



Disincentive or Incentive? What Role Do Government Subsidies Play for High-Tech Companies in the New “Double-Cycle” Development Model?- The Moderating Role of the Internal Corporate Governance Mechanism

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Abstract. During the “14th Five-Year Plan” period, some high-tech enterprises are facing many difficulties in foreign trades. How to break through the difficulties and find the right time to promote the positive development of high-tech technologies is the focus of building a “double-cycle” pattern, which is also a key point of the great concern for the Government. Although government subsidies are one of the important policies of the state to guide the innovative development of high-tech enterprises, there are different views on their influence on the financial performance of enterprises. In this paper, a panel of high-tech companies listed on A-shares from 2016 to 2020 is selected for empirical analyses using a fixed-effects model to explore the relationship among government subsidies, internal corporate governance mechanisms and corporate performance under the new “double-cycle” development pattern. The results show that government subsidies have a significant positive impact on the financial performance of high-tech enterprises. Using internal corporate governance mechanisms as the moderating variables, it was found through further tests that the relationship between the two was significantly negatively moderated through shareholding concentration while was significantly positively moderated through shareholding checks and balances. The relationship was significantly and positively moderated based on board size and executive compensation incentives. The findings of the study can provide recommendations in terms of both policy formulation, the improvement of internal governance mechanisms of enterprises and the rational use of government subsidies.

Keywords: double-cycle · government subsidies · internal corporate governance mechanisms · corporate performance

1 Introduction

Today’s economic globalization and trade liberalization have been seriously adjusted, and the impact of the sudden new coronavirus epidemic coupled with technological sanctions that the US as well as other western countries impose on China has made China’s

economic and foreign trade forms increasingly severe, with the development space for high-tech enterprises increasingly narrowing. Against this backdrop, the Party Central Committee has proposed a new “double-circulation” development pattern, with a view to achieve high-quality trade development with the focus on high-tech enterprises. As a key objective of national support and development, high-tech enterprises have an indispensable influence on promoting the completion of China’s industrial transformation, adjusting the economic structure and improving the ability of independent innovations. The Government has been providing subsidies for high-tech enterprises to promote their technological innovations, which has already contributed to the development of enterprises to a certain extent. As global trades deepen with high-tech companies becoming more competitive in international markets, governments are increasing the sum of subsidies for high-tech companies in the hope of improving their performance. For example, the Government will continue to incentivise enterprises to invest more in R&D with tax incentives and promote the policy of adding deductions to R&D expenses. However, is government subsidy policy playing a positive role in this, as expected?

Some of the enterprises receiving government subsidies have not improved their performance due to the imbalance of power among internal shareholders, which has allowed some major shareholders with weak moral values to hollow out the interests of the enterprise for their own benefit. Such behavior manifests itself in a form that major shareholders fabricate projects by virtue of their position, etc., so as to obtain subsidy payments on the one hand, and to maximize their own earnings possibly through connected transactions on the other hand. The root cause of this is a company’s inadequate internal governance structure, whose level of governance still needs to be improved. The integrity of a company’s internal governance structure, as a set of institutional frameworks for its business, can have a direct impact on its investments in technological research and development as well as the use of subsidized funds. Clarifying the relationship among government subsidies and the development of high-tech enterprises and the role of internal corporate governance mechanisms in regulating the two is of great theoretical value and practical significance in promoting the sound development of the high-tech industry.

Many scholars home and abroad have conducted a lot of theoretical discussions and empirical studies on government subsidies and the economic performance of enterprises. Most of them believe that government subsidies can provide a favorable trend for business development. Xu Minli and Zhu Xiaojian (2019) believe that high-tech enterprises are facing a double-layer financial pressure internally and externally, government subsidies can be timely R&D funds for enterprises, so that enterprises will have more funds for product development and innovations, and the iteration of innovative products can enable enterprises to continuously expand their market shares, thus improving their financial performance. However, some scholars have come to an opposite conclusion through their analysis, with Yang Yajie (2021) arguing that an excessive reliance of firms on government subsidies will inhibit their innovative dynamism, thus making it difficult to achieve the goal of enhancing their profitability. Li Shengkun and Zhang Anqi (2016) point out that when enterprises receive government subsidies, their financial problems will be alleviated accordingly, and managers will overlook the problems existing in the enterprises themselves, or even generate speculative behavior, resulting in problems

such as enterprises maintain their daily operation and development relying more on subsidized funds. In view of the above two views, this paper aims to analyze the impact of government subsidies on the economic performance of high-tech enterprises taking high-tech enterprises listed on A-shares during 2016–2020 as research objects. This paper is focused on the high-tech industry, which has rarely been covered before. At the same time, the moderating effect of government subsidies on the financial performance of high-tech companies is explored in this paper, using internal corporate governance mechanisms as the moderating effect.

