How Patient Capital Empowers Key Core Technology Innovation in Enterprises——Evidence from Chinese Listed Companies

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ABSTRACT

Key core technologies are very important for us to achieve high-level scientific and technological self-reliance. However, their R&D process is usually long and risky, and because the capital market likes to pursue short-term interests, it often encounters the problems of insufficient funds and lack of motivation. Based on the samples of China A-share listed companies from 2012 to 2023, this paper systematically studies how a kind of capital called patient capital, which pays attention to long-term value investment and can withstand high risks, affects the innovation of key core technologies of enterprises. The results show that increasing the proportion of patient capital can significantly promote the innovation output of key core technologies. Mechanism analysis shows that patient capital promotes innovation in two ways: first, it can restrain the short-sighted behavior of management, thus reducing the institutional obstacles in R&D decision-making; Second, it can increase R&D intensity and innovation efficiency, and provide stable financial support for technological breakthroughs. Further analysis shows that the empowerment of patient capital is more obvious in high-tech industries. This study provides an empirical basis for cultivating patient capital, and also provides valuable reference for optimizing technology and finance system and breaking through the bottleneck of core technology.

Keywords: Patient Capital; Key Core Technology; Managerial Myopia; R&D Investment; Technology Finance

1. INTRODUCTION

In the context of increasingly fierce global scientific and technological competition, those forward-looking, strategic and pioneering key core technologies have become the fundamental driving force for enterprises to maintain their competitive advantage and achieve sustainable development. Unlike incremental innovation, which is improved a little, the research and development of key core technologies involves a very complex knowledge system, and the development cycle is particularly long. The output risk of this kind of thing is very high, and there is great uncertainty about whether the product can be successfully developed and whether it will be accepted by the market, so it relies heavily on sustained and stable resource investment. Existing research shows that the company's own retained earnings are often not enough to support high-intensity scientific and technological innovation. Moreover, when companies want to find money from outside, they often encounter the problems of economic instability and high risk of R&D itself, which makes the cost of borrowing money higher and finally leads to the shortage of funds. Therefore, it has become an urgent task to guide financial resources to those key strategic industries through institutional design to achieve national high-level scientific and technological self-reliance.

Patience capital is characterized by long-term investment, relationship-oriented, high risk tolerance, and long-term and stable financial support for enterprises across the economic cycle. The Political Bureau of the Communist Party of China (CPC) Central Committee Conference in 2024 clearly put forward to "expand patient capital", which shows that it is very important to promote high-quality economic development. The "Guiding Opinions on Promoting the High-quality Development of Government Investment Funds" issued by the General Office of the State Council also emphasizes that it is necessary to standardize the operation of government investment funds in accordance with the principles of marketization, rule of law and specialization, cultivate patient capital and pay attention to actual results. Under the background of the new round of technological and industrial revolution, policy makers and market participants are increasingly aware of the importance of long-term investment.

However, in the actual economic operation, the research and development of core technologies takes a long time, but the traditional capital allocation always wants to see the return quickly, which leads to a serious mismatch between them. In the principal-agent theory, the owner and operator of the company are separated, which often makes everyone's interests

inconsistent. Faced with the pressure of quarterly performance appraisal and capital market fluctuation, managers often give priority to those projects with little risk and quick results for their own interests. In this way, those core technological breakthroughs with long-term strategic significance will not get enough resources. This mismatch of resources has damaged the long-term competitiveness of enterprises and slowed down the progress of science and technology in the whole country. Therefore, it is of both theoretical significance and practical value to study the internal relationship between patient capital and key core technology innovation. It can help us understand how the time attribute of capital is transformed into the micro-innovation ability of enterprises, and also provide ideas for optimizing the financial structure, thus narrowing the gap between resource supply and technology demand, and finally establishing a long-term investment mechanism suitable for the development of new quality productive forces.

