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I hereby declare that this dissertation is my original work and it has been written by me in its entirety.
I have duly acknowledged all the sources of information which have been used in this dissertation.

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Abstract

Against the backdrop of intensifying global economic competition and the deepening reform of state-owned enterprises (SOEs), improving the operational efficiency of central state-owned enterprises has become a core issue in China's pursuit of high-quality economic development. Meanwhile, as market-oriented reforms advance and capital markets open further in both directions, central state-owned enterprises' market value management has increasingly emerged as a pivotal mechanism connecting national strategies with market value, necessitating the establishment of an institutional framework that balances value creation and value realization.

In 2009, the State-owned Assets Supervision and Administration Commission of the State Council introduced the Economic Value Added (EVA) assessment system, explicitly incorporating capital costs to shift enterprises from scale expansion to value creation, thereby providing a new pathway for the market-oriented reform of central state-owned enterprises. Using a sample of Chinese A-share state-owned listed companies from 2007 to 2023, this paper examines the impact of the EVA assessment system on value creation in central state-

owned enterprises, focusing on whether the implementation of the EVA performance assessment system effectively guides enterprise managers to prioritize value creation and achieve the intended policy outcomes. Additionally, it explores whether the EVA system can address the long-standing issue of low innovation efficiency in central state-owned enterprises, ultimately enhancing their core competitiveness in market value management.

The findings of this study not only contribute to a deeper understanding of the EVA assessment mechanism but also provide new insights and approaches for central state-owned enterprises to achieve high-quality development in the new era.

Keywords: Economic Value Added, Market Value Management, Innovation Efficiency

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Chapter 1 Introduction

1.1 Research Questions

In today's increasingly competitive global economic environment, enhancing the operational efficiency of state-owned enterprises, particularly the management effectiveness of central state-owned enterprises, has become a critical issue for China's high quality economic development. After four decades of market-oriented reforms, China's state-owned enterprises have successfully transitioned from being mere executors of planned economy directives to market entities adapted to the socialist market economy. However, optimizing capital allocation efficiency remains a core challenge in the ongoing reform process. Due to their unique functional positioning, central state-owned enterprises hold a pivotal position in the national economic system. As guardians of the national economic lifeline, central state-owned enterprises must fulfill dual missions: on one hand, they are tasked with safeguarding national strategic security, ensuring control and influence in key sectors; on the other hand, they bear the economic responsibility of preserving and increasing the value of state-owned assets while pursuing corporate profitability and market competitiveness. This dual mandate requires central state-owned enterprises to strike a dynamic balance between administrative objectives and market goals in decision-making, reconciling national strategic needs with corporate economic performance. In terms of ownership structure, central state-owned enterprises exhibit multi-tiered principal-agent relationships, with more complex holding chains compared to private enterprises. While this multi-layered holding structure helps disperse risks and integrate resources to some extent, it also increases management complexity and information transmission costs, potentially leading to reduced decision-making efficiency and suboptimal resource allocation. Moreover, central state-owned enterprises are predominantly concentrated in key sectors with natural monopoly attributes, which are strategically significant for national economic security

and stability. Yet, the high entry barriers and low competition in these sectors present unique operational environments and competitive challenges. Therefore, how to improve operational efficiency and economic performance while ensuring the realization of national strategic objectives is a major challenge for central state-owned enterprises and a core issue of concern for both government and academia.

To enhance the operational efficiency of central state-owned enterprises and address the widespread issue of blind pursuit of corporate scale, the State-owned Assets Supervision and Administration Commission (SASAC) has been exploring the establishment of an evaluation system compatible with the market economy. It has gradually constructed a comprehensive evaluation framework combining annual assessments with tenure assessments, supplemented by both financial and non-financial indicators. Prior to the 2009 revision, the evaluation system primarily relied on four core indicators: total profit, return on net assets, preservation and appreciation rate of state-owned capital, and growth rate of main business income. These were assessed through an A-E grading system directly linked to executive compensation and appointments. While this accounting profit-oriented evaluation mechanism improved short-term corporate profitability, it failed to effectively curb the short-term behavior of some central state-owned enterprises artificially inflating profits through capital expansion. The global financial crisis in 2008 exposed the institutional flaws of the traditional evaluation system. During periods of severe macroeconomic volatility, when central state-owned enterprises faced systemic risks such as shrinking market demand and significant asset price fluctuations, SASAC encountered difficulties in setting appropriate evaluation targets, and central state-owned enterprises similarly struggled to meet corresponding assessment tasks, placing unprecedented pressure on performance evaluation. Additionally, before 2009, SASAC predominantly used indicators like revenue and total profit for performance evaluation. However, for central state-owned enterprises with ample funding sources, achieving high return on assets (ROA) was not

particularly challenging. Yet when the financial crisis hit, if a company's ROA fell below its financing costs, high debt levels immediately posed significant risks. Thus, even when central state-owned enterprises reported high total profits or net profits, this did not necessarily equate to positive shareholder value creation. Only when economic profit-calculated after deducting capital costs-exceeds zero does corporate value truly increase.

Meanwhile, against the backdrop of economic globalization and marketization, the importance of market value management for central state-owned enterprises has become increasingly prominent. The State-owned Assets Supervision and Administration Commission (SASAC) plans to introduce market value management assessments in 2024, reflecting the government's further requirements for high-quality development and market-oriented operations of central state-owned enterprises. This will encourage central state-owned enterprises to place greater emphasis on market value management, optimize resource allocation, enhance market competitiveness, and improve returns to investors. Market value is not "managed" but rather "demonstrated" through competitiveness. Market value management is not simply equivalent to stock price management; which encompasses multiple aspects such as value creation, value transmission, and value realization. Therefore, market value management should involve the reasonable management of stock price fluctuations under the premise of legality, compliance, fairness, and transparency, aligning them with the company's long-term and short-term strategic goals. Given the unique ownership characteristics of central state-owned enterprises, they must exercise greater caution when employing sensitive measures like equity incentives to ensure compliance. Against this backdrop, central state-owned enterprises need to shift from their previous singular focus on financial metrics and explore incentive mechanisms that better align market value growth with intrinsic value to achieve sustainable development.

Since Stern Stewart & Co. introduced the Economic Value Added (EVA) theoretical framework in the 1990s, this new corporate value assessment tool

has rapidly gained attention in international capital markets. Pioneers in corporate governance reform, such as Coca-Cola and Siemens, were among the first to incorporate EVA into their management performance evaluation systems. The mature property rights environment in developed countries—characterized by clear shareholder rights, robust disclosure mechanisms, and effective investor protection laws—has provided institutional support for performance evaluation systems based on capital costs. Under the pressure of global competition, the EVA metric, by quantifying real profits after deducting equity capital costs, has effectively curbed reckless capital expansion and gradually become a key management tool in global corporate governance.

Based on this, SASAC initiated a market-oriented reform of the evaluation system in 2008, piloting EVA assessments in some central state-owned enterprises to strengthen value creation orientation and improve capital utilization and resource allocation efficiency. In December 2009, SASAC issued the "Interim Measures for the Performance Evaluation of Central Enterprise Executives", fully incorporating EVA into annual assessment indicators with a 40% weighting and introducing a differentiated capital cost rate mechanism. This reform established the opportunity cost of shareholder equity through the concept of capital cost, shifted the focus of evaluation from accounting profits to economic profits, and created a cross-cycle performance evaluation mechanism. Additionally, linking EVA with total compensation budget management formed an incentive and constraint mechanism where resource allocation is determined by value creation. Subsequent revisions in 2012, 2016, and 2019 further optimized the calculation standards for capital cost rates, gradually introduced industry benchmarking, and treated R&D expenditures as profit add-backs, forming a value-oriented evaluation system with Chinese characteristics.

The implementation of the EVA appraisal system has not only significantly enhanced the operational efficiency and resource allocation efficiency of central SOEs, but also effectively enhanced the market value of enterprises by guiding

corporate managers to focus on long-term value creation rather than on short-term fluctuations in share prices. Compared to traditional financial indicators, EVA makes the cost of equity capital explicit, prompting enterprises to shift from scale expansion to quality improvement, thereby laying a solid value foundation for market capitalization management. Simultaneously, this system aligns management's strategic decisions with long-term valuation anchors in the capital markets and optimizes resource allocation by differentiating capital cost rates among enterprises. This ensures that the market value of strategic investments receives institutional recognition within the evaluation framework. Essentially, this institutional reform establishes a transmission channel between genuine corporate value creation and capital market recognition. When a company's EVA consistently improves, it not only reflects an enhancement in intrinsic value but also drives rational market capitalization adjustments through investor expectation revisions. Thus, the implementation of the EVA evaluation system provides central state-owned enterprises with a robust tool and institutional safeguard for market capitalization management, facilitating efficient operations and sustainable development under national strategic guidance while bolstering national economic strength and international competitiveness.

Based on this, this paper focuses on the following two research questions: First, can the implementation of the EVA performance evaluation system effectively guide central state-owned enterprises' managers to focus on value creation, thereby achieving the intended policy outcomes? Second, can the EVA performance evaluation system address the long-standing issue of low innovation efficiency in central state-owned enterprises, thereby enhancing their ability to create long-term value? These two questions are logically interconnected and progressively layered. Firstly, by making capital costs explicit, the EVA performance evaluation system encourages managers to prioritize long-term value creation over short-term profit pursuit. This shift in orientation is a prerequisite for studying the system's impact on corporate

innovation efficiency. Secondly, improved innovation efficiency is a key driver of market capitalization management. By optimizing innovation resource allocation and enhancing innovation efficiency, central state-owned enterprises can not only strengthen their market competitiveness but also further improve EVA performance. Therefore, exploring the policy effects of the EVA evaluation system and its influence on innovation efficiency not only deepens the understanding of the EVA mechanism but also provides new insights and methods for central state-owned enterprises to achieve high-quality development in the new era.

1.2 Research Framework

The research framework of this paper includes the following components:

Chapter 1 introduces the research background of this paper, briefly outlines the implementation context of the EVA performance evaluation system in state-owned enterprises, emphasizes the importance of market value management, and further clarifies the research question, namely the impact of the EVA performance evaluation system on market value management in state-owned enterprises.

Chapter 2 reviews the relevant background of the performance evaluation system for central state-owned enterprises, including a systematic overview of the development and revisions of the *Measures for the Performance Evaluation of Central Enterprise Executives* , as well as an analysis of the current state of market value management in state-owned listed companies.

Chapter 3 presents the theoretical foundation and literature review. It first elaborates on the main theoretical bases of this paper, including principal-agent theory and incentive theory. Simultaneously, it systematically reviews and critiques the comparison between traditional performance evaluation indicators and the EVA indicator, the economic consequences of EVA performance evaluation, and the influencing factors of corporate innovation.

Chapter 4 examines the implementation effects of the EVA performance evaluation system in central state-owned enterprises. First, this paper theoretically analyzes the impact of the EVA performance evaluation system on corporate EVA performance. Second, it examines the specific mechanisms through which managers respond to the EVA performance evaluation system from the perspectives of operational efficiency and inefficient investment. Then, it further analyzes the impact of revisions to the evaluation system on corporate EVA performance. Finally, this paper empirically tests the influence of the EVA performance evaluation system on corporate market value.

Chapter 5 examines the impact of the EVA performance evaluation system on the innovation efficiency of central state-owned enterprises. First, this paper theoretically analyzes the influence of the EVA performance evaluation system on corporate innovation efficiency. Second, it examines the specific mechanisms through which the EVA performance evaluation system enhances innovation efficiency from the perspectives of innovation input and output. Then, it further explores the incremental effect of revisions to the performance evaluation system on corporate innovation efficiency. Finally, this paper discusses the heterogeneous impact of the EVA performance evaluation system on innovation efficiency under different market conditions and analyzes whether improvements in innovation efficiency can receive positive feedback from the capital market.

Chapter 6 summarizes the main research findings of this paper, analyzes their theoretical and practical implications and contributions, and proposes potential directions for future research.

Chapter 2 Background of the Performance Evaluation System for Central state-owned enterprises

2.1 Development and Revisions of the *Measures for the Performance Evaluation of Central State-owned Enterprises Executives*

In 2003, the State Council established the State-owned Assets Supervision and Administration Commission (SASAC) to guide the reform and development of state-owned enterprises, supervise the preservation and appreciation of state-owned assets, and oversee the appointment, dismissal, assessment, and rewards or penalties of enterprise leaders. Since the issue of the *Interim Measures for the Performance Evaluation of Central State-owned Enterprises Executives* in November 2003, SASAC has revised the performance evaluation measures five times in 2006, 2009, 2012, 2016,and 2019, ultimately forming the *Measures for the Performance Evaluation of Central State-owned Enterprises Executives*. The evolution of the performance evaluation system for central state-owned enterprises is shown in Table 2-1. From the development trajectory of the performance evaluation system for central state-owned enterprises, it can be observed that the evaluation orientation has shifted from focusing on economic benefits to emphasizing scientific development, from strengthening and expanding enterprises to prioritizing development quality and enhancing international competitiveness. The evaluation indicators have transitioned from traditional accounting profit assessments to economic profit assessments, and the evaluation methods have evolved from uniform assessments to classified assessments for commercial and public welfare enterprises. The performance evaluation system has become more scientific and effective, playing a significant role in promoting high-quality enterprise development.

Table 2-1 Evolution of the Performance Evaluation System for Central State-Owned Enterprises

Revision Time	Revision Version	Core Changes and Characteristics	EVA Assessment Adjustment
2003	First Issue	The first establishment of a performance evaluation system for executives of central State-owned Enterprises, with total profit and return on equity (ROE) as the core indicators.	EVA assessment had not yet been introduced, focusing solely on traditional financial metrics.
2006	First revision	Improve the guiding direction of operational performance evaluation and the calculation methods of specific indicators.	EVA is not mentioned, but the supplementary role of non-financial indicators begins to be explored.
2009	Second revision	EVA replaced ROE as the core indicator for the first time, strengthening awareness of capital costs and driving central state-owned enterprises to shift from profit orientation to value creation.	Emphasized the important role of EVA in assessments, guiding state-owned enterprises to pay more attention to capital costs and value creation.
2012	Third revision	The assessment weight for EVA was adjusted, stipulating that except for military-industrial, reserve, and scientific research enterprises, as well as power, petroleum, and petrochemical enterprises, the assessment weight for other enterprises is set at 50 points.	The guiding role of EVA assessment was further strengthened.
2016	Fourth revision	It highlights the assessment orientation of high-quality development, constructing a high-quality development assessment index system that combines annual and tenure evaluations, covering aspects such as efficiency and benefits, technological innovation, and structural adjustment, while emphasizing categorized and differentiated assessments.	Replacing total profit with net profit, retaining Economic Value Added as the basic indicator for annual assessment; replacing total asset turnover with labor productivity of all employees, retaining the rate of preserving and increasing the value of state-owned capital as the basic indicator for tenure assessment.
2019	Fifth revision	Further revisions and improvements, with greater emphasis on high-quality development assessments,	Highlight the guidance of scientificand technological innovation evaluations, encourage enterprises to

	highlighting the guidance of scientific and technological innovation evaluations, encouraging enterprises to increase R&D investment, and treating R&D expenditures as equivalent to profits. At the same time, it emphasizes classified and differentiated assessments, setting different assessment priorities and standards for enterprises with different functions and categories.	increase R&D investment, and treat R&D expenditures as equivalent to profits. For enterprises with high technological advancement requirements, strengthen the assessment of indicators such as R&D investment, output and transformation of scientific and technological achievements.

2.1.1 The first issue of Interim Measures for the Performance Evaluation of Central State-owned Enterprises Executives in 2003

The 2003 version of the performance evaluation system was oriented towards improving economic efficiency and focused on traditional financial indicators as the main content of operational performance evaluation, implemented specifically from 2004 to 2006. The performance evaluation system for central state-owned enterprises primarily consisted of two parts: annual operational performance evaluation and tenure based operational performance evaluation. Since the research subject of this paper is central enterprise groups rather than their leaders, the study focuses solely on the content of the annual operational performance evaluation. Additionally, the introduction of the EVA indicator pertains only to the annual operational performance evaluation and does not involve the tenure based operational performance evaluation. The annual operational performance evaluation indicators include basic indicators and classified indicators, accounting for 70 and 30 base points[1], respectively, in the

[1] Each indicator in the annual business performance assessment is assigned a base score. When the enterprise leader achieves the target value, they receive the full base score. If the business performance exceeds the target value, additional points can be awarded. For example, if the annual total profit indicator exceeds the target value, for every 3% over the target, 1 point is added, up to a maximum of 6 points. Conversely, if the business performance falls below the

comprehensive performance evaluation score. Among these, the basic indicators comprise the total annual profit and return on net assets, each accounting for 30 and 40 base points, respectively, in the comprehensive performance evaluation score. Based on the industry and characteristics of the enterprise, the SASAC determines the classified indicators separately, considering factors that reflect the enterprise's management level and development capabilities. According to the final score of the leader's operational performance evaluation, the annual operational performance evaluation results are divided into five levels: A (highest), B, C, D, and E (lowest), with the achievement of the evaluation target value serving as the threshold for advancing to level C. In the specific calculation of basic indicators, the total annual profit equals the audited consolidated profit of the enterprise, which may include approved adjustments for losses absorbed from previous years. The ratio of the enterprise's current net profit to its average net assets represents the current return on net assets for central state-owned enterprises. When calculating the return on net assets, the denominator (net assets) must exclude minority interests. Since the 2003 performance evaluation method primarily relied on accounting indicators, it can be considered a form of accounting data evaluation.

2.1.2 First Revision in 2006

In December 2006, the SASAC issued Order No. 17 to revise the performance evaluation system, which was implemented from 2007 to 2009. Compared to the 2003 version, the 2006 version did not make significant adjustments to the overall framework. The main changes were reflected in the guiding direction of operational performance evaluation and the calculation methods of specific indicators.

target value, points are deducted. For instance, if the annual total profit indicator is below the target value, for every 3% under the target, 1 point is deducted, up to a maximum of 6 points.

First, in terms of the guiding direction of operational performance evaluation, the 2006 version required adherence to the principles of scientific development, continuously promoting enterprise progress in strategic management, independent innovation, resource conservation, and environmental protection, thereby enhancing core competitiveness and sustainable development capabilities.

Secondly, regarding the performance evaluation indicators for business operations, the annual performance evaluation indicators remain unchanged, still comprising basic indicators and classified indicators, accounting for 70 points and 30 base points respectively. Among these, the basic indicators remain the same, consisting of the total annual profit and the return on net assets, which account for 30 base points and 40 base points respectively in the comprehensive scoring of business performance evaluation. However, in terms of specific calculation methods, the total annual profit of the enterprise must exclude non-recurring gains obtained through the sale of high-quality assets of the core business. When calculating the return on net assets, the denominator (net assets) should subtract minority interests, and the numerator (net profit) should also subtract minority interest income.

During this phase, in addition to maintaining the traditional financial indicator evaluation system, the SASAC also initiated and promoted the introduction of the EVA indicator for central state-owned enterprises, encouraging them to actively use EVA for annual business performance evaluation. Moreover, SASAC adopted a reward-only and no penalty approach for central state-owned enterprises that voluntarily adopted the EVA indicator, meaning that enterprises using the EVA indicator and showing improvement over the previous year would be rewarded, while no penalties would be imposed on those without improvement. Pilot enterprises for preliminary EVA calculations included Ansteel Group, Wuhan Iron and Steel Group, China National Nuclear Corporation, and China Eastern Airlines, among others. Additionally, when determining the classified indicators for enterprises, SASAC required that not

only should the level of business management be considered and reflected, but factors such as technological innovation investment and risk control capabilities should also be emphasized. For performance evaluation indicators of research-oriented enterprises, particular attention should be paid to technological innovation input and output.

2.1.3 The Second Revision in 2009

In December 2009, SASAC issued Order No. 22 to revise the performance evaluation measures once again. This revision aimed to fully implement the EVA based business performance evaluation for central enterprise groups, with the specific implementation period from 2010 to 2012. Compared to the previous performance evaluation measures, the most significant change in the 2009 version was the replacement of the return on equity (ROE) indicator with the economic value added (EVA) indicator.

