Analysis on the Status quo of Government subsidies for High-tech enterprises in China

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Abstract—In order to promote technological innovation of high-tech enterprises and speed up the process of enterprise innovation, the government has issued a series of subsidy policies. Among them, government subsidies can provide direct financial support for enterprises' innovative research and development. The extent to which government subsidies cover high-tech enterprises and the use of government subsidies by enterprises have also attracted more and more attention. This article selects the high-tech companies from the Shanghai Stock Exchange and the Shenzhen Stock Exchange from 2010 to 2019, and studies the status quo of their government subsidies in terms of coverage, total distribution, use, and industries. It is found that the current high-tech companies have a high coverage of government subsidies and involve a wide range of industries, The financial support is relatively large, but different enterprises and industries are relatively unbalanced, and a relatively high proportion of government subsidies in enterprises are used for daily business activities. At the same time, it provides suggestions for the investment and utilization of government subsidies based on the research status.

1 Introduction

Government subsidy, also known as government subsidy, is the government or other public organizations directly or indirectly transfer economic interests to micro subjects, in essence, it is a means of financial transfer payment. In accounting standards, government subsidies can be divided into asset-related government subsidies or income-related government subsidies. The former refers to the government's capital input related to the formation of long-term assets of enterprises; otherwise, it is income-related government subsidies. From the expression form, the government subsidy is mainly divided into free allocation, financial discount interest, tax refund and impermanent non-monetary assets. The government subsidy studied in this paper mainly provides direct financial subsidy to enterprises in the form of free grant.

In recent years, relevant departments have successively issued policies to encourage and support high-tech enterprises to carry out innovation activities and further improve relevant policies of government subsidies, which are reflected in all aspects of research and development. Yue Hongjie and Jiang Xinsu[1] believe that government subsidies have the following characteristics: large amount, wide range of audience, and widely distributed in electronic information, biology and new medicine, new materials, new energy and energy conservation, resources and environment, etc. The form is varied and has certain sustainability. New chapter for different forms of government subsidies, Zhang Xinrong,

Liu Yi, Chen Xujiang[2] through empirical analysis that the government subsidies for different life cycle of high and new technology enterprise innovation capacity adjustment, subsidies beforehand and things will improve enterprise innovation ability, and the current and lag issue of financing constraints are restricting enterprise innovation ability. The optimal time of subsidy for enterprises in the growth period should be the event subsidy, while the optimal time of subsidy for enterprises in the mature period should be the advance subsidy. Government subsidies also help companies get more external financing. Feldman[3] proposed that government subsidies have the function of signal transmission. Enterprises receiving government subsidies mean that their R & D projects have been approved by the government after successive screening, indicating that their R&D activities are of high quality and high quality, so external funds are more assured to invest in such enterprises.

With the advent of the fourth Industrial Revolution, high-tech enterprises stand at the forefront of technological development and become an important supporting force to promote the development of national economy. Liang Laiyi, Zhang Yongping[4] through empirical research shows that the overall investment in high-tech enterprises is low, at the same time, the difference between enterprises in R & D investment is large. The government subsidy has also become an important incentive means to reduce the capital pressure and environmental pressure of high-tech enterprises'

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research and development, and to increase the support for enterprises in capital, technology, personnel and other aspects. Under this opportunity, this paper selects high-tech enterprises as samples, analyzes the status quo of government subsidy support for high-tech enterprises, and puts forward relevant Suggestions to help enterprises and investors make relevant decisions more fully and rationally.

2 Data Sources

The data samples were downloaded from the Guotai'an (CSMAR) database and the iFind database. The high-tech enterprises of Shanghai and Shenzhen A-share listed companies were selected as the research objects, and the government subsidy items in the notes to their financial statements from 2010 to 2019 were analyzed. Among them, high-tech enterprises are enterprises that have intellectual property rights and patents through the research and development of high-tech and the transformation of research and development results, and all meet the requirements of the Ministry of Science and Technology, the Ministry of Finance, and the State Administration of Taxation to jointly issue the "High-tech Enterprise Certification" Management Measures. The stipulated "products or services fall within the scope of the "High-tech Fields Supported Internationally"" and other six conditions. All sample data are true and reliable, and some data are manually calculated based on the original data or processed and analyzed using Excel and Stata.

