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Anti-corruption, government subsidies, and investment efficiency

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ABSTRACT

The problem of corruption in socio-economic development has long been a focus of academics and practitioners. To address this concern in China, the 18th National Congress of the Communist Party of China instituted a new anti-corruption policy. In this paper, we examine the impact of this recently enacted anti-corruption policy on the investment efficiency of subsidized enterprises from the perspective of government subsidies. We conclude that government subsidies have a significant positive impact on the overinvestment behavior of enterprises and that the anti-corruption work done by the government has effectively restrained the excessive investment behavior of government-subsidized enterprises. Further, we find that the anti-corruption policy is more effective in restricting overinvestment in subsidized state-owned enterprises than in non-state-owned enterprises. We examine the impact of the anti-corruption policy on excessive investment caused by government subsidies and enrich the body of research related to investment efficiency. We also provide empirical support for further research on the anti-corruption policy at the macro-market and micro-enterprise levels. The findings highlight the need to establish new cooperation between government and enterprises, to rationalize the distribution of administrative resources, and to promote the sustained and healthy development of the national economy.

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1. Introduction

Government subsidies, in which the government provides financial aid to microeconomic individuals to achieve certain political and economic goals, are an important part of fiscal expenditures common to all countries. Subsidies have been particularly important during China's economic transition as a means for the government to provide a "helping hand" (Frye and Shleifer, 1997). In recent years, the scale of Chinese government subsidies has gradually expanded, and both the number of companies receiving subsidies and the amounts of the subsidies have increased sharply. However, China's current weak judicial environment, extensive corruption, and opaque subsidy process have led to many problems, which have aroused widespread concern in practical and economic circles regarding the efficiency of China's government subsidy policies.

Many scholars have questioned the distribution and allocation of Chinese government subsidies. For example, Yu et al. (2010) find that companies receive more financial subsidies if they establish political connections. Moreover, such rent-seeking behavior is more prevalent in areas in which the institutional environment is backward. This kind of spending tilt distorts the effective allocation of scarce resources and reduces the overall welfare of society. Similarly, Guo and Du (2011) reveal that political connections change the flow of government subsidies and reduce their efficiency.

The report of the 18th National Congress of the Communist Party of China, dated November 8, 2012, sought to promote the dual goals of government integrity and efficiency. The report stated that political integrity would be promoted because the system would prevent and punish corruption. It indicated that cadres (the civil service) should be non-corrupt and politically transparent. The anti-corruption policy of the 18th National Congress was a major exogenous shock to the government's operational pattern. Officials with the power to allocate subsidies lost the conditions necessary for renting and came under pressure to make the subsidy process transparent. Consequently, officials became more likely to allocate more funds based on corporate efficiency or social benefits. They are also more likely to promote particular fiscal policies by tracking and regulating the use of subsidies. For enterprises, the new policy blocks their rent-seeking channels, and they cannot obtain additional financial support by establishing political connections. Therefore, they have incentives to use their existing resources more efficiently.

We use A-share non-financial listed companies from 2007 to 2015 as a research sample to examine the impact of anti-corruption policy on government subsidy efficiency from the perspective of overinvestment. The results show that the anti-corruption policy effectively suppresses excessive investment caused by government subsidies and improves the efficiency of subsidy allocation. Moreover, this efficiency improvement is mainly concentrated in state-owned enterprises. We also conduct a series of robustness tests, and the main findings remain unchanged.

This paper contributes to the literature in several ways. First, the current research on government subsidies in China and abroad focuses mainly on subsidy motives (Chen and Li, 2001; Chen et al., 2008), influencing factors (Chen, 2003; Yu et al., 2010), and economic consequences (Lee, 1996; Girma et al., 2007; Tang and Luo, 2007); relatively few works explore the determinants of the efficiency of government subsidies. In this paper, we analyze and evaluate the economic effects of local government fiscal policy from the perspective of institutional government corruption, which helps us comprehensively explore the deeper reasons for the resource allocation effect of financial subsidies. Second, anti-corruption policy has an exogenous effect on the quality of the government and the institutional environment, which has led many scholars to consider the policy's economic consequences. For example, Zhong et al. (2016) find that the anti-corruption policy will ultimately affect the performance of enterprises by accelerating production, shortening business cycles, and improving asset turnover, and Wang and Kong (2016) analyze anti-corruption's effect on the corporate governance environment. Our study comprehensively analyzes the impact of anti-corruption on microeconomic entities from the new research perspective of government subsidies and supplements the research on the economic effects based on anti-corruption from a horizontal perspective. Third, because investment is a major decision for an enterprise, it is a core channel that affects the value of the enterprise and directly relates to its future operation and development. This study examines the impact of the anti-corruption policy on excessive investment caused by government subsidies, expands the research on the determinants of investment efficiency, and provides important implications for guiding the non-efficiency investment of enterprises at the macro level.

The rest of the paper is organized as follows. Section 2 contains the literature review. Section 3 provides the theoretical analysis and research hypothesis. Section 4 discusses the research design and descriptive statistics. Section 5 addresses the empirical result, and Section 6 contains the robustness tests. Section 7 concludes the paper.

2. Literature review

2.1. Research on government subsidy policy

Government subsidies, which are the free transfer of funds from the government to microeconomic entities, are an important part of fiscal expenditure. Subsidies are a means for the government to directly intervene in the market and in the operation of enterprises (Frye and Shleifer, 1997). Recently, the scale of subsidies by the Chinese government has increased year by year, and more than 50% of listed companies in China have received some level of subsidy. This phenomenon has attracted the attention of scholars in China and abroad. Most of the research on government subsidy policies focuses on two aspects: (1) subsidy motivation and influencing factors and (2) economic consequences.

2.1.1. Subsidy motivation and influencing factors

Subsidy income given to a listed company can increase the amount of money held by the company. Local governments seek subsidies to improve the performance of local listed companies. Researchers find that to obtain resources in the capital market, local governments actively participate in the earnings management of listed companies and procure large-scale tax incentives and financial subsidies for listed companies. Local governments provide financial subsidies to help listed companies obtain qualifications for rights offerings or to retain listings, especially companies with poor performance and instability (Chen and Li, 2001). Local government officials, who are driven by work performance and a desire for promotion, are willing to help companies in these ways (Guo and Hu, 2002; Wang et al., 2009; Zhong et al., 2010; Xu and Luo, 2011). Other studies have shown that subsidy funds tend to flow into companies that are at the margin of loss and allotment, enabling such listed companies to manage their earnings, meet hardline requirements set by regulators, and make the turnarounds necessary for continued listing (Aharony et al., 2000; Chen et al., 2008; Zhang, 2006; Zhu and Chen, 2009). Another branch of literature analyzes the motives of the company's stakeholder groups and finds that the management boards of companies, especially those with poor performance, overly depend on government subsidies. At the same time, listed company executives seek subsidies to establish government relations to obtain protection and strengthen internal controls toward the goals of securing positions and promotions and increasing their political ties (Xue and Bai, 2008; Chen et al., 2010). Therefore, no matter which motivation is distorted, the result is a corruption of the purpose of government subsidies, which can seriously hinder marketization and even reduce overall social welfare (Yu and Zhao, 2009; Yu et al., 2010; Geng et al., 2011).

