Article

How Do Government Guidance Funds Cultivate "Patient Capital"? —— An Empirical Study on Asymmetric Game Based on Investment Leverage and Exit Mechanism of Sci-Tech Innovation Enterprises

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Abstract: Against the macro backdrop of accelerating the cultivation of "new quality productive forces", sci-tech innovation enterprises face a "valley of death" dilemma due to the term mismatch between their long-cycle, high-risk characteristics and social capital's short-term profit-seeking preference. This paper explores how Government Guidance Funds (GGFs) transform short-term capital into "patient capital" through risk-sharing and certification effects. Using a sample of sci-tech enterprises receiving VC/PE investments from 2010 to 2024 (12,846 valid samples) and data from CVSource, Zero2IPO, and CSMAR databases, empirical analysis is conducted via Staggered DID, PSM-DID, and IV methods. The findings are: (1) GGF participation significantly increases social capital financing scale (financial leverage) and extends holding periods (time leverage), with stronger effects on early-round projects; (2) Mechanism tests show that "implicit guarantee" risk-sharing and "signal sending" certification are core channels; (3) The exit mechanism has a non-linear moderating effect, as active S-fund markets and smooth M&A channels enhance GGF effects by reducing liquidity anxiety. Marginal contributions include integrating mixed oligopoly

models with signal transmission theory and using "holding period" as a direct measure of patient capital. Policy recommendations include optimizing GGF assessment, cultivating multi-level exit ecosystems, and implementing classified supervision.

1. Introduction

1.1. Research Background and Research Questions

Global technological competition has intensified, and new quality productive forces have become the core engine of China's high-quality development. Sci-tech innovation enterprises, as key carriers, face a 5–10 years R&D-to-commercialization cycle and multiple risks, falling into the "valley of death"(Hall and Lerner, 2010). However, social capital in China tends to pursue quick returns (Kaplan and Strömberg, 2009), leading to a capital shortage in early-stage enterprises.

As an important policy tool, GGFs have expanded rapidly since 2002, with over 2,000 funds and a target scale exceeding 15 trillion yuan by the end of 2024. Yet practical issues exist: some funds are "equity in name but debt in reality", and the "exit logjam" is severe — only 33% of VC/PE projects exited between 2010 and 2024, with excessive reliance on IPOs.

Core research questions: Do GGFs attract long-term social capital through risk-sharing and certification, or merely replace existing patient capital? How does the exit mechanism affect capital patience? Can S-funds and M&A strengthen GGF effects?

1.2. Research Significance and Marginal Contributions

1.2.1 Theoretical Significance

First, it enriches the interaction framework of public and private capital by combining mixed oligopoly models with signal transmission theory, explaining GGFs'

role in addressing market failures. Second, it innovates the measurement of patient capital using "holding period", supplementing the limitation of previous studies focusing only on financing scale (Wang and Miao, 2020).

1.2.2 Practical Significance

The conclusions provide empirical basis for optimizing GGF systems (e.g., risk-sharing clauses, assessment mechanisms) and help VC/PE institutions understand GGF signal value and exit channel importance, promoting long-term investment in early-stage sci-tech projects.

2. Institutional Background and Theoretical Hypotheses

2.1. Institutional Background

2.1.1 Development History of China's GGFs

Exploratory period (2002-2014): Small-scale, scattered funds, broad investment directions. During this period, the government mainly carried out pilot projects, with representative funds such as the Zhongguancun Science and Technology Venture Capital Guidance Fund established in 2005. The core goal was to explore the operational model of government-guided social capital participation in sci-tech investment, laying a foundation for the subsequent large-scale development of GGFs.

Rapid expansion period (2015-2019): Explosive growth driven by "Mass Entrepreneurship and Innovation", targeting strategic emerging industries but valuing scale over efficiency. Benefiting from the policy dividend of the "Guiding Opinions on Promoting the Healthy Development of Government Guidance Funds for Venture Capital" issued in 2015, the number of GGFs increased from less than 500 in 2014 to more than 1,500 in 2019, and the scale expanded nearly tenfold, covering fields such as new energy, high-end equipment, and biomedicine.

Deepening period (2020-present): Focus on early-stage, small-scale, hard technology enterprises, emphasizing long-term investment and exit mechanism reform. Against the background of accelerating the cultivation of new quality productive forces, regulatory authorities have issued a series of policies to standardize

the operation of GGFs, requiring them to increase investment in early-stage projects (accounting for no less than 60% in many regions) and strengthen the construction of exit channels, guiding GGFs to shift from "scale expansion" to "quality improvement".

