

Does Technology and Finance Enhance the Innovation Capacity of High-tech Industries?

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Abstract: Based on the data of 30 provinces and cities from 2013 to 2020, this paper uses the entropy method to construct the regional technology financial development index from three dimensions of public technology financial resources, market technology financial resources and technology financial environment, and empirically tests the influence of science and technology finance on the innovation ability of high-tech industry. The study finds that the financing ability and cultivation ability of science and technology finance can significantly promote the development of the innovation ability of high-tech industry. The influence of science and technology finance on the innovation ability of high-tech industry has the regional heterogeneity and the heterogeneity of enterprise ownership background, which has a better effect on promoting the innovation ability of high-tech industry in the eastern region and the private background. The influence of science and technology finance on the innovation ability of high-tech industry has the threshold effect of absorption ability. When the threshold value is crossed, the promotion effect of science and technology finance on the innovation ability of high-tech industry will be further enhanced.

Keywords: Science and Technology Finance; High-tech Industry; Innovation Ability; Threshold Effect.

1. Introduction

High-tech industry is the core carrier to realize innovation-driven development and enhance China's comprehensive innovation capacity, which is of great significance to promoting national economic growth. Persisting in innovation is the first driving force, opening up new fields and new tracks, and accelerating the development of strategic emerging industries are the key problems facing at the present stage, among which, the improvement of the innovation ability of high-tech industry has become a key problem to be solved urgently at present. The development of high-tech industry needs the support of science and technology finance. As a resource system of providing supporting policy support, services and financial products for innovation subjects, including the government, venture capital institutions and financial departments, science and technology finance can effectively promote the growth of high-tech industry. Hong and Feng et al. (2016) believe that government grants have different effects on high-tech industrial innovation in different industries. Government grants can promote the innovation of industries such as medicine and aircraft and spacecraft, and inhibit the innovation of industries such as office equipment and medical equipment [1]. Wang and Chen et al. (2022) found that tax incentives have a significant crowding effect on the R & D expenditure of high-tech industries, which is conducive to promoting the technology R & D efficiency of high-tech industries [2]. However, most scholars have explored the impact of single technology and financial factors on the innovation of high-tech industry, and few literatures has studied the impact of the regional development level of comprehensive science and technology finance on the innovation of high-tech industry. In this context, does science and technology finance have a positive impact on the innovation ability of high-tech industry? Is there any regional heterogeneity and enterprise ownership background heterogeneity? What role does the absorption capacity of high-tech industries play in it? Few studies have also given

positive responses. In view of this, this paper is based on 30 provinces and cities from 2013 to 2020 level panel data, empirical test the technology financial influence on high technology industry innovation ability, compared with previous research, this paper may be marginal contribution is: (1) from the public financial resources, market financial resources and technology and financial environment of science and technology three dimensions measure the regional financial comprehensive development level of science and technology, enrich the existing research of regional science and technology financial level.(2) The demonstration of the influence of science and technology finance on the innovation ability of high-tech industries is tested, and the heterogeneity of science and technology finance on the innovation ability of high-tech industries in different regions and different ownership is examined, which complements the shortcomings of existing research.(3) The threshold model is used to test the non-linear influence of science and technology finance on the innovation ability of high-tech industry under the absorption ability of high-tech industry, which provides a new theoretical basis for improving the innovation ability of high-tech industry.

2. Theory and Hypothesis

The combination of public science and technology finance market can effectively technology and finance reduce government failure and market failure, optimize the allocation of innovation resources, and promote the innovative development of high-tech industry. Specifically, the influence of science and technology finance on the innovation ability of high-tech industry is mainly reflected in the direct drive and indirect drive. Direct drive is the direct inflow of science and technology financial resources into the innovation process of high-tech enterprises. High-tech industry is a strategic emerging industry with capital intensive, strong spillover, large investment, long cycle and oriented to cutting-edge technology. In the process of innovation, it is in urgent need

of advanced technical equipment and professional talents, and is facing the pressure of capital shortage. At this point, on behalf of the public financial resources of science and technology of government subsidies and government funds, financial resources on behalf of the market of science and technology risk investment and private loans financial direct financing function of science and technology can help high technology enterprises get money, resist innovation dilemma due to financial pressure, to spread the risk of innovation, reduce the cost of enterprise innovation failure. Further, the entry of science and technology financial resources can also cause the supervision and assessment of science and technology financial subjects to high-tech enterprises [3], encourage enterprises to invest more in R & D, reduce the crowding out effect of science and technology financial resources on enterprises' own research and development funds, so as to promote the innovation and development of high-tech enterprises. The indirect driver is the cultivation and optimization of high-tech enterprises by science and technology finance. Financial incubation ability of science and technology can promote the growth of start-ups, provide start-up enterprise market experience and industry experience, and constantly screening innovation ability, good development prospects of enterprise [4], optimize the overall structure of high technology industry, promote the innovation of high technology industry from quantity to qualitative transformation, and promote the overall innovation ability of the high technology industry. Based on this, the hypothesis is proposed that:

H1: Science and technology finance can promote the innovation ability of high-tech industries.

The development of regional science and technology finance provides a good basic condition for the innovation of high-tech industry. However, not all science and technology financial resources can be guided into the innovation activities by high-tech enterprises, and their guiding efficiency largely depends on the absorption capacity of high-tech enterprises. Absorption ability is based on high technology enterprise cognition, the ability of digestion and application of internal and external resources, a high level of absorption ability not only means that high technology enterprise is easy to identify and use external knowledge innovation [5], also represents the high technology enterprise financial high utilization efficiency of science and technology, can lead more technology financial resources to production research and development activities. Chung et al. (2022) also pointed out that absorption capacity is an important factor in strengthening the innovation performance of high-tech start-ups [6]. Therefore, when the absorption capacity is low, the utilization efficiency of technology financial resources is low, resulting in the relatively weak promotion effect of technology finance on the innovation capacity; when the absorption capacity reaches a certain critical point, the utilization efficiency of technology financial resources will be improved, thus enhancing the promotion effect of technology finance on the innovation ability of high-tech enterprises. Based on this, the hypothesis is proposed that:

H2: The impact of science and technology finance on the innovation ability of high-tech industry has the threshold effect of absorption ability. When the threshold value is crossed, the positive role of science and technology finance on the innovation ability of high-tech industry will be further improved.

3. Research Design

3.1. Selection of Variables

3.1.1. Explained Variables

High-tech industry innovation ability (IA): previous research using the patent application or new product sales revenue measure the innovation ability of high technology industry [7], however, this way failed to fully consider the high technology industry innovation input and output capacity, so the high technology industry R&D personnel, R&D expenditure and new product development costs as the innovation of high technology industry, select the patent application and new product sales revenue as the innovation output index of high technology industry, and further use entropy method to determine the weight of each index, see table 1.

Table 1. Index weights of all levels of innovation capacity

Level 1 indicators	Secondary indicators	weight	Level 3 indicators	weight
innovation ability	Innovation investment	56.71%	R&D personnel	16.66%
			R&D appropriation expenditure	18.49%
			New product development costs	21.56%
	Innovative output	43.29%	Number of patent applications	22.04%
			New product sales	21.25%

3.1.2. Interpret Variables

Science and Technology Finance (TF): According to the connotation of science and technology finance, this paper subdivides science and technology finance into three dimensions: public science and technology financial resources, market science and technology financial resources and science and technology financial environment, and further selects 10 categories of three-level science and technology finance related indicators for measurement. In order to clarify the contribution of each index, the entropy method is used to calculate the weight of each index. See Table 2 for the specific weights.

3.1.3. Control Variables

(1) Opening to the outside world (Open): select the total amount of foreign investment in each year to measure as the logarithm, and the level of opening to the region is conducive to high-tech enterprises to obtain foreign capital or talent and technology support. (2) Human capital (Peo): Select the proportion of college students in the total local population in various provinces and cities. Human capital is an important driving force to promote the sustainable development of the innovation process of high-tech enterprises, and a large number of technical and management talents are needed in the input and output stage of enterprise innovation.(3) Government scale (Gov): The government is an important factor to promote the development of high-tech industries by measuring the ratio of the local GDP, which is mainly manifested in the government's help in policies and funds for high-tech enterprises.(4) Informatization level (Int): Measured by the ratio of the total business volume of posts and telecommunications to that of local GDP in the current year, the informatization level is conducive to promoting the

innovative circulation of local high-tech enterprises.(5) High-tech enterprise aggregation (Sum): Select the number of high-tech enterprises in provinces and cities (measure the logarithm), the aggregation of high-tech enterprises and promote the local innovation atmosphere, so as to promote

innovative development.(6) Economic development level (Pgdp): the per capita GDP is measured as a logarithm, and the regional economic situation can affect the development of high-tech industry innovation to a certain extent.