2 Study Design

2.1 Research Hypothesis

Government Subsidies and Business Performance

Government subsidies help improve the business performance of high-tech enterprises. In such circumstances, timely government subsidies can provide more financial support to enterprises and be used to solve the problems caused by the tight and slow flow of funds. This will allow a company to redirect its capital towards product development and innovations, which will enable it to increase its market share, thus improving its financial performance. On this basis, a hypothesis is formulated as follows.

Hypothesis 1: Government subsidies have a positive impact on the performance of high-tech firms.

The Moderating Role of Internal Corporate Governance Mechanisms on Government Subsidies and Corporate Performance

The concentration of shareholding is usually measured by the percentage of shares held by a company's largest shareholder. The higher the indicator is, the greater the voice and influence of the major shareholders in the management of business are. Liu Shengqiang and Liu Xing (2010) argue that the first major shareholder, as the *de facto* controller of a firm, may override management, transferring and diverting part of the subsidy funds for his own selfish interests, cutting R&D investments and thus negatively affecting the firm's performance. The higher the concentration of shares is, the higher the likelihood of the "encroachment effect" will be. Major shareholders tend to divert government subsidies from their own interests taking advantage of their position as effective controllers, leading government subsidies to have a significant negative impact on business performance and long-term development. Therefore, Research Hypothesis 2 is proposed in this paper.

Hypothesis 2: Equity concentration has a negative moderating effect on the relationship between government subsidies and corporate innovation performance.

Equity checks and balances, on the other hand, are opposite to equity concentration, that is, the effective control of business is not completed by one shareholder, but by several major shareholders. Zhu Lei et al. (2016) argue that mutual checks and balances among shareholders of enterprises avoid the situation in which one share is dominant, and that the scientific nature of decision making is improved through mutual checks and balances among shareholders, which can effectively avoid risks, meanwhile mutual

checks and balances among shareholders can play a supervisory role, reduce the lazy behavior of management, and urge the management to not only make a reasonable use of government subsidies to make them work, but also achieve the goal of maximizing corporate performance. Therefore, Research Hypothesis 3 is proposed in this paper.

Hypothesis 3: Equity checks and balances have a positive moderating effect on the relationship between government subsidies and firm innovation performance.

The board of directors is the main decision-maker in the management of a company, which has an undeniable influence on its innovative decisions and behavior. Lerner J (2002) argues that the board of directors, as the relationship between a firm and external organizations, is a strategic resource for a firm. The larger the board is, the more diverse the resources and expertise available to the business will be. Increasing the size of board is conducive to enhancing the professionalism of its advice, which in turn facilitates good decision-making and promotes an improved corporate performance. Based on this, the following hypothesis is formulated in this paper.

Hypothesis 4: There is a positive moderating effect of board size on the relationship between government subsidies and firm innovation performance.

Li Xiaoqing et al. (2020) argue that executive compensations can effectively increase managers' motivations, and by linking executive compensations to firm performance, agency costs can be reduced while increasing the incentive effect on top managers. Reasonable remuneration incentives satisfy executives' pursuit of private gains and encourage them to engage in more risky and innovative activities. Increasing executive remuneration can therefore effectively discourage managers from failing to act on government subsidies received by their company, meanwhile motivating them to work hard to improve their corporate business performance and long-term sustainable competitiveness. Therefore, Research Hypothesis 5 is proposed in this paper.

Hypothesis 5: There is a positive moderating effect of executive compensation incentives on the relationship between government subsidies and corporate innovation performance.

2.2 Sample Selection and Data Sources

High-tech companies listed on A-shares from 2016–2020 are selected in this paper and the samples are treated as follows: 1% tail reduction; companies with ST or *ST and missing key data such as government subsidy income are excluded. The data was obtained from the Guotaian Database and the relevant data was processed and tested using Stata17 statistical software.