3 Analysis on the status quo of government subsidies for high-tech enterprises

3.1 The overall coverage of government subsidies

Table 1 Coverage of government subsidies for high-tech enterprises from 2010 to 2019

Year	Observed sample size	Number of enterprises subsidized by the government	The proportion of enterprises receiving government subsidies (%)
2010	734	716	97.55
2011	1678	1647	98.15
2012	1501	1478	98.47
2013	1189	1179	99.16
2014	1829	1822	99.62
2015	1395	1389	99.57
2016	1235	1234	99.92
2017	1114	1104	99.10
2018	1114	1108	99.46
2019	1114	1105	99.19

From the statistics of the coverage of government subsidies received by high-tech enterprises, from 2010 to

2011, high-tech enterprises have grown substantially to 128.61%, and the proportion of enterprises receiving government subsidies has also exceeded 98%. Since then, they have received government subsidies from 2011 to 2019. Although the proportion of enterprises fluctuates slightly, it is relatively stable, and the coverage rate has remained above 99% since 2013, almost achieving full coverage of high-tech enterprises of listed companies. Thanks to the country's continuous improvement of the government subsidy-related policy system in recent years, in addition to direct government subsidies, subsidies are also provided in various forms, such as technology incentives, tax incentives, to provide firm policies for high-tech enterprises to carry out innovative activities Support and a good R&D environment.

3.2 Analysis of the amount of government subsidies

Table 2 Analysis of the amount of government subsidies for high-tech enterprises from 2010 to 2019

Unit of amount: million Yuan						
Year	Sample size	Total amount	Mean value	Standard deviation	kurtosis	Skewness
2010	734	35844.57	74.8	224	69.70	7.34
2011	1678	64093.86	56.2	16.1	79.38	7.73
2012	1501	79674.16	80.0	202	41.16	5.52
2013	1189	67497.27	82.5	185	34.72	5.07
2014	1829	97350.26	77.5	244	195.75	11.27
2015	1395	87594.26	90.3	265	65.35	7.16
2016	1235	67559.29	76.3	221	79.45	7.82
2017	1114	80085.15	43.4	1450	191.32	11.54
2018	1114	86080.26	46.7	161	262.46	13.57
2019	1114	96123.31	52.1	181	359.76	15.71

From the perspective of the total amount of government subsidies received by high-tech enterprises, the amount of state subsidies for high-tech enterprises from 2010 to 2019 has shown an overall upward trend. Although the number of high-tech enterprises has fluctuated in the past decade, the government's Subsidies are constantly increasing. Especially from 2010 to 2011, the total subsidy to high-tech enterprises increased by 50%. However, from the average point of view, the average amount of government subsidies received by each enterprise varies greatly from year to year. Except for the relatively small standard deviation in 2011, the standard deviation was relatively large in other years. In 2017, it even exceeded 1400. The kurtosis and skewness were both positive and showed an increasing trend. The amount is not balanced, the gap is large, and the distribution is more volatile, which is steeper than the normal distribution, and there are more extreme values.

3.3 Analysis of the use of government subsidies

Government subsidy is divided into asset - related and income - related. In which the government subsidies pertinent to assets and enterprises related to the formation of long-term assets, and the benefits and related government subsidies for compensation during or after the relevant expenses and losses have occurred, according

to the accounting standards for enterprises No.16 - government grants, which the government subsidies pertinent and enterprise daily activities, shall, in accordance with the economic business essence, included in the other gains or write-downs related costs; The government subsidies that have nothing to do with the daily activities of the enterprise shall be included in the non-business income and expenditure. Therefore, the government subsidy under the details of non-business income of high-tech enterprises and the amount of government subsidy recorded into the current profit and loss are respectively studied to analyze the use of government subsidy in enterprise business activities.