Specifically, the composition of annual operational performance evaluation indicators remains unchanged, but the basic indicators are now composed of two metrics: total profit and EVA, accounting for 30 and 40 base points respectively in the comprehensive performance evaluation score. The specific calculation method for total profit remains the same, while EVA is defined as the after-tax net operating profit minus the capital cost, as approved. In the supplementary provisions of the performance evaluation method, the SASAC details the EVA assessment rules. The formula for EVA is: Economic Value Added (EVA) = After-tax Net Operating Profit - Capital Cost = After-tax Net Operating Profit - Adjusted Capital × Average Capital Cost Rate. Here, After-tax Net Operating Profit = Net Profit + (Interest Expense + R&D Adjustment - Non-recurring Income Adjustment × 50%) × (1 - Corporate Income Tax Rate), and Adjusted Capital = Average Owner's Equity + Average Total Liabilities - Average Interest-free Current Liabilities - Average Construction in Progress. Accounting adjustments include items such as interest expense under financial expenses in financial statements, R&D expenses under administrative expenses,

R&D expenditures capitalized as intangible assets, exploration expenses in cost statements, gains from selling core high-quality assets, gains from transferring non-current assets outside core business, other non-recurring income, interest-free current liabilities, and construction in progress in financial statements that meet core business criteria. Interest-free current liabilities mainly include seven items in financial statements: notes payable, accounts payable, advances from customers, taxes payable, interest payable, other payables, and other current liabilities. The capital cost rate for central state-owned enterprises is generally set at 5.5%. However, for enterprises undertaking significant national policy tasks with less versatile assets, the rate is set at 4.1%. Additionally, for industrial enterprises with a debt-to-asset ratio above 75% and non-industrial enterprises above 80%, the capital cost rate is set at 6%. Once determined, the capital cost rate should remain unchanged for three years.

In addition to mandating the inclusion of EVA metrics, the 2009 performance evaluation method also integrates supplementary provisions related to the 2008 annual operational performance scoring rules. For instance, the benchmark value for basic indicators is the lower of the actual completion value from the previous year or the average of the actual completion values from the past three years. By comparing target values with benchmark values, the evaluation method determines the additional or deducted points for enterprise leaders based on whether targets are met. By establishing benchmark values for enterprise indicators, the new performance evaluation method helps enterprises set more scientific targets, thereby achieving the strategic goal of long-term sustainable value creation. Furthermore, the 2009 performance evaluation method also stipulates reward and penalty scoring for circumstances beyond indicator evaluation. When an enterprise undertakes national structural adjustment tasks and achieves outstanding results, SASAC may add 0.5 to 2 points based on task completion. However, if an enterprise experiences significant asset losses, production safety accidents, environmental pollution incidents, violations of regulations, financial mismanagement, or lacks a sound performance evaluation

system, the enterprise's annual performance evaluation should be downgraded or penalized accordingly. This stage of the performance evaluation method, guided by the strategic objective of sustainable growth, emphasizes shareholder capital returns and capital efficiency, transitioning from encouraging EVA adoption to comprehensive EVA evaluation.

2.1.4 The Third Revision in 2012

In December 2012, the SASAC conducted the third revision of the performance evaluation measures, which were implemented from 2013 to December 2016. In terms of the overall guidance direction of the performance evaluation measures, the 2012 version added the requirement to guide central state-owned enterprises toward scientific development, aligning with the main theme of the 12th Five-Year Plan to accelerate the transformation of the economic development model and promote scientific development. This revision was conducive to actively advancing the transformation of central state-owned enterprises from the perspective of performance evaluation.

First, regarding the specific provisions of the evaluation methods, SASAC introduced two new regulations. One was to encourage central state-owned enterprises to participate in benchmark evaluation pilots, formally incorporating benchmark management into the operational performance evaluation system since the supplementary provisions proposed the benchmark principle in 2008. The other was that, in addition to the annual basic indicators and classified indicators, SASAC could add binding indicators as needed.

Second, the 2012 version of the performance evaluation measures also made some adjustments to the basic indicators. The basic indicators still included total profit and EVA. When calculating total profit, in addition to deducting non-recurring gains from selling high-quality assets of the main business, factors approved to have a significant impact on current operational performance due to addressing historical issues could also be considered for deduction. Regarding the adjustments in EVA calculation: first, non-recurring gains from

selling high-quality assets of the main business were changed from a 50% deduction to a full deduction in after-tax net operating profit. Second, the interest-free current liabilities in accounting adjustments were expanded to include employee compensation payable and dividends payable. Third, the provision that the capital cost rate should remain unchanged for three years after determination was removed.

Finally, the most significant change in the 2012 version of the performance evaluation measures was the adoption of industry-specific weight adjustments for annual operational performance evaluation indicators. Specifically, as shown in Table 2-2, the basic score for the total profit indicator was set at 30 points for military industrial, reserve, and research enterprises, as well as power and petrochemical enterprises, while it was 20 points for other enterprises. The basic score for the EVA indicator was 30 points for military-industrial, reserve, and research enterprises, 40 points for power and petrochemical enterprises, and 50 points for other enterprises. Conducting classified evaluations by industry sector allows for an assessment of central state-owned enterprises' economic benefits, capital return levels, and market competitiveness, while also considering their responsibilities in serving national strategies and society. This makes the revised evaluation method more scientific and reasonable.

Table 2-2 Adjustment of Industry Indicator Weights in the 2012 Edition of the "Performance Evaluation Measures"

Industry Classification	Basic Indicators		Classification Indicators
	Total profit	Economic Value Added	
Research, reserves, military industry	30 points	30 points	40 points
Petroleum and petrochemical, electric power	30 points	40 points	30 points
Other industries	20 points	50 points	30 points

2.1.5 Fourth Revision in 2016

On December 8, 2016, the SASAC issued Order No. 33, approving the *Measures for the Performance Evaluation of Central State-Owned Enterprise Executives*. Compared to earlier versions, the 2016 performance evaluation measures underwent significant structural adjustments. The full text is divided into seven chapters, consisting mainly of evaluation orientation, classified evaluation, target management, evaluation implementation, and reward and punishment components, in addition to the general provisions and supplementary provisions.

Firstly, the General Provisions and Assessment Orientation sections clarify the main principles and direction of performance evaluation, which is to guide central state-owned enterprises to improve quality, efficiency, and upgrading, and achieve stronger, better, and larger development. The performance evaluation of enterprise leaders should adhere to four principles: compliance with laws and regulations, adherence to market oriented reform, close integration with incentives and constraints, and alignment of short-term goals with long-term development. At the same time, the performance evaluation method also emphasizes aspects such as the development quality of central state-owned enterprises, capital operation efficiency, innovation development, international operations, and compliance management. It requires enterprises to fulfill economic tasks while also assuming corresponding responsibilities in serving national strategic objectives, safeguarding national security, and ensuring the operation of the national economy.

Secondly, similar to the 2012 version's industry-based assessment approach, the new performance evaluation method formally introduces the concept of classified assessment and divides central state-owned enterprises into commercial and public welfare categories. Among them, commercial central state-owned enterprises are further divided into two types: the first type operates in fully competitive industries and fields, with the goal of enhancing the vitality

of the state-owned economy, amplifying the function of state-owned capital, and achieving the preservation and appreciation of state-owned capital. The focus of their evaluation lies in economic benefits, capital return levels, and market competitiveness, while also encouraging them to actively undertake social responsibilities. The second type operates in key industries and fields related to national security and the lifeline of the national economy, primarily undertaking major specialized tasks. These enterprises are oriented toward supporting sustainable development and serving national strategies. On the basis of ensuring reasonable returns and the preservation and appreciation of state-owned capital, the evaluation emphasizes their contributions to serving national strategies, safeguarding national security and the operation of the national economy, developing forward-looking and strategic industries, and completing major specialized tasks. Additionally, public welfare central state-owned enterprises are those oriented toward better ensuring people's livelihoods, serving society, and providing public products and services. They combine economic and social benefits, prioritizing social benefits. The evaluation of such enterprises focuses on product and service quality, cost control, operational efficiency, and support capabilities. Based on the nature of the enterprise's operations, development stage, management shortcomings, and industrial function, the new performance evaluation method sets targeted and differentiated assessment indicators, enhancing the rationality and scientific nature of the evaluation. However, the new performance evaluation method does not disclose the classified list of central state-owned enterprises as required by the classified assessment.

In terms of target setting, the 2016 performance evaluation method only specifies that enterprises need to determine overall business performance goals and set evaluation target values based on the overall goals, enterprise functions, and benchmark values. The annual evaluation benchmark values are determined by integrating the previous year's completion values, the average of the past three years' completion values, external factors, and industry benchmarking. In

terms of specific target setting, the new performance method only involves two indicators: total profit and economic value added, without mentioning the classified indicators from previous evaluation methods. Furthermore, the new performance evaluation method stipulates that the annual business performance evaluation results will be divided into four grades: A, B, C, and D, eliminating the E grade. Building on the experience of past performance evaluations, the evaluation methods in this stage are more mature, reasonable, and scientific in terms of assessment principles, content, and methods.

2.1.6 Fifth Revision in 2019

The 2019 version was promulgated by Order No. 40 of the SASAC of the State Council on March 1, 2019, and came into effect on April 1, 2019, simultaneously repealing the 2016 version. Compared to the 2016 edition, the 2019 version underwent significant adjustments in overall structure and content, placing greater emphasis on the assessment orientation of high-quality development. It highlights performance efficiency, innovation-driven growth, core business operations, international operations, and service guarantees.

Firstly, it clarifies the main principles and directions of performance assessment, which are to guide central state-owned enterprises toward achieving high-quality development and accelerating their transformation into world-class enterprises with global competitiveness. The assessment of business performance for enterprise executives should adhere to four principles: compliance with laws and regulations, alignment with market-oriented reform, integration with incentives and constraints, and harmonization of short-term goals with long-term development. Additionally, the performance assessment measures focus on the development quality of central state-owned enterprises, capital operation efficiency, innovation, international operations, and compliance. Enterprises are required to fulfill economic tasks while also bearing corresponding responsibilities in serving national strategic objectives,

safeguarding national security, and maintaining the operation of the national economy.

Secondly, the new performance assessment measures formally introduce the concept of classified assessment, dividing central state-owned enterprises into commercial and public welfare categories. Commercial central state-owned enterprises include two types: those in fully competitive industries and sectors, which are oriented toward enhancing the vitality of the state-owned economy, amplifying the function of state-owned capital, and achieving capital preservation and appreciation, with assessment focusing on economic benefits, capital return levels, and market competitiveness; and those in key industries and fields related to national security and the national economy, primarily undertaking major specialized tasks, which are oriented toward supporting sustainable development and serving national strategies, with assessment emphasizing service to national strategies, safeguarding national security and economic operations, developing forward-looking strategic industries, and completing major specialized tasks. Public welfare central state-owned enterprises are oriented toward better ensuring people's livelihoods, serving society, and providing public products and services, prioritizing social benefits while combining economic and social outcomes, with assessment focusing on product and service quality, cost control, operational efficiency, and support capabilities. Based on the nature, development stage, management shortcomings, and industrial function of enterprises, the new performance assessment measures set targeted and differentiated assessment indicators, enhancing the rationality and scientific nature of the assessment. Furthermore, in terms of assessment indicators, for commercial enterprises, net profit replaces total profit in annual assessments, while economic value added is retained; in tenure assessments, labor productivity replaces total asset turnover, and the state-owned capital preservation and appreciation rate is retained. For public welfare enterprises, the total profit indicator is removed from annual assessments, with economic value added retained; tenure assessments only

evaluate the state-owned capital preservation and appreciation rate, while increasing the weight of social benefit indicators.

Additionally, the new performance evaluation methodology strengthens the application of international and industry benchmarking in aspects such as indicator setting, target determination, scoring, and result grading. It specifies that Grade A enterprises are comprehensively determined based on their operational performance evaluation scores and benchmarking results, with strict control over the number of such enterprises. In terms of incentive and constraint mechanisms, the new methodology enhances positive incentives, reinforcing the principle of higher performance leads to higher compensation, and lower performance leads to lower compensation. It appropriately increases the performance-based annual compensation coefficient for leaders of Grade A enterprises and publicly commends enterprises with outstanding operational performance or significant achievements in technological innovation during their tenure. At the same time, it encourages exploration and innovation. For enterprises whose operational performance is significantly impacted by major technological innovations, the evaluation will not impose negative assessments, adhering to the Three Distinctions principle.

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2.2 Analysis of the Current State of Market Value Management in State Owned Enterprises

State-owned listed companies play a pivotal role in China's economy. According to data from the China Securities Regulatory Commission, by the end of 2023, state-owned listed companies accounted for nearly one-third of the A-share market in terms of quantity and over 40% in terms of market capitalization. The importance of market value management has become increasingly prominent, as market value not only reflects a company's economic strength and market competitiveness but also serves as a key indicator of corporate governance structure and operational efficiency. However, compared to private enterprises, state-owned listed companies exhibit certain shortcomings in market value management, such as lower marketization levels and less robust corporate governance structures, which to some extent hinder their healthy development. With the continuous opening and improvement of China's capital market, state-owned listed companies face more intense market competition and higher governance requirements. Therefore, effective market value management for state-owned listed companies is essential for promoting the preservation and appreciation of state-owned assets.

2.2.1 The concept of market value management

Scholars have conducted in-depth research on the concept of market value management. Ba and Jiao (2007) proposed that the market value management of listed companies should focus on intrinsic value, with activities primarily including core business development, corporate governance, and supervision, while emphasizing investor relationship management in the value realization process. Zhang and Miao (2010) argued that the connotation of market value

management encompasses value creation, value realization, and value operation. Listed companies should formulate strategic plans based on the relationship between market value enhancement and stability, implement effective operational management and investor relationship management to ensure that stock prices fully reflect the intrinsic value of the enterprise. Xu (2013) defined market value management as the process of maximizing corporate value, with its essence being value creation for shareholders rather than profiting from stock price differentials. It involves using market value evaluation indicators to incentivize management to enhance corporate value. Xia et al. (2014) pointed out that market value management for listed companies is a strategic management activity aimed at continuously improving corporate value. It includes three components: value creation, value operation, and value realization. Based on signals from changes in market value, it promotes dynamic interaction between enterprises and capital markets through compliant capital operation methods. The China Securities Regulatory Commission (CSRC) plans to develop market value management into a key management tool, providing effective market incentives and constraints to foster capital market operation concepts, brand awareness, and innovation among listed companies. Synthesizing existing research, market value management has the following characteristics: first, it emphasizes the intrinsic value of the company, with the long-term goal of maximizing intrinsic value; second, intrinsic value needs to be reasonably reflected in the capital market; third, given the dynamic changes in the economic environment, market value management must maintain a dynamic balance between market value and intrinsic value through capital market operations; fourth, its operational strategies include improving corporate governance, enhancing operational management, and cultivating core competitiveness.

2.2.2 The Practical Evolution of Market Value Management in State-Owned Listed Companies

The practice of market value management in state-owned listed companies has evolved from initial awareness to gradual deepening. Since the SASAC proposed that state-owned asset supervision agencies should consider setting market value indicators when assessing state-owned controlling shareholders of listed companies, state-owned listed companies began to prioritize market value management. In 2014, the State Council's *Several Opinions on Further Promoting the Healthy Development of the Capital Market* further clarified the importance of market value management, encouraging listed companies to establish market value management systems. On June 10, 2021, SASAC held a national conference on state-owned property rights management, emphasizing that central state-owned enterprises should pay high attention to the development quality and market performance of listed companies, continuously enhance their value creation and realization capabilities, and improve the quality of listed companies. In May 2022, SASAC issued the *Work Plan for Improving the Quality of Central Enterprise-Controlled Listed Companies*, encouraging central state-owned enterprises to explore incorporating value realization factors into the performance evaluation system of listed companies and establish long-term, differentiated assessment mechanisms to guide listed companies in legally and scientifically promoting the realization of market value.

In recent years, the importance of market value management for state-owned enterprises has become even more prominent. First, SASAC has increasingly mentioned market value management, further refining its connotation and methods. In January 2024, at a meeting of local state-owned asset supervisors, SASAC proposed strengthening market value assessment and evaluation, incorporating the effectiveness of market value management into the performance evaluation of central enterprise leaders. On January 26, 2024, the

SASAC Party Committee published a signed article in the Study Times, advocating for fully reflecting the true value of listed companies. Second, under the theme of building a valuation system with Chinese characteristics, the CSRC has also set requirements for the market value management of central and state-owned enterprises. In January 2024, the CSRC held its 2024 system work conference, proposing to accelerate the construction of a valuation system with Chinese characteristics and promote the inclusion of market value in the performance evaluation system of central and state-owned enterprises.

2.2.3 Current Market Capitalization Status of Central State-Owned Enterprises

According to the market capitalization structure of China's A-share market compiled from the Wind database, as of December 31, 2024, the total market capitalization of A-share listed companies in China was RMB 93.9332 trillion. Among this, the total market capitalization of central state-owned enterprises was RMB 30.0405 trillion, accounting for 31.98% of the overall A-share market capitalization, while the total market capitalization of local state-owned enterprises was RMB 18.3185 trillion, representing 19.50% of the overall A-share market capitalization. Overall, state-owned listed enterprises accounted for 51.48% of the total A-share market capitalization, highlighting the significant role of state-owned enterprises in the A-share market. As vital pillars of the national economy, state-owned enterprises often possess notable advantages in resources, technology, market share, and other aspects. Their proportion of market capitalization in the A-share market reflects their substantial influence in the economy, further underscoring the importance of market capitalization management for state-owned enterprises. Effective market capitalization management can not only enhance the market value and shareholder returns of state-owned enterprises but also strengthen their market competitiveness and influence.

It is worth mentioning that the total market capitalization of private enterprises was RMB 33.2719 trillion, accounting for 35.42% of the overall A-share market capitalization. Although the total market capitalization of private enterprises is lower than that of state-owned enterprises, private enterprises are the most numerous, indicating their widespread distribution and significant dynamism in the A-share market. The more intense competition among private enterprises in the market will drive them to continuously improve their management levels and core competitiveness, thereby fostering the development and vitality of the entire A-share market.

Table 2-3 Market Capitalization Structure of China's A-Share Market (as of December 31, 2024)

Company Attributes	Number of Enterprises	Total Market Capitalization (Trillion RMB)	Proportion of Total Market Capitalization
Central State-Owned Enterprises	465	30.0405	31.98%
Local State-Owned Enterprises	972	18.3185	19.50%
Publicly Listed Enterprises	306	9.4661	10.08%
Other Enterprises	25	0.2147	0.23%
Foreign-funded enterprises	183	2.0892	2.22%
Private enterprises	3406	33.2719	35.42%
Collective enterprises	24	0.5323	0.57%

Data source: Wind Database

From a valuation perspective, as shown in Figure 2-1, central state-owned enterprises are relatively undervalued. As of December 31, 2024, the median PE ratio of central state-owned enterprises is 22.0306, in stark contrast to the median PE ratio of private enterprises at 111.4567. Additionally, compared to the overall A-share market level, the PE ratios of central state-owned enterprises remain relatively low. This undervaluation contrasts sharply with the significant role central state-owned enterprises play in the national economy and their

substantial influence in the A-share market, further highlighting the necessity of strengthening market value management for central state-owned enterprises.

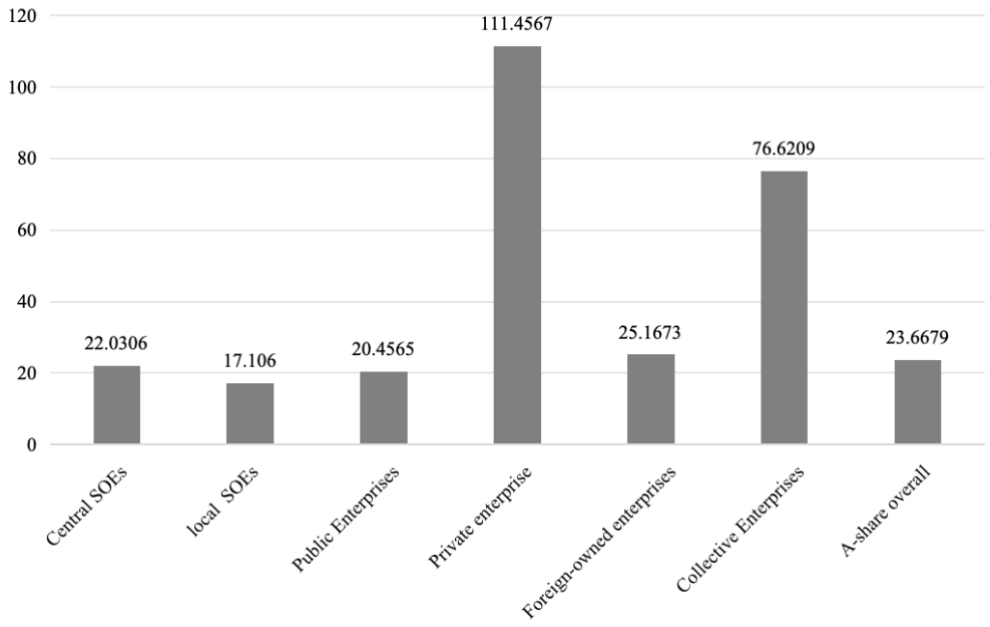

Figure 2-1 Comparison of PE Ratios Among Different Types of Chinese A-Share Enterprises (As of December 31, 2024)

Data source: Wind Database

2.2.4 The Intrinsic Relationship Between EVA Performance Evaluation and Market Value Management in Central state-owned enterprises

The fundamental reason for the severe undervaluation of central state-owned enterprises' market capitalization lies in the widespread market perception that their scale expansion leads to capital allocation deviating from optimal efficiency. To enhance the market value management of state-owned listed companies, establishing appropriate organizational structures and incentive systems is essential. For central state-owned enterprises, the EVA performance evaluation serves as an effective tool to improve their market value management capabilities.