2.3 Variable Description and Model Design

Description of Variables

The variable table is set up and shown in Table 1.

Table 1. Description of study variables [Self-drawn]

Variables	Variable type	Control variables	Variable symbols	Variable symbols
Corporate Performance	Explained variables	Control variables	ROE	Return on Net Assets = Net Profit /Shareholders' equity
Government subsidies	Explanatory variables	Government subsidy income	GOV	Non-operating income - government subsidies
Internal corporate governance mechanisms	Adjustment variables	Concentration of shareholding	Top1	Percentage of shareholding of the largest shareholder
		Concentration of shareholding	Herf5	The ratio of the shareholding of the second largest shareholder to the fifth largest shareholder to the shareholding of the first largest shareholder to the shareholding of the first largest shareholder
		Board size	BS	Number of board members
		Board size	Salary	Using the logarithm of the total remuneration of the top three executives of the company
Company profile	Control variables	Size of business	SIZE	Enterprise size = \ln (total assets at end of period)
		Financial leverage	LEV	Gearing ratio = total liabilities/total assets

(continued)

Table 1. (continued)

Variables	Variable type	Control variables	Variable symbols	Variable symbols
		Financial leverage	Growth	Operating income growth rate = increase in operating income / total operating income in the previous year

Model Design

Based on the above study, the following multiple linear regression model was constructed to test Hypothesis H1.

$$ROE = \beta_0 + \beta_1GOV + \beta_2 SIZE + \beta_3LEV + \beta_4Crowth + \varepsilon \tag{1}$$

To test hypotheses H2 to H4, internal corporate governance of three levels was added for further studies, and based on the same model as above, Eq. (2) was used to investigate the moderating effect of equity structure, board structure as well as executive incentives on the relationship between government subsidies and corporate innovation performance respectively.

$$ROE = \beta_0 + \beta_1GOV + \beta_2GOV * Top11(Herf5, BS, Salary) + \beta_2SIZE + \beta_3LEV + \beta_4Crowth + \varepsilon \tag{2}$$

where: ROE denotes return on net assets, β is a parameter to be estimated, and ε denotes the random disturbance term.

3 Results of the Empirical Analysis

3.1 Descriptive Statistical Analysis

As is shown in the descriptive statistical analysis of the variables in Table 2, for government grants, the mean is 6.31, the standard deviation is 1.43, the minimum is 0.43 and the maximum is 10.42. It can be seen that there is a large difference in the sum of government subsidies received by different enterprises; in terms of return on net assets, the minimum value is -0.87, the maximum value is 0.31 and the mean value is 0.06, indicating a large difference in the financial performance of high-tech enterprises. The average shareholding concentration (Top11) is 32.4, indicating that the largest shareholder of the sample companies has a higher and more concentrated shareholding with the maximum value reaching 70.42, indicating that the phenomenon is more serious. The mean value of shareholding checks and balances (Herf5) is 0.15, representing the presence and prevalence of small and medium shareholders of the sample companies holding major shares. The large difference between the mean and maximum board size

Table 2. Descriptive statistics of the variables [Self-drawn]

Variables	N	Mean	SD	Min	Max
ROE	8819	0.06	0.15	-0.87	0.31
GOV	8819	6.31	1.43	0.43	10.42
Top11	8819	32.40	14.09	8.09	70.42
Herf5	8819	0.15	0.10	0.01	0.50
BS	8819	8.36	1.59	5	14
Salary	8819	14.64	0.65	13.14	16.50
LEV	8819	0.41	0.19	0.07	0.86
Growth	8819	0.19	0.37	-0.50	2.21
SIZE	8819	22.33	1.26	20.02	26.24

(BS) value indicates that the size of the board of directors varies among the sample firms, together with the forces influencing the behavior of their innovative activities. The large variations in executive compensation indicate that there are significant differences in the incentive level of executives across companies.