Table 3 Analysis of the amount of government subsidies included in the non-business income of high-tech enterprises from 2010 to 2019

Unit of amount: million Yuan

Year	Sample size	Total amount	Mean value	Standard deviation	kurtosis	Skewness
2010	734	12786.93	26.7	67.4	41.44	5.60
2011	1678	27416.90	24.0	71.8	107.11	8.95
2012	1501	31702.71	33.0	82.6	40.13	5.46
2013	1189	25280.84	36.0	87.2	39.02	5.47
2014	1829	36607.06	33.2	111	271.67	13.40
2015	1395	37465.96	38.6	115	77.32	7.66
2016	1235	29184.88	33.0	99.8	90.19	8.43
2017	1114	65366.15	35.4	113	200.31	11.56
2018	1114	77211.18	41.8	147	251.68	13.46
2019	1114	8158.77	4.42	24.9	249.08	13.94

It can be seen from Table 3 that the total and average value of government subsidies included in the current profits and losses of high-tech enterprises from 2010 to 2019 showed an increasing trend, and there were slight fluctuations in 2015. In 2018, the total amount of government subsidies included in current profits and losses increased by approximately 22%, indicating that the total amount of government subsidies related to the daily business activities of enterprises has been increasing. However, the standard deviation has also increased year by year, and there is a large gap between the government subsidies received by different enterprises and the government subsidies included in the current profits and losses. The kurtosis and skewness fluctuate greatly, but both are large. Especially in 2019, the kurtosis and skewness reached the maximum in 10 years. Compared with the previous years, the distribution of government subsidies included in the current profits and losses of different companies is more significant, with more extreme differences greater than or less than the average.

Table 4 Analysis of the amount of government subsidies included in the current profits and losses of high-tech enterprises from 2010 to 2019

Unit of amount: million Yuan

Year	Sample size	Total amount	Mean value	Standard deviation	kurtosis	Skewness
2010	734	23057.65	48.1	184	116.63	9.83
2011	1678	36676.96	32.1	99.5	95.46	8.44
2012	1501	46806.77	47.0	141	106.86	8.63
2013	1189	38074.48	46.5	102	30.42	4.74
2014	1829	55627.19	44.3	148	160.50	10.84
2015	1395	50128.30	51.7	168	99.59	8.79
2016	1235	38374.41	43.4	127	74.98	7.70
2017	1114	14719.01	7.98	43.4	206.59	13.00
2018	1114	8869.09	4.81	24.5	226.27	13.26
2019	1114	8158.77	4.42	24.9	249.08	13.94

It can be seen from Table 4 that the total amount and average value of government subsidies included in non-operating income in high-tech enterprises from 2010 to 2019 showed an increasing trend from 2010 to 2015, and began to decrease sharply after 2016. Especially in 2017, government subsidies The total amount decreased by more than 60% compared with 2016, that is, government subsidies that are not related to daily activities in enterprises are significantly reduced. Although the standard deviation increased year by year from 2010 to 2015, it can be seen that the gap in the amount of government subsidies included in non-operating income among high-tech enterprises is shrinking from the standard deviation that has been decreasing year by year after 2016. However, the kurtosis and skewness fluctuate greatly. After 2016, the skewness and kurtosis are both higher values in 10 years. The data has a higher degree of right-skewed distribution, which is steeper than the normal distribution and has more Extreme values appear.

From the perspective of the trend of government subsidies included in non-operating income and current profits and losses of enterprises, enterprises are increasingly investing government subsidies in business activities related to daily activities, and government subsidies are increasingly serving the production of enterprises In operation and R&D activities, to a certain extent, the input efficiency of government subsidies has been improved. Government subsidy funds can help companies ease the pressure on operating cash flow and invest in research and development, and objectively have a positive effect on achieving the goal of government subsidies to promote innovation and research and development capabilities of high-tech enterprises.