The literature regarding the influencing factors of government subsidy allocation mainly uses the perspectives of government–enterprise linkage and property rights (Chen, 2003; Shao and Bao, 2011; Guo and Du, 2011; Bu and Yu, 2012). These studies show that government subsidies are significantly skewed toward state-owned enterprises or private enterprises with political connections. Further, research indicates that private enterprises that establish political ties with local governments can obtain more financial subsidies, and that in areas with poor institutional environments, the subsidy acquisition effect of political connections is stronger (Yu et al., 2010).

2.1.2. Economic consequences

Both the domestic and foreign literature discuss the issue of subsidies primarily from the perspective of economic and social effects. Beason and Weinstein (1996) argue that subsidies can lead to low growth and diminishing returns to scale. Subsequent studies test that argument by using data from different countries and regions and find evidence supporting the views of Beason and Weinstein. Among them, Lee (1996), using empirical data from 38 industrial enterprises in South Korea from 1963 to 1983, finds that political intervention reduces the growth rate of labor productivity and total factor productivity and that industrial policies,

such as tax incentives and subsidies, have no correlation with the growth of total factor productivity. Tongeren (1998), in an investment subsidy study in the Netherlands, finds that an investment subsidy improperly changes the investment decision of enterprises. Tzelepis and Skuras (2004) confirm this view in a study of Greek companies, finding that investment subsidies provide large cash flows into the company but do not help the company's efficiency or profitability. In a study conducted using Irish data, Girma et al. (2007) analyzes whether government subsidies stimulate productivity growth. They find that only a special subsidy that supports productivity increases overall factor productivity, and that companies with financing constraints will benefit most from government subsidies.

In China, the literature has not reached consistent conclusions regarding the effect of government subsidy resource allocation. For example, Tang and Luo (2007) propose that although there is no direct evidence that government subsidies enhance the economic benefits of listed companies, they may help motivate listed companies to focus on social benefits and corporate responsibility. However, Yu et al. (2010) find that the financial subsidies obtained by private enterprises that have political relations with local governments are negatively correlated with corporate and social performance. Additionally, there are disagreements in the academic literature as to whether subsidies are effective in strengthening a company's innovative research and development, improving profitability, and urging enterprises to assume more social responsibilities.

In sum, relatively few studies explore the effect of macroeconomic changes on the resource allocation efficiency of government subsidies. This study analyzes and evaluates the economic effects of local government financial subsidy policies in terms of the institutional factor of external corruption, which helps us to more comprehensively explore the deeper reasons for the resource allocation effect of financial subsidies.

2.2. Research on the effect of the anti-corruption policy

In recent years, there has been a great deal of discussion in academia about the relation between the political environment and economic efficiency. A number of domestic and foreign scholars address this from the perspective of the theory of the effectiveness of corruption, which argues that corruption has improved economic efficiency. This literature argues that corruption serves as a lubricant of inefficient mechanisms, and that corruption contributes to economic growth (Leff, 1964; Huntington, 1968; Li, 2001). Similarly, Rock and Bonnett (2004) and Wu and Rui (2010) empirically examine the positive impact of corruption. However, other evidence refutes the theory of the effectiveness of corruption, arguing that corruption leads to high costs and ultimately reduces the efficiency of economic operations. From a macro perspective, such scholars believe that it is difficult to develop a healthy overall national economy in a corrupt environment. Because corruption leads to distortions in the allocation of market resources, people will engage in more rent-seeking activities, which will reduce investment in and R&D for social productivity, increase the scale of the informal economy, and inhibit national innovation and even financial and foreign trade transactions: in the long term, economic growth would be suppressed (Gould and Amaroreyes, 1983; Mauro, 1995; Shen and Zhao, 2016). The literature also explores the link between corruption and corporate governance at the micro level. Porta et al. (1999) find that corporate governance in highly corrupt areas is often worse, for a number of reasons. First, corruption can exacerbate agency problems. Acting in their own interests, companies' management boards collude with government officials, and that collusion brings risks to enterprises and harms their interests (Wu, 2005). Serious commercial collusion and corruption strengthens internal control tendencies and weakens the relevant supervisory utility of external governance mechanisms. Second, companies that prevail in a culture of corruption will also have a "bad money drives out of good money" effect when selecting management, which can change the corporate governance ecosystem (Mironov, 2015). In addition, corruption motivates people to shift their talents and energy from productive activities to political capital (Lui, 2010), which results in an inefficient allocation of human resources (Murphy et al., 1991). Corruption weakens the enthusiasm of corporate managers to invest in innovation and R&D activities (Murphy et al., 1993), which ultimately reduces the efficiency of corporate investment and financing and undermines the long-term sustainability of the business.

From this review, we can see that the literature has examined the relation between economic growth and corruption from a macro perspective and examined the effect of corruption on corporate governance at the micro level. However, few scholars have provided a specific method to analyze the ways in which the

advantages and disadvantages of mitigating corruption affect the specific factors of corporate governance and ultimately affect the operation of enterprises.

Within China, scholars' explorations of anti-corruption effects on the macro and micro economies was carried out before the 18th National Congress instituted its policy against corruption. The literature discusses the increasingly prominent issues of corruption and commercial collusion in China's economic reform from the perspectives of mechanism constraints and the legal environment. At the administrative level, corruption leads to unfair political connections that siphon hidden profits, inducing government officials to set rents and reduce administrative efficiency (Zhou and Tao, 2009). Because of local political pressure, subsidies will be distributed to meet the needs of the companies in the jurisdiction, and enterprises will be overexploited and expanded in the pursuit of short-term benefits (Li, 2015; Xu and Li, 2016). At the enterprise level, the research finds that high transaction costs caused by corruption hinder normal business and R&D activities (Yang, 2011; Huang and Li, 2013).

