 STAB1_{it}+M_{it}+\delta X_{it}+\lambda_j+\mu_t+\varepsilon_{it} \tag{9}$$

In Eqs. (5)-(9) above, i and t denote firms and years, respectively; X is a control variable; M is a mechanism variable; is the industry to which Enterprise belongs; is the fixed effect of the year; is a random disturbance term, and to solve the heteroscedasticity problem, a robust standard error was carried out.

5. Empirical Analyses

5.1 Descriptive Analysis

Table 2 shows the descriptive analysis of the sample data, in which the mean value of enterprises' continuous innovation input is 9.496 and the standard deviation is 1.651, indicating that the data distribution is relatively concentrated. The minimum value is 2.722 and the maximum value is 13.83, indicating that the overall level of innovation input in the sample data is moderately high; the difference between enterprises is significant (standard deviation ≈ 17.4% of the mean), indicating that there is a clear differentiation in the innovation input strategies of different enterprises. The mean value of enterprises' sustained innovation output is 4.150, the standard deviation is 1.609, the minimum value is 0.000, and the maximum value is 8.237, indicating that the innovation output of the sample enterprises shows extreme polarisation; the standard deviation (1.609) is greater than 1/3 of the mean, indicating that the data has a high degree of right-skewed distribution (with the output of the majority of enterprises being lower than the mean value, and a minority of enterprises pulling up the overall level); and the significant efficiency of the head enterprise advantage (maximum value (8.237) ≈ 2 times the mean (4.150)). Executive team stability mean of 0.821, standard deviation of 0.234, minimum of 0.212, and maximum of 1 indicate structural differentiation in the context of overall high stability; mean of 0.821 is close to the theoretical peak, suggesting that the majority of firms tend to maintain executive stability; extreme differentiated groups exist because of the low minimum value.

Table 2. Descriptive Analysis

Variable Name	Observed Value	Mean	Standard Error	Minimum value	Maximum value
IIP	28,668	9.496	1.651	2.722	13.830
OIP	28,668	4.150	1.609	0.000	8.237

STAB1	28,668	0.821	0.234	0.212	1.000
Size	28,668	8.513	1.265	5.888	12.780
Age	28,668	10.600	7.206	2.000	30.000
ROA	28,668	0.032	0.069	-0.493	0.239
Lev	28,668	0.425	0.196	0.046	0.925
SupSize	28,668	3.461	0.962	2.000	8.000
Boardsize	28,668	8.479	1.672	4.000	18.000
StaffN	28,668	7.815	1.177	5.112	11.590
Dual	28,668	0.299	0.458	0.000	1.000
Indep	28,668	37.670	5.360	25.000	60.000

5.2 Correlation Analysis

In order to identify the correlation between each variable, correlation analysis was carried out and correlation heat map was drawn, Figure 1 shows the heat map of correlation analysis, it is found that the stability of the executive team shows a significant positive correlation with both the sustained innovation input and sustained innovation output of the enterprise, indicating that the stability of the executive team has a positive impact on the enhancement of the enterprise's innovation capability. The correlation coefficients between most of the variables are less than 0.5, indicating that the problem of multiple covariances is avoided between most of the variables. However, the correlation coefficients of a few variables are greater than 0.5, and to further ensure that the multiple covariance problem doesn't affect the results of the sample data, a VIF test was conducted. Table 3 shows results of the VIF value test for each variable, it was found that the VIF value for each variable was less than 5 and the average VIF value was 1.64, thus ensuring that the multicollinearity problem was avoided between the variables.
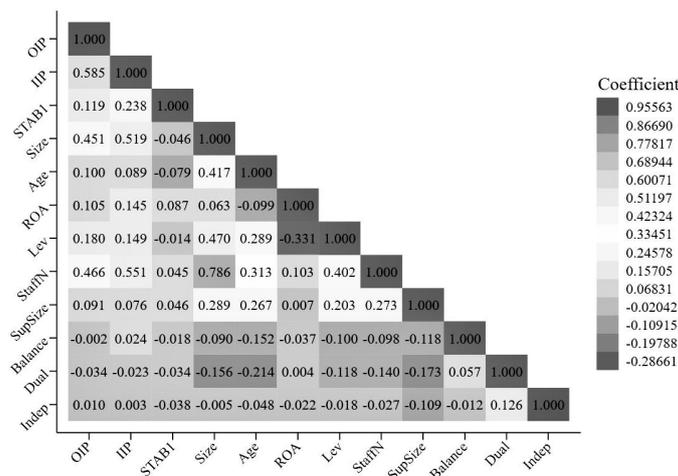