3.4 The distribution of government subsidies among different industries

Table 5 Analysis of government subsidies in various industries in 2016

Unit of amount: million Yuan

Industry	Sample size	Proportion (%)	Total government subsidies	Mean
Mining	9	1.02	781.93	86.89
Media	53	5.99	2973.39	56.10
Electrical equipment	55	6.21	3968.72	72.16
Electronic engineering	71	8.02	6230.00	87.75
Real estate	6	0.68	130.91	21.82
Textile and garment	16	1.81	1688.48	105.53
Non-bank financial	4	0.45	324.96	81.24
Iron and steel	10	1.13	739.10	73.91
Public utility	29	3.28	2972.43	102.50
National defense and military	27	3.05	2413.16	89.38
Chemical engineering	85	9.60	3558.72	41.87
Machinery and equipment	102	11.53	8191.34	80.31
Computers	69	7.80	4354.80	63.11
Household appliances	31	3.50	6805.78	219.54
Building materials	15	1.69	2296.90	153.13
architectural ornament	44	4.97	5170.45	117.51
Transportation	10	1.13	84.57	8.46
Agriculture, forestry and fishing	13	1.47	487.16	37.47

Automobile	42	4.75	2678.39	63.78
Light manufacturing	37	4.18	2151.97	58.16
Commercial trade	6	0.68	418.22	69.70
Food and beverage	9	1.02	262.49	29.17
communication	35	3.95	1495.14	42.72
Leisure services	4	0.45	78.41	19.60
Medicine and biology	73	8.25	3488.89	47.79
Nonferrous metal	25	2.82	1287.39	51.50
comprehensive	5	0.56	150.68	30.14

Table 6 Analysis of government subsidies in various industries in 2017

Unit of amount: million Yuan

Industry	Sample size	Proportion (%)	Total government subsidies	Mean	Proportion (%)
Mining	17	0.92	1177.77	69.28	5.26
Media	85	4.61	2872.15	33.79	2.57
Electrical equipment	142	7.70	4577.59	32.24	2.45
Electronic engineering	172	9.32	11385.95	66.20	5.03
Real estate	11	0.60	186.21	16.93	1.29
Textile and garment	30	1.63	2733.74	91.12	6.92
Non bank financial	6	0.33	213.35	35.56	2.70
Iron and steel	9	0.49	475.33	52.81	4.01
Public utility	49	2.66	1260.14	25.72	1.95
National defense and military	49	2.66	2067.99	42.20	3.21
Chemical engineering	182	9.86	5318.38	29.22	2.22
Machinery and equipment	235	12.74	6690.20	28.47	2.16
Computers	154	8.35	4101.38	26.65	2.02
Household appliances	43	2.33	4534.78	105.46	8.01
Building materials	30	1.63	2116.61	70.55	5.36
architectural ornament	65	3.52	6073.34	93.44	7.10
Transportation	16	0.87	2651.41	165.71	12.59
Agriculture, forestry and fishing	26	1.41	1154.15	43.39	3.30
Automobile	97	5.26	8328.83	85.86	6.52
Light manufacturing	60	3.25	1033.66	17.23	1.31
Commercial trade	8	0.43	208.86	26.11	1.98
Food and beverage	14	0.76	260.71	18.62	1.41
communication	75	4.07	1778.61	23.71	1.80
Leisure services	5	0.27	81.81	16.36	1.24
Medicine and biology	201	10.89	6447.70	32.08	2.44
Nonferrous metal	50	2.71	1594.86	39.10	2.97
comprehensive	14	0.76	396.61	28.33	2.15

Table 7 Analysis of government subsidies in various industries in 2018

Unit of amount: million Yuan

Industry	Sample size	Proportion (%)	Total government subsidies	Mean	Proportion (%)
Mining	17	0.92	2215.37	130.32	10.03
Media	85	4.61	2165.54	25.48	1.96
Electrical equipment	142	7.70	4634.83	32.64	2.51
Electronic engineering	172	9.32	16700.12	97.09	7.48
Real estate	11	0.60	188.16	17.11	1.32
Textile and garment	30	1.63	778.00	25.93	2.00
Non bank financial	6	0.33	163.77	27.29	2.10
Iron and steel	9	0.49	419.23	46.58	3.59
Public utility	49	2.66	1249.95	25.51	1.96