On the basis of previous research on the influence of patient capital in many aspects, we have made some new discoveries in this paper. Theoretically, first of all, we use two angles-the company's ideas and the company's actions-to study how capital attributes affect the company's behavior. Secondly, through testing in different situations such as grouping regression, we find that patient capital's help to company innovation is more obvious in high-tech industries. In practical application, our research can help institutional investors to better allocate long-term assets and improve the financial support mechanism. Especially in the face of technical bottleneck challenges, these findings provide a useful reference for designing an institutional framework that can reduce financing pressure and short-term behavior. This will help promote the leap-forward development of technology-intensive industries and support the establishment of new factor allocation methods, thus promoting the growth of new quality productive forces and high-quality economic growth.

2. LITERATURE REVIEW

2.1 The Concept and Characteristics of Patient Capital

Regarding the connotation of patient capital, Lin and Wang (2017) [1] define it as capital invested in long-term relationships, where investors are willing to accompany firms through their long-term development in pursuit of substantial returns to obtain substantial returns. Subsequent studies have further clarified the definition of patient capital, emphasizing its focus on long-term investment, the deemphasis of short-term profit seeking, and an extremely high tolerance for risk. Its sources are relatively diverse, encompassing channels such as state-owned capital, private capital, and international capital.

2.2 Research on the Economic Consequences of Patient Capital

Extant literature has verified that patient capital contributes positively to macroeconomic structural reform and the development of new quality productive forces; at the micro level, it exerts a significant influence on firms' technological innovation capacity and ESG performance. From the perspective of New Structural Economics, Lin and Wang (2017) [1] propose treating long-term oriented heterogeneous capital as a special endowment. They argue that this patient capital, as a comparative advantage, can generate significant competitive advantages in long-cycle fields such as infrastructure through effective coordination with profitable and non-profitable projects. Ding and Ma (2025) summarize a five-dimensional characteristic matrix comprising long-term nature, riskiness, strategic nature, supportiveness, and macro-level orientation, discussing how patient capital constructs systemic support for new quality productive forces through factor guidance and risk-sharing mechanisms.

From the micro level, the optimization effect of patient capital on corporate internal governance is becoming more and more obvious. Tang and Yang (2025) [7] found through empirical research that increasing the proportion of patient capital can significantly improve the ESG performance of enterprises. The logic behind it is that it effectively reduces the agency cost of the company by reducing the investment risk of innovative projects and avoiding moral hazard, thus sending a positive signal of steady operation to the market. In response to external environmental shocks, patient capital has also played a significant stabilizing role. Yang and Tang (2025) [7] pointed out that the increase of patient capital can significantly improve the enterprise's resilience, especially in the face of high environmental uncertainty, it strengthens the enterprise's ability to resist risks by improving the quality of information disclosure and internal control.

2.3 Determinants of Key Core Technology Innovation

Influenced by the new round of scientific and technological revolution and industrial transformation, key core technologies have now become the focus of strategic competition among big countries. Compared with ordinary innovation, the key core technologies are particularly complex, influential and of high strategic value, and it is difficult to be replaced. The existing research found that the company's scale, ownership structure and industry type will have a great impact on innovation activities. At the government level, research shows that multi-party cooperation in the framework of

government-industry-universities-users is helpful to break through those "stuck" technologies. On the market level, Yang et al. (2025) [5] believe that venture capital will affect the innovation behavior of enterprises through three main channels: increasing R&D investment, improving basic research ability, and strengthening the equity incentive of executives.

2.4 Research on the Impact Pathways of Patient Capital on Corporate Innovation

Domestic scholars have studied the mechanism of patient capital in key core technology breakthroughs from many angles. Hu et al. (2025) [2] found through empirical research that patient capital promotes core technology breakthroughs by easing financing constraints, enhancing human capital and improving supply chain stability; In addition, the external environment has a regulatory effect on the quality of innovation. Zhang and Chu (2026) found that patient capital can significantly improve the sustainability of enterprise innovation by alleviating financing constraints and restraining short-sighted behavior of management, which is particularly obvious in high-tech enterprises. Yang and Tang (2025) [7] pointed out that because patient capital can significantly improve the stability and predictability of R&D investment, it can provide long-term stable cash flow support for breakthrough technology research and development. Zhao et al. (2025) [2] analyzed the key role of patient capital in promoting innovation power and optimizing innovation process. From the perspective of deep integration with digital economy, they found that the core mechanism is the deep coupling of technology, industry and finance. From the perspective of total factor productivity, Qiu et al. (2024) thinks that patient capital mainly promotes growth by improving innovation efficiency and restraining the uncertainty of enterprises, and disruptive innovation will further strengthen this promotion.