On one hand, the implementation of the EVA performance evaluation system encourages central state-owned enterprises to strike a better balance between

efficiency and profitability in their operational decisions. State-owned enterprises, particularly central state-owned enterprises, often benefit from lower financing costs due to government credit backing, which may inadvertently lead managers to pursue political empires through scale expansion, thereby exacerbating agency problems. Incorporating the EVA metric into the performance evaluation system means that enterprises must not only focus on profit growth but also prioritize the efficiency of capital investment returns. By making capital costs explicit, the EVA evaluation guides enterprises to shift from a pure scale expansion model to an efficiency-driven operational model, enabling them to respond swiftly to market changes, adjust strategies flexibly, seize market opportunities, and achieve sustainable growth. This fundamentally addresses investors' concerns about the operational efficiency of central state-owned enterprises.

On the other hand, the EVA performance evaluation can steer central state-owned enterprises toward high-value-added businesses, thereby enhancing their profitability. Although central state-owned enterprises have been undergoing market-oriented reforms, their operations are largely concentrated in strategic national sectors, granting them a competitive or even monopolistic edge in the market. However, in stark contrast, private enterprises, despite operating in fiercely competitive environments, have produced numerous disruptive innovations. This discrepancy suggests that the substantial long-term investments by central state-owned enterprises have not translated into breakthroughs in cutting edge innovations. By integrating the EVA metric into the performance evaluation system, central state-owned enterprises are incentivized to focus on efficient resource allocation and business innovation, facilitating their transformation and upgrading from traditional operations to high-value-added sectors and strengthening their core competitiveness.

Furthermore, the EVA evaluation encourages central state-owned enterprises to prioritize value creation over short-term profit pursuit. The EVA system requires enterprises to capitalize R&D expenditures and apply tax deductions, a

policy design that not only mitigates the short-term profit impact of innovation investments but also signals to the market the strengthening of technological barriers through improved patent quality. This gradually reverses the valuation discount associated with prioritizing scale over innovation. Additionally, the EVA evaluation promotes greater transparency and quality in corporate disclosures. Under this system, enterprises must provide investors with more detailed and accurate financial information, enabling better assessment of their value creation capabilities and future prospects. Such high quality disclosures enhance investor confidence, elevate corporate market image, and boost market capitalization. Essentially, the EVA evaluation bridges the gap between financial performance and market perception through the transmission chain of capital cost constraints—resource allocation optimization—value signal release, ensuring that improvements in operational efficiency and the accumulation of long term competitive advantages are substantively reflected.

In summary, the EVA performance evaluation system enables central state-owned enterprises to focus more on value creation, enhancing their market value and competitiveness. This management philosophy, centered on value creation, not only facilitates the high quality development of central state-owned enterprises but also generates more substantial returns for investors.

2.3 Case Study 1: The EVA Performance Evaluation Practice of CRRC

2.3.1 Overview of CRRC

CRRC Corporation Limited (hereinafter referred to as "CRRC") is a globally leading rail transportation equipment supplier formed by the merger of CSR Corporation Limited (hereinafter referred to as "CSR") and CNR Corporation Limited (hereinafter referred to as "CNR"). In the late 1990s, to clarify property rights and improve production efficiency, the Chinese government implemented a series of measures to break the integration of government and enterprises and industry monopolies. Against this backdrop, the Ministry of Railways successively transferred five major non-transportation enterprises

under its direct control, including China Railway Engineering Corporation, China Railway Construction Corporation, and China Railway Rolling Stock Corporation, to central government management. In September 2000, with the approval of the State Council and in line with the principle of establishing competitive entities and avoiding redundant construction, China Railway Rolling Stock Corporation was split into two state-owned enterprises: CNR Group Corporation and CSR Group Corporation. The division was based on the Yangtze River as the boundary, with the principle that the two post-split entities should be of comparable strength and possess comprehensive product portfolios. CSR was established as a joint-stock company on December 28, 2007, by CSR Group Corporation and Beijing Railway Industry and Trade Corporation. Its A-shares were listed on the Shanghai Stock Exchange in August 2008, and its H-shares were listed on the Main Board of the Hong Kong Stock Exchange. CNR was established as a joint-stock company on June 26, 2008, by CNR Group Corporation, Datong Qianjin Investment Co., Ltd., China Chengtong Holdings Group Co., Ltd., and China Huarong Asset Management Co., Ltd. Its A-shares were listed on the Shanghai Stock Exchange in December 2009, and its H-shares were listed on the Main Board of the Hong Kong Stock Exchange in May 2014. On October 27, 2014, CSR and CNR announced that their stocks would be suspended from trading due to the planning of significant matters. On December 30, 2014, CSR and CNR signed a merger agreement and issued a joint announcement, stipulating that CSR would exchange its A-shares and H-shares for CNR's A-shares and H-shares at a uniform ratio of 1:1.1, respectively. All existing issued shares of CNR would be exchanged and absorbed. The merger agreement took effect on May 28, 2015, with all CNR shares delisted, and CSR inheriting all assets, liabilities, and businesses of CNR. On June 1, 2015, CSR was renamed CRRC Corporation Limited. Post-merger, the newly established CRRC inherited all assets, liabilities, businesses, personnel, contracts, qualifications, and other rights and obligations of both companies.

CRRC is a central enterprise under the actual control of the State-owned Assets Supervision and Administration Commission (SASAC) of the State Council, with CRRC Group Corporation as its controlling shareholder. Since its inception, CRRC has consistently emphasized technological and product innovation, consolidating and expanding its market with high-quality products and services. In terms of R&D, CRRC has made substantial investments, establishing multiple research centers and gathering a large number of outstanding scientific talents. The Fuxing series EMUs developed by CRRC possess complete independent intellectual property rights, featuring high operational speeds and superior comfort, representing the advanced level of China's high-speed rail technology. Additionally, CRRC actively expands its overseas market, with products covering over 100 countries and regions, holding a significant position in the global rail transit equipment market as a world-class supplier. In the field of global rail transit equipment manufacturing, CRRC has risen to become one of the largest enterprises worldwide. Its technological innovation and market expansion capabilities have gained global recognition, with products widely applied in numerous major railway and urban rail transit projects globally. The development of CRRC not only enhances China's international standing in the rail transit equipment sector but also makes significant contributions to the advancement of global rail transit.

2.3.2 Implementation Process of EVA Evaluation in CRRC

According to CRRC's annual reports, prior to 2010, CRRC strictly adhered to the SASAC's performance assessment indicators based on return on equity (ROE), to some extent pursuing profit maximization. Its net profit grew from RMB 1.069 billion in 2007 to RMB 2.116 billion in 2009, with a compound annual growth rate of 25.7%. Although CRRC achieved favorable growth in net profit, its ROE was severely inconsistent with its operational performance. Data shows that CRRC's ROE declined from 18.58% in 2007 to 10.04% in 2009. This indicates that the additional capital during CRRC's scale expansion failed

to be promptly converted into profit increments, possibly due to inefficiencies in asset operation or substantial initial investments in fixed assets and R&D that could not yield immediate profits. This contradiction further highlights the shortcomings of using net profit and ROE as performance assessment indicators for central state-owned enterprises.

In 2010, the State-owned Assets Supervision and Administration Commission (SASAC) began implementing the Economic Value Added (EVA)-oriented performance evaluation system for central state-owned enterprises. CRRC Corporation Limited actively responded to SASAC's call and requirements by vigorously implementing innovation strategies. According to CRRC's "2009 Annual Shareholders' Meeting Materials" and other announcements released in June 2010, then-Chairman Zhao Xiaogang presided over multiple board meetings to actively communicate the EVA evaluation requirements. He also instructed senior executives to proactively study and research the system. Starting in 2010, CRRC improved its operational performance in accordance with SASAC's EVA evaluation methodology and has consistently implemented this evaluation system ever since.

In terms of R&D expenditure, CRRC's annual reports show that before the implementation of the EVA performance evaluation system, R&D expenditures in 2008 and 2009 were RMB935 million and RMB1.31 billion, respectively, remaining stable below RMB1.5 billion with modest growth. After the EVA system was implemented, the company's R&D investment exceeded RMB2 billion. In 2010, CRRC's R&D investment reached RMB2.444 billion, an 86.6% increase compared to 2009. Since then, CRRC's R&D investment has maintained strong growth momentum, reaching RMB14.813 billion by 2023, with a compound annual growth rate of 19.7%, demonstrating the powerful driving effect of the EVA evaluation on the company's innovation strategy.

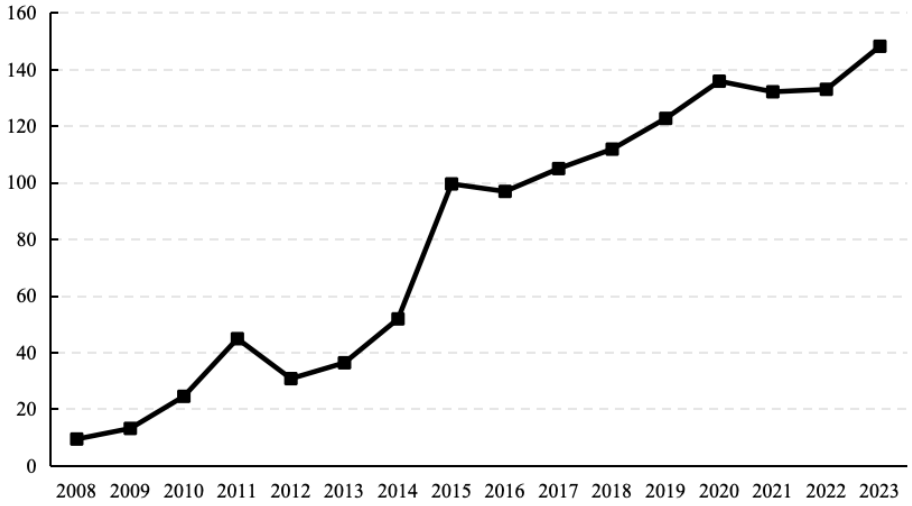

Figure 2-2 CRRC's R&D Investment from 2007 to 2023

Data source: Wind Database, company announcements

In terms of R&D intensity, according to the annual reports of CRRC, before the implementation of the EVA performance evaluation system, the ratio of CRRC's R&D investment to operating revenue remained below 3%, showing a significant gap compared to global rail transit giants. After the implementation of the EVA system, CRRC's R&D intensity consistently stayed above 3% and exhibited a stepwise increase. This structural transformation reflects the institutional incentives of the EVA evaluation system for the capitalization of R&D expenses. By reclassifying R&D expenditures from income statement expenses to balance sheet capital items, the system effectively alleviated short-term performance pressures, enabling management to more confidently undertake long-cycle, high-risk original technology breakthroughs.

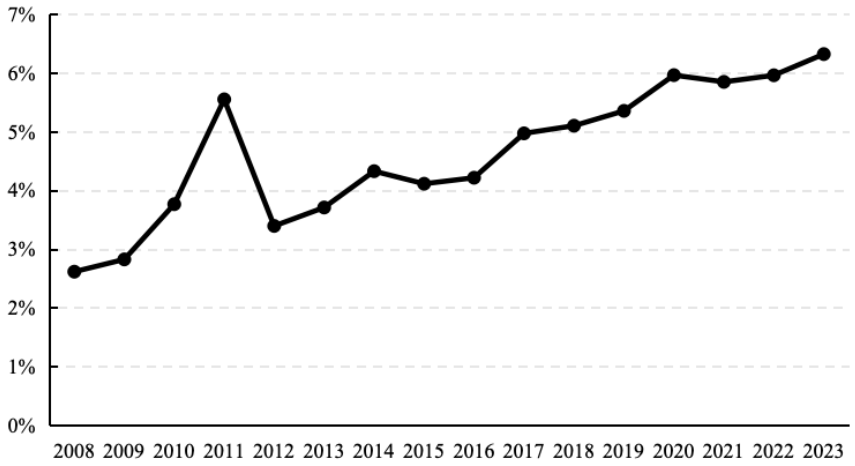

Figure 2-3 CRRC's Ratio of R&D Investment to Operating Revenue

Data source: Wind Database, company announcements

After the implementation of the EVA performance evaluation system, CRRC's R&D expenditures, both in absolute terms and as a proportion, showed a significant upward trend and maintained an overall growth trajectory in subsequent years. This change reversed the unfavorable situation of insufficient and slow-growing R&D investment before the EVA system, strongly demonstrating the system's role in promoting R&D investment and laying a solid foundation for achieving innovative outcomes.

The case of China CNR shows that the implementation of an EVA oriented performance appraisal system can guide managers to focus on the construction of the enterprise's core competitiveness. Although early market investors have been questioning the large amount of corporate investment in R&D investment, the development of China High Speed Rail has responded well to the investor's questioning, which further highlights the important value of long-term orientation for high-quality corporate development.

2.4 Case Study 2: The Paradox of Price and Innovation in CSEC

2.4.1 Overview of CSEC

CSEC Energy Company Limited (hereinafter referred to as CSEC) was established on November 8, 2004. It is a comprehensive A+H-share energy central SOE controlled by China Energy Investment Corporation. As a global

leading integrated energy company based on coal, CSEC's business spans seven major segments: coal mining, power generation, coal chemical industry, railway transportation, port operations, shipping, and new energy. The company has established a fully integrated industrial chain of coal, power, railway, port, shipping, and chemical, forming a coordinated operation model covering the entire process from resource extraction to end-user sales.

As of the end of 2024, CSEC had total assets of RMB 658.1 billion, a combined market capitalization of RMB 822.1 billion, and a workforce of 83,000 employees. It has been listed among China's Top 500 Enterprises for several consecutive years and ranks among the highest in market capitalization among publicly listed coal companies worldwide.

The company's core business lies in the coal sector. It has developed the first 200-million-ton-level coal production base in China, with performance indicators such as production, technology, quality, energy consumption, and environmental protection remaining at a globally advanced level. CSEC owns 21 provincially recognized green mines and has been repeatedly awarded the title of "Advanced Enterprise in Energy Conservation and Emission Reduction in the Coal Industry" by the China National Coal Association.

In the power sector, the company has an installed capacity of over 46 million kilowatts, primarily coal-fired generation, while also gradually expanding into gas, hydropower, and new energy. Its transportation network includes 2,408 kilometers of railways, port throughput capacity of 270 million tons per year, and a shipping fleet with an annual transport capacity of 54 million tons, forming an efficient "West-to-East coal transport" corridor.

2.4.2 CSEC's Stock Performance

Over the period from 2008 to 2023, CSEC's stock price exhibited significant cyclical fluctuations, influenced by macroeconomic conditions, industry cycles, and policy interventions. In 2008, impacted by the global financial crisis, coal demand declined sharply, and CSEC's stock price dropped rapidly from its peak

early in the year. During 2009–2010, with the gradual recovery of China's domestic economy and a rebound in coal demand, the company's stock price experienced a moderate recovery. From 2011 to 2012, the European sovereign debt crisis and the subsequent global economic slowdown led to an imbalance in coal supply and demand, placing renewed downward pressure on CSEC's stock price. Between 2013 and 2016, severe overcapacity in the coal sector and declining profitability among enterprises caused the company's stock to fluctuate within a low price range over a prolonged period. With the advancement of supply-side structural reforms in 2016–2017, industry overcapacity was effectively curbed, coal prices rebounded, and CSEC's stock price showed a marked recovery. However, from 2017 onward, macroeconomic regulation, environmental restrictions, and energy structure adjustments led to a period of price consolidation. Between 2017 and 2020, the coal market remained relatively stable, and CSEC's stock price fluctuated within a narrow range. Since 2020, driven by post-pandemic economic recovery, government policies to ensure energy supply, and a rise in coal prices, the company's stock has entered a rapid upward trajectory, showing strong growth momentum.

Overall, the stock price movement of CSEC generally mirrors trends in the broader coal industry, though some periods exhibit notable deviations. For instance, the company's stock declined more sharply than the industry average following the 2008 crisis, yet it significantly outperformed the industry after 2020. This reflects the impact of multiple factors on market expectations. In a cross-sectional comparison, CSEC's stock price has long remained above the industry average, highlighting the capital market's recognition of its stable profitability, abundant resource reserves, and state-owned enterprise background—factors that contribute to a valuation premium.

It is noteworthy that on January 5, 2024, CSEC's total market capitalization reached RMB 664.6 billion. On the same day, the share price of Contemporary Amperex Technology Co., Limited (CATL), a leading new energy company, closed at RMB 150.9, reflecting a 0.2% decline from the previous trading day,

with a total market capitalization of RMB 663.82 billion. Consequently, CSEC surpassed CATL in market value. Despite being a traditional coal enterprise, CSEC exhibits significant differences from new energy companies in terms of business model, growth potential, and innovation capacity. However, its stock valuation has, to a certain extent, rivaled that of CATL, a flagship in the new energy sector. This phenomenon suggests a possible inconsistency in the market's valuation logic between traditional and emerging energy industries. Specifically, it may indicate that CSEC's market value is overestimated relative to its long-term growth fundamentals, especially when compared to high-innovation, high-growth firms in the new energy sector. In particular, such stock price increases driven by high dividend payouts are often influenced by short-term market sentiment and may not fully reflect the company's long-term intrinsic value.

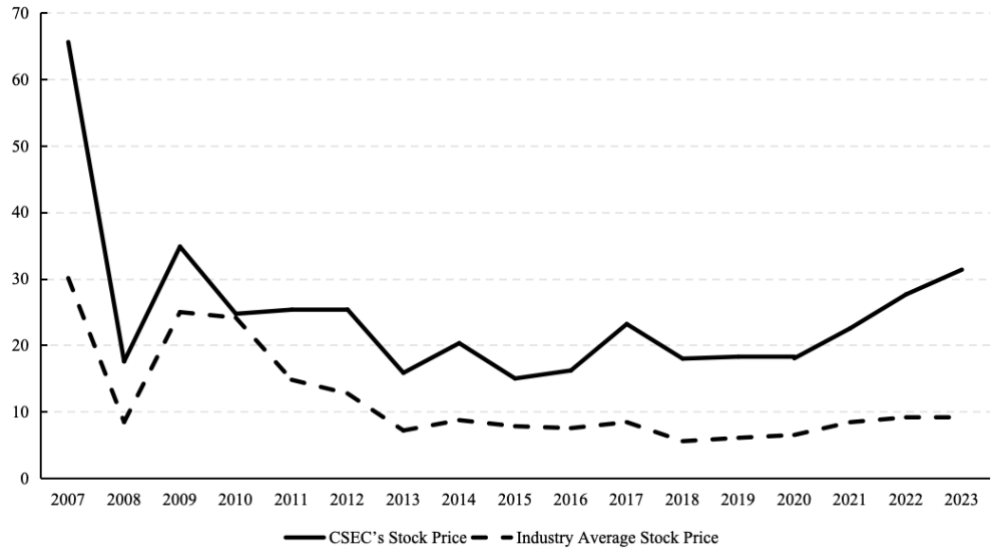

Figure 2-4 CSEC's Stock Performance and Industry Average Performance
Data source: Wind Database, company announcements

2.4.3 CSEC's R&D Investment

According to CSEC's historical data on R&D intensity, the company's R&D expenditure has consistently accounted for less than 1% of its operating revenue, presenting a stark contrast to that of CRRC discussed earlier. This phenomenon

can be attributed to several factors. First, CSEC operates across multiple sectors, including coal mining, power generation, and railway transportation, forming a vertically integrated industrial chain. Such diversification necessitates a balanced allocation of resources among various business segments, limiting the extent to which the company can concentrate resources on R&D activities. Moreover, CSEC is well known for its high dividend payout policy and emphasizes providing stable returns to shareholders through cash dividends. In 2023, the company proposed a cash dividend of approximately RMB 44.903 billion, accounting for 75.2% of its annual net profit. This strategic orientation prioritizes dividend distribution over reinvestment, thereby constraining the amount of capital available for R&D.