National defense and military	49	2.66	2340.24	47.76	3.68
Chemical engineering	182	9.86	7176.99	39.43	3.04
Machinery and equipment	235	12.74	6506.54	26.69	2.05
Computers	154	8.35	4078.27	26.48	2.04
Household appliances	43	2.33	2888.06	67.16	5.17
Building materials	30	1.63	1271.92	42.40	3.26
architectural ornament	65	3.52	4547.26	69.96	5.39
Transportation	16	0.87	2329.20	145.58	11.21
Agriculture, forestry and fishing	26	1.41	1091.67	41.99	3.23
Automobile	97	5.26	11085.22	114.28	8.80
Light manufacturing	60	3.25	1363.78	22.73	1.75
Commercial trade	8	0.43	420.06	52.51	4.04
Food and beverage	14	0.76	246.74	17.62	1.36
communication	75	4.07	2132.51	28.43	2.19
Leisure services	5	0.27	93.56	18.71	1.44
Medicine and biology	201	10.89	7346.66	36.56	2.81
Nonferrous metal	50	2.71	2264.17	45.28	3.49
comprehensive	14	0.76	382.45	27.32	2.10

Table 8 Analysis of government subsidies in various industries in 2016

Unit of amount: million Yuan

Industry	Sample size	Proportion (%)	Total government subsidies	Mean	Proportion (%)
Mining	17	0.92	1907.23	112.19	7.46
Media	85	4.61	2246.60	26.43	1.76
Electrical equipment	142	7.70	5648.27	39.78	2.65
Electronic engineering	172	9.32	15455.18	89.80	5.97
Real estate	11	0.60	282.75	25.70	1.71
Textile and garment	30	1.63	777.74	25.92	1.72
Non bank financial	6	0.33	230.66	38.44	2.56
Iron and steel	9	0.49	627.05	69.67	4.64
Public utility	49	2.66	2471.07	50.43	3.36
National defense and military	49	2.66	2755.18	56.23	3.74
Chemical engineering	182	9.86	8109.27	44.06	2.93
Machinery and equipment	235	12.74	7606.89	32.37	2.15
Computers	154	8.35	4962.68	32.22	2.14
Household appliances	43	2.33	4805.81	111.76	7.44
Building materials	30	1.63	1635.81	54.53	3.63
architectural ornament	65	3.52	4906.26	75.48	5.02
Transportation	16	0.87	2731.78	170.74	11.36
Agriculture, forestry and fishing	26	1.41	1574.47	60.56	4.03
Automobile	97	5.26	12464.42	128.50	8.55
Light manufacturing	60	3.25	1402.55	23.38	1.56
Commercial trade	8	0.43	320.31	40.04	2.66
Food and beverage	14	0.76	263.53	18.82	1.25
communication	75	4.07	227.10	29.69	1.98
Leisure services	5	0.27	120.43	24.09	1.60
Medicine and biology	201	10.89	7345.57	36.55	2.43
Nonferrous metal	50	2.71	2979.82	59.60	3.97
comprehensive	14	0.76	364.89	26.06	1.73

The high-tech enterprises studied are classified according to the Shenwan first-level industry standards. From the preliminary statistics of government subsidies for high-tech enterprises in various industries from 2016 to 2019 in Tables 5-8, it can be seen that high-tech listed