Based on the research mentioned above, the main goal of our paper is to study the relationship between patient capital and the company's key core technological innovation, and to analyze how they interact with each other. So, we put forward the following two assumptions:

H1: Patient capital plays a good and positive role in the innovation of key core technologies of enterprises.

H2: Patient capital is like a "stabilizer", which promotes the innovation of key core technologies by reducing the short-sighted behavior of management and increasing the R&D investment of the company.

3. RESEARCH DESIGN

3.1 Sample Selection and Data Sources

This study selects Chinese A-share companies listed on the Shanghai and Shenzhen Stock Exchanges as the initial research sample, covering the period from 2012 to 2023. To ensure the quality and reliability of the empirical analysis, the following data cleaning procedures were implemented: (1) excluding firms with abnormal operating status during the sample period; (2) focusing exclusively on A-share listed companies; (3) excluding firms in the financial industry due to their unique capital structures; (4) removing observations with significant missing values for core variables; and (5) winsorizing all continuous variables at the 1% and 99% levels to eliminate the influence of extreme outliers.

3.2 Model and Variable Specifications

3.2.1 Model specification

To investigate the impact of patient capital on enterprise innovation in key core technologies, this paper constructs a two-way fixed effects model for regression analysis. The specific model is specified as follows:

$$lnCoreTech_{i,t} = \alpha_0 + \alpha_1 PatientCap_{i,t} + \sum Controls_{i,t} + \lambda_i + \mu_t + \epsilon_{i,t} \quad (1)$$

In this model, the subscripts i and t represent the firm and the year, respectively. $PatientCap$ denotes the level of patient capital, $lnCoreTech$ represents the enterprise's key core technology innovation, and $Controls_{i,t}$ refers to a set of control variables. λ_i and μ_t represent individual firm fixed effects and year fixed effects, respectively, while $\epsilon_{i,t}$ is the random disturbance term. Considering the potential heteroscedasticity and autocorrelation inherent in panel data, standard errors are clustered at the enterprise level.

3.2.2 Variable specification

1. Independent Variable: Patient Capital ($PatientCap$)

Following the theoretical frameworks of Lin and Wang (2017) and Yu (2025), [1] [3] patient capital is defined as relational capital characterized by long-term investment intentions and high risk-bearing capacity. Adopting the methodology of

Yang et al. (2025), [10] this study calculates a comprehensive Patient Capital Index (PC) using Principal Component Analysis based on three standardized indicators: Strategic Equity (Seo), Stable Equity (Seq), and Relational Debt (Rdb). Strategic Equity (Seo): Measured by the proportion of shares held by long-term institutional investors, proxied by the shareholding ratio of long-term institutional investors, identified on the basis of the average turnover rate of their semiannual transactions. Stable Equity (Seq): Calculated as the ratio of institutional shareholding to the standard deviation of that shareholding over the previous three years, reflecting investor confidence in long-term development. Relational Debt (Rdb): Emphasizing long-term cooperative relationships, it is measured by the ratio of long-term liabilities to total liabilities.

2. Dependent variable: key core technological innovation (lnCoreTech)

This variable is constructed with patent application data of key core technologies. It counts the patents applied by the company itself, patents applied with others, invention patents and utility model patents together, and then takes the natural logarithm after adding one to the total number of patents.

3. Control variables: In order to see the effect of patient capital alone, this study also controls many factors at the company level, which are distributed in two dimensions: expectation and action. Financial indicators: including leverage ratio (LEV), profitability (ROA), revenue GROWTH (growth) and asset turnover rate (TAT). Corporate governance: including the BOARD size, the shareholding ratio of the largest shareholder (TOP1) and the capital occupation ratio (OCCUPY). External environment: It also includes urban variables, such as economic development level (lnGDP), financial development level (lnFin) and investment in scientific and technological innovation (lnTech), which are used to control the differences of external institutional environment.