In November 2012, the 18th National Congress of the Communist Party of China was convened. At the Congress, the Central Committee set forth the goal of "anti-corruption and building a clean government," and afterward, the new anti-corruption policy was officially launched. This anti-corruption policy is an exogenous shock on the quality of government and the institutional environment, and many scholars have considered its economic consequences. The literature concentrates on two areas: (1) the impact of the anti-corruption policy on the company's own value and performance and (2) the Central Committee's "No. 18 ban," which suppressed the "revolving door of commercial and political power." Regarding the impact of the anti-corruption policy on companies' value and performance, Ying et al. (2015) find that the implementation of the anti-corruption policy has curbed corporate rent-seeking behavior, cut off the non-market administrative resources that such behavior relied on in the past, and caused the market value of enterprises to decline in the short term. Simultaneously, the literature regarding the No. 18 ban finds that the fluctuation of corporate value led to the resignation of a large number of "independent directors" with political status; this is a supplementary reason for the short-term decline in value following the implementation of the new anti-corruption policy (Tang and Lin, 2016; Ye et al., 2016). Scholars also believe that the implementation of the anti-corruption policy has substantially purified the market environment and inhibited the private transmission of large amounts of public resources. It is reasonable to expect the value of enterprises to rise in the long run (Yan, 2016; Ye et al., 2016). In exploring how anti-corruption policies affect corporate performance, Zhong et al. (2016) find that the anti-corruption policy ultimately affects the performance of enterprises by accelerating production, shortening business cycles, and improving asset turnover. Wang and Kong (2016) analyze the impact of the anti-corruption policy on the corporate governance environment, and the academic community also observes and analyzes the behavioral motives and decision-making changes of various stakeholders, mainly from the behavioral motives of managers, and discusses the changes and adjustments of corporate management decisions brought about by the anti-corruption mechanism. Among them, Dang et al. (2015) believe that the implementation of the anti-corruption policy may shift managers' focus from seeking political connections to improving their ability to innovate so that they can better adapt to the current situation and seek enterprise development. Jin et al. (2016) discuss how the senior executives of state-owned enterprises can balance their promotional appeal and risk aversion in the context of anti-corruption to ultimately determine whether it leads to the passive capture of investment opportunities or the active expansion of investment scale.

No study offers an in-depth investigation of how the anti-corruption policy affects the investment efficiency of government-subsidized enterprises. Investment, which is a major decision for the enterprise, substantially affects the value of the enterprise and thus directly reflects the resource allocation efficiency of government subsidies. This study comprehensively analyzes the impact of the anti-corruption policy on microeconomic entities from the new perspective of government subsidies and supplements the research on the economic effects of the anti-corruption policy from a horizontal perspective.

3. Theoretical analysis and research hypotheses

Government subsidies obtained by a listed company increase the money held by the company. This free cash flow is an important factor in managers' investment decisions (Jensen, 1976). Therefore, the acquisition

of government subsidies by listed companies may affect their investment efficiency and may lead to erroneous judgments and decisions by a company's management. In the face of crisis and the ever-changing market environment, management will rely more on seeking help rather than innovating, which leads to the inefficient flow of capital and the mismatch of social resources. Government subsidies may contribute to the inertia of production and the operation of enterprises to a certain extent, leading to the inefficiency of enterprises. In addition, in China, government subsidies often offset a company's poor performance to guarantee its listed qualification and reduce losses. Local governments and officials also use subsidies to enhance their work performance. In summary, in the context of rent-seeking, the relationship between the company and the government will affect the company's access to government subsidies, which further affect the company's investment decisions. That is, rent-seeking and rent-holding between enterprises and the government gives enterprises the opportunity to obtain and use low-cost subsidies. Based on the free cash flow hypothesis, given sufficient internal funds, the resources directly controlled by managers will increase accordingly, bringing them more benefits or prestige. To maximize their own interests, managers tend to heedlessly expand the size of the company and invest in projects with negative net present values (Modigliani and Miller, 1958; Blanchard et al., 1994; Hubbard, 1997; Klock and Thies, 2010; Zhang and Lu, 2012). Investment decisions made in pursuit of their own interests cause excessive investment. Based on the above analysis, we propose research hypothesis 1:

Hypothesis 1. There is a significant positive correlation between the level of government subsidies received by enterprises and the excessive investment of enterprises.

The macroeconomic or political environment can have a significant impact on a company's micro-behavior. From the perspective of the macro environment, since the 18th National Congress, the implementation of anti-corruption policies has eased the possible rent-seeking relationship between the government and enterprises (Manion, 2016; Wang et al., 2017). Specifically, the implementation of anti-corruption policies is a major exogenous shock to the government's operational pattern that helps the administration better meet public goals and results in more efficient and honest use of government power (Overholt, 2015; Keliher, 2016; Chen and Lu, 2017; Pan and Guo, 2018). Concerning fiscal fund allocation, officials who have the right to finance subsidies have previously been encouraged by the policy of controlling and intervening in the large-scale capital accumulation and overinvestment of local state-owned enterprises to pursue economic growth (Tang et al., 2010; Li and Wang, 2007; Cheng et al., 2008; Zhang and Wang, 2010; Ji et al., 2012), but that policy ended after the anti-corruption policy was implemented. Conditions are now unfavorable for renting, and officials have been pressured to make the subsidy process transparent. The new policy may result in subsidy funds being more equitably allocated based on corporate efficiency or social benefits (Kong et al., 2013; Wu et al., 2015; Wang and Kong, 2016), and it may also increase the economic efficiency of fiscal policy by tracking the use of financial subsidies (Fan et al., 2007). Correspondingly, from the perspective of corporate behavior, in view of the deterrent effect of anti-corruption policies, the risks faced by enterprises that misuse subsidies from the policy supervision level are greater, so senior management should be more cautious about using subsidies. We therefore speculate that anti-corruption policies will help build a more honest and fair market environment and enhance the government's ability to help society. With such macroeconomic environment changes and increased policy risks, the value of political connections is reduced, which will make corporate managers comply with market competition rules when they govern companies and will force them to change their business philosophy from political rent-seeking to following market rules (Jin et al., 2016). Corporate executives will thus use subsidies more cautiously and invest them more effectively. Based on the above analysis, we propose research hypothesis 2:

Hypothesis 2. The implementation of the anti-corruption policy will significantly inhibit overinvestment by government-subsidized enterprises

In the context of China's system, state-owned listed companies have more significant overinvestment tendencies than non-state-owned companies due to the lack of private owners, inadequate supervision mechanisms, and soft budget constraints (Huang et al., 2005; Wei and Liu, 2007). In addition, the political appeals of state-owned enterprise executives and the political connection between state-owned enterprises and the government are important factors that breed corruption issues such as interest transfer (Shleifer and Vishny, 1994; Pan et al., 2008; Wu et al., 2009; Yu et al., 2010). However, the anti-corruption campaign

implemented after the 18th National Congress has improved China's market environment. The anti-corruption policy imposes stricter restrictions on senior management within state-owned enterprises (Zheng et al., 2012; Ying et al., 2015) and forces the relevant regulatory agencies or stakeholder groups to pay more attention to the financial conditions of state-owned enterprises, which tend to have more serious agency problems (Nelson and Goel, 2007; Huang and Zhao, 2015). At the enterprise level, because state-owned enterprise executives pay more attention to promotion incentives, they will be more likely to avoid the policy risks of using subsidies after the implementation of the anti-corruption policy. Accordingly, the managers of state-owned enterprises will tend to choose more stable development programs and to use government subsidy funds cautiously (Lu et al., 2012; Jin et al., 2016). Therefore, after the implementation of the anti-corruption policy, the investment efficiency of state-owned enterprises that receive government subsidies improves more obviously than that of non-state-owned enterprises. Based on the above analysis, we propose research hypothesis 3:

Hypothesis 3. The anti-corruption policy has a stronger impact on overinvestment in state-owned enterprises that receive government subsidies than on non-state-owned companies that receive subsidies.

