Research on the Innovative Performance of Credit Financing in New Generation Information Technology Industry

Sirui Wu

Finance, South China Agriculture University, Guangzhou, 510000, China
18819046147@163.com

Abstract. At present, there are still some problems in the financing process of China's new-generation information technology industry. Regional heterogeneity in the scale of exogenous financing, long-term loans tilted toward medium and large enterprises, and fiscal policies that set limits on enterprises' access to bank loans. The empirical results show that long-term credit loans and mortgage loans from banks have a significant role in promoting the innovation performance of the new generation of information technology industry, while the other explanatory and explanatory variables are not correlated. Based on this, banks need to strengthen the investment of long-term credit and mortgage loan funds to the new generation information technology industry in order to improve the performance of the use of funds.

Keywords: New-generation information technology industry; innovation; bank; upgrading.

1 Introduction

New-generation information technology industry is the leading industry of China's economic development, which is an important guarantee for the realization of “Network Power” and “Intelligent Manufacturing Power”, covering various industries such as artificial intelligence, big data, cloud computing, AI, etc. From 2012 to 2023, the output value of new-generation information technology industry has increased from 7 trillion yuan to 16.39 trillion yuan, with an average annual growth rate of 7% [1]. The rapid development of new-generation information technology industry needs a large amount of financial support, and China's financial system is currently dominated by banks, whose credit funds can largely promote industrial upgrading and innovation, and support the development of initial technological innovation of some start-up enterprises.

K. Zhang et al. (eds.), *Proceedings of the 2024 3rd International Conference on Economics, Smart Finance and Contemporary Trade (ESFCT 2024)*, Advances in Economics, Business and Management Research 305,
https://doi.org/10.2991/978-94-6463-548-5_22

2 Literature Review

From the literature in recent years, the research direction and content of scholars mainly focus on the impact of financial subsidies on the performance of the new generation of information technology industry, the impact of enterprise patents on the new generation of information technology industry and the impact of bank loans on the new generation of information technology industry[2].

Enterprise innovation is the driving force of the real economy and a key driver of enterprise competitiveness[3]. Patents are an important form of technological innovation for enterprises, and as the number of patent citations increases, the short-term performance of enterprises will improve, while the long-term performance improvement of enterprises is more related to the quality improvement of patents [4]. showed that the number of patents and patent citations are correlated with future firm performance.

The development of new-generation information technology industry cannot be separated from the support of capital, when the enterprise is in the development stage, it is difficult to support the development of the enterprise only by internal financing, therefore, external financing, especially the indirect financing of the bank to the enterprise has become an important way for the enterprise to obtain capital [5]. Margaritis and psillaki (2009)[6] found a significant increase in the efficiency of the enterprise with higher bank loans, controlling for equity structure and the effect of equity type in a sample of French enterprises. Margaritis and psillaki (2009)[6], using a sample of French firms and controlling for the effects of shareholding structure and shareholding type, find that firms with higher bank loans are significantly more efficient. Meanwhile, Xu et al. (2020)[7] studied a sample of Chinese listed PV firms from 2007-2017, and finally showed that restricting firms' access to bank loans significantly reduces firms' performance. To improve the efficiency of industrial financing should be diversified program design, reduce the degree of information asymmetry of the bank; actively develop the bond market, innovative financing tools .

Existing literature mostly focuses on the role of bank credit capital in promoting the performance of the IT industry, but does not distinguish the differences in credit maturity structure. Harhoff & Scherer (1997)[8] argue that although patents have limitations as a measure of firms' innovation performance, there is no better alternative, and patent statistics are still the most commonly used indicator. Therefore, this paper randomly selects 500 samples and retains 313 samples after screening to study the impact of the differences in credit term structure on the innovation performance of the new generation of information technology industry.