Second, as a traditional energy enterprise, the coal industry is characterized by relatively mature mining technologies and production processes. CSEC has established a comprehensive technological system and operational procedures for coal extraction, which are sufficient to support large-scale production and day-to-day operations. As a result, the company has a comparatively lower reliance on sustained high-intensity R&D investment.

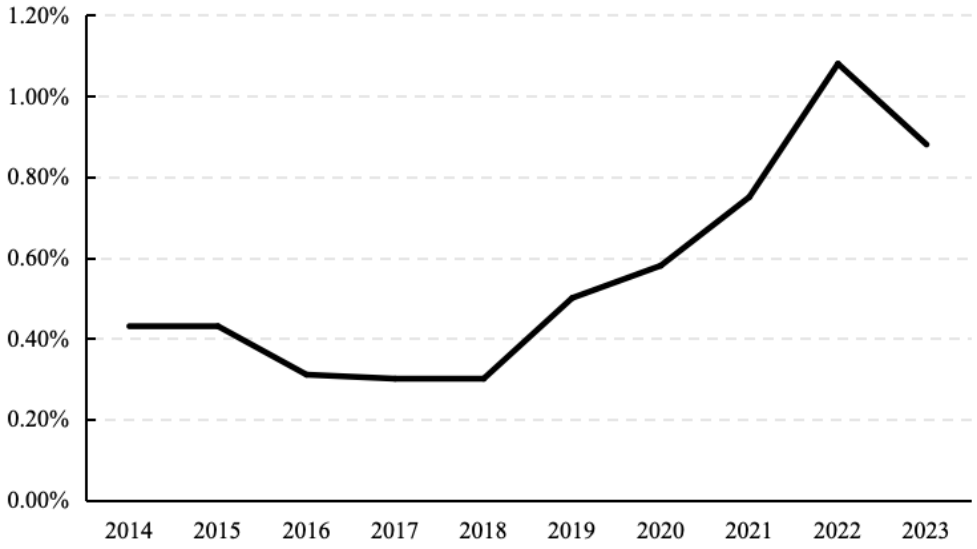

Figure 2-5 CSEC's Ratio of R&D Investment to Operating Revenue

Data source: Wind Database, company announcements

However, CSEC's low level of R&D investment contrast to its strong stock market performance. Although it is also a central SOE subject to the SASAC's EVA-based performance evaluation, the data suggest that CSEC has placed excessive emphasis on short-term market value management while neglecting deeper, innovation-driven activities that are crucial for high-quality development. This raises an important question: Does the implementation of the EVA performance evaluation system uniformly lead all central SOEs to focus on enhancing intrinsic corporate value? To address this concern, this paper conducts an empirical analysis to examine whether the EVA evaluation reform has effectively improved the EVA performance and innovation efficiency of central SOEs.

Chapter 3 Theoretical Basis and Literature Review

3.1 Theoretical Basis

3.1.1 Principal-Agent Theory

The principal-agent theory proposed by American scholars Jensen and Meckling in 1976 reveals the core contradiction in modern corporate governance. This theoretical framework indicates that when enterprise owners (principals) delegate decision-making authority to professional managers (agents) through contracts, a typical principal agent relationship characterized by the separation of ownership and control is formed. Although principals retain residual claim rights, they cannot compel agents to fully comply with their will through mandatory contracts. This institutional defect necessitates the design of incentive compatibility mechanisms—namely, constructing incentive systems that align the interests of agents and principals to achieve organizational goal optimization.

Theoretical analysis shows that corporate principal-agent relationships face dual dilemmas. The first is the inconsistency of utility functions. Both owners and managers are rational economic agents who seek to maximize their personal interests. Owners pursue shareholder wealth maximization, expecting managers to utilize corporate resources rationally and invest in projects that increase shareholder value. In contrast, managers aim to maximize their own interests, avoiding investments that may harm their personal benefits. Consequently, conflicts of interest arise, and without effective institutional arrangements, agents may sacrifice the interests of principals to achieve personal gain. The second issue is information asymmetry. Principals can only observe the outcomes of agent behavior but cannot fully monitor the actions taken by agents. Owners, who do not participate in daily operations or investment activities, delegate management authority to managers and possess far less information than the latter. This asymmetry in information access enables managers to act in ways that benefit themselves at the expense of owners' interests.

Compared to private enterprises, the principal-agent problem in state-owned enterprises exhibits unique complexities. First, the ownership structure involves a dual-layer principal-agent chain of the public-government-enterprise. The State-owned Assets Supervision and Administration Commission, as an intermediary agent, assumes dual roles as both regulator and investor, creating role conflicts that undermine supervisory effectiveness. Second, the multiplicity of objectives leads to a loss of focus in incentive and constraint mechanisms. SOEs must balance economic efficiency, social benefits, and political missions, while managerial behavior often reflects diverse motivations such as personal career advancement and departmental interests. This results in blurred boundaries of authority and ineffective accountability mechanisms. Such institutional defects amplify agency costs in SOEs, necessitating the development of corporate governance solutions with Chinese characteristics.

3.1.2 Incentive Theory

As the core theoretical system of organizational behavior, motivation theory profoundly reveals the dynamic correlation mechanism between human needs, motivations, and behaviors, providing critical theoretical support for the design of performance evaluation systems in modern enterprise management. Starting from the complete transmission chain of need identification, motivation formation, and behavior reinforcement, this theory constructs a theoretical framework encompassing three major branches: content theories, process theories, and behavior modification theories. Among them, content theories such as Maslow's hierarchy of needs and McClelland's achievement motivation theory focus on the differentiated structure of individual needs, offering diagnostic tools for managers to identify employees' dominant needs. Process theories like Vroom's expectancy theory and Adams' equity theory explain the decision-making mechanism between goal setting and behavior selection by constructing a motivational function model of valence-expectancy instrumentality. Behavior modification theories such as Skinner's

reinforcement theory and Weiner's attribution theory establish dynamic regulatory mechanisms for behavior shaping from the perspective of behavioral outcome feedback. Together, these theories form the underlying logic of performance evaluation system design, an effective incentive system must simultaneously satisfy the dual compatibility of individual need fulfillment and organizational goal achievement, structurally coupling employees' personal interests with corporate strategic objectives through institutional design.

In the field of management, motivation theory holds fundamental guiding significance for the design of evaluation systems. An effective evaluation system must meet three theoretical conditions: First, based on content theories, it should establish a need-oriented differentiated incentive structure by identifying needs at different levels and designing corresponding material and non-material rewards, ensuring dynamic alignment between incentive methods and individual need spectrums. Second, following process theories, it should construct a transparent goal transmission mechanism, using the motivational function model of expectancy theory to set challenging yet achievable performance goals, and relying on equity theory to establish observable and verifiable contribution evaluation criteria, thereby forming stable behavioral expectations. Third, based on behavior modification theories, it should design a closed-loop feedback system, enhancing the repetition probability of target behaviors through the positive incentive cycle of reinforcement theory and optimizing behavior modification efficiency via the cognitive regulatory function of attribution theory. This theory-driven institutional design essentially achieves dual compatibility, at the individual level, it ensures basic incentive conditions for behavioral agents through the participation constraint of need satisfaction, while at the organizational level, it guides the co-evolution of individual behaviors and strategic directions through the incentive compatibility constraint of goal convergence.

Management practices in modern enterprises demonstrate that the effectiveness of a scientific evaluation system depends on its alignment with motivation

theory. When an enterprise establishes diversified incentive methods matching need hierarchies, transparent reward mechanisms corresponding to expectancy theory, and immediate feedback systems adapted to reinforcement theory, it can achieve incentive compatibility while addressing information asymmetry. For example, designing challenging goals and excess profit-sharing mechanisms for employees with high achievement motivation, or providing stable compensation and career security for those dominated by safety needs—such differentiated incentive strategies not only meet participation constraints but also align employee interests with corporate goals by reinforcing positive behavioral motivations. Therefore, an ideal performance evaluation system should be regarded as the institutional embodiment of motivation theory. Through precise need identification mechanisms, fair motivation guidance mechanisms, and continuous behavior reinforcement mechanisms, abstract management theories are transformed into actionable governance tools, ultimately constructing a value symbiosis system for organizational development and individual growth.

3.2 Literature Review

3.2.1 Comparison between Traditional Performance Evaluation Indicators and EVA Indicators

The traditional performance evaluation system revolves around indicators such as net profit, earnings per share (EPS), and return on equity (ROE), with its design logic rooted in the productivity perspective of the industrial economy era. In 1903, DuPont Corporation adopted return on investment to evaluate corporate performance, forming the DuPont System. In 1928, Alexander Wall proposed the famous Wall Scoring Method, which used multiple financial indicators to calculate a comprehensive score for evaluating business performance. By the 1950s, responsibility center performance evaluation had continuously developed and improved, utilizing cost accounting, budgeting systems, and variance analysis as tools, leading to the widespread establishment of three types of responsibility centers in enterprises: cost centers, profit centers,

and investment centers. Although these indicators are easy to calculate and highly comparable, they have three key limitations: First, they do not fully account for capital costs, particularly equity capital costs, which have long been excluded from profit and loss calculations, potentially inflating profitability levels. Second, constrained by the prudence principle of accounting standards, strategic investments such as R&D expenditures and goodwill amortization are expensed, distorting the true value creation capability of enterprises. Third, the indicators exhibit a clear short-term bias, enabling managers to manipulate short-term financial data by cutting R&D investments or delaying equipment updates. These structural flaws have become increasingly prominent in the knowledge economy era, especially for innovative enterprises with high intangible asset ratios and long investment return cycles, as traditional indicators struggle to accurately reflect the essence of value creation.

Economic Value Added (EVA), as a crucial tool in modern enterprise value management, traces its theoretical origins to the residual income concept proposed by Edwards and Bell in the 1960s. Stewart (1994) systematically reconstructed this theoretical framework, integrating the concept of capital costs with accounting adjustment mechanisms to develop a more practical EVA evaluation system. Compared to traditional accounting indicators, the fundamental breakthrough of EVA lies in transcending the “accounting profit supremacy” mindset. By calculating the difference between after-tax net operating profit and capital costs, it organically unifies the balance sheet and income statement, not only requiring enterprises to generate accounting profits but also emphasizing that these profits must exceed the opportunity costs of all capital providers. This value creation-oriented evaluation logic fundamentally addresses the inherent flaws of traditional financial indicators, which overly rely on accounting standards and neglect capital efficiency.

At the level of management practice, EVA has evolved from a single evaluation metric into an integrated value management system. Stern and Stewart, a financial consulting firm, proposed the EVA value management system and

summarized its characteristics as the 4M framework: Measurement system, Management system, Motivation system, and Mindset system. Unlike the drawbacks of traditional budget management and performance evaluation being disconnected, this system integrates strategic planning, resource allocation, performance evaluation, and compensation incentives into a unified framework. The Measurement system emphasizes EVA as the primary accounting metric for reviewing the performance of corporate managers and employees responsible for implementing strategic plans, including specific aspects such as evaluation objectives, targets, metrics, methods, standards, and analytical reports. The Management system focuses on building an enterprise value management system centered on EVA, optimizing resource allocation around strategic objectives, implementation, and evaluation to achieve the goal of maximizing shareholder value. The Motivation system refers to linking EVA with compensation during the value management process to incentivize collaboration between managers and employees. The Mindset system involves corporate training and communication to foster employee identification with the value represented by EVA, embedding this philosophy deeply into corporate culture to facilitate value management.

Empirical research in academia further validates the theoretical advantages of EVA. Lehn & Makhija (1996) demonstrated that, compared to traditional financial metrics, EVA exhibits a stronger positive correlation with corporate value. O'Byrne (1996) supported this view, noting that EVA serves as a critical basis for investors to assess the intrinsic value of different companies due to its systematic relationship with corporate value. Ehrbar & Stewart III (1999) argued that EVA is a more effective performance evaluation method and incentive mechanism than traditional metrics, playing a vital role in helping enterprises achieve excellence. Fatemi et al. (2003) employed comparative analysis and found that using EVA for performance evaluation yields more incremental performance information than financial metrics. Malmi & Ikäheimo (2003) compared the similarities and differences between EVA and

traditional financial metrics, concluding that maximizing EVA aligns with the goal of maximizing shareholder wealth and that EVA is more suitable for corporate performance evaluation. Abdeen & Haight (2002) observed that EVA is particularly effective for larger enterprises, providing a more accurate reflection of their operational performance.

Currently, the selection of performance evaluation system indicators is trending towards diversification and comprehensiveness. On one hand, performance metrics related to corporate business strategies and non-financial performance evaluations have been incorporated into modern performance evaluation systems. On the other hand, quantitative (objective) and qualitative (subjective) performance indicators have also significantly enriched these systems. As performance evaluation frameworks and systems mature, they are increasingly integrated into the performance management process and linked to compensation management systems. Ensuring the objectivity of executive performance evaluations and enhancing the effectiveness of executive incentives and performance management remain important areas for future exploration and research.

3.2.2 Economic Consequences of EVA Performance Evaluation

As a novel financial performance metric for measuring corporate value creation, EVA has gradually become a crucial tool for both internal performance evaluations and external investor assessments. A substantial body of literature examines the impact of the EVA evaluation system on corporate governance, management incentives, resource allocation, and long-term economic outcomes. As a key indicator for measuring genuine corporate value creation, in theory, when companies adopt the EVA evaluation system, management tends to focus more on capital costs and long-term value growth rather than merely pursuing short-term profits in their investment and operational decisions. In practice, EVA is the most commonly used value-oriented metric by companies and stock analysts, making the residual profit concept based on book value a new

technique in value management. Biddle et al. (1997) explored the relationship between EVA and corporate market value, finding a positive correlation—companies using the EVA system exhibited significantly better stock performance and market value growth compared to those under traditional evaluation methods. Chen & Dodd (1997) compared EVA metrics with accounting earnings metrics in terms of their association with earnings per share, concluding that EVA metrics better explain corporate stock market performance. Similarly, Lefkowitz (1999) contrasted EVA with other traditional evaluation metrics, arguing that EVA is highly correlated with stock returns and aids investors in making investment decisions. Ghanbari (2007) also supported these findings by studying the correlation between EVA and MVA in India's automotive industry.

The EVA performance evaluation system emphasizes the inclusion of capital costs, thereby requiring management to consider whether investment projects can generate returns exceeding the cost of capital when making decisions. This leads to a greater focus on the true economic benefits of projects. On one hand, this mechanism to some extent constrains short-term managerial behavior, helping to mitigate agency problems. O'Byrne (1996) noted in his research that using EVA as a performance metric can effectively reduce earnings management behaviors driven by short-term accounting profits, thereby promoting long-term stable development for firms. Stern (2004) pointed out that making EVA the core metric in executive compensation incentive systems can significantly reduce various inefficient investment and financing behaviors. Moreover, this governance effect is not only effective in private enterprises but also enhances value creation and operational efficiency in state-owned enterprises. Rogerson (1997) based on the principal-agent model, deduced that allocation rules influence managerial investment behavior incentives and argued that, compared to accounting profits, allocation rules based on economic profit or EVA can guide managers to choose efficient investment levels and make sound investment decisions. Mohnen & Bareket (2007) found that under

capital constraints, adopting EVA as a performance measurement method helps alleviate principal-agent problems between owners and managers, encouraging managers to allocate resources to projects with positive expected net present values. Jacque & Vaaler (2001) highlighted that in an international context, agency problems between parent companies and subsidiaries are often exacerbated by exchange rate fluctuations between the local currency of foreign subsidiaries and the reference currency of multinational parent companies. Using Economic Value Added as a performance evaluation standard helps address subsidiary performance assessment issues in multinational corporations. On the other hand, implementing EVA metrics enables corporate management to use surplus funds more prudently. Research indicates that firms adopting EVA performance evaluations tend to be more cautious about new investments, allocating excess funds to stock repurchases and dividend distributions, resulting in higher overall firm value compared to those not using EVA (Biddle et al., 1997). Hamilton et al. (2009) also support this view, noting that EVA-adopting firms exhibit greater caution in investment projects, leading to a positive trend in the return on investment for new projects. Reichelstein (1997) argued that EVA helps firms make better investment decisions and improve capital allocation efficiency. Specifically, when evaluating investment projects, firms consider the project's contribution to EVA, thereby avoiding reckless investments and resource wastage. Furthermore, implementing EVA metrics can continuously enhance firm value by improving operational performance. Kleiman (1999) demonstrates that firms adopting EVA evaluations effectively improve operational performance. Ehrbar & Stewart III (1999) found that firms implementing EVA outperformed their industry peers not using EVA in terms of market performance. Ferguson et al. (2005) also discovered that EVA implementation enhances stock market performance, further increasing a firm's intrinsic value.

Although the existing literature generally acknowledges the positive role of EVA assessment in enhancing corporate value and incentivizing management,

there are still some controversies and shortcomings. Firstly, some scholars argue that EVA is not a perfect indicator for evaluating corporate value. Garvey & Milbourn (2000), based on the principal-agent model, analyzed EVA and accounting earnings as two candidate performance measurement indicators. Their study found that accounting earnings often perform better in terms of their correlation with actual stock returns and corporate value. Biddle et al. (1999) compares EVA with residual income, operating cash flow, and stock market returns, concluding that EVA is not correlated with these corporate performance indicators and cannot serve as a reliable measure of corporate performance. McCormack & Vytheeswaran (1998) analyzes samples from the fossil energy industry and found that the EVA indicator only affects the wealth fluctuations of some shareholders and does not effectively measure corporate performance. Abdeen & Haight (2002) demonstrates that among the top 500 U.S. companies, whether or not they implemented EVA assessment, there was no significant difference in total operating revenue and earnings per share; in fact, companies implementing EVA assessment performed worse than those that did not. Additionally, Sparling & Turvey (2003) pointed out that shareholder returns do not increase with higher EVA values. Richardson (2006) showed that companies with negative EVA results had even lower stock returns.

Secondly, the effectiveness of the EVA indicator exhibits significant context-dependent characteristics. Some multinational or industry specific studies have explored the differences in EVA application across various markets and sectors. Biddle et al. (1997) found that due to variations in capital intensity, market competition levels, and profit models across industries, the sensitivity and applicability of the EVA indicator differ significantly. For example, multinational corporations such as Coca-Cola, Infosys, and Amazon have achieved notable economic benefits by optimizing capital allocation and improving operational efficiency through the EVA assessment system. However, in some developing countries, the application of EVA faces numerous challenges, such as difficulties in data acquisition and insufficient corporate

awareness. This suggests that when promoting the EVA assessment system, it is essential to fully consider industry-specific characteristics and regional economic environments to avoid a one size-fits-all approach.

Additionally, when companies adopt EVA as a performance metric for executives, it may trigger opportunistic behavior among them. Wallace's (1997) research indicates that firms using EVA exhibit stricter investment controls, greater capital returns to shareholders, and higher growth in residual income. Milano (2019) further points out that the numerous adjustments to Generally Accepted Accounting Principles (GAAP) accounting make it possible for EVA to encourage "short termism". Pham et al. (2011) examined the extent to which individual monitoring mechanisms enhance corporate performance and shareholder value, finding no significant relationship between EVA as a performance measure and corporate governance. O'Byrne (2019) argues that EVA bonus plans reward growth based on current EVA without considering changes in future expected growth, potentially encouraging profit margin improvements at the expense of business growth and deterring positive net present value investments, as long-term returns would reduce current EVA. He et al. (2020) found that after the implementation of the EVA performance evaluation system in central state-owned enterprises, executives were more inclined toward accrual-based earnings management rather than real earnings management, with stronger motivations for earnings management in firms that had incurred losses the previous year or had higher degrees of separation between ownership and control. Furthermore, Du et al. (2018) demonstrated that adopting new performance metrics creates fairness issues, prompting managers to consider personal preferences in subjective adjustment decisions.