Figure 1. Heat Map of Correlation

Table 3. Multiple Covariance Analysis

Variables	Size	Staff N	Balance	Lev	Indep	OIP	Age	ROA	SupSize	Dual	STAB1	VIF Mean
VIF	3.290	2.830	1.650	1.580	1.390	1.360	1.320	1.250	1.250	1.090	1.060	1.640
1/VIF	0.304	0.353	0.606	0.634	0.718	0.738	0.760	0.801	0.803	0.918	0.945	

5.3 Regression Analysis

5.3 Regression Analysis

Table 4 shows the main effect test of executive team stability on sustained innovation capability Column (1) results show that executive team stability significantly enhances firms' sustained innovation output; Column (2) empirical evidence shows that adding control variables is also a significant positive driver of sustained innovation input. However, given the control for omitted variable bias, the fixed effects of industry and year are added. Columns (3) and (4) of the regression analysis in Table 4 show the results of the effect of executive team stability on firms' continuous innovation output and the result of the effect of executive team stability on continuous innovation input after adding the fixed effects of industry and year, respectively, which are both significant at the 1% level, but the regression coefficients both decrease, indicating that the original results are affected by industry and time. The empirical analysis confirms that there is a significant promotion effect of executive team stability on the continuous innovation ability of enterprises. That is, the more stable the executive team is, the higher the level of corporate sustained innovation capacity is, and it coincides with the findings of Tan (2024), which verifies the research hypothesis 1.

Table 4. Regression Analysis

	(1)	(2)	(3)	(4)
	OIP	*IIP*	*OIP*	*IIP*
STAB1	0.798***	1.671***	0.417***	0.615***
	(23.326)	(56.111)	(2.579)	(4.068)
Control Variables	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes
Constant term	-2.032***	1.602***	-2.953***	1.031***
	(-17.766)	(13.913)	(-17.567)	(6.404)

Sample size	28,668	28,668	28,668	28,668
Adjusted R^2	0.262	0.414	0.434	0.610

Note. t-values in parentheses, *p < 0.1, **p < 0.05, ***p < 0.01 (same below).

5.4 Robustness Analysis

1) Endogeneity test

In order to avoid the effect of endogeneity of sample data on the reliability of results, therefore, endogeneity test of sample data is needed. Considering the problems of omitted variable bias and selection bias, this study refers to the studies of Zhou et al. (2017) and Yao et al. (2025), and adopts the method of adding fixed-effects variables and propensity score matching (PSM) to conduct endogeneity tests. In order to control for heterogeneity of firms that do not change over time and inherent regional differences, individual fixed effects and regional fixed effects are therefore added. Columns (1) and (2) of the endogeneity analysis in Table 5 show the regression results of adding individual fixed effects and regional fixed effects in the effect of executive team stability on firms' sustained innovation outputs and firms' sustained innovation inputs, respectively, which are both significant at the 1% level, initially checking the endogeneity problem of the sample data.