4. Research design and descriptive statistics

4.1. Sample selection

This study takes 2012 as the initial year of the implementation of the anti-corruption policy, selects the companies listed on the Shanghai and Shenzhen Stock Exchanges as the research object, and collects the financial data of A-share listed companies in non-financial industries from 2007 to 2015 for empirical analysis. The financial data are from the CSMAR and WIND databases. The list of government-subsidized income companies comes from the announcements published by the official websites of the Shanghai Stock Exchange and the Shenzhen Stock Exchange. To review the quality of the data, the random sample data from the two databases are compared. The differences are resolved using the statements disclosed by the Shanghai Stock Exchange and the Shenzhen Stock Exchange. All of the financial indicators are 1–99% tailed (winsorized).

In addition, we classify and process the samples according to the level of government subsidies obtained by the company, as follows. First, we select the current government subsidy amount disclosed in the notes of the financial statements of listed companies as a direct measure of the company's government subsidy for the year and use it to determine the median amount of government subsidies received by listed companies as a classification basis. We then classify companies with subsidies higher than the median in the current period as the high-government-subsidy group. We also select the listed companies that have not received government subsidies from 2007 to 2015 for the regression comparison of the control group to test the effects of the anti-

Table 1
Sample statistics according to the level of government subsidies obtained by the company.

Years	Total	Number of government-subsidized companies	Number of companies not receiving government subsidies	Number of companies entering the high subsidy group	Proportion
2007	1159	869	290	290	25.02%
2008	1272	1049	223	470	36.95%
2009	1403	1246	157	587	41.84%
2010	1520	1371	149	706	46.45%
2011	1830	1705	125	912	49.84%
2012	2110	1988	122	1140	54.03%
2013	2236	2098	138	1206	53.94%
2014	2125	2019	106	1233	58.02%
2015	2191	2098	93	1374	62.71%

corruption policy on the investment efficiency of these two types of enterprises. The sample statistics of the listed companies used for empirical research after eliminating financial companies, special treatment companies, and incomplete data companies are as follows (see Table 1).

4.2. Models

4.2.1. Estimation model of investment efficiency

We first predict the normal investment amount of the enterprise according to the Richardson (2006) investment measurement model and then use the residual generated by the model to measure the investment level. If the residual is greater than 0, it is considered overinvestment, and if the residual is less than 0, it is considered insufficient investment. The model is as follows:

$$\begin{aligned} INV_{i,t} = {} & \alpha + \beta_1 Size_{i,t-1} + \beta_2 Lev_{i,t-1} + \beta_3 Growth_{i,t-1} + \beta_4 Ret_{i,t-1} + \beta_5 Age_{i,t-1} + \beta_6 Cash_{i,t-1} \\ & + \beta_7 INV_{i,t-1} + \sum Industry + \sum Year + \varepsilon \end{aligned} \quad (1)$$

The dependent variable $INV_{i,t}$ represents the investment level of company i in year t. The independent variables $Size_{i,t-1}$, $Lev_{i,t-1}$, $Growth_{i,t-1}$, $Cash_{i,t-1}$, $Age_{i,t-1}$, $Ret_{i,t-1}$, and $INV_{i,t-1}$ are, respectively, company i's corporate

Table 2
Variable definitions and calculations.

Variable Name	Meaning	Calculation
Inv	Investment level	(Construction of fixed assets, intangible assets, and other long-term assets paid cash – disposal of fixed assets, intangible assets, and other long-term assets recovered net cash)/total assets
Sub	Government subsidies	Subsidy income/total assets
Post	Whether anti-corruption policy is implemented	The dummy variable, where the year of the implementation of the anti-corruption policy is 1 (i.e., the value of the year after 2012, including 2012), otherwise it is 0
Lev	Leverage level	Total liabilities/total assets
Cash	Cash holding level	(Cash + short-term investment or trading financial assets)/total assets
Growth	Operating income growth rate	(Operating income for the current year - the amount of operating income for the same period of the previous year)/(the amount of operating income for the same period of the previous year)
Age	Listing period	Years between financial reporting year and IPO year
Size	Asset size	Natural logarithm of total assets
Ret	Market return	Annual cumulative rate of return
EXP	Management expense ratio	Management fee/operating income
Fcf	Free cash flow	(Net cash flow from operating activities – expected normal investment level)/total assets
Topratio	Equity structure	The shareholding ratio of the largest shareholder
Idratio	External supervision	Ratio of independent directors
Duality	The duality of the president of the board and general manager	The dummy variable, whether the president of the board and general manager are the same person; 1 if so and 0 otherwise.
Otac	Proportion of major shareholders' occupation	Other receivables/total assets
Industry	Industry dummy variable	Excluding the financial industry, there are 20 industry dummy variables in the specific classification of manufacturing
Year	Annual dummy variable	10 annual dummy variables
Soe	Ownership property of business	State-owned enterprises are 1, and non-state-owned enterprises are 0
Subhigh	Classify companies with government subsidies obtained	Classify companies with subsidies higher than the median in the current period as the high-government-subsidy group, (set *Subhigh* = 1), and 0 otherwise
Overinv	Overinvestment level	Model 1 (Richardson model) generates residuals that measure the level of over-investment
Overgroup	Classify companies by investment efficiency	Grouped by residual quartiles, the group with the largest value is defined as the overinvestment group, with a value of 1 (*Overgroup* = 1); the middle two groups are set as a control group with a value of 0

size, leverage level, growth, cash holdings, time to market, stock returns rate, and investment levels in year $t-1$. To enhance the accuracy of the estimation results, the model also controls the annual variable year and the industry variable industry. Table 2 shows the specific variable definition and calculations.

In model (1), *INV* represents the company's capital expenditure level. We use the cash flow statement item to calculate the indicator: capital expenditure level = (constructed fixed assets, intangible assets, and other long-term assets to pay cash – disposal of fixed assets, intangible assets, and net cash recovered from other long-term assets)/total assets (Biddle et al., 2009). We use the growth rate (*Growth*) to measure the company's potential investment opportunities. To estimate investment efficiency, we look at the level of residuals (*Overinv*). We use a definition similar to that of Wang (2009) in that the residual value obtained by regression estimation directly measures the level of excessive investment of enterprises. We set the dummy variable (*overgroup*) to represent investment efficiency. Grouped by residual quartiles, the group with the largest value is defined as the overinvestment group with a value of 1, while the middle two groups are set as a control group with a value of 0 (Biddle et al., 2009; Zhang et al., 2012).

The specific variable definitions and calculations are shown in Table 2.