Table 2. Weights of indicators at all levels of science and technology finance

Level 1 indicators	Secondary indicators	weight	Level 3 indicators	weight
Technology finance	Public technology and financial resources	15.80%	Size of government guide fund (one million)	4.75%
			The proportion of science and technology expenditure in local fiscal expenditure	11.05%
	Market, science, technology and financial resources	50.69%	Early Venture capital / VC / PE turnover (million)	16.24%
			Science and Technology Business Incubator Incubation Fund (1,000 yuan)	13.24%
			Financial fund support for mass maker space (1,000 yuan)	11.54%
			Balance of the small loan company (RMB 100 million yuan)	5.40%
			Loan balance of banking financial institutions (RMB 100 million yuan)	4.27%
			Number of venture capital institutions	13.00%
	Technology and financial environment	33.51%	The number of science and technology business incubators	7.91%
			Number of maker Spaces	10.34%
			Number of small-loan companies	2.26%

3.1.4. Threshold Variable

Absorption capacity of high-tech industries: previous studies chose the input intensity of R & D funds as the agent index to measure the absorption capacity of enterprises [6]. However, due to the intensity of R & D funding, it is difficult to measure the integration ability of foreign knowledge and

technology and the utilization efficiency of technology finance. Therefore, this paper selects the sum of technology transformation expenditure, technology introduction expenditure, absorption expenditure and domestic technology expenditure (logarithmic) to measure the absorption capacity of high-tech industry (Aa). Descriptive statistics for each variable are shown in Table 3.

Table 3. Descriptive statistics

variable	Variable meaning	observed value	mean	standard error	least value	crest value
<i>IA</i>	innovation ability	240	0.067	0.136	0.0001	0.994
<i>TF</i>	Technology finance	240	0.118	0.132	0.003	0.640
<i>Open</i>	open door to the outside world	240	6.824	1.375	3.401	10.220
<i>Peo</i>	human capital	240	0.021	0.005	0.009	0.041
<i>Gov</i>	Government scale	240	0.267	0.113	0.119	0.753
<i>Int</i>	informatization	240	0.074	0.059	0.020	0.290
<i>Sum</i>	High-tech industries cluster together	240	4.934	1.538	0.693	8.967
<i>Pgdp</i>	economic development	240	10.869	0.423	10.036	12.013
<i>Aa</i>	absorbing capacity	240	10.911	2.121	0.000	15.612

3.2. Model Design

In order to study the influence of science and technology finance on the innovation ability of high-tech industry, this paper constructs a basic regression model (1), *IA* is the innovation ability of high-tech industry, *TF* is regional science and technology finance, β is the core parameter, if β is positive, science and technology finance has a positive impact on the innovation ability of high-tech industry; *Controls* is a series of control variables, including opening up, human capital, government scale, information level, high-tech enterprise aggregation and economic development. μ_i For the province fixed effect, μ_t For the year-fixed effect, ε_{it} For error terms.

$$IA_{it} = \alpha_0 + \beta_0 TF_{it} + \beta_1 Controls + \mu_i + \mu_t + \varepsilon_{it} \quad (1)$$

In this study, the threshold model was used to investigate the non-linear influence of technology finance on the innovation capacity of high-tech industry under the Bootstrap method was used to determine the threshold value based on data characteristics. In this paper, a single threshold model,

see Equation (2), where q_{it} is the absorption capacity of the threshold variable, $I(\cdot)$ is an indicator function, indicating that 1 takes 1 when the condition is established, and otherwise 0 takes.

$$IA_{it} = \alpha_0 + \beta_0 TF_{it} I(q_{it} < \delta) + \beta_1 TF_{it} I(q_{it} \geq \delta) + \beta_2 Controls + \mu_i + \mu_t + \varepsilon_{it} \quad (2)$$

In addition, considering that there may be multiple thresholds for the absorption capacity of high-tech industries, the multi-threshold model (3), including $\delta_1, \delta_2, \dots, \delta_n$. For the multiple thresholds for the absorption capacity.

$$IA_{it} = \alpha_0 + \beta_0 TF_{it} I(q_{it} < \delta_1) + \beta_1 TF_{it} I(\delta_1 \leq q_{it} < \delta_2) + \dots + \beta_n TF_{it} I(q_{it} \geq \delta_n) + g Controls + \mu_i + \mu_t + \varepsilon_{it} \quad (3)$$