China's new-generation information technology industry covers a wide range of industries, and the strength of bank credit support for small, medium and large enterprises varies. Table 1 shows the 15 randomly selected companies in the sample, and it can be seen that 11 of the 15 selected companies have long-term loans much larger than short-term loans. The five companies with the highest innovation performance in the past three years are BOE A (Beijing) with 5,028 patents, NDT (Fujian) with 4,025 patents, China Unicom (Beijing) with 3,303 patents, Hohua (Sichuan) with 612 patents, and SMIC (Shanghai) with 522 patents. The five companies with the lowest innovation

performance are Sun Cable (Fujian Province) with 19 patents, Runhe Software (Jiangsu Province) with 34 patents, Chuan Da Zhisheng (Sichuan Province) with 36 patents, Dagang (Jiangsu Province) with 49 patents, and Zhongfutong (Fujian Province) with 56 patents. Three of the five sample companies with the highest innovation performance are located in first-tier cities, while the five companies with the lowest performance are not located in first-tier cities, and the number of long-term bank loans for the five companies with higher performance is significantly larger than the number of short-term loans. This suggests that banks in larger cities with better economic development are more willing to grant long-term loans.[9]

Further analysis in Table 1 shows that smaller capitalized firms receive more short-term loans, while larger capitalized firms receive more long-term loans, suggesting that a stable period of growth increases the bank's confidence in the firm and its willingness to lend for the long term.

Table 1. Credit financing for the new-generation information technology industry.

corporations	year	Short-term loans ($ million)	Long-term loans ($ million)	Total capital at the end of the year ($ million)	Number of patents granted (number)
Ningde Times	2022	4,228,756.63	5,714,509	60,095,235.19	2369
	2021	2,572,009.77	2,329,514.5	30,766,686.09	1024
	2020	805,860.28	658,067.62	15,661,842.69	632
Saiwu technology	2022	56,827.25	47,832.86	497,430.16	60
	2021	44,690.38	33,663.96	474,734.7	36
	2020	30,603.51	22,940.78	327,633.9	20
Tomfool Microelectronics	2022	423,106.8	516,112.22	3,562,942.83	143
	2021	362,702.71	317,860.9	2,710,106.62	99
	2020	328,058.84	132,363.2	2,123,075.11	91
Changdian Technologies, Inc.	2022	117,366.15	574,302.56	3,940,773.17	119
	2021	219,313.61	574302.56	3,709,861.89	108
	2020	528,840.31	538134.47	3,232,819.62	154
Runho Software	2022	27,360	44,919.83	480,523.22	9
	2021	24,900	47,962.76	441,369.49	0
	2020	36,000	44,763.76	432,387.91	25
China Unicom	2022	50,210.55	219,579.37	64,468,702.76	1593
	2021	38,526.46	220,650.78	59,328,447.99	1161
	2020	74,000	290,101.18	58,247,543.04	549

BOE A	2022	28,243.26	11,140.11	42,056,786.59	1490
	2021	18,069.83	16,033.13	45,023,260.34	2020
	2020	45,29.84	6,504.87	42,425,680.63	1518
Qianzhao Optoelectronics	2022	46,533.74	95,242.64	701,525.27	79
	2021	60,332.62	90,441.84	607,379.8	73
	2020	56,880.39	95,958.18	621,365.79	83
Hao Hua Technology	2022	87,746.39	117,519.19	1,542,490.7	184
	2021	27,197	40,611.1	1,165,785.13	216
	2020	10,480	38,900	1,000,708.75	212
Dagang Corporation	2022	24,430.17	24,000	442,615.02	20
	2021	31,156.48	28,000	445,534.39	19
	2020	56,170	32,778.1	999,036.58	10
Shanghai silicon industry	2022	9697.71	179,377.97	2,546,260.64	53
	2021	29655.13	198,033.03	1,625,671.27	54
	2020	50008.04	162,602.21	1,449,850.73	85
Semiconductor Manufacturing International Corporation (SMIC)	2022	451938.3	5,115,560.6	30,510,369.1	201
	2021	108245.8	3,541,127.5	22,993,280.6	109
	2020	295678.6	409,399.6	20,460,165.4	212
sunspot cable	2022	639255.88	48,153.4	540,783.92	4
	2021	503332.11	59,800	437,742.46	11
	2020	483532.46	54,058.14	400,920.75	4
Nakatomi	2022	54133.49	6,498.6	270,960.43	22
	2021	49227.63	1,581.05	273,831.11	23
	2020	32156.33	8,642.86	197,693.45	11
Sichuan University Wisdom	2022	2867.63	8,910.89	175,118.15	10
	2021	1590.98	6,000	180,609.18	20
	2020	1184.5	3,000	179,719.64	6

Source: Annual reports of enterprises

Theoretically, long-term loans are better able to promote firm growth for the following reasons: first, long-term loans provide a stable source of capital, which allows firms to plan and invest for the long term. This stability reduces the risk of interrupting a project due to lack of funds, and helps enterprises achieve sustained growth[10].