3.2.3 Factors Influencing Corporate Innovation

Enterprises are the main entities implementing the innovation driven development strategy and the backbone of achieving the strategy of becoming a technologically powerful nation, possessing the capability and motivation for

proactive and independent innovation. At the same time, innovation serves as the driving force for corporate survival and development, enhancing innovation capacity, operational efficiency, and market competitiveness. However, corporate innovation is not an isolated economic activity but is embedded within a complex internal and external ecosystem. From macro-level institutional constraints to financial market structures, from government policy interventions to endogenous corporate characteristics, the dynamic interplay of multidimensional factors collectively shapes the opportunities and risks of innovation.

First, economic cycles and institutional design constitute the foundational environment for corporate innovation. Campello et al. (2010) pointed out that the credit crunch triggered by financial crises not only directly suppresses R&D investment but also forces firms to abandon long-term investment opportunities with potential. Legal protection regulates innovation incentives through multiple pathways. Due to the high uncertainty of innovation outcomes, ex-ante contracts are often ineffective in motivating employees (Aghion & Tirole, 1994), while legal rigidity serves as a stabilizing safeguard for expectations. For instance, dismissal laws significantly enhance employees' willingness to engage in high-risk innovation by reducing the risk of layoffs (Acharya et al., 2013). The strength of intellectual property protection directly determines the profit exclusivity of innovation outcomes, with Spulber (2013) demonstrating that imitation competition in weak protection environments severely undermines innovation incentives. Brown et al. (2013) further extended this to shareholder rights protection, finding its leveraging effect on the long-term efficiency of R&D investment. Notably, the orientation of bankruptcy laws also influences innovation decisions. Debtor-friendly bankruptcy systems objectively encourage firms to undertake breakthrough projects by tolerating failure persistence (Acharya & Subramanian, 2009). Chen et al. (2023) demonstrated that demand-side, supply-side, and environmental talent policies can all positively impact corporate innovation, with various talent policies

generating synergistic effects and talent agglomeration further optimizing these impacts.

Second, the functional differentiation of financial markets profoundly affects the allocation of innovation resources. Stock markets and credit markets exhibit asymmetric effects. Specifically, Hsu et al. (2014) found that the former positively promotes innovation through risk-sharing mechanisms, while the latter exerts a restraining effect due to creditors' risk aversion, with this disparity being particularly pronounced in emerging markets and common law countries. The internationalization process injects much-needed capital and technology into small and medium-sized enterprises (SMEs) by breaking geographical barriers (Ren et al., 2015). Fang et al. (2014), based on their exploration of hostile takeover risks, high-frequency trading, and quasi index investing, argued that higher stock liquidity can trigger managerial myopia and negatively impact long-term investments such as corporate innovation. The venture capital cycle exhibits a unique screening mechanism, with startups entering during active investment periods more inclined toward high-risk innovation, resulting in a polarized distribution of outcomes (Nanda & Rhodes-Kropf, 2013), while financial market activity further strengthens this mechanism by optimizing the matching of financing frequency and scale (Nanda & Rhodes-Kropf, 2017). The role of debt financing channels is equally complex. While banking development generally benefits small business innovation (Benfratello et al., 2008), U.S. experience shows that the expansion of in-state banking power may suppress startup vitality, whereas cross-state competition provides positive incentives (Chava et al., 2013; Cornaggia et al., 2015). Zhang et al. (2024) noted that digital finance can provide robust support for corporate innovation through channels such as reducing financing costs.

Moreover, in the modern economy, governments can utilize targeted policy tools such as tax credits, subsidies, and loan guarantees to adjust the costs and benefits of innovation. Bernstein (1986) examined the impact of direct and indirect tax incentives on R&D expenditures, finding that tax credits and special

allowances related to R&D investments increased firms' innovation spending. Kang & Park (2012) explored the relationship between government policies and corporate innovation strategies, arguing that government funding influences firm innovation by stimulating internal R&D and upstream downstream collaboration. Czarnitzki et al. (2011) found that tax credits have become the most significant tool for the Canadian government in supporting innovative technology projects, with recipients achieving more product innovations and higher sales of innovative products. Clausen (2009) tested the effects of "research" and "development" subsidies on innovation activities, revealing that "research subsidies far from the market" stimulated firms' innovation by increasing spending on research activities, whereas "development subsidies close to the market" substituted for R&D expenditures by reducing budgets allocated to development activities. Wallsten (2000) demonstrated that government financial support might lead firms to reduce their own R&D investments, and this substitution effect could adversely affect corporate innovation activities.

Since Schumpeter (1942) proposed that competitive markets are not necessarily the most efficient market structure for promoting research and development, the impact of competition on innovation incentives has remained a contentious topic in economics. Schumpeter (1942) argued that firms with greater market power are more inclined to innovate, as larger firms benefit from economies of scale in R&D, whereas market competition reduces firms' market shares, thereby inhibiting innovation. In contrast, Arrow (1972) presented an opposing view, demonstrating that product market competition can stimulate corporate innovation, with the mechanism being the increased income for independent inventors. It was not until Aghion et al. (2005) introduced the inverted U-shaped curve theory that the optimal level of competition for innovation was revealed—excessive concentration dampens the drive to catch up, while perfect competition erodes the returns to innovation. Meanwhile, Negassi & Hung (2014) explored the nature of competition across different industries and found

a strong positive correlation between competition and innovation output in the civilian sector.

The funding sources for technological innovation also include debt financing, leading to a growing body of literature examining the role of banks—a critical financial intermediary and provider of debt financing—in corporate innovation. Benfratello et al. (2008) found that banking sector development has a positive and significant impact on the introduction of process or product innovations, with this effect being stronger for small firms, high-tech firms, and those more reliant on external financing. Leveraging the policy shift of banking deregulation at the national level in the United States, numerous scholars have investigated the impact of bank credit supply on corporate innovation. Chava et al. (2013) focused on how banking deregulation affects the innovation activities of startups, showing that deregulating intrastate banking inhibits innovation in early-stage private firms by strengthening their local market power, whereas deregulating interstate banking enhances innovation by reducing such power. Cornaggia et al. (2015), in studying the effects of banking deregulation on technological innovation in state-owned and private enterprises, found that competition induced by deregulating interstate bank branches reduces innovation output for listed companies headquartered in those states but improves innovation performance for private firms. Overall, banking competition benefits small firms' innovation by lowering the likelihood of their acquisition by listed companies.

From an internal organizational perspective, size is a significant factor influencing corporate innovation activities. Schumpeter (1942) proposed that larger firms generate more innovation output. On one hand, there are economies of scale in R&D expenditures. If a company engages in only one innovation activity, it bears the full risk of innovation failure. The more diverse the activities a company undertakes, the lower this risk becomes. Therefore, large firms often have more diversified innovation activities than small firms and can derive greater benefits from their R&D expenditures. On the other hand,

economies of scale exist in financial markets, where large firms find it easier to access financing and possess greater borrowing capacity, thereby enhancing their ability to conduct innovation activities. Noori et al. (2017) argue that the dispersion of innovation risks, economies of scale, and scope economies give large firms an advantage in innovation activities. Conversely, Pavitt et al. (1987) pointed out that due to their simpler internal structures, more flexible business models, and the absence of principal-agent conflicts, small and medium-sized enterprises (SMEs) exhibit higher innovation efficiency, suggesting that larger firm size does not necessarily equate to higher efficiency. Wennekers et al. (2005) further noted that over the past few decades, the innovation advantage has shifted from large firms to smaller businesses. From the perspective of ownership structure, Zhang et al. (2003) demonstrated that non-state-owned enterprises, particularly foreign-invested firms, outperform state-owned enterprises in terms of R&D efficiency, among other aspects. Ayyagari et al. (2011) analyzed data from firms in developing countries and found that even though state-owned enterprises enjoy advantages in financing and other areas, their innovation capabilities remain inferior to those of private enterprises, highlighting the importance of private firms in the innovation landscape.

From the perspective of managerial characteristics, due to the high failure rate, significant uncertainty, and long payback period of innovation activities, managers often need to invest substantial personal effort (Bertrand & Mullainathan, 2003). However, the benefits of successful innovation are primarily enjoyed by owners, while failure can negatively impact managers' compensation, reputation, and career prospects. This imbalance between costs and benefits often diminishes managerial motivation for innovation (Fogel et al., 2008). Therefore, only by demonstrating higher tolerance for the risks of innovation failure can enterprises incentivize managers to actively engage in innovation (Tian & Wang, 2014). Additionally, characteristics such as gender, tenure, psychological traits, and personal experiences of managers also influence corporate innovation. For instance, Zhou et al. (2023) from the

perspectives of knowledge specificity and resource dependency, demonstrated that directors with extensive innovation experience exhibit a stronger inclination and capability to drive innovation activities, thereby facilitating greater innovation output. Liu et al. (2012) examined the impact of executive tenure on corporate innovation performance, finding that longer-tenured executives often lack the knowledge for further development, particularly when companies undergo fundamental changes in production operations and internal organization, leading to a significant negative correlation between executive tenure and invention performance. The psychological traits of managers are also critical factors influencing corporate innovation. Galasso & Simcoe (2011) using a career concerns model and U.S. corporate data, argued that CEO overconfidence promotes corporate innovation, with the degree of product market competition moderating this effect. They suggested that overconfident managers tend to underestimate the probability of innovation failure and are more likely to lead firms into new technological domains. Hirshleifer et al. (2013) further provided empirical support for the positive relationship between CEO overconfidence and corporate innovation. Sunder et al. (2017) found that firms hiring CEOs with pilot qualifications produced more innovation output.

3.2.4 Literature Review

A review of existing literature reveals that scholars generally agree that the EVA performance evaluation system, by internalizing capital costs into corporate decision making mechanisms, effectively corrects the short-term biases of traditional financial metrics. This encourages management to make investment decisions aligned with shareholder value maximization, thereby mitigating principal-agent conflicts. Some studies further suggest that EVA has a dual effect on innovation activities: its capital constraint effect may compel firms to reduce inefficient R&D investments, while its long-term value orientation can incentivize high-quality innovation.

However, existing literature still has the following limitations. First, research perspectives are overly skewed toward market-oriented enterprises, neglecting the heterogeneity of state-owned enterprises under unique institutional contexts such as redundant staffing and intertwined social and economic objectives. The pervasive issues of hidden employment and inefficient human resource allocation in SOEs may dilute per-capita EVA creation, yet existing literature has not given this sufficient attention. Second, scholars have yet to reach a consensus on innovation activities. Most studies focus solely on single dimensions such as R&D intensity or patent counts, failing to construct a comprehensive framework that evaluates the efficiency ratio of input to output. This makes it difficult to identify the root causes of the high-input, low-output dilemma in SOEs.

Based on the practical needs of state-owned enterprises, particularly central state-owned enterprises, to enhance their market value management levels, this study aims to address two gaps in existing research. On one hand, by introducing a per capita EVA analytical framework, it reveals the actual impact of EVA performance evaluation on the efficiency of human capital allocation in central state-owned enterprises under the characteristic of personnel redundancy, thereby assessing whether managers of central state-owned enterprises actively respond to the EVA performance evaluation system. On the other hand, it constructs a comprehensive efficiency indicator for innovation input and output to analyze whether the EVA performance evaluation can resolve the chronic issue of imbalanced innovation resource allocation in state-owned enterprises, thus providing a basis for enhancing their innovation capabilities.

Chapter 4 The Implementation Effects of the EVA Performance Evaluation System in Central state-owned enterprises

4.1 Overview

In modern enterprise management, performance evaluation serves as a core tool for strategy implementation. By quantifying objectives, guiding resource allocation, and establishing incentive mechanisms, it becomes a critical driver of corporate value creation. Within this system, the design of the indicator framework directly determines the scientific validity and effectiveness of the evaluation. In 1991, Stern Stewart & Co. proposed the Economic Value Added theory, which, with its focus on capital costs and emphasis on shareholder value creation, has been regarded by global enterprises as an innovative tool to overcome the limitations of traditional financial metrics. Its core logic lies in the fact that EVA, by deducting the cost of equity and debt capital from economic profit, can more accurately reflect a company's value creation capability and encourage managers to prioritize long-term capital efficiency over short-term profit scale (Stewart, 1994).

However, the application of EVA in China exhibits distinct institutional embeddedness characteristics. Unlike the market-driven model in Western countries, the EVA performance evaluation system in central state-owned enterprises represent a mandatory institutional change imposed top-down by the State-owned Assets Supervision and Administration Commission (SASAC). This process underwent prolonged adaptive adjustments: the 2003 "Interim Measures for the Performance Evaluation of Central Enterprise Executives" first established total profit and return on equity (ROE) as core indicators; the 2006 revision introduced the concept of classified assessment; while the third revision in 2009 completely replaced ROE with EVA, marking the official shift of central enterprise evaluation systems toward value management orientation. Notably, SASAC implemented Sinicization modifications in the institutional design: on one hand, extending pilot periods (5-year measurement rankings and

3-year trials) to reduce institutional friction; on the other hand, adopting differentiated accounting rules regarding capital cost rates and R&D expenditure adjustments based on functional positioning differences among central state-owned enterprises.

Existing literature has extensively studied the economic consequences of the EVA evaluation system. Research has confirmed that EVA implementation significantly improved cash holdings (Shen et al., 2015), risk-taking levels, and investment efficiency (Ou and Sun, 2018) in central state-owned enterprises, but also led to earnings management (He et al., 2019) and regulatory fairness issues (Du et al., 2018). However, these studies generally assume institutional effectiveness while overlooking the complexity of principal-agent relationships in central enterprise performance evaluation. In reality, information asymmetry exists between SASAC and central enterprise managers. On one hand, given the numerous and organizationally complex central state-owned enterprises, SASAC lacks sufficient time, human resources, and organizational capacity to comprehensively evaluate the management systems (including strategies, operational plans, and budget indicators) built around EVA evaluation, creating communication barriers. On the other hand, although China's highly concentrated ownership structure ensures controlling shareholders' supervision over managers, such oversight may be merely nominal. During performance evaluation, internal managers possess certain private information about central state-owned enterprises and wield soft power in setting evaluation standards. More critically, when enterprises perform well on traditional indicators like ROE, regulators show higher tolerance for EVA underperformance, leading to softened evaluation constraints (Du et al., 2018). This suggests that EVA's actual effectiveness may depend more on managers' perception and response strategies than on mere policy pressure.

This study breaks through the assumption of institutional effectiveness by reexamining the efficacy of the EVA performance evaluation system from a managerial behavior perspective. Specifically, it seeks to answer the following

questions: (1) Did central state-owned enterprises' EVA performance show systematic improvement after the comprehensive implementation of EVA evaluation in 2010? (2) What primary methods do managers employ to optimize EVA performance? (3) Does EVA performance in central state-owned enterprises generate positive market reactions? Addressing these questions will facilitate deeper understanding of the micro-level mechanisms of the central enterprise EVA evaluation system and provide theoretical support and practical insights for optimizing state capital regulatory frameworks.

4.2 Theoretical Analysis and Research Hypotheses

A scientific performance evaluation mechanism serves as both an incentive and a constraint for executives, mitigating principal-agent problems and enhancing the alignment of executive and shareholder objectives. Existing research has found that, compared to financial performance, non-financial performance better reflects long term orientation and value creation, providing incremental information for assessing executives' progress toward long-term goals (Dikolli & Vaysman, 2006; Servaes & Tamayo, 2013).

Unlike general enterprises, executives of central state-owned enterprises are managed similarly to civil servants, enjoying administrative benefits and promotion prospects akin to government officials of corresponding ranks. Political promotion represents a crucial implicit incentive for central enterprise executives, influencing their degree of commitment to contractual obligations. This is because promoted executives gain access to higher control benefits, enhanced reputation, and broader resource allocation authority (Cao et al., 2019). Therefore, within China's long-standing "official-centric" context, central enterprise executives are not content with merely fulfilling their roles as corporate managers but are also highly motivated to pursue political advancement. In terms of personnel appointments, despite the increasing autonomy of central state-owned enterprises due to market-oriented reforms, the appointment and dismissal of executives remain under the purview of the

State-owned Assets Supervision and Administration Commission Specifically, SASAC retains the authority to select, appoint, and dismiss central enterprise executives. To achieve personal promotion, these executives tend to align their actions with government policies and directives (Bradshaw et al., 2019).

The performance evaluation index system, comprising various assessment indicators and criteria, communicates the long-term strategic and short-term operational goals that SASAC expects central state-owned enterprises to achieve, thereby guiding managerial decision-making. The appointment and dismissal of central enterprise executives largely depend on the outcomes of their performance evaluations. Under the incentive of political promotion expectations, performance evaluations can alter executives' perceptions of their promotion prospects and the extent of their efforts in alignment with evaluation criteria. Consequently, after incorporating the EVA indicator into the performance evaluation system for central enterprise executives, their promotions become tied to EVA performance levels, motivating them to strive for improved EVA performance. Thus, this study anticipates that implementing an EVA-oriented performance evaluation system will enhance the EVA performance levels of central state-owned enterprises.

Hypothesis 1: The implementation of an EVA-oriented performance evaluation system can significantly improve the EVA performance of central state-owned enterprises.

4.3 Empirical Research Design

4.3.1 Sample Selection and Data Sources

This study selects state-owned enterprises listed on the Shanghai and Shenzhen A-share markets from 2007 to 2023 as the research sample. We apply the following screening criteria to the initial sample: excluding listed companies in the financial and insurance industries with special investment behaviors, ST and *ST companies, as well as companies with missing data. The final sample comprises 20,777 firm-year observations.

The data used in this study are sourced from the CSMAR database, annual reports of Shanghai and Shenzhen A-share listed companies, and relevant websites of the State-owned Assets Supervision and Administration Commission. The EVA values are obtained from the China Listed Companies EVA Research Database provided by CSMAR. Following the explanation of EVA calculation standards provided by the database, we adopt the EVA values based on Method 1, which is consistent with SASAC's calculation formula. In addition, robustness checks are conducted using EVA values under Method 2, as presented in Table 4-1. To mitigate the impact of data outliers on the empirical results, all continuous variables are winsorized at the 1% level.

Table 4-1 Two Different Calculation Formulas for EVA in the CSMAR Database

EVA = Net operating profit after tax - Total capital × WACC	
Method 1 EVA Referencing the SASAC's *Interim Measures for the Performance Evaluation of Central State-owned Enterprises*	NOPAT = Net Profit + (Interest Expense + Development Expenditure - Non-operating Income) × (1 -Corporate Income Tax Rate) Total Capital = Average Shareholders' Equity +Average Total Liabilities - Average Non-interest-bearing Current Liabilities - Average Construction in Progress Weighted Average Cost of Capital (WACC) = 5.5% Specifically, the corporate income tax rate was 33% before 2008 and 25% from 2008 onwards. The average non-interest-bearing current liabilities are calculated as the sum of notes payable, taxes payable, accounts payable, advances from customers, employee compensation payable, interest payable, dividends payable, other payables, and other current liabilities. Special payables are treated as non-interest-bearing current liabilities and are deducted accordingly.
Method 2 EVA	NOPAT=Operating Profit - Income Tax Expense + [Interest Expense (Non-Financial Institutions) + Asset Impairment Loss + Development Expenditure] × (1- Corporate Income Tax Rate) + Increase in Deferred Tax Liabilities - Increase in Deferred Tax Assets Total Capital = Total Equity + Asset Impairment Provision - Construction in Progress Impairment Provision - Net Construction in Progress + Deferred Tax Liabilities - Deferred Tax Assets + Short-Term Borrowings + Trading Financial Liabilities + Current Portion of Non-Current Liabilities + Long-Term Borrowings + Bonds Payable + Long-Term Payables WACC = Cost of Debt × (1 - Corporate Income Tax Rate) × (Debt Capital / Total Capital) + Cost of Equity × (Equity Capital / Total Capital)

	Cost of equity capital = Risk-free rate + Risk factor× Market risk premium Specifically, the cost of debt capital is proxied by the one-year bank loan interest rate; the risk-free rate is represented by the one-year bank deposit interest rate; and the risk factor is measured using the BETA value weighted by the circulating market capitalization over 250 trading days in the Shanghai and Shenzhen stock markets. Considering the high volatility characteristic of the Chinese stock market, a market risk premium of 4% is adopted in the calculations.