3.2 Correlation Analysis

As is shown in the Pearson correlation coefficient test of the variables in Table 3, the correlation coefficients of almost all the variables are less than 0.5, indicating that the correlation basically passes the significance test, there is no problem of multiple collinearity, and the model is reasonable. GOV is positively correlated with ROE at the significance level of 1%, indicating that government subsidies are significantly and positively related to financial performance. The coefficient of Top11 and ROE is negative and significant at the confidence level of 1%, tentatively indicating that the concentration of equity structure can negatively affect corporate innovation performance. The coefficient of BS and ROE is positive, showing a significant positive correlation at the level of 1%, tentatively indicating that corporate innovation performance can be improved with board size. SALARY also shows a significant positive relationship with ROE, providing preliminary evidence that executive compensations can positively affect corporate innovation performance.

3.3 Analysis of Regression Results

Regression Analysis of Government Subsidies and Firm Performance

We used Eq. (1) to perform a regression analysis of GOV and ROE, and the results are shown in the regression analysis in Table 4, indicating that the F-value of the model built in this paper is 19.44, which is within the standard range, and that the adjusted R² value is 0.138, which is significant at the level of 1%, proving that the model fit is good and

Table 3. Pearson correlation coefficients of variables [Self-drawn]

VARIABLES	ROE	GOV	Top1l	Herf5	BS	Salary	SIZE	LEV	Growth
ROE	1								
GOV	0.075***	1							
Top1l	-0.162***	0.100***	1						
Herf5	0.163***	0.123***	0.956***	1					
BS	0.031***	0.137***	-0.032***	-0.019*	1				
Salary	0.143***	0.312***	-0.0140	0.027**	0.137***	1			
SIZE	0.061***	0.572***	0.117***	0.140***	0.267***	0.415***	1		
LEV	-0.192***	0.245***	0.018*	0.0090	0.138***	0.120***	0.526***	1	
Growth	0.252***	-0.011	0.00500	0.0080	-0.008	0.0050	0.025**	0.023**	1

Note: ***, ** and * represent being significant at the level of 1%, 5% and 10% respectively

Table 4. Regression analysis of government subsidies and firm performance [Self-drawn]

Projects	Coefficient
GOV	0.0091***
SIZE	0.0228***
Growth	0.1018***
LEV	-0.2249***
Constant	-0.6137***
Sample size N	8819
Adjusted fit R ²	0.138

Note: *** ** and * indicate being significant at the level of 1%, 5% and 10% respectively

the results obtained are more reliable. Among them, the GOV regression coefficient is 0.0091, which is significant at the level of 1%, proving that among the sample enterprises, the stronger the government subsidies are, the more likely they can be used to solve the problems caused by financing difficulties and insufficient investments, indicating that government subsidies improve the level of financial performance of enterprises, thus verifying Hypothesis H1.

The Moderating Role of Internal Corporate Governance Mechanisms on Government Subsidies and Corporate Performance

We use Eq. (2) to test the moderating effect of intra-firm governance on the relationship between government subsidies and the performance of high-tech firms, for the regression of the intra-firm governance variables on the cross-section of government subsidies respectively, as is shown in Table 5. In terms of equity structure, the adjusted R² for the inclusion of both Top11 and Herf5 model was around 0.16, close to 1, indicating a good fit for the model. According to the results of Model I, under the main effect of a significant positive relationship between GOV and ROE, the cross-product term of Top11 equity concentration and government-subsidized GOV is -0.0019, which is significantly negatively correlated at the level of 1%, thus testing Hypothesis H2. That is, the more equity the first major shareholder of an enterprise holds, the more its interests will be maximized, thus diverting part of the subsidies to avoid some high-risk innovation projects, or even encroaching on the interests of middle and small shareholders, reducing the effect of government subsidies and leading to lower innovation performance of the enterprise. According to the results of Model II, under the main effect of the significant positive relationship between GOV and ROE, the coefficient of the cross-product term of Herf5 and GOV is 0.221, which are significantly positively correlated at the level of 1%, thus verifying Hypothesis H3, that is, middle and minority shareholders can check and supervise the behavioral decisions of major shareholders, avoiding the phenomenon that “one share is too big”. The coefficient of the multiplier is 0.221, which is significantly correlated at the level of 1%. In terms of board structure, the inclusion of a board size (BS) regression also results in an adjusted R² that is close to 1, indicating

Table 5. Regression analysis of the moderating effect of internal corporate governance mechanisms on government subsidies and corporate performance [Self-drawn]