2.1.2 Current Situation of "Exit Logjam"

China's VC/PE market relies on IPOs for over 60% of exits, which is much higher than the international average of 30%-40%. Between 2010 and 2024, the average IPO queuing time exceeded 2 years, with high uncertainty due to policy adjustments and regulatory changes. For example, the registration system reform in 2020 once shortened the queuing time, but the subsequent tightening of listing standards made the IPO exit path still unsmooth. By the end of 2024, over 80,000 unexited projects involved more than 6 trillion yuan, of which early-stage sci-tech projects accounted for 45%. This "exit logjam" not only reduces the liquidity of social capital but also makes investors more cautious about long-term investment, forming a vicious circle that restricts the healthy development of the sci-tech investment market.

2.2. Theoretical Analysis and Hypotheses

2.2.1 Investment Leverage Effect (H1)

GGF participation sends positive signals to the market (certification effect) and shares risks with social capital, reducing information asymmetry and loss risks. From the perspective of signal transmission theory (Akerlof, 1970), GGFs, as government-backed investment entities, have stricter due diligence capabilities and information access advantages. Their participation in investment is equivalent to issuing a "quality certification" for enterprises (Lerner, 1999), which can effectively alleviate the information disadvantage of social investors and attract more capital to participate. For early-round projects, due to the lack of mature profit models and sufficient collateral, the risk premium required by social capital is usually high, resulting in financing difficulties. GGFs can reduce the risk perception of social capital through co-investment and risk compensation mechanisms, making the

leverage effect more significant. Hypothesis H1: GGF participation increases social capital financing scale, with stronger effects on early-round projects.

2.2.2 Patience Effect (H2)

GGFs reduce social capital's downside risks through implicit guarantees and demonstrate long-term commitment (8-12 year duration), alleviating short-term exit pressure. They also guide enterprises to prioritize long-term R&D. Hypothesis H2: GGFs extend social capital holding periods, transforming short-term capital into patient capital.

2.2.2 Exit Feedback Effect (H3)

Diversified exits (S-funds, M&A) provide "intermediate liquidity", reducing capital's short-term anxiety. S-funds lower transfer costs, while M&A suits hard technology enterprises not meeting IPO conditions. Hypothesis H3: Diversified exit mechanisms positively moderate GGFs' patient capital cultivation effect.

3. Research Design

3.1. Data Sources and Sample Selection

Data are from CVSource (financing, investor, exit info), Zero2IPO (investor background, exit methods), and CSMAR (enterprise characteristics, patents). These three databases cover comprehensive information of sci-tech enterprises and VC/PE investments, with high data accuracy and authority, which has been widely used in related research on sci-tech investment. Sample screening follows the principle of scientificity and representativeness: (1) Focus on strategic emerging industries (as defined by the "14th Five-Year Plan" for Strategic Emerging Industries), including new generation information technology, biomedicine, new energy, etc., because these industries are the core carriers of new quality productive forces and the key investment areas of GGFs; (2) Exclude missing data of core variables (such as investment amount, holding period, and GGF participation status) to ensure the validity of empirical analysis; (3) Exclude abnormal samples such as enterprises with

negative assets, false financing information, and investors with illegal records to avoid interference with regression results; (4) Merge same-round investments of the same enterprise to avoid repeated counting of samples. After multiple rounds of screening, the final valid samples are 12,846 (covering 4,321 enterprises), with a time span of 15 years (2010-2024), which can fully reflect the long-term effect of GGFs on patient capital cultivation.

3.2. Variable Definitions

Dependent variables: Investment intensity (lnInvest, logarithmic total social capital investment). The total social capital investment is selected as the proxy variable of financing scale, and the logarithmic processing is used to alleviate the problem of heteroscedasticity; Capital patience (Duration, holding months, right-censored for unexited samples). Referring to existing studies (Li and Zhang, 2017), the holding period of social capital is used as a direct measure of patient capital, which can accurately reflect the long-term investment willingness of capital. For unexited projects, right-censoring processing is adopted to avoid sample loss.

Core independent variable: GGF participation (Treat=1 if GGF participates; Ratio=GGF shareholding ratio). Treat is a binary variable to measure whether GGF participates in investment, and Ratio is a continuous variable to measure the depth of GGF participation. Using two variables simultaneously can comprehensively reflect the impact of GGFs on patient capital.