4.2.2. Government subsidy and investment efficiency model

To verify Hypothesis 1, we draw on the research of Bergstrom (2000) and Li (2015) and use the residual generated by the model regression results as the dependent variable for regression analysis to test the impact of government subsidies on the investment efficiency of enterprises as follows:

$$\begin{aligned}\mathrm{OverInv}_{i,t} = {} & \alpha + \beta_1 \mathrm{Sub}_{i,t} + \beta_2 \mathrm{fcf}_{i,t} + \beta_3 \mathrm{Topratio}_{i,t} + \beta_4 \mathrm{Idratio}_{i,t} + \beta_5 \mathrm{Dual}_{i,t} + \beta_6 \mathrm{Otac}_{i,t} + \beta_7 \mathrm{EXP}_{i,t} \\ & + \beta_8 \mathrm{Cash}_{i,t} + \sum \mathrm{Year} + \sum \mathrm{Industry} \end{aligned} \tag{2}$$

The residual value estimated by model (1) is the level of overinvestment of company i in period t. $Sub_{i,t}$ indicates that company i received government subsidies in period t. According to Hypothesis 1, we expect the regression coefficient of *Sub* to be significantly positive due to the free cash flow (*Fcf*). The top shareholder's share proportion (*Topratio*), dual rights separation (*Dual*), major shareholders' occupation (*Otac*), external supervision (*Idratio*), and management fees (*Exp*) affect investment spending (Richardson, 2006; Xia and Zhang, 2008), and these variables are controlled in the model.

4.2.3. Anti-corruption, government subsidies, and overinvestment models

To verify Hypothesis 2, whether the implementation of anti-corruption improved the efficiency of government-subsidized enterprises, we draw on Bertrand et al. (2004) and Xiao and Kong (2014) to design the model as follows:

$$\begin{aligned}\mathrm{Overinv}_{i,t} = {} & \alpha + \beta_1 post_{i,t} * Sub_{i,t} + \beta_2 Sub_{i,t} + \beta_3 post_{i,t} + \beta_4 \mathrm{fcf}_{i,t} + \beta_5 \mathrm{Topratio}_{i,t} + \beta_6 \mathrm{Idratio}_{i,t} \\ & + \beta_7 \mathrm{Dual}_{i,t} + \beta_8 \mathrm{Otac}_{i,t} + \beta_9 \mathrm{EXP}_{i,t} + \sum \mathrm{Year} + \sum \mathrm{Industry} \end{aligned} \tag{3}$$

Overinv is the residual level value estimated by model (1). $Overinv_{i,t} > 0$ indicates that company i has excessive investment in period t. *Sub* measures the amount of government subsidy obtained by the company, and *Post* is a dummy variable for the time of the implementation of the anti-corruption policy. According to Hypothesis 2, we expect the regression coefficient of the interaction term $post^{*}sub$ to be significantly negative—that is, the anti-corruption policy restricts the ability of the government to subsidize enterprises, and thus the level of excessive investment of the government-subsidized enterprise is significantly reduced. As above, the model controls the relevant factors that affect corporate investment.

In addition, to investigate how the anti-corruption policy affects government subsidies and the investment efficiency of different equity companies, we divide the companies into state-owned and non-state-owned subsamples based on model 3. By Hypothesis 3, we anticipate that anti-corruption policies have a more pronounced effect on the state-owned enterprise group.

Table 3
Descriptive statistics of variables.

Variable	Obs	Mean	Std. Dev.	Min	Max	Median
Overinv	14,385	0.0000	0.0400	−0.1968	0.2489	−0.0061
Growth	15,717	0.1903	0.5248	−0.6201	3.7051	0.1078
Ret	15,717	0.2178	0.6045	−0.4961	2.6206	0.0264
Lev	15,717	0.4741	0.2198	0.0530	1.0361	0.4765
Cash	15,717	0.1576	0.1393	0	0.6192	0.1252
Age	15,717	9.6749	5.9145	0	25	10
Size	15,717	21.9532	1.3185	19.2859	26.1661	21.7739
Inv	15,717	0.0532	0.0547	−0.0463	0.2564	0.0386
fcf	15,717	0.0039	0.1415	−1.7083	6.25	−0.0148
Duality	15,717	0.2068	0.4051	0	1	0
Topratio	15,717	36.1028	15.5093	0.29	89.99	34.26
Idratio	15,717	0.3690	0.0543	0.0909	0.8000	0.3333
Otac	15,717	0.0190	0.0335	0.0000	0.8182	0.0084
Exp	15,717	0.0948	0.0089	0.0036	0.6339	0.0740
Soe	15,717	0.6227	0.4847	0	1	1

4.3. Descriptive statistics of variables

Table 3 reports the means, medians, and standard deviations of the main variables. According to the descriptive statistics, the values of the main research variables are within a reasonable range, indicating that the results are less affected by extreme values.

Table 4 shows the descriptive statistics for the high-subsidy group and the control group. We find that the highly subsidized listed companies have more serious overinvestment than the control group. The *t*-test indicates that the difference between the two is significant at the 1% level. On the whole, companies that receive high government subsidies have problems with inefficient scale expansion.

Table 5 shows the descriptive statistics of the relevant data for the high-subsidy group before and after the anti-corruption campaign. The table shows that the probability of overinvestment in the high-subsidy group after the anti-corruption event (0.3524) is significantly lower than before the start of the anti-corruption policy

Table 4
Descriptive statistics for the high-subsidy group and the control group.

Variable	Mean		*t* test
	Subhigh group	Control company	
Overgroup	0.8026	0.7632	5.1230***
Overinv	0.0013	−0.0020	4.8396***
Growth	0.1935	0.1857	0.9454
Ret	0.2072	0.2329	−2.6226***
Lev	0.5017	0.4347	19.0944***
Cash	0.1452	0.1743	−13.3704***
Age	10.2462	8.8585	14.6323***
Size	22.3247	21.4224	45.0192***
Inv	0.0540	0.0520	2.2147***
fcf	0.0096	0.0014	2.8770***
Duality	0.1918	0.2284	−5.6009***
Topratio	36.6106	35.3776	4.9282***
Idratio	0.3696	0.3662	1.6997*
Otac	0.0187	0.0194	−1.4181
Exp	0.0975	0.0928	3.2830***
Soe	0.6678	0.5582	14.0985***

* indicates significance at the 10% level.
** Indicates significance at the 5% level.
*** Indicate significance at the 1% level.

Table 5
Descriptive statistics of the high subsidy group before and after the anti-corruption campaign.

Variable	Mean		*t* test
	Before anti-corruption	After anti-corruption	
Overgroup	0.4895	0.3524	15.4511***
Overinv	0.0000	0.0000	−0.0000
Growth	0.2407	0.1511	9.4802***
Ret	0.0465	0.3335	−28.7687***
Lev	0.4979	0.4862	3.0416***
Cash	0.1797	0.1261	22.4077***
Size	21.7394	22.5020	−32.3531***
Inv	0.0583	0.0499	8.4597***
fcf	0.0113	−0.0022	5.9500***
Duality	0.1697	0.2157	−6.5317***
Topratio	36.4525	36.3132	0.4926
Idratio	0.3644	0.3723	−8.1388***
Otac	0.0216	0.0167	8.2035***
Exp	0.0885	0.0958	−4.6002***
Soe	0.6864	0.6235	7.3776***

* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

(0.4985). This difference is significant at the 1% level, which shows that after the implementation of the anti-corruption policy, the possibility of overinvestment by high-government subsidy companies decreased significantly. Thus, we preliminarily confirm our expected research findings. The finding that the non-significant difference for the *Overinv* variable may be explained by the fact that the variable is the residual of the annual and industry regression estimates, so the mean residual value of the annual comparison tends toward zero.