	Model I: Equity concentration	Model 2: Equity Checks and Balances	Model 3: Board size	Model 4: Executive Compensation
VARIABLES	ROE	ROE	ROE	ROE
GOV	0.0090***	0.0092***	0.0089***	0.0081***
Top11	-0.0017***			
Herf5		0.2313***		
BS			0.0032***	
Salary				0.0241***
SIZE	0.0206***	0.0201***	0.0217***	0.0174***
LEV	-0.2387***	-0.2356***	-0.2449***	-0.2341***
Growth	0.1015***	0.1012***	0.1022***	0.1019***
GOV*Top11	-0.0019***			
GOV*Herf5		0.2110***		
GOV*BS			0.0016***	
GOV*Salary				0.0019***
Constant	-0.3836***	-0.3519***	-0.3770***	-0.6112***
OBServations	8,819	8,819	8,819	8,819
Adjusted R-squared	0.160	0.158	0.139	0.147

that the model yields more reliable results. In Model III, under the significant positive primary effect of GOV and ROE, the cross-product term coefficient of BS and the government subsidies GOV is 0.0016, which shows a significant positive correlation at a confidence level of 1%, thus verifying Hypothesis H4 that an increase in board size can enhance the responsibility of individual directors and the professionalism of innovative decision making, which is conducive to promoting the implementation of government subsidies. This is conducive to the implementation of government subsidies and the improvement of corporate innovation performance. In terms of executive incentives, the inclusion of the SALARY factor resulted in an adjusted R2 of 0.147, which is close to 1, proving that the model fits well. From the results of Model IV, the main effect of GOV and ROE is still significantly positive, and the coefficient of the cross-product term of SALARY and GOV is 0.0019, which is significantly positively correlated at the level of 1%, thus verifying Hypothesis H5, that is, as the incentive for executive compensations increases, the incentive for executives to make innovative decisions and motivate them to make decisions conducive to the effect of government subsidy implementation can be better improved. The relationship between executive compensations and innovation performance is thus positively moderated.

4 Conclusions and Insights

The impact of government subsidies on the financial performance of high-tech enterprises is empirically analyzed in this paper, using panel data of A-share-listed high-tech enterprises from 2016 to 2020 as a sample. The study shows that government subsidies can play a facilitating role in the financial performance of high-tech enterprises. At the same time, shareholding concentration negatively moderates the relationship between the two, while shareholding checks and balances, the board size and executive compensation incentives all positively moderate the relationship between the two.

Based on this conclusion, recommendations can be made in two dimensions in the paper: the Government and business.

Based on the government dimension, the following three recommendations will be made in this paper. First of all, support policies for government subsidies should not be generalized, but should be refined, with each payment of government subsidies being specific to different aspects of an enterprise, such as tax, legislation and talents. Secondly, it is important to strengthen the supervision of enterprises and keep track of the movements of allocated subsidies in real time after entering these enterprises, so as to ensure that they implement subsidies on relevant R&D and innovation projects while reducing their own rent-seeking behavior (Xu et al., 2022). Finally, to avoid the phenomenon of “fraudulent subsidies” caused by some enterprises to obtain special state subsidies, the Government should also add a system for evaluating the results of innovations to the original subsidy model and raise a threshold for government subsidies in terms of innovation output, so that subsidies can be allocated to enterprises in genuine need in a more targeted manner while ensuring an efficient use of government subsidies.

Based on the enterprise dimension, enterprises, as subjects of innovations, should make a reasonable use of government subsidies to promote their financial performance and thus improve their development. Companies should maximize the efficiency of their use of government subsidies. Government subsidies are used wisely and effectively for different projects to optimize budgetary cost control, staff administration and risk management during a project. At the same time, enterprises should further optimize the original internal control system, control the phenomenon that “one share is too big”, clarify the power scope of the majority shareholders, and enhance their innovation consciousness to ensure a reasonable use of support funds. It is also important to control the flow and use of government subsidies and make them as open and transparent as possible. High-tech enterprises should also strengthen an effective oversight of top management to reduce managerial laziness, so that government subsidies can play a positive role in the development of high-tech enterprises (Liu Manzhi et al., 2022). As an important player in the new “double-cycle” development pattern, high-tech enterprises should be able to break away from technological dependence by continuously improving their independent innovation capabilities, so as to open up the domestic economic cycle. At the same time, high-tech enterprises should also actively go out, strengthen their international cooperation on science and technologies and integrate into the international economic cycle.

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