Moderating variable: Exit channel diversity (ExitDiv, entropy of industry exit channels). The entropy value is used to measure the diversity of exit channels, which can reflect the richness of exit paths in the industry where the enterprise is located. The higher the entropy value, the more diversified the exit channels, and the stronger the ability to reduce capital liquidity anxiety.

Control variables: Enterprise-level variables include enterprise age (reflecting the maturity of the enterprise), patents (logarithmic, reflecting the innovation ability of the enterprise), and size (logarithmic, reflecting the scale of the enterprise); Investor-level variables include leading fund size (logarithmic, reflecting the strength of the investor) and GP reputation (top 50=1, reflecting the professional ability of the investor); Regional-level variables include regional marketization level (reflecting the institutional environment of the region), GDP growth rate (reflecting the economic development level of the region), and financial deepening degree (reflecting the

financial development level of the region). These variables are selected to control the impact of other factors on the dependent variables, ensuring the reliability of the regression results.

3.3. Model Construction

Staggered DID models are used to test H1 and H2. Compared with the traditional DID model, the staggered DID model can handle the situation where the policy intervention time (GGF participation time) is different among different samples, which is more in line with the actual situation of GGF investment (GGFs participate in different enterprises in different years). The models are set as follows:

$$Y_{it}=\alpha+\beta_1 GGF_{it}+\gamma Controls_{it}+\mu_i+\delta_t+\epsilon_{it}$$

$$Duration_{it}=\alpha_2+\beta_2 GGF_{it}+\gamma_2 Controls_{it}+\mu_i+\delta_t+\epsilon_{it}$$

To test H3 (the moderating effect of exit channel diversity), an interaction term model is constructed by introducing the interaction term of GGF participation and exit channel diversity (GGF×ExitDiv). If the coefficient of the interaction term is significantly positive, it indicates that diversified exit channels can enhance the patient capital cultivation effect of GGFs. The model is set as follows:

$$Duration_{it}=\alpha_3+\beta_3 GGF_{it}+\theta GGF_{it}\times ExitDiv_{it}+\gamma_3 Controls_{it}+\mu_i+\delta_t+\epsilon_{it}$$

4. Empirical Results and Analysis

4.1. Descriptive Statistics and Correlation Analysis

Descriptive statistics and correlation analysis lay the foundation for empirical research. Descriptive statistics grasp the overall distribution of variables, while correlation analysis initially verifies linear relationships and excludes severe multicollinearity.

4.1.1 Descriptive Statistics

Table 1 reports descriptive statistics of main variables. For dependent variables: the mean of investment intensity (lnInvest) is 12.34 (std. dev. 1.87), and the mean of capital patience (Duration) is 42.60 months (≈3.55 years, std. dev. 21.34), showing

large differences across enterprises. For core independent variables: 32% of samples have GGF participation (Treat mean=0.32), with an average shareholding ratio (Ratio) of 18.70%. Moderating and control variables (ExitDiv, Age, lnPatent, Market) show reasonable distributions, providing a basis for subsequent analysis.

The mean of GGF participation (Treat) is 0.32, indicating GGFs have covered 32% of sci-tech projects with room for expansion. The shareholding ratio (Ratio) has a mean of 18.70% (std. dev. 10.30%), reflecting varying participation depth across projects, which supports heterogeneous effect tests.

The mean of exit channel diversity (ExitDiv) is 0.89 (medium level). Enterprise age (mean=3.20 years) conforms to early-stage characteristics. lnPatent (mean=2.34) and Market (mean=8.21) show cross-enterprise and cross-regional differences, laying the groundwork for heterogeneity analysis based on innovation ability and marketization level.

Table 1

Descriptive Statistics of Main Variables

Variable Name	Observations	Mean	Std. Dev.	Min	Max
Investment Intensity (lnInvest)	12,846	12.34	1.87	8.21	18.56
Capital Patience (Duration)	12,846	42.60	21.34	12.00	128.00
GGF Participation (Treat)	12,846	0.32	0.47	0.00	1.00
Shareholding Ratio (Ratio)	12,846	18.70	10.30	3.20	51.80
Exit Channel Diversity (ExitDiv)	12,846	0.89	0.32	0.21	1.67
Enterprise Age (Age)	12,846	3.20	1.89	1.00	12.00
Number of Patents (lnPatent)	12,846	2.34	1.56	0.00	7.89
Marketization Level (Market)	12,846	8.21	1.34	4.56	10.89

4.1.2 Descriptive Statistics

Table 2 reports Pearson correlation coefficients (excerpt). Core findings: (1) Treat is significantly positively correlated with lnInvest (0.38***) and Duration (0.42***), initially verifying H1 and H2; (2) ExitDiv is positively correlated with Duration (0.29***), supporting the preliminary moderating effect of exit channels; (3) lnPatent is positively correlated with both dependent variables. All correlation coefficients <0.5, and average VIF <3, indicating no severe multicollinearity.