Columns (3) and (4) of Table 5 show the regression results of the propensity score matching (PSM) method in the effects of executive team stability on firms' continuous innovation output and firms' continuous innovation input, respectively. The Propensity Score Matching (PSM) test is firstly processed by grouping according to the median, then estimated propensity scores, matched according to 1:1 nearest neighbours, and then followed by the balance test. Where the balance test results %bias are less than 10, and P is greater than 0.1, passed the balance test Fig. 2a and Fig. 2b show the balance test results in the effect of executive team stability on firms' sustained innovation output and firms' sustained innovation input. Finally, the matched samples are retained for regression, and columns (3) and (4) in Table 5 show the regression results, which are all significant at the 1% level, further testing the endogeneity problem and verifying the robustness of the sample data.
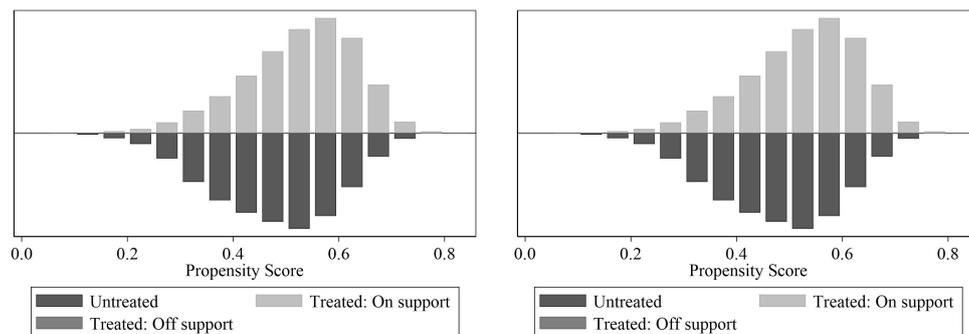

Figure 2a. Balance test (*OIP*) Figure 2b. Balance test (*IIP*)

Table 5. Endogeneity Analysis

	(1)	(2)	(3)	(4)
	OIP	*IIP*	*OIP*	*IIP*
*STAB*1	0.688***	0.387***	0.418***	0.616***
	(4.693)	(2.901)	(2.585)	(4.071)
Control Variables	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes
Constant term	-2.820**	1.599	-2.953***	1.031***
	(-2.025)	(1.389)	(-17.570)	(6.403)
Sample size	28,139	28,139	28,666	28,666
Adjusted R^2	0.671	0.808	0.434	0.610

2) Other Robustness Tests

In order to ensure the further robustness of the sample data and the reliability of the results, it is also necessary to carry out other robustness tests, and this study adopts the method of replacing variables, increasing control variables and proposing a special year method to carry out the robustness test. Firstly, the replacement variable method, considering that different measurement methods will also produce different results on its results, this paper draws on the robustness test method of Shen and Chen (2023), and conducts the test by decreasing the control variables, and recalculates the stability of the executive team to verify its robustness by excluding independent directors and supervisors, and the columns (1) and (2) in Table 6 are the recalculated stability of the executive team, respectively. Columns (1) and (2) in Table 6 show the results of the impact of stability on firms' continuous innovation output and firms' continuous innovation input, both of which are significant at the 1% level, which preliminarily verifies the robustness of the sample data.

This study refers to the operation of Yu et al. (2024) to add control variables for testing, which can effectively ensure the robustness of the sample data results. Employee intensity can well respond to the efficiency of human capital allocation. High employee intensity, the existence of organisational redundancy, may undermine the stability of the team; management top three pay and, measures the incentive strength of the core agent, high pay can improve the willingness of executives to stay in the job, may enhance the stability of the executive team; management expense ratio represents the agency cost and administrative efficiency, high expense ratio may exist in the case of a serious agency problem, may affect the stability of the executive team. Therefore, this study conducts a robustness test by increasing employee intensity, top three management compensation and and management expense ratio as control variables. Columns (2) and (3) in Table 6 show the results of the impact of executive team stability on firms' continuous innovation output and firms' continuous innovation inputs after adding control variables, respectively, which are positively significant at the 1% level, further verifying the

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robustness of the sample data and the reliability of the results.