4.3.2 Variable Definition and Measurement

4.3.2.1 Dependent Variable: EVA Performance

To evaluate the effectiveness of the *Interim Measures for the Performance Evaluation of Chief Executives of Central State-owned Enterprises*, this study follows the approach of Shen et al. (2015) and uses per capita EVA (*EVA*), calculated based on Method 1 in the CSMAR database, to measure firms' EVA performance.

This paper employs per capita EVA to measure the EVA performance level of listed state-owned enterprises, primarily considering their unique characteristics. Historically, SOEs have often shouldered greater social responsibilities and policy objectives, such as ensuring employment and maintaining social stability, which may lead to certain redundancies in staffing. Therefore, compared to existing literature that uses overall corporate EVA to measure performance, this paper argues that per capita EVA is more suitable for evaluating the EVA performance of SOEs. Per capita EVA more accurately reflects the value created by each employee, helping to eliminate the impact of corporate size and staffing redundancies, thereby enabling a fairer assessment of SOEs' operational efficiency and value creation capabilities.

4.3.2.2 Explanatory Variable: Central State-owned Enterprises EVA Performance Evaluation System

The *Interim Measures for the Performance Evaluation of Chief Executives of Central State-owned Enterprises* issued by the State-owned Assets Supervision

and Administration Commission (SASAC) requires central SOEs to implement the system starting from January 1, 2010. This revision marked a fundamental shift from "encouraging the adoption of EVA indicators" to "comprehensive EVA indicator evaluation." Therefore, we construct a time dummy variable (*Post*) to represent the implementation of the *Interim Measures for the Performance Evaluation of Chief Executives of Central State-owned Enterprises* . Specifically, *Post* is assigned a value of 0 for sample years from 2007 to 2009 and a value of 1 for sample years from 2010 to 2023.

Since the performance evaluation system specifically targets the performance evaluation of senior management in central state-owned enterprises, local SOEs are not directly affected by this policy. Therefore, we use local state-owned listed enterprises as the control group. Accordingly, a dummy variable *Central* equals 1 if the enterprise is a central SOE and 0 if it is a local SOE.

4.3.2.3 Control Variables

Drawing on existing literature (Shen et al., 2015), we control for firm-level financial and governance characteristics, including firm size (*Size*), leverage ratio *(Lev*), firm age (*Age*), cost-to-profit ratio (*Cost*), capital intensity (*Capital*), market-to-book ratio (*MB*), growth opportunity (*Growth*), and board size (*Boar*d). The specific definitions of these variables are detailed in Table 4-2. To effectively account for potential confounding effects from time-invariant firm characteristics and macroeconomic factors, we introduce firm fixed effect and year fixed effect in the model.

Table 4-2 Definitions and Measurements of Key Variables

Variable Name	Variable Definition	Variable Measurement Method
EVA	EVA performance	Per capita EVA of enterprises calculated according to CSMAR Method 1
Post×Central	policy treatment effect	Refer to "4.3.2.2 Central State-owned Enterprises EVA Performance Evaluation System "
Size	firm size	Natural logarithm of total assets
Lev	asset-liability ratio	The ratio of total liabilities to total assets

Age	firm age	The natural logarithm of the number of years since the firm's IPO plus one
Cost	cost-to-profit ratio	The ratio of total profit to the sum of operating costs, taxes and surcharges, sales expenses, administrative expenses, financial expenses, and R&D expenses
Capital	capital intensity	The natural logarithm of fixed assets divided by the number of employees
MB	market-to-book ratio	The ratio of year-end total assets to market value
Growth	growth opportunity	The ratio of the difference between current operating revenue and previous operating revenue to the previous operating revenue
Board	board size	The natural logarithm of the number of board members

4.3.3 The econometric regression model

To test the research hypotheses proposed in this paper, we constructed the following econometric regression model for examination:

$$EVA = \alpha_0 + \alpha_1 POST \times Central + \sum Control + FirmFE + YearFE + \varepsilon \quad (4\text{-}1)$$

EVA is a metric reflecting corporate EVA performance, and *Post×Central* is the variable representing the EVA performance evaluation system for central state-owned enterprises. *Control* denotes all control variables, while *FirmFE* and *YearFE* represent firm fixed effect and year fixed effect, respectively. According to the theoretical expectations of the research hypothesis 1, the coefficient of *Post×Central* α_1 should be significantly positive, indicating that after the implementation of the EVA-oriented performance evaluation system in central state-owned enterprises, EVA performance has significantly improved.

4.4 Analysis and Discussion of Empirical Results

4.4.1 Descriptive Statistical Results

Table 4-3 presents the descriptive statistics of the main variables in this study. The mean and standard deviation of the variable *EVA* are -3.637 and 32.401, respectively, with maximum and minimum values of 90.504 and -208.799, indicating significant variation in EVA performance levels among the sample

firms, which provides ample variability for the regression analysis. The mean of the variable *Central* is 0.161, indicating that 16.1% of the sample consists of central state-owned enterprises during the study period. Regarding other control variables, the mean of the *Size* variable is 22.593, with a standard deviation of 1.424, suggesting that state-owned enterprises are generally large in size with limited variation. The mean of the variable *Lev* is 0.499, indicating an average leverage level of 49.9% among the sample firms. The mean of the variable *Cost* is 0.100, with a standard deviation of 0.222, reflecting significant differences in cost management among the sample firms. The mean of the variable *MB* is 0.676, with maximum and minimum values of 1.233 and 0.125, respectively. The mean of the variable *Growth* is 0.428, with a standard deviation of 1.324, indicating that state-owned enterprises generally exhibit good growth potential, though with considerable variation among firms. The mean of the variable *Board* is 2.183, suggesting an average board size of 9 members among the sample firms. The control variables are within reasonable ranges and show no anomalies compared to existing literature.

Table 4-3 Descriptive Statistics of Main Variables

Variable	N	Mean	SD	Min	p50	Max
EVA	20777	-3.637	32.401	-208.799	-0.357	90.504
Central	20777	0.161	0.367	0.000	0.000	1.000
Size	20777	22.593	1.424	19.838	22.422	26.669
Lev	20777	0.499	0.202	0.075	0.506	0.941
Age	20777	2.477	0.734	0.000	2.708	3.367
Cost	20777	0.100	0.222	-0.689	0.065	1.084
Capital	20777	14.129	2.058	10.366	13.733	19.980
MB	20777	0.676	0.266	0.125	0.681	1.233
Growth	20777	0.428	1.323	-0.780	0.117	9.778
Board	20777	2.183	0.196	1.609	2.197	2.708

4.4.2 Pearson Correlation Coefficient Analysis

Table 4-4 presents the Pearson correlation coefficient analysis results of the main variables in this study. As shown in the table, the correlation coefficient

between corporate EVA performance *(EVA*) and the implementation of the new performance evaluation system *(Post×Central*) is 0.023, which is statistically significant at the 1% level. This indicates that the EVA-oriented performance evaluation system implemented for central state-owned enterprises help improve corporate EVA performance, demonstrating the effective guiding role of the new system and providing preliminary supporting evidence for the research hypothesis of this paper. Regarding control variables, the correlation coefficients between corporate size (*Size*), cost-to-profit ratio (*Cost*), and board size (*Board*) and corporate EVA performance (*EVA*) are all significantly positive, suggesting that these variables contribute to enhancing corporate EVA performance. In contrast, the correlation coefficients between asset-liability ratio *(Lev*), corporate age (*Age*), capital intensity (*Capital*), book-to-market ratio (*MB*), growth opportunities (*Growth*), and corporate EVA performance (*EVA*) are significantly negative, indicating that these variables reduce corporate EVA performance. Additionally, the correlation coefficients among the control variables are mostly below 0.5, implying that introducing these control variables into the model will not cause severe multicollinearity issues.

Table 4-4 Pearson Correlation Coefficient Analysis Results

Variable	1	2	3	4	5	6	7
1 *EVA*	1						
2 *Post×Central*	0.023***	1					
3 *Size*	0.036***	0.125***	1				
4 *Lev*	-0.169***	-0.014*	0.366***	1			
5 *Age*	-0.096***	0.030***	0.193***	0.166***	1		
6 *Cost*	0.532***	-0.024***	0.096***	-0.332***	-0.083***	1	
7 *Capital*	-0.033***	0.062***	0.481***	0.137***	0.263***	0.031***	1
8 *MB*	-0.098***	0.016**	0.623***	0.335***	0.122***	-0.057***	0.330***
9 *Growth*	-0.077***	0.023***	-0.025***	0.065***	0.030***	0.041***	-0.033***
10 *Board*	0.068***	0.032***	0.183***	0.070***	-0.055***	0.054***	-0.010
Variable	8	9	10				
8 *MB*	1						
9 *Growth*	-0.021***	1					
10 *Board*	0.106***	-0.058***	1				

4.4.3 Multiple Regression Analysis Results

Table 4-5 presents the multiple regression analysis results of the EVA performance evaluation system for central state-owned enterprises and their EVA performance. Model 1 includes only the interaction term of policy implementation and enterprise nature (*Post×Central*), controlling for firm fixed effect and year fixed effect. Model 2 incorporates other financial and corporate governance control variables. The regression results of Model 1 show that the coefficient of *Post×Central* is significantly positive at the 10% statistical level, while in Model 2, the regression coefficient of *Post×Central* is significantly positive at the 5% statistical level. These indicate that after the implementation of the EVA performance evaluation system in central state-owned enterprises, their EVA performance levels have significantly improved. This suggests that the EVA-oriented performance evaluation system has heightened managers' focus on EVA performance, making them pay more attention to the long-term development of the enterprise, demonstrating favorable policy effects. The regression results support research hypothesis 1 of this paper.

Table 4-5 EVA Performance Evaluation System and EVA Performance

Variables	Dependent Variable: *EVA*			
	Model 1		Model 2	
	Coefficient	T-value	Coefficient	T-value
Post×Central	1.532*	(1.917)	1.507**	(2.471)
Size			0.029	(0.052)
Lev			5.465***	(2.789)
Age			4.410***	(7.818)
Cost			101.183***	(44.524)
Capital			-0.059	(-0.302)
MB			-9.333***	(-6.831)
Growth			0.252	(0.828)
Board			1.951	(1.329)
Constant	-3.854***	(-17.650)	-25.528**	(-2.204)
Firm fixed effects	Control		Control	
Year fixed effects	Control		Control	
Observations	20777		20777	

F	3.674	297.094
Adj_R^2	0.322	0.575

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

4.4.4 Robustness Test

(1) Parallel Trend Test

The parallel trend hypothesis is a crucial prerequisite for using the difference-in-differences model to evaluate policy effects, ensuring that the EVA performance of sample firms follows a consistent temporal trend before policy implementation. In this paper, the time dummy variable *Post* in model (4-1) is decomposed into seven dummy variables: *Pre_3, Pre_2*, *Pre_1*, *Current*, *Post_1*, *Post_2*, and *Post_3*. These variables take the value of 1 when the observation falls in the third year before the policy, the second year before the policy, the first year before the policy, the year of policy implementation, the first year after the policy, the second year after the policy, and the third year and beyond after the policy, respectively, and 0 otherwise. These variables are then interacted with *Central*. If the coefficients of the interaction terms before the implementation of the EVA performance evaluation system for central state-owned enterprises are insignificant, it indicates that the treatment and control groups exhibit parallel trends. We use the year before the policy as the baseline period for the parallel trend test, with results shown in Table 4-6. The findings reveal that there is no significant difference in EVA performance between central state-owned enterprises and local state-owned enterprises before the implementation of the EVA performance evaluation system, satisfying the parallel trend assumption. These results further support the causal relationship between the EVA performance evaluation system for central state-owned enterprises and their EVA performance.

Table 4-6 Parallel Trend Test Results

Variable	Dependent Variable: *EVA*

	Coefficient	T-value
Pre_3×Central	-0.582	(-0.360)
Pre_2×Central	0.919	(0.624)
Current×Central	2.235*	(1.755)
Post_1×Central	-0.275	(-0.248)
Post_2×Central	-2.126	(-1.549)
Post_3×Central	1.907***	(2.816)
Size	0.013	(0.023)
Lev	5.498***	(2.804)
Age	4.432***	(7.859)
Cost	101.153***	(44.512)
Capital	-0.059	(-0.303)
MB	-9.254***	(-6.772)
Growth	0.250	(0.821)
Board	2.017	(1.371)
Constant	-25.428**	(-2.194)
Firm fixed effect	Control	
Year fixed effect	Control	
Observations	20777	
F	191.997	
Adj_R^2	0.575	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

(2) Propensity Score Matching with Difference-in-Differences (PSM-DID)

In the baseline regression process, since the division into treatment and control groups is not randomly selected and the two groups exhibit different characteristics, the difference-in-differences method may introduce selection bias, leading to endogeneity issues. To address this, this study employs propensity score matching to match the experimental and control groups.

First, we conducts a probit estimation using all control variables from Model (4-1) as covariates for central state-owned enterprises and local state-owned enterprises, with the predicted values serving as scores. If two enterprises have identical or similar scores, it indicates that their characteristics are comparable. The balance test results for the covariates are presented in Table 4-7, which

shows that before propensity score matching, there were significant differences in the control variables between central and local state-owned enterprises. After matching, no significant differences remain between the experimental and control groups.

Table 4-7 Covariate Balance Test Results

Variable	Unmatched / Matched	Mean		%bias	%reduct	t-test	
		Treated	Control		|bias|	t	p>|t|
Size	U	22.898	22.534	25.1		13.62	0.000
	M	22.896	22.885	0.8	97.0	0.30	0.736
Lev	U	.49555	.49962	-2.0		-1.07	0.284
	M	.49559	.49594	-0.2	91.6	-0.07	0.945
Age	U	2.4654	2.4741	-1.2		-0.62	0.533
	M	2.4662	2.4667	-0.1	94.7	-0.03	0.980
Cost	U	.08515	.10329	-8.9		-4.33	0.000
	M	.08512	.08299	1.0	88.2	0.44	0.660
Capital	U	14.222	14.112	5.2		2.85	0.004
	M	14.222	14.204	0.9	83.0	0.36	0.719
MB	U	.67984	.67521	1.7		0.92	0.356
	M	.67979	.68011	-0.1	93.0	-0.05	0.961
Growth	U	.48331	.41793	5.0		2.62	0.009
	M	.48361	.48737	-0.3	94.3	-0.11	0.912
Board	U	2.2055	2.179	13.7		7.19	0.000
	M	2.2052	2.2053	-0.1	99.5	-0.03	0.978

Secondly, the experimental and control groups were further matched using the nearest neighbor matching method based on propensity scores, followed by a difference-in-differences test according to Model (4-1). The results, as shown in Table 4-8, indicate that the regression coefficient of the variable *Post×Central* is significantly positive at the 5% statistical level, demonstrating that the research conclusions remain robust after controlling for self-selection issues.

Table 4-8 Robustness Test Results of Propensity Score Matching

Variable	Dependent Variable: *EVA*	
	Coefficient	T-value
Post×Central	1.435**	(2.358)

Size	-0.247	(-0.452)
Lev	6.062***	(3.107)
Age	4.419***	(7.843)
Cost	102.777***	(46.225)
Capital	-0.088	(-0.453)
MB	-8.615***	(-6.473)
Growth	0.231	(0.764)
Board	2.140	(1.464)
Constant	-20.109*	(-1.783)
Firm fixed effect	Control	
Year fixed effect	Control	
Observations	20736	
F	304.823	
Adj_R^2	0.579	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

(3) Altering the measurement of dependent variable

To ensure the reliability of the research findings, this paper further conducts robustness tests by reconstructing the measurement method of the dependent variable. Specifically, based on the second calculation standard for EVA provided by the CSMAR database, we calculate the per capita EVA performance (*EVA2*) and the ratio of EVA to total assets (*EVAasset*) for enterprises, and reintroduces them into Model 4-1 for regression. According to the regression results in Table 4-9, the coefficient of the variable *Post×Central* is significantly positive, indicating that the measurement method of the dependent variable does not substantially affect the research conclusions of this paper.

Table 4-9 Robustness Test Results of Altering Measurement of Dependent Variable

Variable	Dependent variable: *EVA2*		Dependent variable: *EVAasset*	
	Model 1		Model 2	
	Coefficient	T-value	Coefficient	T-value
Post×Central	5.372***	(3.993)	0.003**	(2.194)
Size	-4.638**	(-2.090)	0.010***	(10.442)
Lev	11.993	(1.572)	-0.010**	(-2.124)

Age	12.501***	(3.224)	-0.000	(-0.113)
Cost	162.741***	(10.997)	0.224***	(39.979)
Capital	1.260	(1.089)	-0.000	(-0.503)
MB	4.281	(0.813)	-0.022***	(-6.932)
Growth	-2.091	(-0.851)	0.001**	(2.544)
Board	6.177	(1.095)	-0.000	(-0.077)
Constant	13.941	(0.344)	-0.234***	(-11.609)
Firm fixed effect	Control		Control	
Year fixed effect	Control		Control	
Observations	20777		20777	
F	39.350		357.378	
Adj_R^2	0.368		0.602	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

4.5 Extended Analysis

4.5.1 EVA Performance Evaluation System and Corporate Operational Efficiency

The findings from previous research indicate that after the implementation of the new performance evaluation system for central state-owned enterprises, the per capita EVA performance has significantly improved, demonstrating the notable effectiveness of the evaluation system. However, a critical question arises: Is this policy outcome attributable to a substantive enhancement in managerial operational efficiency or to strategic manipulation of performance metrics through opportunistic behavior? From the perspective of the EVA calculation formula, this metric is derived from the difference between the cash return on invested capital (ROIC) and the weighted average cost of capital (WACC), multiplied by the capital invested. Here, ROIC reflects the return on all capital employed by the company, representing a comprehensive manifestation of the firm's competitive advantages in product markets and production capacity. WACC, on the other hand, reflects the cost of all capital, including equity capital, representing the minimum return rate the company must pay to secure capital.

The improvement in ROIC is fundamentally a direct result of enhanced corporate operational efficiency. Through measures such as production process reengineering, cost structure optimization, and improved resource allocation efficiency, companies can effectively expand the after-tax net operating profit margin, thereby driving sustained growth in ROIC. For instance, when a company adopts advanced production technologies, it not only reduces resource waste during production but also enhances product quality and production speed. This strengthens the company's competitive edge in the market, enabling it to sell products at higher prices or provide services at lower costs, thereby increasing profits. Simultaneously, efficient resource allocation ensures that capital is invested in projects that generate the most value, avoiding waste capital and further improving capital utilization efficiency, which robustly supports ROIC growth. In other words, under the premise of maintaining reasonable operational and financial policies, maximizing ROIC is a critical step in enhancing corporate value. Therefore, if the ROIC of central state-owned enterprises significantly improve after the implementation of EVA performance evaluation, it largely proves that the enhancement in EVA performance stems from genuine value creation capabilities rather than short-term opportunistic behavior by managers. Thus, we further examine the relationship between the EVA performance evaluation system and ROIC. Specifically, ROIC = (Net Profit + Financial Expenses) / (Total Assets - Current Liabilities + Notes Payable + Short-term Borrowings + Current Portion of Non-current Liabilities). The regression results presented in Table 4-10 show that the coefficient of the variable *Post×Central* is significantly positive, indicating that the implementation of the EVA performance evaluation system in central state-owned enterprises has led to a notable improvement in the return on invested capital. This suggests that enterprises have achieved substantial growth in capital returns by optimizing resource allocation, enhancing operational efficiency, and strengthening market competitiveness. Such growth not only reflects the improvement in business efficiency and the competitive advantage

of products in the market but also demonstrates significant progress in the enterprises' value creation capabilities.