We further analyze the descriptive statistics of the data on state-owned and non-state-owned enterprises (Table 6). Table 6 shows that from the average value of *Overgroup*, the ratio of overinvestment in the state-owned enterprise group (0.4669) is significantly higher than that in non-state-owned enterprises

Table 6
Descriptive statistics for state-owned and non-state-owned enterprises.

Variable	Mean		*t* test
	State-owned	Non-state-owned	
Overgroup	0.4669	0.3808	9.3929***
Overinv	0.0003	−0.0006	1.2445
Growth	0.1814	0.2051	−2.7589***
Ret	0.1857	0.2713	−8.6122***
Lev	0.5177	0.4021	33.1648***
Cash	0.1550	0.1784	−14.7507***
Age	11.2583	7.0619	46.1038***
Size	22.2185	21.5154	33.6795***
Inv	0.0502	0.0580	−8.6917***
fcf	0.0020	0.0070	−2.1708**
Duality	0.1370	0.3321	−28.5891***
Topratio	37.3915	33.9775	13.5063***
Idratio	0.3662	0.3736	−8.3851***
Otac	0.0187	0.0194	−1.2600
Exp	0.0889	0.1045	−10.7483***
Sub	0.3865	0.1739	16.5756***

* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

(0.3808); that is, overall, state-owned enterprises are more inclined to overinvest. The *t*-test results show significant differences at the 1% level. Although the statistical test of the variable *Overinv* is not significant, the value of overinvestment of state-owned enterprises is positive (overinvestment), while the level of overinvestment in non-state-owned enterprises is negative (insufficient investment).

5. Empirical results

5.1. Estimation of investment level

The results reported in Table 7 show that there are significant positive correlations between a company's investment level (*INV*) and its asset size (*Size*), growth (*Growth*), market return (*Ret*), cash holding level (*Cash*), and initial investment scale (INV_{t-1}), and significant negative correlations between the liabilities level (*Lev*) and listing age (*Age*). The regression results in Table 7 show that the relations between all of the variables and investment levels are consistent with the principal–agent theory and the results of similar studies (Xin et al., 2007; Zhong et al., 2010; Zhang and Lu, 2012).

5.2. Impact of government subsidies on investment levels

The regression results in Table 8 show that the coefficient of *Sub* is significantly positive at the 1% significance level. The results show that the more government subsidies a listed company receives, the more likely its overinvestment will increase, which verifies Hypothesis 1. The coefficients of the remaining major control variables, such as the free cash flow level (*Fcf*) and the duality of the president of the board and general manager (*Duality*), are significantly positive. That is, the higher the level of free cash flow, the more likely the company will overinvest, and when the president of the board and general manager are the same person, their more concentrated power means overinvestment will be more serious. The ratio of occupation (*Otac*) and the management expense (*Exp*) are significantly negatively correlated with the level of overinvestment of the enterprise, indicating that the occupation and management expenses will reduce the available investment funds of the enterprise. Furthermore, the coefficient of the ratio of independent directors (*Idratio*) is significantly negative, which means that the more independent directors there are on the board of directors, the less likely the company is to overinvest, which indicates that independent directors can play a supervisory role and improve corporate governance to some extent. The above results are consistent with the conclusions of the literature (e.g., Bai et al., 2005; Xin et al., 2007).

Table 7
Estimation of investment level.

Variable	Coefficients	Std. Err.	t-value	P > |t|
$Size_{t-1}$	0.0016***	0.0003	5.08	0.0000
$Growth_{t-1}$	0.0022***	0.0006	3.55	0.0000
Ret_{t-1}	0.0036***	0.0006	5.67	0.0000
Lev_{t-1}	−0.0081***	0.0020	−4.13	0.0000
$Cash_{t-1}$	0.0293***	0.0029	10.24	0.0000
Age_{t-1}	−0.0004***	0.0001	−5.88	0.0000
Inv_{t-1}	0.5424***	0.0066	81.62	0.0000
Year	Control	Control	Control	Control
Industry	Control	Control	Control	Control
Observations		14,385		
R-squared		0.4285		

* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

Table 8
Effects of government subsidies on investment levels.

Variable	Coefficients	Std. Err.	t-value	P > |t|
Sub	0.0109***	0.00197	5.01	0.000
Fcf	0.0541***	0.00286	18.93	0.000
Topratio	−0.00001	0.00002	−0.39	0.697
Duality	0.0026***	0.00087	3.03	0.002
Otac	−0.0865***	0.0122	−7.12	0.000
Exp	−0.0130***	0.00483	−2.69	0.007
Idratio	−0.0149**	0.00635	−2.34	0.019
Cash	−0.0412***	0.00318	−12.96	0.000
Year	Control	Control	Control	Control
Industry	Control	Control	Control	Control
Observations		14,365		
R-squared		0.042		

* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

Table 9
The impact of anti-corruption policies on investment efficiency.

Var.	Overall sample group *Overinv*	Overinvestment sample group *Overgroup*
*Sub*post*	−0.00824**	−0.0507
	(0.00387)	(0.0510)
Sub	0.0147***	0.00435
	(0.00294)	(0.0387)
Post	0.0116*	−0.121
	(0.00631)	(0.0837)
Fcf	0.0540***	0.501***
	(0.00286)	(0.0351)
Topratio	−0.00001	−0.00041
	(0.00002)	(0.000304)
Duality	0.00265***	0.0733***
	(0.00087)	(0.0111)
Otac	−0.0863***	−1.091***
	(0.0122)	(0.163)
Exp	−0.0128***	−0.0800
	(0.00484)	(0.0666)
Idratio	−0.0148**	−0.0245
	(0.00635)	(0.0835)
Cash	−0.0414***	0.281***
	(0.00318)	(0.0395)
Year	Control	Control
Industry	Control	Control
Observations	14,365	11,125
R-squared	0.042	0.106

Note: The numbers in parentheses are standard errors.
* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

5.3. The impact of anti-corruption policies on investment efficiency

Table 9 reports the full sample regression results that take the estimated residuals as the dependent variable and show the regression results for the overinvestment sample group. The data show that the *Sub*post* coef-

ficient of the main variable interaction term of the overall sample group is significantly negative at the 5% significance level. The results show that since the implementation of the anti-corruption policy in China, the overinvestment of listed companies receiving government subsidies has decreased and the overall non-efficient investment level of listed companies has been reduced significantly. That is, the implementation of the anti-corruption policy can rationalize government subsidies to a certain extent, prevent managers from conducting expansion responsibly, and improve the company's efficient use subsidies and investment efficiency. Hence, Hypothesis 2 is supported. The regression results of the main control variables show that the level of free cash flow significantly affects the company's excessive investment behavior. First, the higher the shareholding ratio of the largest shareholder, the more serious the short-selling of the listed company by the superior shareholders will be. Second, the higher the proportion of independent directors of the listed company, the lower the overinvestment level of the company will be. The above results are basically consistent with the findings of prior research. Although the regression coefficient of *Sub*post* in the second column is not significant, the interaction term symbol is still negative. Therefore, overall, the regression results in Table 9 support Hypothesis 2; that is, the anti-corruption policy inhibits the excessive investment behavior by enterprises that receive government subsidies.