3.3. Data Description

This study used the panel data of 30 provinces and cities from 2013 to 2020 (Tibet data lack of serious, be removed), among them, the high technology industry and regional related data from the China statistical Yearbook, China high technology statistical Yearbook, China science and technology statistical Yearbook, technology financial related data from the China torch statistical Yearbook, China financial statistical Yearbook and qing division private

database, panel data since 2013 because the China torch statistical Yearbook statistics regional science and technology business incubator data. In addition, it is worth noting that the balance data of small loan companies and small loan companies are only updated to 2019. In order to meet the research needs, this paper calculates the number of small loan companies and the balance of small loan companies in 2020 based on the average annual growth rate of the variables from 2013 to 2019.

4. Empirical Results and Analysis

4.1. Measurement and Analysis of the Science and Technology Financial Index

From 2013 to 2020, the comprehensive level of science and technology finance in all provinces and cities has been steadily improved, which is consistent with the level of China's economic development. The average index of science and technology finance in all provinces and cities is shown in Table 4. Guangdong province, Beijing City and Jiangsu Province and other regions with strong economic development ability of science and technology and finance

development index are also higher. Most provincial and municipal governments maintain the overall development of science and technology finance, market science and technology finance and science and technology financial environment in a balanced state, but some regional development is not coordinated. For example, in Guizhou province, the market science and technology finance rank the eighth, but the total index of science and technology finance ranks in the 20th.

The richness of technology and financial resources in the market fails to drive the overall development of science and technology finance. Therefore, this type of city needs to give full play to the advantages of local characteristic resources to further promote the development of the comprehensive level of science, technology and finance. In addition, the level of science and technology finance between regions also varies significantly. The level of science and technology finance in the eastern region is better than that in the central and western regions. This may be because the eastern region has strong economic strength and financial resources, and has more advantages in the development policies and talent training related to science and technology finance.

Table 4. The average technology financial index of 4 30 provinces and cities

province	synthesize	ranking	public	ranking	market house	ranking	environment	ranking
Guangdong	0.412	1	0.075	2	0.165	3	0.172	1
Beijing	0.395	2	0.094	1	0.193	1	0.108	3
Jiangsu	0.374	3	0.042	4	0.178	2	0.154	2
Zhejiang	0.294	4	0.043	3	0.150	4	0.102	4
Shanghai	0.254	5	0.038	5	0.127	5	0.088	5
Shandong	0.173	6	0.024	10	0.076	6	0.074	6
Hubei	0.122	7	0.024	9	0.052	9	0.045	9
Anhui	0.119	8	0.033	6	0.040	11	0.045	8
Shaanxi	0.106	9	0.014	15	0.057	8	0.035	14
Sichuan	0.104	10	0.016	14	0.046	10	0.041	10
Chongqing	0.102	11	0.008	24	0.062	7	0.031	15
Hebei	0.095	12	0.008	26	0.029	16	0.058	7
Fujian	0.093	13	0.019	11	0.033	14	0.040	12
Henan	0.087	14	0.016	13	0.036	12	0.035	13
Tianjin	0.083	15	0.030	7	0.025	18	0.028	19
Liaoning	0.081	16	0.009	22	0.030	15	0.041	11
Hunan	0.072	17	0.011	20	0.036	13	0.025	21
Jiangxi	0.067	18	0.019	12	0.028	17	0.020	25
Shanxi	0.060	19	0.013	17	0.019	21	0.029	16
Guizhou	0.058	20	0.026	8	0.015	22	0.017	26
NeiMengu	0.055	21	0.005	28	0.024	19	0.025	20
Guangxi	0.053	22	0.012	18	0.019	20	0.022	23
Gansu	0.052	23	0.010	21	0.014	23	0.028	17
Jilin	0.047	24	0.006	27	0.013	25	0.028	18
Yunnan	0.045	25	0.012	19	0.013	24	0.020	24
Heilongjian	0.039	26	0.004	29	0.013	26	0.022	22
Xinjiang	0.038	27	0.013	16	0.011	27	0.014	27
Ningxia	0.017	28	0.009	23	0.003	30	0.005	28
Hainan	0.017	29	0.008	25	0.006	29	0.003	30
Qinghai	0.014	30	0.003	30	0.008	28	0.004	29
east	0.206	1	0.035	1	0.092	1	0.079	1
middle	0.077	2	0.016	2	0.030	2	0.031	2
west	0.059	3	0.012	3	0.025	3	0.022	3

4.2. Benchmark Regression

The influence of science and technology finance on the innovation ability of high-tech industry is shown in Table 5, and column (1) to column (7) is the estimation results of adding other control variables successively after controlling the fixed effect of the province and the annual fixed effect.