Table 4-10 EVA Performance Evaluation System and Business Efficiency

Variable	Dependent Variable: *ROIC*	
	Coefficient	T-value
Post×Central	0.007*	(1.800)
Size	0.029***	(7.028)
Lev	-0.136***	(-4.732)
Age	0.007*	(1.658)
Cost	0.401***	(16.786)
Capital	-0.001	(-1.180)
MB	0.014	(0.627)
Growth	0.003**	(2.539)
Board	0.007	(0.734)
Constant	-0.609***	(-6.315)
Firm fixed effect	Control	
Year fixed effect	Control	
Observations	20756	
F	130.573	
Adj_R^2	0.246	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

4.5.2 EVA Performance Evaluation System and Corporate Inefficient Investment

As previously mentioned, the EVA performance evaluation system can drive the growth of EVA performance, a process that requires optimized capital allocation as a prerequisite. This is because when enterprises blindly expand inefficient investments, redundant capital occupation inevitably dilutes the value contribution per unit of human capital. Due to the regulation of executive compensation in central state-owned enterprises, monetary incentives are significantly insufficient, leading managers to often prioritize short-term accounting profits. They tend to use the ability to cover debt capital costs as the baseline standard for investment decisions, neglecting the corresponding equity

capital costs (Richardson, 2006). Additionally, central state-owned enterprises have relatively easy access to debt financing and lower debt capital costs. When faced with investment projects that can compensate for debt capital costs, managers may blindly expand investment scale, pursuing quantity over quality. Even if the project's return rate is lower than the equity capital cost, they can still achieve net profit growth by expanding investment scale. However, this extensive expansion essentially comes at the expense of shareholder value. The EVA evaluation system makes equity capital costs explicit, reshaping the value standards for investment decisions (Stewart, 1994). Once EVA is linked to the performance evaluations of central enterprise leaders, rational economic agents will become more cautious about the equity capital costs of investment projects. Only by allocating funds to projects where after-tax net operating profits exceed all capital costs and generate residual income can operational performance be improved, thereby earning corresponding salary increases and political promotions. Therefore, this paper anticipates that implementing an EVA-oriented performance evaluation system can effectively curb inefficient investment behaviors in central state-owned enterprises.

Drawing on Richardson (2006), this paper employs the following model to measure corporate investment efficiency:

$$Inv_t = \alpha_0 + \alpha_1 Growth_{t-1} + \alpha_2 Lev_{t-1} + \alpha_3 Cash_{t-1} + \alpha_4 Age_{t-1} + \alpha_5 Size_{t-1} + \alpha_6 Ret_{t-1} + \alpha_7 Inv_{t-1} + \sum Industry + \sum Yea + \varepsilon \quad (4\text{-}2)$$

In this model, the dependent variable *Inv* represents the actual new investment expenditure of a company in year t, calculated as (cash paid for the acquisition of fixed assets, intangible assets, and other long-term assets + net cash paid for acquiring subsidiaries and other business units - net cash received from the disposal of fixed assets, intangible assets, and other long-term assets - net cash received from the disposal of subsidiaries and other business units - (depreciation of fixed assets + amortization of intangible assets + amortization of long-term deferred expenses)) / total assets at the beginning of the year. *Growth* denotes the company's growth opportunities, measured by Tobin's Q;

Age represents the company's age, measured by the number of years since listing; *Lev* is the company's financial leverage, measured by the asset liability ratio; *Cash* reflects the company's cash flow status, calculated as net cash flow from operating activities / total assets at the beginning of the year; *Size* indicates the company's asset scale, measured by the natural logarithm of total assets; *Ret* is the company's stock return, measured by the annual individual stock return considering cash dividend reinvestment; *Inv* represents new investment expenditure; ∑*Industry* denotes industry dummy variables, classified according to the China Association of Listed Companies' industry classification standards (using 2-digit codes for manufacturing industries starting with C and 1-digit codes for other industries); ∑*Year* represents year dummy variables; and ε is the residual estimated by the model. The model (4-2) is subjected to annual OLS regressions, and the absolute value of the residual represents the degree of inefficient investment. A larger absolute residual indicates a higher level of inefficient investment, i.e., lower investment efficiency. A positive residual indicates overinvestment, while a negative residual indicates underinvestment.

Model 1 in Table 4-11 presents the regression results with the absolute value of the model residual (*INVEST*) as the dependent variable. It can be observed that the regression coefficient of the variable *Post×Central* is significantly positive at the 5% statistical level, indicating that the EVA performance evaluation system can curb inefficient investment in central state-owned enterprises and guide managers to allocate resources to investments more conducive to long-term corporate development. Models 2 and 3 respectively display the regression results for the overinvestment *(INVEST_OVER*) and underinvestment *(INVEST_UNDER*) subsamples. In Model 2, the regression coefficient of the variable *Post×Central* is significantly negative, while in Model 3, it is not statistically significant. This suggests that the impact of the EVA performance evaluation system on the investment efficiency of central state-owned enterprises primarily manifest in curbing overinvestment. These results collectively demonstrate that after implementing the EVA-oriented

performance evaluation system for central state-owned enterprises, their investment efficiency has significantly improved, particularly in restraining managers' overinvestment behavior.

Table 4-11 EVA Performance Evaluation System and Corporate Inefficient Investment

Variables	*INVEST*	*INVEST_OVER*	*INVEST_UNDER*
	Model 1	Model 2	Model 3
Post×Central	-0.005**	-0.008*	0.003
	(-2.398)	(-1.817)	(1.583)
Size	0.010***	0.016***	0.004***
	(2.604)	(2.749)	(3.376)
Lev	-0.018	-0.020	-0.003
	(-0.993)	(-0.762)	(-0.516)
Age	-0.004	-0.011*	0.003
	(-1.460)	(-1.766)	(1.184)
Cost	0.046***	0.078***	-0.029***
	(5.176)	(2.821)	(-6.292)
Capital	-0.002*	-0.006***	-0.001*
	(-1.906)	(-2.601)	(-1.722)
MB	-0.010**	0.003	0.016***
	(-1.975)	(0.278)	(5.109)
Growth	0.006***	0.012***	-0.001
	(2.675)	(2.641)	(-1.143)
Board	-0.009	-0.010	0.004
	(-1.551)	(-0.720)	(1.228)
Constant	-0.117	-0.201	-0.141***
	(-1.532)	(-1.603)	(-5.240)
Firm fixed effect	Control	Control	Control
Year fixed effect	Control	Control	Control
Observations	19753	8183	11410
F	9.329	3.035	14.870
Adj_R^2	0.113	0.168	0.189

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

4.5.3 Further Revisions to the EVA Performance Evaluation System

Following the issue of the *Interim Measures for the Performance Evaluation of Central Enterprise Executives* in 2009, the State-owned Assets Supervision and

Administration Commission revised the system to better guide central state-owned enterprises to focus on value creation and long-term sustainable development. The 2012 revision of the *Interim Measures for the Performance Evaluation of Central Enterprise Executives* not only further established the leading role of the EVA indicator in the performance evaluation system for central enterprise executives, but also by increasing the weight of the EVA indicator and optimizing the evaluation system, more scientifically guided enterprises to prioritize value creation and long-term sustainable development. This revision marked a shift in the performance evaluation of central state-owned enterprises from traditional financial indicators to Economic Value Added, providing stronger institutional safeguards for the preservation and appreciation of state-owned assets. Therefore, this paper constructs a time dummy variable *Post2* for the policy implementation phase to more accurately reflect the phased impact of this policy. Specifically, if the sample year is between 2007 and 2009, *Post2* is assigned a value of 0; if the sample year is between 2010 and 2012, *Post2* is assigned a value of 1; and if the sample year is between 2013 and 2023, *Post2* is assigned a value of 2.

Furthermore, this paper interacts the time dummy variable *Post2* for the 2012 policy revision with the enterprise nature variable *Central* to examine the impact of the revised EVA performance evaluation system on the EVA performance of central state-owned enterprises. The regression results are shown in Table 4-12. It can be observed that in Models 1 and 2, the regression coefficients of *Post2*×*Central* are significantly positive at the 1% statistical level, indicating that the revision of the EVA performance evaluation system had a significant positive impact on the EVA performance of central state-owned enterprises. Compared to the pre-revision period, the 2012 policy revision further incentivized and guided central state-owned enterprises to focus on value creation and long-term sustainable development by increasing the weight of the EVA indicator and optimizing the evaluation system.

Table 4-12 Based on the 2012 Revised EVA Performance Evaluation System for Central state-owned enterprises

Variable	Dependent variable: *EVA*			
	Model 1		Model 2	
	Coefficient	T-value	Coefficient	T-value
Post2×Central	1.312***	(3.101)	0.938***	(2.936)
Size			0.043	(0.077)
Lev			5.655***	(2.890)
Age			4.333***	(7.641)
Cost			100.446***	(43.300)
Capital			-0.105	(-0.542)
MB			-8.778***	(-6.466)
Growth			0.262	(0.864)
Board			2.017	(1.374)
Constant	-3.976***	(-18.251)	-26.155**	(-2.258)
Firm fixed effect	Control		Control	
Year fixed effect	Control		Control	
Observations	20777		20777	
F	9.619		281.151	
Adj_R^2	0.323		0.575	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

4.5.4 EVA Performance and Corporate Market Value

In today's complex and volatile market environment, market value management holds significant importance for central state-owned enterprises. As key pillars of the national economy, central state-owned enterprises play a pivotal role in the national economic landscape. Their development not only impacts their own economic performance but also profoundly influences national economic stability, industrial growth, and social welfare. Market value management helps central state-owned enterprises optimize resource allocation, enhance operational efficiency, and strengthen market competitiveness, thereby maximizing corporate value. Through effective market value management, central state-owned enterprises can better gauge market recognition of their value, implement measures to improve stock performance, and generate greater returns for shareholders, safeguarding and increasing shareholder equity. As an

advanced performance evaluation tool, EVA performance assessment aligns closely with the objectives of market value management. Previous empirical results indicate that after implementing the new performance evaluation system, central state-owned enterprises have seen notable improvements in operational efficiency and a reduction in inefficient investments. These outcomes not only directly contribute to economic performance growth but also provide a solid foundation for market value management. Whether the internal efficiency and profitability gains driven by EVA performance assessment ultimately translate into market value remains an open question. Therefore, this study further explores the relationship between EVA performance and market value in central state-owned enterprises to verify whether EVA performance assessment can serve as a powerful tool for market value management.

This study uses the total market value (*VALUE*) of listed companies as the dependent variable and EVA performance (*EVA*) as the key explanatory variable for regression analysis. The regression results are presented in Table 4-13. The coefficient of the variable *EVA* is significantly positive at the 5% statistical level, indicating that corporate EVA performance drives the increase in market value of listed companies. This suggests that investors respond positively to corporate EVA performance in the market. It also implies that the implementation of an EVA-based performance evaluation system by central state-owned enterprises serve as an effective tool to address current challenges in market value management.

Table 4-13 EVA Performance and Corporate Market Value

variable	Dependent variable: *VALUE*	
	coefficient	T-value
EVA	0.353**	(2.045)
Size	170.562***	(12.787)
Lev	-15.961	(-0.735)
Age	9.885	(0.501)
Cost	57.310**	(2.444)
Capital	10.989**	(2.108)

Growth	-4.424***		(-2.996)
Board	-158.015***		(-2.949)
Constant	-3345.280***		(-19.979)
Firm fixed effect		Control	
Year fixed effect		Control	
Observations		20777	
F		102.801	
Adj_R^2		0.852	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

4.6 Chapter Summary

Since 2010, the State-owned Assets Supervision and Administration Commission has implemented a performance evaluation system centered on the Economic Value Added indicator for central state-owned enterprises, aiming to enhance their operational efficiency and market recognition of corporate value. However, whether managers will actively respond to the new EVA-based performance assessment remains an open question. This study examines the implementation effects of the EVA performance evaluation system using a sample of A-share listed central state-owned enterprises in Shanghai and Shenzhen from 2007 to 2023. The findings reveal that the implementation of the EVA performance evaluation system significantly improves the per capita EVA performance of central state-owned enterprises, indicating its positive role in guiding managers to focus on long-term development and value creation. Furthermore, mechanism tests show that after the adoption of EVA performance evaluation, central state-owned enterprises experience a notable increase in investment return rates, while inefficient investment behaviors are effectively curbed. This suggests that the performance improvement primarily stems from enhanced genuine value creation capabilities rather than short-term opportunistic actions. Lastly, extended analyses demonstrate a significant positive correlation between EVA performance and corporate market value,

proving that EVA performance evaluation can serve as a powerful tool for central state-owned enterprises in market value management.

The conclusions of this chapter not only enrich the literature on the economic consequences of the EVA performance evaluation system but also provide new insights into the micro-level mechanisms of the EVA system in central state-owned enterprises. Additionally, they offer theoretical support and practical implications for optimizing the state-owned capital supervision framework. By revealing the positive impacts of the EVA evaluation system on the operational efficiency, investment behaviors, and market value of central state-owned enterprises, this study contributes to promoting high-quality development of central state-owned enterprises in the new era, thereby enhancing national economic strength and international competitiveness.

Chapter 5 The EVA Performance Evaluation System for Central state-owned enterprises and Corporate Innovation Efficiency

5.1 Overview

Currently, China's economy is at a critical stage of developmental paradigm shift, undergoing a historic transition from factor-driven and investment-driven growth to innovation-driven growth. In this transformative process, innovation has surpassed traditional production factors to become the core driver reshaping national competitive advantages. State-owned enterprises, particularly central state-owned enterprises, with their economies of scale, resource aggregation capabilities, and policy support, should theoretically serve as the primary force for innovation (Zhou et al., 2017). Notably, against the backdrop of government departments increasingly emphasizing market value management as a long-term strategic management behavior for central state-owned enterprises, technological innovation may be the core driver for enhancing future corporate value. However, relevant data show that from 2012 to 2021, patent applications by Chinese private enterprises grew exponentially, from 144,000 to 721,000, with an average annual compound growth rate of 19.7%. In stark contrast, patent applications by state-owned enterprises declined from 31,000 to 23,000 during the same period, a drop of 25.8%[2]. This divergence in patent application trends reveals a structural contradiction in the innovation dynamics of state-owned enterprises: despite their absolute advantage in resource allocation, their efficiency in transforming innovation outcomes is significantly weaker than that of market-oriented entities. This resource misallocation dilemma essentially reflects institutional barriers in innovation governance mechanisms, R&D motivation transmission, and innovation value assessment systems within state-owned enterprises. Therefore, addressing the "low-quality, low-efficiency"

[2] Data source: Analysis of the Current Situation of Private Enterprise Innovation, Development Research Center of the State Council, 2023-10-17. URL: https://www.drc.gov.cn/DocView.aspx?chnid=379&leafid=1338&docid=2907294

innovation dilemma of state-owned enterprises is not only a strategic pivot for deepening SOE reforms but also a key to realizing the innovation-driven development strategy, constituting a core proposition urgently requiring resolution in current innovation research.

Innovation activities are characterized by long payoff periods, high failure rates, and significant risks, and usually require a long-term orientation on the part of managers. Managers, often motivated by risk aversion and self-interest, tend to favor conservative investment strategies, abandoning high-risk R&D projects to boost short-term performance (Francis & Smith, 1995; Graham et al., 2005). According to agency theory, reasonable incentive mechanisms can achieve incentive alignment between shareholders and management to a certain extent, thereby mitigating managerial myopia and reducing executive suppression of innovation activities (Jensen & Meckling, 1979; Yanadori & Cui, 2013). Meanwhile, strategic innovation investments can create long-term monopoly rents by building technological barriers, ultimately translating into sustained premium in corporate market value.

In modern corporate management, performance evaluation plays a crucial role by quantifying corporate objectives in strategic planning, guiding strategic implementation, and constructing incentive mechanisms aligned with corporate strategy. Since Stern Stewart introduced the EVA metric, this method has become widely adopted for performance evaluation in capital markets of mature economies. In 2009, China's State-owned Assets Supervision and Administration Commission (SASAC) issued the "Interim Measures for the Performance Evaluation of Central Enterprise Executives," fully incorporating EVA into the performance evaluation system for central state-owned enterprises. The inclusion of EVA aims to guide central state-owned enterprises toward a value-oriented approach that emphasizes returns on shareholder capital, improves capital utilization efficiency, and fosters sustainable growth. However, under the EVA-oriented performance evaluation system, an important question is whether central SOEs can break through their innovation constraints to

enhance capital market recognition, and whether the system can effectively guide managers to allocate corporate resources toward long-term innovation activities and improve innovation output efficiency through the optimization of management mechanisms. Therefore, this paper leverages the natural experiment of EVA implementation in central state-owned enterprises to study the impact of performance evaluation systems on innovation efficiency and further examines their effect on corporate market value.

5.2 Theoretical Analysis and Research Hypotheses

The purpose of executive performance evaluation is to adjust managerial behavior through performance assessment and organizational reward mechanisms, thereby mitigating principal-agent issues within enterprises and encouraging managers to focus more on long-term objectives. This paper argues that the implementation of an EVA-centered performance evaluation system in central state-owned enterprises can exert incentive effects and resource allocation effects, enhancing the innovation motivation and capability of enterprises, thereby improving overall innovation efficiency.

Firstly, the implementation of the EVA performance evaluation system in central state-owned enterprises can generate incentive effects, addressing the issue of insufficient investment that constrains innovation efficiency. Corporate R&D innovation is a process that integrates human capital with enterprise resources, and as the ultimate decision-makers of corporate R&D investment levels, senior executives have an almost decisive influence on corporate innovation activities (Barker & Mueller, 2002). On one hand, senior executives in SOEs possess dual identities as “economic agents” and “political agents”, with their compensation and career advancements tied to corporate performance. SOEs, leveraging their monopolistic industry positions, policy advantages, and government budget soft constraints, can secure competitive advantages and meet government evaluation metrics even without engaging in high-intensity innovation activities. The uncertainty and risks associated with innovation

activities increase the costs for managers to pursue innovation during their tenure, thereby affecting their material interests and political promotions (Liu, 2023), leading to conservative approaches in innovation investment. On the other hand, innovation is a long-term process that, while capable of generating long-term revenue streams and enhancing corporate competitiveness, often fails to deliver immediate financial returns. SOE managers typically have short tenures, which inclines them to prioritize short-term gains and political career objectives in decision-making, further exacerbating short-term-oriented behavior. Consequently, managers may not reap the benefits of innovation during their tenure, weakening their incentives for innovation (Zhou et al., 2017) and resulting in inefficiencies in innovation. However, the EVA-based performance evaluation system significantly elevates the importance of innovation in the assessment of senior executives in central state-owned enterprises. Under the revised performance evaluation system for central state-owned enterprises, the specific calculation of EVA not only allows R&D expenses recognized in the current period to be added back as profits but also permits the addition of R&D expenditures capitalized as intangible assets. This means that expensed R&D expenditures do not reduce EVA levels, while capitalized R&D expenditures can even enhance EVA levels. Therefore, any increase in R&D expenditures that meet capitalization criteria can boost EVA levels, provided the original scale of capitalized R&D expenditures remains unchanged. This greatly alleviates executives' concerns about declines in net profits due to R&D investments, thereby significantly increasing their enthusiasm for R&D and innovation activities. Thus, the EVA performance evaluation system effectively incentivizes managers to increase R&D investments, thereby improving corporate innovation efficiency.

Secondly, the implementation of the EVA performance evaluation system in central state-owned enterprises can leverage the resource allocation effect to address the issue of insufficient output that constrains innovation efficiency. Traditional scale-oriented evaluation systems, such as total assets and total

profit indicators, exhibit strong correlations with managers' personal interests, leading managers to pursue short-term scale growth through expanding fixed asset investments, mergers, and acquisitions rather than accumulating long-term innovation value (Chen et al., 2016). This "scale competition" induces management to engage in overinvestment behaviors to obtain satisfactory organizational returns while neglecting innovation investments that are more conducive to sustainable enterprise development, resulting in the typical characteristic of being large but not strong (Malmendier & Tate, 2005). The EVA evaluation system, by introducing the concept of capital cost, links managerial incentives to capital efficiency rather than scale expansion, thereby curbing inefficient investment behaviors and providing institutional safeguards for innovation resource allocation. On one hand, the EVA indicator can more comprehensively measure the true profitability or value creation of enterprise production and operations. Through EVA evaluation, enterprises can more clearly understand the profitability of different business segments and projects, thereby reallocating resources from inefficient areas to high-efficiency areas, particularly those with innovation potential and high added value. Simultaneously, the EVA evaluation requires enterprises to establish a more robust innovation management system, optimize innovation processes, and enhance innovation efficiency. On the other hand, the EVA evaluation emphasizes the calculation of capital costs, making enterprises more attentive to capital utilization efficiency. Enterprises must fully consider capital costs in investment decisions to avoid reckless expansion and inefficient investments. This helps enterprises more prudently select investment projects, prioritizing those innovation projects that can yield higher EVA returns, thereby improving the scientific and rational allocation of resources. Therefore, under the guidance of the EVA evaluation system, managers are more likely to focus on the efficiency of innovation resource utilization, enhancing enterprise innovation efficiency by reducing inefficient investments, improving the innovation management system, and investing in higher-yield innovation projects.

In summary, this paper proposes the following research hypothesis 2 to be tested:

Hypothesis 2: After implementing the EVA-centered performance evaluation system, the innovation efficiency of central state-owned enterprises have significantly improved.