Meanwhile, from a broader perspective, long-term loans increase the capital abundance of an enterprise, which reduces the pressure on the cash flow of an enterprise compared to short-term loans, and can improve efficiency while reducing the risk of an enterprise. Second, long-term loans have a longer repayment cycle, which can fully link the enterprise's long-term research and development and fixed assets and other project investment needs, and long-term credit usually has a lower interest rate, because the lender can share the risk through a longer term. This reduces an enterprise's financing costs and increases its profitability, which in turn allows it to have more funds for reinvestment and expansion. Third, long-term loans allow firms to make large-scale capital expenditures, such as building new plants, purchasing new equipment, and conducting research and development. These investments usually require a long payback period and therefore require long-term financial support. Long-term credit is of strategic importance to the innovative business performance of China's enterprises and to their sustainable production capacity.

Therefore, in order to verify the impact of credit of different maturities on the innovation performance of the new generation of information technology industry in China, the following empirical study is conducted with the five-year data of 313 sample enterprises as panel data.

By analyzing the loan structure of the four major banks in China, it can be seen that the loan funds provided by Bank of China, Agricultural Bank of China, China Construction Bank and Industrial and Commercial Bank of China for the new generation of information technology industry are mainly classified into credit loans, guaranteed loans, mortgages and pledged loans, and each type of loan is divided into two types of maturities: long-term and short-term. Therefore, this paper takes short-term and long-term loans as the basis of explanatory variables, and at the same time subdivided long-term and short-term loans into eight explanatory variables: long-term and short-term credit loans, guaranteed loans, mortgage loans and pledged loans, and chose total equity as the control variable to analyze its impact on the innovation performance of new generation information technology industry (Table 2).

Table 2. Indicator design and definitions.

variable	norm	coding
explanatory variable	Number of patents granted	PN
explanatory variable	Short-term credit facilities	SL1
	Short-term secured loans	SL2
	short term mortgage	SL3
	short term pledge loan	SL4
	Long-term credit facilities	LL1
	Long-term secured loans	LL2
	Long-term mortgages	LL3
	Long-term pledge loans	LL4
control variable	Total share capital (shares)	TSC

Since the study is based on six consecutive years of 313 sample companies, there are 1878 observations for each of the 11 indicators, which are analyzed by STATA.15 econometric software and the results of variable analysis are shown in Table 3.

Table 3. Description of variables.

variable	mean	standard deviation	minimum value	maximum values	Number of observations
corp	157	90.37892	1	313	1878
year	2019.5	1.70828	2017	2022	1878
PN	38.21512	116.7842	0	2369	1878
SL1	14488.41	51336.41	0	1106300	1878
SL2	14132.22	46026.83	0	657628.1	1878
SL3	2900.954	12315.19	0	212591.6	1878
SL4	4120.239	29107.91	0	612921.5	1878
LL1	6304.449	76934.112	0	2787216	1878
LL2	6659.333	64125.59	0	2412400	1878
LL3	4403.056	26338.53	0	503809.3	1878
LL4	2119.502	14151.04	0	261820.9	1878
TSC	5,14e+08	8.79e+08	0	9.43e+09	1878

As can be seen from the maximum and mean values in the table, for the strategic new-generation IT industry, the financing model is mainly based on long-term loans.

3 Model Validation and Empirical Results

This paper constructs an empirical research model as follows:

$$PN = \beta_0 + \beta_1 SL1 + \beta_2 SL2 + \beta_3 SL3 + \beta_4 SL4 + \beta_5 LL1 + \beta_6 LL2 + \beta_7 LL3 + \beta_8 LL4 + \varepsilon \quad (1)$$

After analyzing the above data through STATA.15 econometric software, the empirical results can be obtained as shown in Table 4.