The deletion of special years method is to change the range of the sample data, which aims to exclude the effect of special years from generating a large bias on the results in the future. In this study, the sample data of 2015 and 2020 will be presented for the robustness test, the reason is that 2015 produced a large financial market volatility, which may lead to the stability of the executive team is affected; 2020 by the impact of the global epidemic of the new crown, more companies have operational problems, on the stability of the executive team may produce greater fluctuations. Columns (5) and (6) in Table 6 show the results of the impact of executive team stability on firms' sustained innovation output and firms' sustained innovation input after proposing the special years, respectively, and they are all positively significant at the 1% level, which once again verifies the robustness of the sample data and the reliability of the results.

Table 6. Other Robustness Tests

	(1)	(2)	(3)	(4)	(5)	(6)
	OIP	*IIP*	*OIP*	*IIP*	*OIP*	*IIP*
*STAB*1			0.398**	0.599***	0.348**	0.584***
			(2.452)	(3.920)	(1.963)	(3.445)
STAB	0.393***	0.638***				
	(2.727)	(4.742)				
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
StaffInt			-0.109***	-0.196***		
			(-3.062)	(-2.996)		
*TOP*3			0.000	0.000***		
			(0.099)	(7.568)		
Mfee			0.862***	1.060***		
			(3.524)	(2.723)		
Constant term	-2.939***	1.002***	-2.857***	1.431***	-2.911***	1.043***
	(-18.525)	(6.641)	(-16.399)	(8.319)	(-16.065)	(5.912)
Sample size	28,668	28,668	28,637	28,637	24,376	24,376
Adjusted R^2	0.434	0.610	0.438	0.622	0.432	0.610

5.5 Mechanism Analysis

1) Management shareholding ratio

Table 7 shows the results of mediation analysis of management shareholding ratio. Columns (1), (2) and (3) in Table 7 are the results of management shareholding ratio in the effect of executive team stability on firms' sustained innovation output. Table 7 shows that the effect of executive team stability on management shareholding ratio is significantly positive at 1% level. It is further found that the contribution of executive team stability on sustained innovation output remains statistically significant at the 10 per cent level after the introduction of management shareholding ratio. This result indicates that management shareholding plays a significant mediating role in the transmission mechanism of "executive team stability→ continuous innovation output", which verifies its bridging effect in the relationship between the two.

Where columns (4), (5) and (6) of Table 7 show the results of management shareholding in the effect of executive team stability on firms' continuous innovation investment. Table 7 shows that the effect of executive team stability on management shareholding ratio is significantly positive at 1% level. Further research at reveals that the contribution of executive team stability on continuous innovation output remains statistically significant at the 1% level after the introduction of management shareholding ratio. This result shows that the management shareholding ratio plays a significant mediating role in the transmission mechanism of "executive team stability→ sustained innovation input", which verifies its bridging effect in the relationship between the two.

In conclusion, the shareholding ratio of the management plays a positive mediating role in the stability of the executive team and the continuous innovation ability of the enterprise. That is, by increasing the shareholding ratio of the management, the influence degree of the stability of the executive team on the continuous innovation ability of the enterprise can be enhanced, verifying research Hypothesis 2a. However, through comparison, it is found that the mediating effect of the management shareholding ratio on the continuous innovation investment of enterprises is stronger than that on the continuous innovation output of enterprises. The possible reason lies in the fact that the management has a large degree of autonomy in decision-making. Investment decisions such as R&D budgets and equipment purchases are directly controlled by senior executives. The increase in the management's shareholding ratio makes them more willing to take risks and increase investment. It has strong short-term visibility. Increasing the continuous innovation investment of enterprises can quickly convey the signal of "innovation determination" to the market, directly pushing up the stock price and benefiting the holding executives. The transformation process involves time lag and noise. The continuous innovation output of enterprises needs to go through the interference of uncontrollable factors such as the R&D cycle, technological uncertainty, and market acceptance. Output measurement is difficult. The patent situation may focus on the quantity of patents while neglecting their quality, and the revenue of new products is disturbed by marketing capabilities. This discovery warns that simply increasing the shareholding ratio of management may exacerbate the misallocation of innovation resources, and incentives need to be directed towards output efficiency through contractual design.