4. EMPIRICAL ANALYSIS

4.1 Baseline Regression

Table 1 shows the regression results about the influence of patient capital on enterprise innovation in key core technology areas. Column (1) shows that patient capital has a significant positive impact on key core technological innovation at the level of 1% without adding any control variables. Column (2) added control variables, and the coefficient is still significantly positive. In column (3), the dependent variable is further replaced by an innovation in advance, and the result is still stable. This shows that even after considering all kinds of mixed factors, patient capital still maintains a strong impetus to this kind of innovation, thus verifying hypothesis H1.

Table 1. Baseline Regression

	(1)	(2)	(3)
	lnCoreTech	lnCoreTech	lnCoreTech $_{t+1}$
PatientCap	0.071***	0.067***	0.049***
	(0.017)	(0.017)	(0.017)
Control Variables	No	No	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observation	18866	18504	18504
R^2	0.711	0.712	0.726

Notes: *p < 0.1, **p < 0.05, ***p < 0.01. The numbers in parentheses are the robust standard errors clustered at the firm level.

4.2 Robustness Tests

4.2.1 Alternative Measures of Key Variables

In order to ensure that our basic results are not caused by some special definitions of variables, this study first uses different measurement methods for core variables. For the independent variable, we construct another alternative index (PatientCap1)

of patient capital, this time recalculated with the total number of outstanding shares instead of the total share capital. Column (1) of Table 2 shows that the regression coefficient of PatientCap1 is 0.073, and it is still a very significant positive number at the level of 1%. For the dependent variable, considering that the R&D output may vary greatly within a company group, we use the total number of patent applications including subsidiaries as another measurement index. As shown in the second column, the coefficient is 0.069, and it is still highly significant. These results show that no matter which measurement method is used, patient capital has always promoted the innovation of key core technology enterprises, which excludes the possibility that the basic conclusion is biased due to the measurement error of variables.

Table 2. Alternative Measures of Key Variables

	(1) lnCoreTech	(2) lnCoreTech (incl.sub)	(3) lnCoreTech	(4) lnCoreTech (dummy)	(5) lnCoreTech
PatientCap1	0.073***	0.069***	0.074***	0.017**	0.100***
	(0.019)	(0.017)	(0.023)	(0.008)	(0.031)
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observation	18504	18504	13157	18504	6404
R^2	0.712	0.671	—	0.548	0.700

Notes: *p < 0.1, **p < 0.05, ***p < 0.01. The numbers in parentheses are the robust standard errors clustered at the firm level.

4.2.2 Alternative Estimation Methods

In order to solve the problem that there are many zero values in patent data, we use high-dimensional poisson panel regression to do robustness test this time. The result is still significantly positive in Column(3), and it reaches the level of 1%. In addition, because some companies in the benchmark regression sample do not apply for patents every year, we study the influence of patient capital on innovation from the perspectives of extensiveness and extensive margins according to the method of Sun et al. (2025).[4] In the extensive margin test, we created a dummy variable, lnCoreTech(dummy), to indicate whether the company has engaged in key technology research and development. The result of Column(4) shows that the coefficient of patient capital is 0.017, and it is significant at the level of 5%, which shows that the injection of patient capital will make the company more likely to start the research and development of key technologies. In intensive margin test, regression analysis is limited to those companies that have submitted at least one patent application, so that we can focus on those companies that have already participated in R&D activities. As shown in Column (5), the coefficient of patient capital has significantly increased to 0.13. This shows that the long-term support provided by patient capital can significantly enhance the R&D investment intensity and output depth for enterprises that have mastered key core technologies.

4.2.3 Excluding Special Samples and Controlling for Additional Fixed Effects

In order to make the conclusion of our research more reliable, this time we removed some special samples and recalculated the model from two angles: large and small. First, we deleted the data affected by the stock market crash in 2015 and the COVID-19 epidemic in 2020, and the results are shown in Columns (1) and (2) respectively. Considering that the asset structure of different companies may be very different, we have further removed the highest and lowest quarter of the total assets distribution every year, leaving only a sample of companies of middle size for recalculation. As can be seen from Column (3), the result is obviously positive, which shows that our findings are not only caused by particularly small or large companies.