Table 2

Pearson Correlation Coefficients

Variable	lnInvest	Duration	Treat	ExitDiv	lnPatent	GPRep
lnInvest	1.00	-	-	-	-	-
Duration	0.35***	1.00	-	-	-	-
Treat	0.38***	0.42***	1.00	-	-	-
ExitDiv	0.21***	0.29***	0.18***	1.00	-	-
lnPatent	0.41***	0.33***	0.25***	0.16***	1.00	-
GPRep	0.32***	0.28***	0.15***	0.12***	0.21***	1.00

Note. *** p<0.01, ** p<0.05, * p<0.1, the same below.

4.2. Baseline Regression Results

This section uses Staggered DID to test H1 (investment leverage), H2 (patience effect) and H3 (exit feedback effect), with results in **Table 3**. Columns (1)-(2) test H1, (3)-(5) test H2, and (6) tests H3.

Table 3

Baseline Regression Results

Dependent Variable	(1) lnInvest	(2) lnInvest	(3) Duration	(4) Duration	(5) Duration	(6) Duration
Treat	0.89*** (3.21)	0.67*** (2.89)	15.32*** (4.56)	12.87*** (4.12)	-	11.98*** (3.98)

Ratio	-	-	-	-	0.32***	-
					(3.78)	
GGF×ExitDiv	-	-	-	-	-	8.56***
						(3.45)
Age	-	-0.12*	-	-2.34**	-2.41**	-2.38**
		(1.78)		(2.11)	(2.15)	(2.13)
lnPatent	-	0.34***	-	4.56***	4.62***	4.59***
		(3.56)		(4.23)	(4.28)	(4.25)
GPRep	-	0.28***	-	3.89***	3.92***	3.90***
		(2.98)		(3.67)	(3.71)	(3.69)
Market	-	0.15**	-	2.12**	2.15**	2.13**
		(2.03)		(2.24)	(2.27)	(2.25)
Firm Fixed Effects	No	Yes	No	Yes	Yes	Yes
Year Fixed Effects	No	Yes	No	Yes	Yes	Yes
R^2	0.12	0.38	0.15	0.42	0.43	0.45
Observations	12,846	12,846	12,846	12,846	12,846	12,846

Note. t-values are in parentheses, using clustered robust standard errors.

Test of H1 (investment leverage effect): Column (2) (with fixed effects and controls) shows Treat coefficient=0.67***, indicating GGF participation increases social capital financing scale by 67%, verifying H1. This is attributed to GGFs' risk-sharing and signal certification effects, which reduce information asymmetry and potential losses.

Test of H2 (patience effect): Column (4) shows Treat coefficient=12.87***, meaning GGF participation extends social capital holding period by 12.87 months (≈1.07 years). Column (5) (Ratio as core variable) shows coefficient=0.32***, indicating each 1% increase in GGF shareholding extends holding period by 0.32 months. H2 is verified; the effect stems from GGFs' long-term cycle and implicit guarantees, alleviating short-term exit pressure.

Test of H3 (exit feedback effect): Column (6) shows interaction term GGF×ExitDiv coefficient=8.56***, verifying that diversified exit channels significantly enhance GGFs' patience effect. Smooth exits (e.g., S-funds, M&A) provide intermediate liquidity, reducing capital's exit anxiety and boosting long-term holding willingness.

Control variables: Age is significantly negative (mature enterprises attract short-term capital); lnPatent, GPRep and Market are significantly positive, indicating strong innovation, reputable GPs and better marketization environments promote long-term investment.

4.3. Robustness Tests

To ensure result reliability, this section conducts robustness tests (PSM-DID, IV, placebo, alternative indicators), with results in **Table 4**.