Table 7. Test Results of the Management Shareholding Ratio Mechanism

	(1)	(2)	(3)	(4)	(5)	(6)
	OIP	*MH*	*OIP*	*IIP*	*MH*	*IIP*
*STAB*1	0.417***	0.407***	0.316*	0.615***	0.407***	0.553***
	(2.579)	(23.372)	(1.911)	(4.068)	(23.372)	(3.573)
MH			0.283***			0.155***
			(6.116)			(4.734)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant term	-2.950***	0.105***	-2.978***	1.031***	0.105***	1.041***
	(-17.567)	(5.848)	(-17.480)	(6.404)	(5.848)	(6.382)
Sample size	28,668	27,982	27,982	28,668	27,982	27,982
Adjusted R^2	0.434	0.338	0.432	0.610	0.338	0.610

3) R&D staff share

Table 8 shows the results of mediation analysis of R&D personnel share, Column (1), Column (2) and Column (3) of Table 8 are the results of R&D personnel share in the effect of executive team stability on firms' continuous innovation output. Table 8 shows that the effect of executive team stability on R&D personnel share is positively significant at the 1% level, and the coefficient of the effect of executive team stability on sustained innovation output is at the 10% significance level after adding the R&D personnel share. This result supports that the R&D personnel ratio plays a mediating effect in the transmission path of "executive team stability→sustained innovation output".

Columns (4), (5) and (6) in Table 8 show the results of R&D personnel ratio in the effect of executive team stability on firms' continuous innovation input. Table 8 shows that the effect of executive team stability on the ratio of R&D personnel is positively significant at the 1% level of significance, and the effect of executive team stability on firms' sustained innovation investment remains statistically significant at the 1% level of significance after the introduction of the variable of the ratio of R&D personnel. This result confirms that R&D personnel ratio has a significant mediating effect in the path of "executive team stability→ firms' continuous innovation investment", suggesting that executive team stability may promote firms' continuous innovation investment through the mechanism of increasing R&D personnel ratio.

In conclusion, the proportion of R&D personnel plays a positive mediating role in the stability of the executive team on the sustained innovation capacity of enterprises, that is, the stability of the executive team can be increased through the increase in the proportion of R&D personnel to increase the degree of influence on the sustained innovation capacity of the enterprise, which is similar to the results of the

study of scholars Berchicci (2013) and Wang (2020), which verifies the research hypothesis 2b. However, through the comparison of the findings that firms' sustained innovation inputs have a stronger mediating effect than firms' sustained innovation outputs by the proportion of R&D personnel. The possible reason for this is that executives, by maintaining stability and improving strategic coherence, will expand the proportion of R&D personnel, which directly determines the scale of resource consumption, and venture capital uses the proportion of R&D personnel to assess technological strength, so that the stability of the executive team can promote the proportion of R&D personnel, which further enhances the firm's sustained innovation input. However, the difference in the matching degree of the decision-making cycle and the long cycle of enterprises' sustained innovation outputs lead to the lack of technology transformation ecology which results in the obstruction of enterprises' sustained innovation outputs, and the mediating effect of the ratio of R&D personnel has a low effect in the influence on enterprises' sustained innovation outputs. This finding warns that there may be a mismatch of innovation resources, and the stable executive team tends to rely on the expansion of manpower scale to obtain policy dividends rather than to improve the transformation efficiency, so it is necessary to break the cognitive misunderstanding of "manpower input is innovation" and release the real innovation effectiveness.