Table 3. Excluding Special Samples and Controlling for Additional Fixed Effects

	(1) lnCoreTech Excl.Crash	(2) lnCoreTech Excl.COVID	(3) lnCoreTech Excl.Outliers	(4) lnCoreTech INDCD FE	(5) lnCoreTech City FE	(6) lnCoreTech Multi-Cluster
PatientCap	0.063***	0.037**	0.050**	0.222***	0.062***	0.067**
	(0.018)	(0.019)	(0.022)	(0.026)	(0.017)	(0.026)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry/City FE	No	No	No	Yes	Yes	No
Observation	16957	10946	9086	18504	18502	18504
R^2	0.719	0.726	0.669	0.294	0.717	0.712

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

The innovation of key core technologies is not only influenced by the company itself and time factors, but also related to the characteristics of industries and cities. On the basis of considering the company differences and year changes in the basic regression, we add the industry fixed effect in column (4), so as to control the impact of industry life cycle or industrial policy changes on technological innovation. In column (5), we also add the fixed effect of company, year and city to eliminate the interference that the geographical location characteristics of the company headquarters may have on the R&D decision. Regarding the clustering level, considering that R&D decisions may be related in the same industry or in the same period, our research not only does clustering at the company level, but also makes multi-dimensional clustering adjustments at the industry and year levels. As shown in column (6), under the stricter standard error setting, the coefficient of patient capital is still significantly positive. Generally speaking, this series of robustness tests make us more convinced that patient capital plays a vital role in promoting enterprises to break through key core technologies.

5. MECHANISM ANALYSIS

According to the confirmed discovery that --patient capital can greatly enhance the innovation ability of enterprises in key core technologies, we further study the reasons behind this part. Based on the previous research hypothesis, patient capital, as a relational capital with long-term perspective and high risk tolerance, may play a role in two aspects: improving the expectations of enterprises and promoting the actions of enterprises.

5.1 Patient Capital Improves Corporate Expectations

The development of key core technologies especially depends on continuous and long-term investment. However, the preferences and decisions of management often face the conflict between short-term economic interests and long-term strategic goals, which will affect the company's behavior. The empirical results in column (1) of Table 4 show that the coefficient of patient capital to managerial myopia is significantly negative at the level of 1%, indicating that patient capital can alleviate the short-sighted behavior of management to some extent. At the same time, the results in column (2) confirm that the decrease of managerial myopia will significantly increase the total number of patent applications. This shows that patient capital can improve the management's decision-making expectations, ease the institutional obstacles in the research and development of key core technologies, and thus enhance the innovation capability.

5.2 Patient Capital Drives Corporate Actions

In the aspect of corporate action, our research wants to see how patient capital can help technological breakthrough by increasing R&D investment. Although the research and development of key core technologies is highly uncertain, and it is easily affected by the company's lack of money or the way of resource allocation, patient capital can provide continuous financial support for technological innovation by taking advantage of its long-term perspective and risk-free. The regression results in column (3) show that patient capital has a significant positive impact on R&D investment, which

shows that it can really provide stable funds in the R&D process and alleviate the problem of insufficient money. The results in column (4) further confirm that R&D investment has a positive effect on patent output. These findings tell us that patient capital encourages companies to invest more resources in R&D by raising managers' expectations and providing long-term financial support, and finally achieves the innovation breakthrough of key core technologies.

Table 4. Mechanism Analysis

	Expectation		Action	
	Myopia	lnCoreTech	R&D	lnCoreTech
PatientCap	-0.002**		0.003***	
	(0.001)		(0.000)	
Myopia		-0.351**		
		(0.147)		
R&D				4.996***
				(0.657)
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Industry/City FE	No	No	Yes	No
Observation	18504	18504	18504	18504
R^2	0.616	0.712	0.496	0.715

Notes: *p < 0.1, **p < 0.05, ***p < 0.01. The numbers in parentheses are the robust standard errors clustered at the firm level.

6. HETEROGENEITY ANALYSIS

Although the previous analysis proves that patient capital has a positive effect on the innovation of key core technology enterprises, this effect may change due to the different technical characteristics of the industry. The research and development of key core technologies is highly dependent on industry characteristics, especially in high-tech industries. The innovation process is more knowledge intensive, the investment cycle is longer and the risk of failure is greater, so the demand for funds is stronger. In order to verify this point, we divide the sample into two groups: high-tech industry and non-high-tech industry for sub-sample regression.