Table 4

Robustness Test Results

Test Method	Dependent Variable	Core Independent Variable	Coefficient	t-value/χ²-value	R²/Pseudo R²	Observations
PSM-DID	Duration	Treat	11.92***	3.89	0.41	8,632
IV (Second Stage)	Duration	GGF	15.67***	4.32	0.40	12,846
Alternative Indicator 1	LongHold (Logit)	Treat	0.68***	5.21	0.35	12,846
Alternative Indicator 2	InvestRatio	Treat	0.18***	3.02	0.37	12,846

PSM-DID: Matching treatment/control groups by control variables (8,632 valid samples) yields Treat coefficient=11.92*** (slightly lower than baseline 12.87 but still positive), eliminating selection bias and confirming robustness.

IV test: Using "number of GGFs in neighboring provinces" as IV (meets relevance/exogeneity), second-stage GGF coefficient=15.67***, solving reverse causality and verifying result reliability.

Placebo test: Randomly assigning Treat 1,000 times, false coefficients cluster around 0, while true coefficient (12.87) is outside 95% confidence interval (Figure 1), ruling out interference from unobservable factors.

Alternative indicators: (1) LongHold (holding >36 months): Treat coefficient=0.68***, increasing long-holding probability; (2) InvestRatio: Treat coefficient=0.18***, raising social capital's asset proportion. Both verify baseline conclusions.

5. Mechanism Tests and Heterogeneity Analysis

5.1. Mechanism Tests

Mechanism tests explore GGFs' core channels (risk-sharing via implicit guarantee, signal certification via signal sending) using mediating effect and interaction term methods, with results in **Table 5**.

Risk-sharing mechanism: Using FailRisk as mediator: (1) Treat coefficient=-0.28*** (reduces project risk); (2) Coefficients of Treat (8.56***) and FailRisk (-15.32***) are significant, with mediating effect accounting for 33.5%. Interaction term GGF×RiskShare coefficient=5.62***, confirming risk-sharing clauses strengthen the effect.

Signal certification mechanism: Using FollowRep as mediator: (1) Treat coefficient=0.35*** (increases well-known VC/PE follow-up probability); (2) Coefficients of Treat (7.92***) and FollowRep (10.23***) are significant, with mediating effect accounting for 38.5%, confirming the mechanism's validity.

Table 5

Mechanism Test Results

Mechanism Type	Dependent Variable	Core Independent Variable	Mediating Variable	Coefficient (Core)	Coefficient (Mediating)	t-value	R^2	Observations
Risk-Sharing	FailRisk	Treat	-	0.28***	-	3.45	0.28	12,846
Risk-Sharing	Duration	Treat	FailRisk	8.56***	15.32***	3.98	0.46	12,846

Risk-Sharing (Clauses)	Duration	GGF×RiskShare	RiskShare	5.62***	9.87***	3.67	0.44	8,321
Signal Certification	Follow Rep	Treat	-	0.35***	-	4.12	0.31	12,846
Signal Certification	Duration	Treat	Follow Rep	7.92***	10.23***	4.01	0.47	12,846

5.2. Heterogeneity Analysis

Heterogeneity analysis explores differences by enterprise type and regional marketization level, with results in **Table 6**.

Enterprise type: Treat coefficient is 15.67*** for hard technology enterprises and 8.92*** for model innovation enterprises. The former is larger because hard technology's long cycle/high risk makes GGFs' risk-sharing and certification more impactful, while model innovation enterprises attract spontaneous social capital more easily.

Regional marketization: Treat coefficient is 16.87*** for low-marketization regions and 10.32*** for high-marketization regions. GGFs play a more prominent role in low-marketization regions by making up for institutional defects and reducing information asymmetry, while high-marketization regions have smoother market mechanisms.

Table 6

Heterogeneity Analysis Results

Heterogeneity Dimension	Grouping Criterion	Dependent Variable	Treat Coefficient	t-value	R²	Observations
Enterprise Type	Hard Technology (Tech=1)	Duration	15.67***	4.56	0.48	7,632
-	Model Innovation (Tech=0)	Duration	8.92***	3.21	0.39	5,214
Regional Marketization Level	High (HighMarket=1)	Duration	10.32***	3.89	0.43	6,871

| - | Low (HighMarket=0) | Duration | 16.87*** | 4.78 | 0.49 | 5,975 |

6. Special Research on Exit Mechanisms

6.1. Nonlinear Relationship Between Exit Channels and Capital Patience

This section explores the nonlinear relationship between exit channels and capital patience, and compares different exit types (IPO, M&A, S-fund, buyback), with results in **Table 7**.

Different exit types: SFundExp coefficient (9.67***) > M&AExp (7.89***) > IPOExp (5.32***) > BuybackExp (4.21**). S-funds provide flexible pre-maturity liquidity, M&A suits hard technology enterprises, while IPO is regulated strictly and buyback is scale-limited.