Table 8. Results of Mechanism Inspection for R&D Personnel

	(1)	(2)	(3)	(4)	(5)	(6)
	OIP	*RDP*	*OIP*	*IIP*	*RDP*	*IIP*
*STAB*1	0.417***	0.067***	0.318*	0.615***	0.067***	0.423***
	(2.579)	(4.545)	(1.773)	(4.068)	(4.545)	(3.288)
RDP			2.024***			3.524***
			(23.002)			(54.717)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant term	-2.953***	0.200***	-3.465***	1.031***	0.200***	0.219
	(-17.567)	(13.051)	(-18.773)	(6.404)	(13.051)	(1.614)

	(1)	(2)	(3)	(4)	(5)	(6)
Sample size	28,668	22,243	22,243	28,668	22,243	22,243
Adjusted R^2	0.434	0.447	0.465	0.610	0.447	0.741

5.6 Heterogeneity Analysis

1) Degree of market competition

The degree of market competition is able to corporate strategic decisions and performance performance of multi-dimensional impact, this study uses market share to measure the degree of market competition for heterogeneity analysis, Table 9 for the degree of heterogeneity analysis of the degree of market competition, which Table 9, column (1), column (2) is divided into high degree of market competition and low degree of market competition in the stability of the executive team on the impact of the enterprise's sustained innovation output results. The results are significant at the 5 per cent level, but the regression coefficients of the results on the effect of executive team stability on firms' sustained innovation output are larger in the high market competition level. The reason for this may lie in the fact that technological moats of firms' continuous innovation output needs and high market share firms need to newly defend against potential entrants through firms' continuous innovation output.

Columns (3) and (4) of Table 9 are divided into results for high and low market competition in the effect of executive team stability on firms' continuous innovation input. The results are significant at the 10% and 1% levels, respectively, and the regression coefficients are larger for the results of the effect of executive team stability on firms' continuous innovation investment in low market competition. The reason may be that enterprises with low and high degree of market competition rely more on the stability of senior management to improve innovation investment , which is essentially the resonance of "survival rationality" and "resource leverage", and the sustained innovation investment of enterprises can help to improve the competitiveness and resource focusing investment. This phenomenon reveals that the stability of the executive team is a core organisational asset that transforms "innovation investment" into "right to survive" at low and high levels of market competition.

Table 9. Results of the heterogeneity Test of Market Competition Degree

	(1)	(2)	(3)	(4)
	OIP	*OIP*	*IIP*	*IIP*
*STAB*1	0.465**	0.453**	0.428*	0.941***
	(2.011)	(2.041)	(1.838)	(5.200)

Control Variables	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes
Constant term	-2.910***	-2.816***	1.830***	1.121***
	(-11.915)	(-10.813)	(7.377)	(5.044)
Sample size	14,335	14,325	14,335	14,325
Adjusted R^2	0.477	0.349	0.605	0.586

2) Employee compensation level

In order to accomplish corporate goals while ensuring their own stability, executives may influence corporate innovation behaviour through employee compensation design, therefore, employee compensation level is selected for heterogeneity analysis to explore the impact of different employee compensation levels in the stability of the executive team on the sustained innovation capability of the firm. Columns (1) and (2) of Table 10 present the effect of executive team stability on sustained innovation output in the subsample of high and low employee compensation levels, respectively. The empirical results show that the regression coefficients are significantly positive at the 5 per cent level for the high pay group; for the low pay group, the estimates pass the significance test at the 10 per cent level; and inter-group comparisons indicate that the promotional effect of executive team stability on innovation output is more economically significant in the high pay group. The reasons for this may be that high employee compensation level can attract high quality talents more effectively, thus enhancing the sustained innovation output of enterprises; enterprises with high employee compensation level have greater ability to bear innovation risks; enterprises with high employee compensation level have relatively high accumulation of technology routes. Compensation levels amplify the innovation effectiveness of executive stability through the "talent quality-risk taking-knowledge compounding" triple transmission chain. This finding reveals that without a competitive remuneration system, executive stability will be reduced to "cooking without rice", and it is difficult to drive enterprises to sustain innovation output.

Columns (3) and (4) of Table 10 report the marginal effect of executive team stability on sustained innovation investment in the high and low employee compensation subgroups, respectively. The empirical results show that the regression coefficients are being significantly positive at the 1 per cent level for the high pay group; the coefficients for the low pay group are being similarly tested for 1 per cent significance; and the key difference is that executive team stability promotes innovation investment with significantly higher intensity in the low pay group. The reason may lie in the difference in decision logic of innovation investment, where firms with low employee compensation levels face the survival push, i.e., innovation or death; and the substitution effect of compensation cost, where firms with low employee compensation levels shift their funds to sustained innovation investment in the firms by controlling the labour cost. This finding reveals that in the dimension of

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innovation investment, the cost-effectiveness of executive stabilisation may be higher in firms with low employee compensation levels than in firms with high employee compensation levels.