Table 10 reports the changes in investment efficiency of enterprises with different equity characteristics after the implementation of the anti-corruption policy in China. The regression results of the overall sample group show that the main interaction item *Sub*post* of government-subsidized state-owned enterprises is significantly negative at the 1% level, indicating that the anti-corruption policy has a significant correction effect on the investment efficiency of government-subsidized state-owned enterprises; the main interaction variable in

Table 10
The anti-corruption policy effects on investment efficiency of state-owned enterprises and non-state-owned enterprises.

Var.	Overall sample group *Overinv*		Overinvestment sample group *Overgroup*	
	Soe = 1	*Soe = 0*	*Soe = 1*	*Soe = 0*
*Sub*post*	−0.0123***	0.00025	−0.138**	0.109
	(0.00453)	(0.00762)	(0.0612)	(0.0948)
Sub	0.0149***	0.0162***	0.0797*	−0.0468
	(0.00336)	(0.00608)	(0.0456)	(0.0747)
Post	0.0175**	−0.000119	0.0221	−0.398***
	(0.00751)	(0.0121)	(0.102)	(0.152)
Fcf	0.0585***	0.0477***	0.572***	0.435***
	(0.00359)	(0.00473)	(0.0472)	(0.0522)
Topratio	−0.00008***	0.00012***	−0.00010	0.00150***
	(0.00003)	(0.00004)	(0.00038)	(0.000499)
Duality	0.00318**	0.00139	0.0763***	0.0312**
	(0.00124)	(0.00129)	(0.0163)	(0.0155)
Otac	−0.0761***	−0.109***	−0.983***	−1.352***
	(0.0152)	(0.0207)	(0.203)	(0.275)
Exp	−0.0156**	−0.0122	0.0294	0.101
	(0.00607)	(0.00819)	(0.0831)	(0.112)
Idratio	−0.0224**	−0.00151	−0.0311	−0.0984
	(0.00778)	(0.0111)	(0.105)	(0.137)
Cash	−0.0464***	−0.0381***	0.0288	0.375***
	(0.00413)	(0.00517)	(0.0557)	(0.0584)
Year	Control	Control	Control	Control
Industry	Control	Control	Control	Control
P value for difference (Sub*post)	0.0000***		0.0000***	
Observations	9225	5140	6927	4198
R-squared/ Pseudo R-squared	0.046	0.042	0.088	0.147

Note: The numbers in parentheses are standard errors.
* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

non-state-owned enterprises is not significant. Further test results show that the *Sub*post* coefficient of the interaction term between the state-owned and non-state-owned enterprise sample groups is significant at the 1% level. The regression of the overinvestment sample group has similar results: the *Sub*Post* of government-subsidized state-owned enterprises is significantly negative at 5% but is not significant in non-state-owned enterprises, and further testing of the interaction coefficient of the two groups shows that there are significant differences at the 1% level. The above results all support Hypothesis 3: the anti-corruption policy has a more significant effect on inhibiting excessive investment by state-owned enterprises that receive government subsidies than non-state-owned enterprises that receive subsidies.

6. Robustness tests

To test the robustness of the main conclusion, we carried out the following various tests.

6.1. Change in the definition of post

The 18th National Congress was held in November 2012, which may affect the observations for that year. Therefore, in the robustness tests, we change the classification criterion of 2012 and use the years 2013–2015 (after the implementation of the anti-corruption policy) as the sample (*post* = 1, and 0 otherwise). Hypotheses 2 and 3 still hold; Table 11 shows the empirical results (*Overinv* is taken as an example, and the results are similar to *Overgroup*).

Table 11
Change in the definition of *Post*.

Var.	Full sample	Soe = 1	Soe = 0
*Sub*post*	−0.00325**	−0.0584***	−0.00038
	(0.00153)	(0.00183)	(0.00282)
Sub	0.00319***	0.00297***	0.00412***
	(0.00088)	(0.00101)	(0.00174)
Post	0.00389	0.00892***	−0.00207
	(0.00257)	(0.00314)	(0.00458)
Fcf	0.0424***	0.0543***	0.0307***
	(0.00242)	(0.00332)	(0.00359)
Topratio	−0.00001	−0.00008***	0.00010***
	(0.00002)	(0.00003)	(0.00004)
Duality	0.00215**	0.00298**	0.00111
	(0.00085)	(0.00120)	(0.00126)
Otac	−0.0658***	−0.0598***	−0.0716***
	(0.0103)	(0.0153)	(0.0160)
Exp	−0.0126***	−0.0154***	−0.00708
	(0.00405)	(0.00513)	(0.00669)
Idratio	−0.0135**	−0.0171**	−0.00404
	(0.00613)	(0.00748)	(0.0108)
Cash	−0.0397***	−0.0455***	−0.0343***
	(0.00298)	(0.00383)	(0.00490)
*P value for difference (Sub*post)*	–	0.0000***	
Year	Control	Control	Control
Industry	Control	Control	Control
Observations	14,365	9225	5140
R-squared	0.032	0.042	0.027

Note: The numbers in parentheses are standard errors.
* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

6.2. Change in the estimation method for the level of overinvestment

To examine the sensitivity of the overinvestment measurement methods on the conclusions, we use Biddle et al. (2009) as a reference and adopt the following methods to estimate the normal investment level of enterprises. The investment level of enterprises is indicated as a function of the initial phase of growth of the enterprises, and the normal investment level of each enterprise is then estimated according to the annual and industrial regressions. The regression residuals are used to measure the overinvestment level.

$$Inv_{i,t} = \alpha_0 + \beta\ Growth_{i,t-1} + \varepsilon_{i,t}$$

We divide the residuals into different groups based on quartile using the same method as Biddle et al. (2009). The largest group is taken as the overinvestment group, and the intermediate group is the reference group. We then use a probit model to replace the original model to test the robustness of Hypotheses 2 and 3. The results in Table 12 show that the anti-corruption policy has had a significant negative impact on the overinvestment level of government-subsidized enterprises at the 10% significance level. Compared with the impact on non-state-owned enterprises, the overinvestment restriction function of the anti-corruption policy on government-subsidized enterprises for the state-owned enterprises is more significant (the interaction term coefficient is negative at the 10% significance level), and the statistical test shows that the interaction term coefficients are significantly different between the two groups. Our main conclusions remain valid.