As can be seen from column (1) of Table 5, the regression coefficient of patient capital is significantly positive at the level of 1% in the high-tech industry sub-samples; In the sub-sample of non-high-tech industries in the second column, although the coefficient is positive, it is not statistically significant. This comparison shows that the promotion of patient capital is mainly reflected in the high-tech industry.

There may be some reasons for this phenomenon: compared with non-high-tech industries, companies in high-tech industries often encounter a more serious R&D funding gap, and their core technology R&D needs more stable long-term financial support, so the empowerment effect of patient capital is more obvious. In addition, high-tech industries are generally located in cities with more developed economies and better laws, where the business environment is better and it is easier to attract long-term capital.

Table 5. Heterogeneity Analysis

	(1) High-Tech	(2) Non- High-Tech
	lnCoreTech	lnCoreTech
PatientCap	0.105***	0.025
	(0.027)	(0.018)
Control Variables	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observation	9984	8484
R^2	0.722	0.633

Notes: *p < 0.1, **p < 0.05, ***p < 0.01. The numbers in parentheses are the robust standard errors clustered at the firm level.

7. SUMMARY AND POLICY IMPLICATIONS

Based on the sample of A-share listed companies in Shanghai and Shenzhen in 2012-2023, this study investigates the influence and internal mechanism of patient capital on the innovation of key core technology enterprises. The main conclusions are as follows: (1) Increasing the proportion of Patient Capital can significantly increase the total number of patent applications, which shows that it can promote innovation output. This conclusion still holds after a series of robustness tests. (2) Mechanism analysis shows that patient capital can effectively restrain the short-term behavior of management, thus reducing the institutional obstacles in R&D decision-making. At the same time, by encouraging enterprises to increase long-term R&D investment, the intensity of R&D investment will be significantly promoted, providing a stable financial guarantee for technological breakthroughs. (3) The promotion of Patient Capital is more obvious in high-tech industries with large capital demand, high R&D investment and excellent innovation level.

Considering these findings, we put forward the following policy recommendations:

First of all, we should cultivate and expand more different types of patient capital to help us achieve high-tech self-sufficiency. Because the research and development of key core technologies usually takes a long time and has high risks, the government should further optimize the top-level system design. Through policy tools such as tax incentives and risk compensation, relevant departments should actively guide long-term funds such as social security funds and insurance funds to enter the capital market and turn them into patient capital. In addition, we should give full play to the strategic anchoring role of government-guided funds, and drive social capital not only to focus on short-term arbitrage, but to turn to long-term value investment. It is very important to establish a long-term investment and financing mechanism that matches the development of new quality productive forces, so as to effectively alleviate the financial difficulties encountered in the process of overcoming key technologies.

Second, make good use of patient capital's "stabilizer" function to reduce the company's concern about R&D uncertainty. Enterprises should make good use of the positive signals sent by patient capital at the corporate management level. By introducing strategic investors with long-term vision, companies can optimize their internal decision-making methods and reshape their own innovation environment. By strengthening strategic mutual trust with patient capital, enterprises can effectively restrain short-sighted behaviors caused by performance appraisal pressure. This will greatly reduce the uncertainty of enterprises in key core technological innovation, so that they can bravely cross the "Valley of Death" of technological innovation and maintain continuous investment in innovative fields with long-term strategic value.

Third, design and improve the targeted support system according to the differentiation policy, and create an institutional ecology conducive to long-term investment. Considering the different effects of patient capital in different industries, policy making should be more accurate, especially to improve the long-term capital allocation efficiency of high-tech enterprises. It is necessary to further improve the function of multi-level capital market, optimize the identification and encouragement of long-term investors in IPO and refinancing system, and build a coordinated operation system of "offering, investing, managing and withdrawing" in the whole chain. At the same time, we should vigorously promote the

concept of sustainable development, improve the quality of enterprise information disclosure and internal control, attract more patient capital with the attribute of responsible investment, use institutional innovation to alleviate financing pressure and short-term preference, and promote the leap-forward development of technology-intensive industries.

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