Table 10. Test Results of Heterogeneity in Employee Compensation Levels

	(1)	(2)	(3)	(4)
	OIP	OIP	IIP	IIP
STAB1	0.585**	0.382*	0.729***	0.732***
	(2.512)	(1.734)	(3.584)	(3.423)
Control Variables	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes
Constant term	-3.262***	-2.371***	1.317***	0.964***
	(-14.402)	(-9.681)	(6.443)	(3.994)
Sample size	14,335	14,329	14,335	14,329
Adjusted R^2	0.489	0.370	0.690	0.527

6. Conclusions and Insights

Based on the top echelon theory, principal-agent theory and human capital theory, this paper empirically analyses the effect and mechanism of executive team stability on the sustained innovation capability of enterprises, using Shenzhen and Shanghai A-share listed companies as the research sample from 2008 to 2023. The study finds that, firstly, executive team stability can directly promote the sustained innovation ability of enterprises, and this conclusion still holds after endogeneity treatment and a series of robustness tests. Second, executive team stability can enhance firms' sustained innovation capability through increasing management shareholding and R&D personnel ratio, and the mediating effect of management shareholding is stronger for firms' sustained innovation input than firms' sustained innovation output; and the mediating effect of R&D personnel ratio is stronger for firms' sustained innovation input than firms' sustained innovation output. Third, the effect will have heterogeneous effects in different types of firms; in high competitive environments, the promotional strength of executive team stability on innovation output is greater; in low competitive environments, its marginal effect on innovation input is more economically significant; in high compensation levels, the explanatory power of executive team stability on innovation output is stronger; in low employee compensation levels, the effect of executive team stability on firms' sustained innovation input is greater.

Based on the above findings, the following research recommendations and insights are drawn:

Strengthen the construction of executive team and optimise stability management. Establish a long-term tenure mechanism, enterprises should avoid frequent turnover of executives, safeguard strategic coherence through tenure system and long-term performance assessment, and promote the precipitation of technological knowledge; design a stability early warning system to monitor the departure rate of senior executives, team tenure dispersion and other indicators.

Improve the mechanism of management shareholding and R&D staff allocation to enhance the efficiency of innovation transformation. Expand the scope of equity coverage, the R & D department head into the shareholding plan, to strengthen the consistency of innovation decision-making; set up innovative output assessment, equity unlocking conditions and patent conversion rate, new product revenue share linked to avoid resource mismatch. R & D staffing, from scale expansion to quality improvement, through the stability of the commitment to retain key technical backbone, to reduce the loss of tacit knowledge. We have implemented the "input-output performance assessment" to increase the weight of the R&D department's assessment of innovation output and reverse the tendency of "manpower input only".

Match heterogeneous needs with enterprise-specific policies. For enterprises with high market competition, we focus on the transformation of innovation output and support patent commercialisation projects led by the senior management team. Enterprises with low salary levels should focus on targeted subsidies for innovation inputs and maximise access to government subsidies for R&D inputs. For enterprises with high remuneration levels, build a "remuneration-innovation" linkage mechanism to tie remuneration to innovation output indicators, so as to release the quality dividend of talents.

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Notes

Note 1. Quoted from the report Global Innovation Index 2024 published by WIPO in 2024, see https://www.wipo.int/web-publicati ons/global-innovation-index-2024/en/index.html

Note 2. Quoted from the report "The added value of core industries will account for 10 per cent of GDP in 2025 - Accelerating the release of

strong kinetic energy of the digital economy", published by China.gov.cn in 2022, see https://www.gov.cn/xinwen/2022-01/20/content_ 5669415.htm