Table 4. Empirical findings.

PN	Coef.	Std. Err. t	t	P>|t|	[95% Conf. Interval]
SL1	0.0000453	0.0000414	1.09	0.274	-0.000359 0.0001264
SL2	0.0000265	0.0000449	0.59	0.554	-0.0000615 0.0001146
SL3	-0.0000476	0.0001278	-0.37	0.709	-0.0002984 0.0002031

SL4	0.0000931	0.0000664	1.40	0.161	-0.0000371 0.0002234
LL1	0.0006906	0.0000419	16.49	0.000	0.0006805 0.0007728
LL2	4.62e-06	0.0000426	0.11	0.914	-0.0000789 0.0000881
LL3	0.0001883	0.0000775	2.43	0.015	0.0000363 0.0003403
LL4	0.000151	0.0001225	1.23	0.218	-0.0000893 0.0003913
TSC	7.91e-08	5.52e-09	14.32	0.000	6.83e-08 9.00e-08
_cons	-6.406066	2.949387	-2.17	0.030	-12.19126 -0.6208707

Prob > F = 0.0000

From the P-value, the parameters in the econometric analysis are quite significant on the whole. From the value of P>|t|, at the 5% level of significance, there is a significant positive correlation between the indicators of Long-term Credit Loan LL1 and Long-term Mortgage Loan LL2 and the explanatory variable of the number of patents granted PN, that is to say, the other variables are not correlated with the explanatory variables.

4 Robustness Check

In order to test the endogeneity problem, this paper processed the indicator data for testing, and the results are shown in Table 5.

Table 5. Robustness Tests.

variable	VIF	1/VIF
LL1_std	4.38	0.228429
LL2_std	4.24	0.236050
SL1_std	1.85	0.541161
LL3_std	1.69	0.590285
SL2_std	1.66	0.601418
SL4_std	1.32	0.756087
LL4_std	1.30	0.770597
SL3_std	1.25	0.801305
Mean VIF	2.21	64125.59

From Table 5, it can be seen that the VIF values of the explanatory variables are less than 5, therefore, the empirical results of this paper are robust.

5 Conclusions

Based on the analysis of the current situation of China's new-generation information technology (IT) industry, banks are more inclined to long-term loans for the new-generation IT industry, especially long-term credit loans and long-term mortgage loans. Long-term credit also has a more significant impact on the innovation performance of the new generation of information technology industry.

From the empirical results, it can be seen that long-term bank loans have more significant support for the innovation of the new generation of information technology industry. Compared with short-term credit, long-term credit financing is more focused on providing stable and long-term financial support for enterprises. Long-term credit is mainly provided by commercial banks, long-term credit banks, life insurance companies and other financial institutions, and is financed by long-term deposits and insurance premiums of depositors and policyholders. Long-term loans are characterized by longer terms, higher interest rates and higher risks. For the new-generation IT industry, long-term credit is a stable and long-term capital, which can support long-cycle innovation and R&D more consistently and firmly, and improve the core competitiveness of the industry. In addition, bank credit can also benefit from the development of the new-generation information technology industry, and the innovative technology of the industry can feed back to the banking system and promote the innovation of the banking system, so the two are mutually complementary.

Short-term credit mainly meets the short-term financial needs of enterprises, such as paying for short-term turnover of companies and emergency financing. Short-term credit is characterized by a short loan period, simple forms and relatively loose post-loan management. This kind of financing has certain positive significance. On the one hand, short-term credit can provide enterprises with timely financial support and help them solve short-term financial difficulties, so as to ensure the normal operation of enterprises and the smooth progress of innovative activities. On the other hand, the flexibility of short-term credit enables enterprises to flexibly adjust the loan amount and repayment period according to their own business situation and market changes, so as to better meet the capital demand of innovation activities. However, short-term credit financing also has certain limitations. Due to the short loan period, enterprises may face greater repayment pressure, which to a certain extent limits their investment in innovative activities. In addition, the interest cost of short-term credit may be relatively high, which increases the financial burden of firms. Therefore, the empirical results show that short-term credit does not support innovation in the new-generation IT industry.