Column (7) shows that the impact of science and technology finance on the innovation ability of high-tech industry is significantly positive at the level of 1%, indicating that the development of regional science and technology finance level is conducive to promoting the growth of the innovation ability of high-tech industry. In addition, among the control variables, the aggregation of human capital and high-tech enterprises

has a significant influence on the innovation ability of high-tech industry, proving that the more abundant human capital in the region, the more innovative talents that high-tech enterprises can attract and promote the innovation ability of

high-tech industry, while the aggregation of high-tech enterprises can create a good innovation environment, reduce the cost of attracting talents or social capital, and thus promote the innovation ability of high-tech industry.

Table 5. Benchmark regression

variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>IA</i>	<i>IA</i>	<i>IA</i>	<i>IA</i>	<i>IA</i>	<i>IA</i>	<i>IA</i>
<i>TF</i>	0.493** (2.39)	0.495** (2.36)	0.542** (2.51)	0.546** (2.51)	0.550** (2.48)	0.485*** (2.96)	0.507*** (3.03)
<i>Open</i>		0.003 (0.38)	0.002 (0.31)	0.003 (0.40)	0.002 (0.28)	0.001 (0.11)	0.003 (0.42)
<i>Peo</i>			5.450 (1.54)	5.399 (1.50)	4.866 (1.58)	3.647 (1.65)	4.900* (1.82)
<i>Gov</i>				-0.082 (-1.13)	-0.078 (-1.10)	0.081 (0.72)	-0.054 (-0.42)
<i>Int</i>					0.085 (0.54)	0.005 (0.05)	-0.005 (-0.05)
<i>Sum</i>						0.043** (2.15)	0.047** (2.12)
<i>Pgdp</i>							-0.135 (-1.20)
<i>Province</i>	YES	YES	YES	YES	YES	YES	YES
<i>Year</i>	YES	YES	YES	YES	YES	YES	YES
<i>Constant</i>	0.022 (1.45)	0.003 (0.04)	-0.097 (-0.89)	-0.079 (-0.76)	-0.066 (-0.75)	-0.271* (-1.79)	1.135 (1.09)
<i>sample capacity</i>	240	240	240	240	240	240	240
<i>R</i> ²	0.568	0.568	0.580	0.581	0.583	0.650	0.666

Note: *, ** and *** are significant at the 10%, 5% and 1% levels, respectively, and robust standard error is used for all regression with t values in parentheses, the same below.

4.3. Robustness Test

Table 6. The robustness tests

variable	Change of the explained variable	Excluding municipalities	The 2020 sample was removed
	<i>Inv</i>	<i>IA</i>	<i>IA</i>
<i>TF</i>	2.798*** (2.86)	0.597*** (3.75)	0.434** (2.67)
Controls	YES	YES	YES
Province	YES	YES	YES
Year	YES	YES	YES
<i>Constant</i>	3.339 (0.44)	0.774 (0.80)	0.618 (0.77)
N	240	208	210
<i>R</i> ²	0.605	0.737	0.644

In order to verify the effectiveness of science and technology finance on the innovation ability of high-tech industry, this paper uses three ways to test the robustness, as shown in Table 6. One is to replace explained variables, invention patent has more stringent audit conditions, more can represent the actual innovation ability of the enterprise, so use per million high technology industry invention patent applications (*Inv*) as a measure of high technology industry innovation ability, to parameter estimation, the results show that the influence coefficient of financial innovation ability is positive, and at the level of 1%, proved robust conclusion. Second, excluding municipalities directly under the Central Government, compared with other provinces, although the quality of resources, but the quantity is less than that, so excluding 4 municipalities directly under the Central Government for reestimate, the coefficient of science and technology finance is still significantly positive, proving that the conclusion is stable. Third, excluding the 2020 sample, due to the impact of the epidemic, the innovation capacity of

high-tech enterprises and the regional level of technology and finance may be subject to external shocks, resulting in some deviation of the data. Therefore, this paper shortened the sample time to 2019, and the results are still robust.