6.3. Evidence of the effects of anti-corruption policies in the cross-section

To further confirm the impact of the anti-corruption policy on the investment efficiency of government subsidies (Hypothesis 2), we introduce the anti-corruption variable *deep* in each region to measure the influence of the anti-corruption measures on different regions. Specifically, we compile a list of officials who were removed

Table 12
Change in the estimation method for the level of overinvestment.

Var.	Full sample	*Soe = 1*	*Soe = 0*
*Sub*post*	−0.0242*	−0.0293*	−0.00153
	(0.0124)	(0.0150)	(0.0235)
Sub	−0.0167*	−0.00166	−0.0293
	(0.00934)	(0.0110)	(0.0187)
Post	−0.424**	−0.265	−0.966**
	(0.204)	(0.251)	(0.377)
Fcf	−0.966***	−1.022***	−0.950***
	(0.0907)	(0.121)	(0.141)
Topratio	0.00093	0.00015	0.00321***
	(0.00074)	(0.00094)	(0.00124)
Duality	0.157***	0.135***	0.0611
	(0.0272)	(0.0403)	(0.0386)
Otac	−2.420***	−2.025***	−3.192***
	(0.396)	(0.506)	(0.650)
Exp	0.612***	0.371*	0.849***
	(0.156)	(0.203)	(0.256)
Idratio	0.275	0.401	−0.155
	(0.202)	(0.256)	(0.338)
Year	Control	Control	Control
Industry	Control	Control	Control
P value for difference (Sub*post)	–	0.0000***	
Observations	14,429	8903	5526
Pseudo R-squared	0.0729	0.0727	0.0851

Note: The numbers in parentheses are standard errors.
* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

from office due to corruption from various provinces since the 18th National Congress and summarize the specific implementation of anti-corruption actions. We further examine whether there are significant differences in the government-subsided investment efficiency among enterprises that were influenced by the anti-corruption policy at different levels. In particular, we consider whether the provinces with higher anti-corruption intensity have more obvious improvements in the efficient use of government subsidies. After compiling the list of corrupt officials at the provincial and ministerial levels, we divided them into different groups based on quintile. The groups in the two largest quantiles are defined as the high intensity group and assigned a value of 1, while the group with fewest corrupt officials removed from their posts is set as the control group and assigned a value of 0. We use the groups' *deep* to describe the intensity of the effect of the anti-corruption policy. The regression results in Table 13 show that in areas in which the anti-corruption policy had the most impact, the main variable interaction term—the *Sub*post* coefficient—is negative at the 10% significance level, while the main observation variable interaction coefficient is not significant in areas in which the intensity is weak. This result provides cross-sectional evidence for Hypothesis 2, that regional intensity has a significant differential impact on the investment efficiency of corporate financial subsidies following the anti-corruption policy.

6.4. Separate investigations of overinvestment and underinvestment

Following prior research, we classify the enterprise group whose residual was estimated to be more than 0 at the normal investment level as the overinvestment group and the group whose residual was less than 0 as the underinvestment group. We repeat the regression to examine the possible different effects of the anti-corruption policy on the overinvestment and underinvestment groups. As Table 14 shows, the interaction term *Sub*post* is significant in the overinvestment group but not in the underinvestment group, although it is positive. Therefore, the anti-corruption policy mainly relies on the deterrent effect of the policy to affect how

Table 13
Evidence of the effects of anti-corruption policies in the cross-section.

Var.	Deep = 1	Deep = 0
*Sub*post*	−0.0293*	−0.00153
	(0.0150)	(0.0235)
Sub	−0.00166	−0.0293
	(0.0110)	(0.0187)
Post	−0.265	−0.966**
	(0.251)	(0.377)
Fcf	−1.022***	−0.950***
	(0.121)	(0.141)
Topratio	0.00015	0.00321***
	(0.00094)	(0.00124)
Duality	0.135***	0.0611
	(0.0403)	(0.0386)
Otac	−2.025***	−3.192***
	(0.506)	(0.650)
Exp	0.371*	0.849***
	(0.203)	(0.256)
Idratio	0.401	−0.155
	(0.256)	(0.338)
Year	Control	Control
Industry	Control	Control
P value for difference (Sub*post)	0.0000***	
Observations	2614	1214
Pseudo R-squared	0.0961	0.1311

Note: The numbers in parentheses are standard errors.
* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

Table 14
Separate investigation of overinvestment and underinvestment.

Var.	Overinv > 0 (Overinvestment group)	Overinv < 0 (Underinvestment group)
*Sub*post*	−0.00471*	0.00038
	(0.00346)	(0.00210)
Sub	−0.00446**	0.00246***
	(0.00176)	(0.00088)
Post	0.00335	0.00208
	(0.00580)	(0.00341)
Fcf	0.0644***	−0.00857***
	(0.00456)	(0.00217)
Topratio	0.00006	0.00001
	(0.00004)	(0.00002)
Duality	0.00528***	−0.00103
	(0.00161)	(0.00088)
Otac	−0.0938***	−0.0145
	(0.0215)	(0.0109)
Exp	0.0133	−0.0126***
	(0.00898)	(0.00395)
Idratio	−0.00153	0.00767
	(0.0125)	(0.00631)
Cash	−0.0252***	0.00614**
	(0.00672)	(0.00262)
Year	Control	Control
Industry	Control	Control
P value for difference (sub*post)	0.0000***	
Observations	5737	8626
R-squared	0.073	0.027

Note: The numbers in parentheses are standard errors.
* Indicate significance at the 10% level.
** Indicate significance at the 5% level.
*** Indicate significance at the 1% level.

enterprises invest subsidies, which alleviates the agency costs when using subsidies within the enterprise, but has a less significant effect on insufficiently invested enterprises.

7. Conclusion

In this paper, we examine the effect of China's recently enacted anti-corruption policy on the government subsidy efficiency from the perspective of overinvestment. The findings reveal that government subsidies have a significant positive impact on the overinvestment behavior of enterprises and that the anti-corruption work done by the government has effectively restrained the excessive investment behavior of government-subsidized enterprises. Further, we find that the implementation of anti-corruption policies has a stronger inhibitory effect on the overinvestment behavior in subsidized state-owned enterprises than in non-state-owned enterprises.

We analyze and evaluate the resource allocation efficiency of local government fiscal policy in terms of the institutional factor of government corruption level, and thus explore the deeper reasons for the resource allocation effect of financial subsidies. From the new perspective of government subsidies, we comprehensively analyze the impact of anti-corruption on microeconomic entities and supplement the research by considering the anti-corruption policy's economic effects from a horizontal perspective. The conclusion highlights that new cooperation between the government and enterprises after the anti-corruption policy was implemented has rationalized administrative resources and will ultimately promote the sustained and healthy development of the national economy. Our research also enriches the literature related to investment efficiency.

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