6 Policy Recommendations

6.1 Strengthening Policy Guidance and Advocacy

The government should introduce clear policies to encourage financial institutions to increase credit support for industrial innovation, and publicize the importance of in-

dustrial innovation and credit support policies through various channels to enhance the confidence of financial institutions and enterprises. The government should also establish a sound credit risk compensation mechanism for industrial innovation and reduce the risk of financial institutions.

6.2 Guiding the Optimization of the Efficiency of Credit Utilization

Financial institutions should streamline the credit approval process and improve the efficiency of approval, so as to ensure that industrial innovation projects can obtain funding support in a timely manner. At the same time, information technology means should be utilized to establish an online application and approval system to achieve automation and rapid approval. Financial institutions should strengthen internal communication and collaboration to ensure efficient allocation of credit resources to industrial innovation projects. An internal collaboration platform can be set up and regular working meetings can be held to realize information sharing and collaborative work.

6.3 Strengthening the Virtuous Circle of the Credit Industry

Establish an comprehensive credit industry service system covering policy consultation, financing services, legal support and so on, so as to provide a whole chain of service support for industrial innovation. Encourage industries and financial institutions to establish close cooperative relationships and jointly develop innovative financial products and services to meet the diversified financing needs of industrial innovation. At the same time, a credit industry information sharing platform can be established to realize information sharing and exchange among industries, financial institutions and the government, so as to improve the transparency and synergy of the credit industry. Establishing a sound credit risk management mechanism, strengthening the monitoring and early warning of credit risks, and discovering and resolving potential risks in a timely manner. At the same time, it will strengthen the assessment and evaluation of the quality of credit assets to ensure the safety and soundness of credit assets.

References

1. New Generation of IT Industry --- “Digital Engine” Unleashes Powerful Momentum [EB/2.OL.2.OL]. (2022-06-02) [2023-01-11]. https://baijiahao.3.baidu.com. 3. baidu. com/s? id=1734469821594454429&wfr=spider&for 4.=pc.2022-06-02.
2. Jiang Yonghong, Yang Chun. Whether government subsidies can promote the transformation of technological innovation from “quantity” to “quality”: the threshold effect of intellectual property protection [J]. Science and Technology Progress and Countermeasures, 2023, 40(20):122-130.
3. Hu Jia. Research on the Innovative Performance of Financing Models of New Generation Information Technology Industry [A]. Journal of Hunan University (Social Science Edition), 2023, 1008-1763(2023)03-0061-11.

4. Li Qiang, Gu Xin, Hu Spy. A study on the correlation between the quantity and quality of patents and corporate performance - an empirical analysis based on Chinese GEM-listed companies [J]. Science and Technology Management Research, 2016, 36(4):5.
5. He Jia, Luo Shujing, Chen Ang. The impact of credit rationing on shadow banking: an empirical study based on entrusted loan financing in real estate industry [J]. Nankai Economic Research, 2022(12):59-78.
6. Margaritis D, Psillaki M. 2009. Capital Structure, Equity Ownership and Firm Performance[J]. Journal of Banking and Finance, 34(3): 621-632.
7. Xu L, Zhang Q, Wang K Y, Shi X P. 2020. Subsidies, Loans, and Companies' Performance: Evidence from China's Photovoltaic Industry[J]. Applied Energy, 260(C): 114280. 1-114280.10.
8. Harhoff, D, F.M. Scherer, K. Vopel. Citations, family size, opposition and the value of patent rights[J]. Research Policy, 1997,32(8): p. 1343-1363.
9. Ministry of Finance official website. Shandong Finance: Investment of 9.5 billion to drive 31.7 billion provincial old and new energy transformation.The change fund to support the accelerated development of a new generation of information technology industry [EB/OL]. [2023-01-11].http://www.mof.gov.cn/zhengwuxinxi/xinwenlianbo/shandongcaizhengxinxilianbo/202005/t20200508_3509982.htm. 2020-05-08.
10. Fan L., Sheng T., Wang Y. 2012. A study on the term structure of the economic effect of credit volume. Economic Research (1): 81-92.