4.4. Heterogeneity Test

The heterogeneity test is shown in Table 7. For the regional consistency of the impact of technology and finance on high-tech industries, etc. Column (1), (2) and (3) are the estimated results of eastern, central and western respectively. Among them, the science and technology finance in the eastern region has significantly promoted the development of the innovation ability of the high-tech industry at the level of 1%. Although the science and technology finance of the central region is positive to the innovation ability of the high-tech industry, it is not significant, indicating that the science and technology finance in the central region has not played a significant role in promoting the innovation ability of the high-tech industry. The influence of science and technology finance in western region on the innovation ability of high-tech industry is significantly positive at the level of 10%, which proves that science and technology finance in western region is conducive to the development of the innovation ability of high-tech industry to a certain extent. Regional heterogeneity test shows that the financial technology of high technology industry presents the eastern strongest, western, central weaker, possible reason is that the eastern region for the coastal cities, transportation, economic development and foreign trade conditions better, science and technology foundation and financial foundation also to a certain extent is better than the Midwest, the efficient allocation of financial resources to reduce the eastern high-tech enterprise financing costs, provides the high technology industry requires external innovation resources, which can foster more high and new technology enterprises, promote the development of high-

technology industry innovation ability. Compared with the eastern and central regions, the development of the high-tech industry in the western region is slightly weaker, and it started late. The innovation ability of the high-tech industry has a high space for improvement. Therefore, the marginal improvement ability of the science and technology finance in the western region to the high-tech industry is relatively significant. Although the central region technology financial average development level is higher than the western region, but due to the local high technology industry has considerable scale, the existing financial resources of science and technology cannot obviously promote the development of high technology industry innovation ability, so the central region of science and technology financial promoting high technology industry innovation ability is not obvious, need to further improve.

According to the ownership background of high-tech enterprises, high-tech enterprises are divided into state-owned high-tech enterprises and private high-tech enterprises, so as to test the role of science and technology finance in promoting the innovation ability of high-tech enterprises with different attributes. The influence of technology finance on the innovation ability of state-owned high-tech industries is

positive, but not significant, indicating that the innovation ability of state-owned high-tech enterprises, and the influence of technology finance on the innovation ability of private high-tech enterprises is significantly positive at 1%, which proves the promotion effect of technology finance on private enterprises. Compared with state-owned enterprises and private enterprises, With much better resources, Also more likely to get preferences from policies such as government, The impact of science and technology finance on the innovation ability of high-tech enterprises is externally driven, High-tech enterprises with state-owned background have a low urgent demand for external technology and financial resources, Lead to science and technology finance is difficult to promote the development of the innovation ability of state-owned high-tech enterprises; In contrast to it, Private enterprises have a relatively weak resource base, Higher demand for external technology and financial resources, And private enterprise managers will have more tolerance for external risks, Will be more receptive to external technology and financial resources, Therefore, the influence of science and technology finance on the innovation ability of private high-tech enterprises is more obvious.

Table 7. Shows the tests of heterogeneity

variable	Region			Enterprise ownership background	
	east	centre	west	belong to the state	privately operated
	(1)	(2)	(3)	(4)	(5)
TF	0.419*** (3.77)	0.111 (1.56)	0.108* (2.00)	0.077 (0.63)	0.369*** (2.95)
Controls	YES	YES	YES	YES	YES
Province	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES
Constant	0.662 (0.43)	-0.075 (-0.26)	-0.403 (-1.25)	-2.018** (-2.67)	0.646 (0.81)
N	88	64	88	240	240
R ²	0.798	0.899	0.703	0.268	0.666

4.5. The Threshold Effect Test

The uptake capacity of high-tech industries as the threshold variable was sampled for 500 times using Bootstrap, and the results are shown in Tables 8 and 9. The results showed that the model of the single threshold was 0.002, which passed the significance test. It shows that under the absorption ability of high-tech industry, the technology and finance have a single threshold effect on the innovation ability of high-tech industry. However, the p values of double threshold and triple threshold

were 0.458 and 0.972 respectively, which failed the test, indicating that under the absorption ability of high-tech industry, there is no double threshold effect and triple threshold effect of high and technology finance on the innovation ability of high-tech industry. In the model with absorbability as the threshold variable, the estimated results of the threshold values and the 95% confidence intervals are shown in the table. The single threshold value for absorption capacity was 12.974 and was in a 95% confidence interval [12.925,12.989].