companies are widely distributed. It is involved in all industries, and the industries covered by government subsidies for high-tech enterprises are also relatively comprehensive. From a horizontal perspective, the industries where there are more high-tech companies include electrical equipment, chemicals, mechanical equipment, computers, medical and biological fields, accounting for about 10% of the total. From a vertical perspective, the number of high-tech companies in the electrical equipment, chemical, computer, and pharmaceutical and biological industries increased the most in 2017, and the industry has developed rapidly in the high-tech field. However, from the perspective of the proportion of total government subsidies and average value, the government subsidies received by industries with more high-tech enterprises are not higher. In the past four years, except for household appliances in 2016, which received the most government subsidies, the remaining three years of transportation The transportation industry received the highest proportion of government subsidies, exceeding 10%. But on the whole, there is not much difference in the average proportion of government subsidies received by various industries. It shows that the state has increased its support for high-tech enterprises in the transportation industry after 2017. It also shows that although the number and level of development of high-tech enterprises in various industries are different, the government subsidies support various industries in a relatively balanced manner.

4 Conclusions and recommendations

From the above analysis, it can be seen that from 2010 to 2019, the coverage rate of government subsidies to high-tech enterprises of listed companies is very high, almost achieving full coverage, indicating that the government attaches great importance to and continues to provide financial support for the development of high-tech enterprises. Moreover, judging from the total amount of government subsidies from 2010 to 2019, the amount of government subsidies is relatively considerable, and it has been increasing steadily year by year. The subsidy has continued to increase, but the imbalance of government subsidies between different enterprises has become more and more obvious, although different enterprises The development stage and operating conditions are different, but the emergence of larger or smaller extreme values in government subsidies has a certain impact on the company's R&D capabilities, R&D enthusiasm, and competition for survival. At the same time, when analyzing the use of government subsidies in high-tech enterprises, it can be seen from the distribution of government subsidies included in non-operating income and current profits and losses of different enterprises that there is a relatively large gap in the amount and intensity of government subsidies for different high-tech enterprises. Large, high degree of dispersion, there are also extreme cases where some companies receive government subsidies much higher than the industry average.

It is worth noting that more and more high-tech enterprises have included government subsidies in the current profits and losses, that is, used in their own daily business activities, indicating that the use of government subsidies by enterprises has become more reasonable and rational, and they have consciously used government subsidies for In business activities and innovation activities. On the one hand, it benefits from the increasingly improved government subsidy policies and government subsidy accounting standards, and on the other hand, it is also conducive to the efficient use of government subsidies by enterprises, increase R&D investment, and enhance innovation capabilities and core competitiveness. From an industry perspective, the government subsidies for high-tech enterprises cover a wide range of industries. Among them, the number of high-tech enterprises is relatively high in areas where technological innovation is relatively active, such as electrical equipment, chemicals, mechanical equipment, computers, and pharmaceuticals. However, in terms of the total and average value of government subsidies received, except for the household appliances industry in 2016 and the transportation industry in 2017-2019, which accounted for more than 10% of government subsidies, all industries basically maintained a relative balance.

In view of the above conclusions, this paper proposes the following Suggestions:

First, the government should take into account the balance of government subsidies among different enterprises while strengthening subsidies for high-tech enterprises. On the one hand, can be done by financial support and policy support in advance, to encourage a high and new technology enterprise innovation activities, enhance research and development ability, on the other hand must be incentives, the government should be in time for outstanding innovation ability, advanced high and new technology enterprise of scientific and technological achievements to subsidize reward, promote the benign competition between enterprises, enhance the level of innovation and competitiveness.

Second, the government subsidies to enterprises, should understand the enterprise situation, the comprehensive level of the innovation of the enterprise, industry status, profitability, financial status, internal management and social benefits, etc., reasonable funding, strengthen the capital management, such as government increase subsidies for a higher R&D companies, to ensure that can fully realize the government subsidy and market combination, optimize the allocation of resources.

Finally, the government should improve the relevant laws and regulations, perfect the enterprise disclosure requirements on government subsidies, for different industries, different development stages and different funding companies formulate relevant information disclosure rules, especially the enterprises in the investment of R&D activity, avoid enterprise excessive dependence on government subsidies, use the subsidy funds management loopholes. We should pay more attention to and supervise the use and use of subsidy funds and improve the efficiency of government subsidy so as to truly enhance the innovation consciousness and ability of high-tech enterprises.

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