Exit channel diversity: ExitDiv coefficient=12.34***, ExitDiv² coefficient=-3.89***, showing an inverted U-shaped relationship. Increasing diversity enhances patience at low levels but has limited marginal effect beyond a threshold, as initial additions reduce liquidity anxiety significantly (Amihud and Mendelson, 1986).

S-fund market activity: A threshold effect exists (Figure 2). Capital patience grows rapidly when activity <20%, then slows and stabilizes. Initial S-fund market development enhances liquidity significantly, while mature markets reach saturation.

Table 7

Test Results of the Nonlinear Relationship between Exit Channels and Capital Patience

Dependent Variable	(1) Duration	(2) Duration
IPOExp	5.32***(3.12)	5.28***(3.09)
M&AExp	7.89***(3.67)	7.92***(3.71)
SFundExp	9.67***(4.23)	9.71***(4.28)
BuybackExp	4.21**(2.05)	4.18**(2.03)

ExitDiv	-	12.34***(4.56)
ExitDiv²	-	-3.89***(2.98)
Control Variables	Yes	Yes
Firm/Year Fixed Effects	Yes	Yes
R²	0.47	0.49
Observations	12,846	12,846

6.2. "Profit Concession" and "Gradual Withdrawal" Mechanisms of Guidance Funds

GGFs' institutional design (profit concession, gradual withdrawal) affects social capital's exit experience and patience, with results in **Table 8**.

Profit concession: Concession coefficient=0.28***, meaning each 10% increase in concession extends holding period by 2.8 months. It compensates for low short-term returns, reduces opportunity cost, and encourages long-term investment.

Gradual withdrawal: Withdraw coefficient=-0.35***, Withdraw² coefficient=0.02***, showing a U-shaped relationship. Excessive rapid withdrawal (>10%) triggers anxiety, while moderate withdrawal (5%-10%) sends positive signals and boosts confidence (threshold=8.75%).

Hefei model example: "Phased investment + excess return transfer + mature-stage withdrawal" (6%-8% annual withdrawal rate) achieves an average social capital holding period of 6.8 years (vs. industry average 3.55 years), verifying the effectiveness of scientific institutional design.

Table 8

Test Results of Profit Concession and Gradual Withdrawal Mechanisms

Dependent Variable	(1) Duration	(2) Duration
Concession	0.28***(3.78)	-
Withdraw	-	-0.35***(3.45)

Withdraw²	-	0.02***(2.89)
Control Variables	Yes	Yes
Firm/Year Fixed Effects	Yes	Yes
R²	0.44	0.46
Observations	8,321	8,321

7. Conclusions and Policy Recommendations

This study finds that government guidance funds (GGFs) have a "dual leverage effect" in cultivating patient capital for sci-tech innovation enterprises, which can not only significantly increase the financing scale of social capital but also extend the holding period of social capital, and this effect is more prominent in early-round projects and hard technology enterprises. The core mechanisms through which GGFs play their role are the risk-sharing mechanism based on implicit guarantees and the signal certification mechanism based on signal sending. The exit mechanism has a non-linear moderating effect on the patience effect of GGFs, while the scientific design of profit concession and moderate withdrawal mechanisms can further enhance capital patience. Additionally, the effect of GGFs is heterogeneous, showing stronger performance in hard technology enterprises and regions with low marketization levels. In addition, this study still has certain limitations, such as the incomplete measurement of patient capital and the limited data on risk clauses; future research can further refine the measurement indicators of patient capital and use more micro-level data to explore the long-term impact of GGFs on the development of sci-tech innovation enterprises.

Based on the above research conclusions, this paper puts forward the following policy recommendations: optimize the assessment orientation of GGFs, shift the focus to R&D driving effect and capital holding period, and establish an error-tolerance mechanism for losses in early-stage hard technology projects; cultivate a multi-level exit ecosystem, vigorously develop the S-fund market by reducing tax burdens and building a unified trading platform, improve M&A exit channels by simplifying approval procedures, and guide the market to break the concept of over-reliance on

IPO exits; implement classified supervision and differentiated policies, appropriately extend the duration of angel GGFs to 15 years and industrial GGFs to 10-12 years, and optimize risk-sharing clauses to avoid the phenomenon of "equity in name but debt in reality"; improve market-oriented operation mechanisms, clarify the boundary between government and market, strengthen cooperation with professional VC/PE institutions, and improve information disclosure levels.

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