Table 8. Test of the threshold effect

The threshold variable	model	F price	P price	critical value		
				1%	5%	10%
Aa	A single threshold	74.69***	0.002	53.533	32.975	24.919
	Double threshold	7.48	0.458	97.631	63.316	35.113
	Triple threshold	1.32	0.972	31.806	19.469	14.351

Table 9. Test of threshold values

model	Threshold estimate	And the 95% confidence interval
A single threshold	12.974	[12.925,12.989]
Double threshold	12.974	[12.925,12.987]
	12.659	[12.566,12.688]
Triple threshold	8.917	[8.862, 8.997]

The results of the single threshold panel regression with absorptive capacity as the threshold variable are shown in Table 10. The results show that the influence of technology finance on the innovation ability of high-tech industry has a significant nonlinear relationship. When the absorption capacity is less than 12.974, the influence coefficient of science and technology finance on the innovation capacity of high-tech industry is 0.286, significant at the level of 5%; When the absorption capacity is greater than 12.974, the influence coefficient of science and technology finance

increases to 0.546, significant at the level of 1%. The above results prove that the positive influence of high-tech industry will be strengthened when the absorption capacity reaches a certain degree. The absorption capacity of high-tech industries can not only help enterprises to identify, integrate and use external knowledge for innovation, but also help enterprises to make efficient use of external technology and financial resources. Therefore, when the absorption capacity of high-tech industry crosses the threshold value, the role of science and technology finance in promoting the innovation capacity of high-tech industry will be further enhanced.

Table 10. For threshold effect regression

variable	coefficient	t price
<i>TF (Aa<12.974)</i>	0.286**	(2.38)
<i>TF (Aa≥12.974)</i>	0.546***	(4.04)
<i>Open</i>	0.005	(1.07)
<i>Peo</i>	3.039*	(1.71)
<i>Gov</i>	0.005	(0.05)
<i>Pgdp</i>	-0.073	(-0.81)
<i>Int</i>	-0.089*	(-1.78)
<i>Sum</i>	0.037**	(2.36)
<i>Constant</i>	0.542	(0.63)

5. Conclusion and Revelation

Based on the influence of science and technology finance on the innovation ability of high-tech industry from 2013 to 2020, this paper shows that the study shows that: (1) science and technology finance has a positive impact on the innovation ability of high-tech industry, and can promote the innovation ability of high-tech industry through direct and indirect driving.(2) There is regional heterogeneity in the influence of science and technology finance on the innovation ability of high-tech industries, and the effect in promoting the innovation ability of high-tech industries in the eastern region is stronger than that in the central and western regions.(3) The influence of the innovation ability of high-tech industry of science and technology finance has the heterogeneity of enterprise ownership background, and the effect of promoting the innovation ability of private high-tech industry is better than that of state-owned high-tech industry.(4) Under the influence of the absorption capacity of high-tech industry, the influence of science and technology finance on the innovation capacity of high-tech industry presents the threshold effect. When the absorption capacity crosses the threshold value, the promoting role of science and technology finance on the innovation capacity of high-tech industry will be further strengthened.

Based on the above conclusions, this paper proposes the corresponding countermeasures and suggestions. (1) Promote the development of regional science and technology and finance. Give full play to the signal effect and guiding effect of public science and technology finance, improve the risk tolerance for the development of science and technology financial system, reduce the supervision level of science and

technology financial system, so as to enhance the role of promoting the innovation ability of high-tech industry. (2) Give full play to the advantages of regional characteristic technology and finance. Public science and technology finance, government finance and technology finance has the ability of coordinated development, therefore, regions to promote local advantages of science and technology financial resources to promote the development of science and technology, to point with surface, comprehensive improve local public financial resources of science and technology, market financial resources and financial environment of science and technology, and enhance the comprehensive development level of finance of science and technology.(3) Enhance the tilt of science and technology financial resources to private high-tech industries. Private high-tech enterprises have a higher demand for and acceptance of science and technology financial resources. Therefore, they should encourage science and technology financial resources to further flow into private high-tech industries to maximize the support effect of science and technology finance on high-tech industries. (4) Optimize the support mode of science and technology finance for high-tech industries. The government should play a guiding role in providing support to high-tech industries with different levels and thresholds, encourage high-tech industries to improve their absorption capacity, and enhance the utilization efficiency of high-tech industries in science and technology finance.

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