5.3 Empirical Research Design

5.3.1 Sample Selection and Data Sources

This study selects state-owned enterprises listed on the Shanghai and Shenzhen A-share markets from 2007 to 2023 as the research sample. We apply the following screening criteria to the initial sample: excluding listed companies in the financial and insurance industries with special investment behaviors, ST and *ST companies, as well as companies with missing data. The final sample comprises 13,797 firm-year observations.

The data used in this study are sourced from the CSMAR database, annual reports of Shanghai and Shenzhen A-share listed companies, and relevant websites of the State-owned Assets Supervision and Administration Commission. To mitigate the impact of data outliers on the empirical results, all continuous variables are winsorized at the 1% level.

5.3.2 Variable Definition and Measurement

5.3.2.1 Dependent variable: Corporate Innovation Efficiency

Corporate innovation activities involve the process from innovation input to innovation output, and innovation efficiency reflects the capability and level of a company in transforming innovation inputs into innovation outputs. It represents the comprehensive performance of utilizing limited resources for innovation activities and achieving effective outcomes, demonstrating the utilization of innovation resources, the management level of the innovation process, and the market value and practical benefits of innovation achievements.

First, following the approach of existing literature, we measure innovation input using corporate R&D investment and construct the variable *LNINPUT*, which

equals the natural logarithm of corporate R&D expenditure plus 1. Second, the number of patent applications is used to measure innovation output. According to Chinese patent classification, patents can be divided into three types: invention patents, utility model patents, and design patents. Invention patents primarily refer to new technical solutions proposed for products, methods, or their improvements. Utility model patents refer to new practical technical solutions proposed for the shape, structure, or combination of products. Design patents refer to new designs that are aesthetically pleasing and suitable for industrial application, created for the shape, pattern, or combination of products, as well as the combination of color with shape or pattern. Drawing on Bereskin et al. (2016), we construct the variable *LNPAT* to represent the natural logarithm of the total number of the three types of patents plus 1. Finally, following the approach of Quan and Yin (2017), corporate innovation efficiency (*Eff*) is calculated as the ratio of innovation output (*LNPAT*) to innovation input (*LNINPUT*). A higher value of this variable indicates greater corporate innovation efficiency.

5.3.2.2 Explanatory Variable: EVA Performance Evaluation System for Central state-owned enterprises

The *Interim Measures for the Performance Evaluation of Chief Executives of Central State-owned Enterprises* issued by the State-owned Assets Supervision and Administration Commission requires central SOEs to implement the system starting from January 1, 2010. This revision marked a fundamental shift from "encouraging the adoption of EVA indicators" to "comprehensive EVA indicator evaluation." Therefore, we construct a time dummy variable (*Post*) to represent the implementation of the *Interim Measures for the Performance Evaluation of Chief Executives of Central State-owned Enterprises*. Specifically, *Post* is assigned a value of 0 for sample years from 2007 to 2009 and a value of 1 for sample years from 2010 to 2023.

Since the performance evaluation system specifically targets the performance evaluation of senior management in central state-owned enterprises, local SOEs are not directly affected by this policy. Therefore, we use local state-owned listed enterprises as the control group. Accordingly, a dummy variable *Central* equals 1 if the enterprise is a central SOE and 0 if it is a local SOE.

5.3.2.3 Control Variables

Drawing on existing literature, we control for firm-level financial and governance characteristics, including firm size (*Size*), leverage ratio *(Lev*), firm age (*Age*), cash holdings (*Cash*), capital intensity (*Capital*), return on assets (*ROA*), book-to-market ratio (*MB*), growth opportunities (*Growth*), board size (*Board*), proportion of independent directors (*Indratio*), and CEO duality *(Dual*). The specific definitions of these variables are presented in Table 5-1. To effectively account for potential confounding effects from time-invariant firm characteristics and macroeconomic factors, we introduce firm fixed effect and year fixed effect in the model.

Table 5-1 Definitions and Measurements of Key Variables

Variable Name	Variable Definition	Variable measurement method
Eff	innovation efficiency	The natural logarithm of the total number of patent applications (inventions, utility models, and designs) plus one, divided by annual R&D expenditure
Post×Central	policy treatment effect	Refer to "5.3.2.2 EVA Performance Evaluation System for Central state-owned enterprises"
Size	firm size	Natural logarithm of total assets at year-end
Lev	asset-liability ratio	The ratio of total liabilities to total assets at year-end
Age	firm age	Natural logarithm of the number of years since the firm's IPO plus1
Cash	cash flow	Ratio of net cash flow from operating activities to total assets at year-end
Capital	capital intensity	Fixed assets divided by the number of employees, and taking the natural logarithm
ROA	return on assets	Ratio of net profit to total assets at year-end
MB	book-to-market ratio	The ratio of year-end total assets to market value
Growth	growth opportunity	The ratio of the difference between current operating revenue and

		previous operating revenue to the previous operating revenue
Board	board size	Natural logarithm of the number of board members at year-end
Indratio	proportion of independent directors	Ratio of the number of independent directors to the total number of board members
Dual	dual role	If the chairman and general manager are the same person, the value is 1; otherwise, it is 0

5.3.3 Econometric Regression Model Specification

To test the research hypotheses 2 proposed in this paper, the following econometric regression model is constructed for examination:

$$Eff = \alpha_0 + \alpha_1 POST \times Central + \sum Control + FirmFE + YearFE + \varepsilon \quad (5\text{-}1)$$

Eff represents the variable indicating corporate innovation efficiency, while *Post×Central* denotes the variable for the EVA performance evaluation system in central state-owned enterprises. *Control* encompasses all control variables, with *FirmFE* and *YearFE* representing firm fixed effects and year fixed effects, respectively. According to the theoretical expectations of the research hypotheses, the coefficient α_1 of Post×Central should be significantly positive, indicating that the innovation efficiency of central state-owned enterprises has significantly improved after the implementation of the EVA-oriented performance evaluation system.

5.4 Analysis and Discussion of Empirical Results

5.4.1 Descriptive Statistical Analysis Results

Table 5-2 presents the descriptive statistical results of the main variables in this study. The mean and standard deviation of the *Eff* variable are 0.166 and 0.087, respectively, with maximum and minimum values of 0.434 and 0.000, indicating significant variation in innovation efficiency among the sample firms, which provides ample variability for the regression analysis. The mean of the *Central* variable is 0.185, indicating that 18.5% of the sample consists of central state-owned enterprises. Regarding other control variables, the *Cash* has a mean

of 0.046 and a standard deviation of 0.065, reflecting substantial differences in cash flows from operating activities across sample firms. The *ROA* has a mean of 0.029 and a standard deviation of 0.058, suggesting considerable variation in profitability among the sample firms, with a minimum value of -0.221 indicating that some firms are not yet profitable. The *Indratio* has a mean of 0.371, showing that independent directors account for approximately 37.1% of the board members in the sample, slightly higher than the mandatory requirement that the proportion of independent directors in listed companies shall not be less than one-third. The *Dual* has a mean of 0.143, indicating that 14.3% of the sample firms have the same person serving as both chairman and general manager. The remaining control variables show no anomalies and are all within reasonable ranges.

Table 5-2 Descriptive Statistics of Main Variables

Variable	N	Mean	SD	Min	p50	Max
Eff	13797	0.166	0.087	0.000	0.175	0.434
Central	13797	0.185	0.388	0	0	1
Size	13797	22.717	1.425	20.056	22.559	26.808
Lev	13797	0.489	0.197	0.077	0.494	0.926
Age	13797	2.446	0.784	0.000	2.708	3.367
Cash	13797	0.046	0.065	-0.143	0.043	0.238
Capital	13797	14.273	2.127	5.118	13.848	22.964
ROA	13797	0.029	0.058	-0.221	0.029	0.188
MB	13797	0.672	0.268	0.136	0.672	1.235
Growth	13797	0.322	0.829	-0.746	0.121	5.625
Board	13797	2.185	0.190	1.609	2.197	2.708
Indratio	13797	0.371	0.054	0.308	0.333	0.571
Dual	13797	0.143	0.350	0	0	1

5.4.2 Pearson Correlation Coefficient Analysis

Table 5-3 presents the Pearson correlation coefficient analysis results of the main variables in this study. The table shows that the correlation coefficient between corporate innovation efficiency (*Eff*) and policy implementation (*Post×Central*) is 0.122, which is statistically significant at the 1% level. This

indicates that the implementation of the EVA-oriented performance evaluation system for central state-owned enterprises help improve corporate innovation efficiency, providing preliminary supporting evidence for the research hypothesis of this paper. Regarding the control variables, the correlation coefficients between corporate innovation efficiency (*Eff*) and firm size (*Size*), asset-liability ratio *(Lev*), firm age (*Age*), capital intensity (*Capital*), return on assets (*ROA*), book-to-market ratio *(MB*), board size (*Board*), and the proportion of independent directors *(Indratio*) are all significantly positive, suggesting that these variables contribute to enhancing corporate innovation efficiency. Additionally, the correlation coefficients among other control variables are generally below 0.5, indicating that introducing these control variables into the model will not cause severe multicollinearity issues.

Table5-3 Pearson Correlation Coefficient Analysis Results

Variable	1	2	3	4	5	6	7
1 *Eff*	1						
2 *Post×Central*	0.122***	1					
3 *Size*	0.385***	0.094***	1				
4 *Lev*	0.125***	-0.010	0.408***	1			
5 *Age*	0.064***	0.042***	0.246***	0.187***	1		
6 *Cash*	0.013	0.011	0.120***	-0.166***	0.016*	1	
7 *Capital*	0.151***	0.038***	0.497***	0.179***	0.286***	0.078***	1
8 *ROA*	0.078***	0.016*	0.063***	-0.372***	-0.122***	0.408***	-0.065***
9 *MB*	0.186***	-0.012	0.629***	0.363***	0.140***	-0.037***	0.354***
10 *Growth*	-0.003	0.084***	-0.058***	0.018**	-0.043***	-0.092***	-0.031***
11 *Board*	0.051***	0.030***	0.201***	0.088***	0.000	0.065***	-0.002
12 *Indratio*	0.072***	-0.010	0.124***	0.035***	0.027***	-0.00500	0.091***
13 *Dual*	-0.041***	-0.081***	-0.105***	-0.055***	-0.096***	-0.030***	-0.040***
	8	9	10	11	12	13	
8 *ROA*	1						
9 *MB*	-0.150***	1					
10 *Growth*	0.017**	-0.078***	1				
11 *Board*	0.052***	0.115***	-0.029***	1			
12 *Indratio*	-0.013	0.039***	0.000	-0.421***	1		
13 *Dual*	-0.005	-0.080***	0.003	-0.130***	0.074***	1	

5.4.3 Multiple Regression Analysis Results

Table 5-4 presents the multiple regression analysis results of the EVA performance evaluation system and innovation efficiency in central state-owned enterprises. Model 1 includes only the interaction term of policy implementation and enterprise nature (*Post×Central*), controlling for firm-fixed effect and year-fixed effect. Model 2 incorporates other financial and corporate governance control variables. The regression results of Model 1 show that the coefficient of *Post×Central* is significantly positive at the 5% statistical level, while in Model 2, the regression coefficient of *Post×Central* is significantly positive at the 1% statistical level. These results indicate that after the implementation of the EVA performance evaluation system in central state-owned enterprises, their innovation efficiency has significantly improved. In terms of economic significance, according to the regression results of Model 2, the innovation efficiency of central state-owned enterprises increased by an average of 4.22% (0.007/0.166) after the implementation of the EVA performance evaluation system, demonstrating economic significance. In conclusion, the regression results support research hypothesis 2 of this paper.

Table 5-4 EVA Performance Evaluation System and Innovation Efficiency

Variables	Dependent variable: *Eff*			
	Model 1		Model 2	
	Coefficient	T-value	Coefficient	T-value
Post×Central	0.006**	(2.264)	0.007***	(2.593)
Size			0.023***	(15.403)
Lev			-0.004	(-0.761)
Age			0.004**	(2.193)
Cash			-0.013	(-1.332)
Capital			-0.000	(-0.567)
ROA			0.025**	(2.006)
MB			0.009**	(2.317)
Growth			0.001*	(1.878)
Board			-0.001	(-0.204)
Indratio			0.019	(1.250)
Dual			0.003**	(2.031)

Constant	0.165***	(268.499)	-0.379***	(-11.376)
Firm fixed effect	Control		Control	
Year fixed effect	Control		Control	
Observations	13797		13797	
F	5.126		32.104	
Adj_R^2	0.658		0.672	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

5.4.4 Robustness Test

(1) Parallel Trend Test

The parallel trend hypothesis is a crucial prerequisite for evaluating policy effects using the difference-in-differences model, ensuring that the innovation efficiency of sample enterprises follows a consistent temporal trend before policy implementation. In this study, the time dummy variable *Post* in Model (5-1) is decomposed into six dummy variables: *Pre_2, Pre_1, Current, Post_1, Post_2,* and *Post_3*. These variables take the value of 1 when the observation falls into the second year and earlier before the policy, the first year before the policy, the policy implementation year, the first year after the policy, the second year after the policy, and the third year and later after the policy, respectively, and 0 otherwise. These variables are then interacted with *Central*. If the coefficients of the interaction terms before the implementation of the EVA performance evaluation system for central state-owned enterprises are insignificant, it indicates the presence of parallel trends between the treatment and control groups. This study uses the year before the policy as the baseline period for the parallel trend test, with results presented in Table 5-5. The findings show that before the EVA performance evaluation was applied to central state-owned enterprises, there was no significant difference in innovation efficiency between central and local state-owned enterprises, satisfying the parallel trend assumption. These results further support the causal relationship between the EVA performance evaluation system for central state-owned enterprises and corporate innovation efficiency.

Table 5-5 Parallel Trend Test Results

Variable	Dependent variable: *Eff*	
	Coefficient	T-value
Pre_2×Central	-0.004	(-0.550)
Current×Central	-0.008	(-1.063)
Post_1×Central	-0.001	(-0.247)
Post_2×Central	0.002	(0.442)
Post_3×Central	0.008***	(2.917)
Size	0.023***	(15.287)
Lev	-0.004	(-0.745)
Age	0.004**	(2.305)
Cash	-0.012	(-1.309)
Capital	-0.000	(-0.503)
ROA	0.025**	(1.998)
MB	0.009**	(2.408)
Growth	0.001*	(1.804)
Board	-0.001	(-0.185)
Indratio	0.017	(1.161)
Dual	0.003**	(1.999)
Constant	-0.377***	(-11.282)
Firm fixed effect	Control	
Year fixed effect	Control	
Observations	13797	
F	24.651	
Adj_R^2	0.672	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

(2) Propensity Score Matching with Difference-in-Differences (PSM-DID)

During the baseline regression process, the division between the treatment group and the control group was not randomly assigned, and the distinct characteristics of these groups introduced selection bias in the difference-in-differences method, leading to endogeneity issues. To address this, this study employs propensity score matching (PSM) to match the experimental and control groups.

First, this study conducts a probit estimation using all control variables from Model (5-1) as covariates for central SOEs and local SOEs, with the predicted values serving as scores. If two enterprises have identical or similar scores, it indicates that their characteristics are comparable. The results of the covariate balance test, as shown in Table 5-6, reveal significant differences in control variables between central and local SOEs before propensity score matching. However, after matching, no significant differences remain between the experimental and control groups.

Table 5-6 Results of Covariate Balance Test

Variable	Unmatched	Mean		%bias	%reduct	t-test	
	Matched	Treated	Control		|bias|	t	p>|t|
Size	U	22.93	22.668	18.0		8.43	0.000
	M	22.928	22.951	-1.6	91.2	-0.55	0.582
Lev	U	0.48455	0.48926	-2.4		-1.09	0.276
	M	0.48449	0.48509	-0.3	87.3	-0.11	0.914
Age	U	2.4719	2.4319	5.1		2.32	0.021
	M	2.4724	2.4711	0.2	96.9	0.06	0.954
Cash	U	0.04665	0.04511	2.4		1.08	0.282
	M	0.04666	0.04734	-1.1	55.1	-0.38	0.701
Capital	U	14.318	14.262	2.6		1.20	0.229
	M	14.317	14.323	-0.2	90.7	-0.08	0.933
ROA	U	0.03091	0.02837	4.6		2.00	0.046
	M	0.03091	0.03125	-0.6	86.6	-0.22	0.829
MB	U	0.66129	0.67429	-4.8		-2.23	0.026
	M	0.6611	0.66308	-0.7	84.8	-0.26	0.796
Growth	U	0.468	0.28866	20.1		9.92	0.000
	M	0.466	0.44365	2.5	87.5	0.79	0.432
Board	U	2.2003	2.1816	10.0		4.51	0.000
	M	2.2003	2.2003	0.0	99.8	0.01	0.996
Indratio	U	0.36839	0.37155	-5.9		-2.70	0.007
	M	0.3684	0.36853	-0.2	95.9	-0.09	0.930
Dual	U	0.08087	0.15629	-23.5		-9.92	0.000
	M	0.0809	0.08062	0.1	99.6	0.04	0.971

Secondly, the experimental and control groups were further matched using the nearest neighbor matching method based on scores, and finally, a difference-in-differences test was conducted according to Model (5-1). The results are shown

in Table 5-7, where the regression coefficient of the variable *Post×Central* is significantly positive at the 1% statistical level, indicating that the research conclusions of this paper remain robust after controlling for self-selection issues.

Table 5-7 Robustness Test Results of Propensity Score Matching

Variable	Dependent variable: *Eff*	
	Coefficient	T-value
Post×Central	0.007***	(2.594)
Size	0.023***	(15.380)
Lev	-0.004	(-0.784)
Age	0.004**	(2.233)
Cash	-0.013	(-1.320)
Capital	-0.000	(-0.545)
ROA	0.025**	(1.982)
MB	0.009**	(2.330)
Growth	0.001*	(1.873)
Board	-0.001	(-0.231)
Indratio	0.019	(1.269)
Dual	0.003*	(1.895)
Constant	-0.380***	(-11.369)
Firm fixed effect	Control	
Year fixed effect	Control	
Observations	13773	
F	32.021	
Adj_R^2	0.672	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

(3) Altering the measurement of dependent variable

Existing research suggests that among the three types of patents, invention patents contain a higher degree of innovation, followed by utility model patents, and finally design patents. The more invention patents a company successfully converts per unit of R&D investment, the greater the transformation of innovation input into innovation output, indicating higher innovation efficiency (Tong et al., 2014). Therefore, in the robustness test, this paper constructs the variable *LNPAT2*, which considers the different contribution weights of the

three types of patents to the enterprise, subjectively assigning weights of 3:2:1, and represents it as the natural logarithm of the weighted total of the three patents plus 1. Then, the ratio of innovation output *(LNPAT2)* to innovation input *(LNINPUT*) is used to measure the enterprise's innovation efficiency (*Eff2*). According to the regression results in Table 5-8, the regression coefficient of the variable *Post×Central* is significantly positive at the 1% statistical level, indicating that the measurement method of the dependent variable does not substantially affect the research conclusions of this paper.

Table 5-8 Robustness Test Results of Altering Measurement of Dependent Variable

Variable	Dependent variable：*Eff*	
	Coefficient	T-value
Post×Central	0.008**	(2.557)
Size	0.025***	(14.157)
Lev	-0.005	(-0.714)
Age	0.004*	(1.848)
Cash	-0.013	(-1.169)
Capital	-0.001	(-1.024)
ROA	0.025*	(1.709)
MB	0.010**	(2.066)
Growth	0.002*	(1.728)
Board	0.000	(0.078)
Indratio	0.028	(1.633)
Dual	0.003*	(1.704)
Constant	-0.387***	(-9.878)
Firm fixed effect	Control	
Year fixed effect	Control	
Observations	13797	
F	26.384	
Adj_R^2	0.638	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

(4) Robustness test with replacement of the control group

In the research design outlined earlier, this paper uses local state-owned enterprises as the control group to examine the impact of the EVA performance

evaluation system on the innovation efficiency of central state-owned enterprises. However, both central and local state-owned enterprises fall under government jurisdiction, albeit at different administrative levels. Central state-owned enterprises may exert a demonstration effect on their local counterparts, implying that the performance evaluation system for central state-owned enterprises could have policy spillover effects. Specifically, local governments might adopt similar evaluation methods for local state-owned enterprise managers, thereby potentially undermining the reliability of this study's conclusions.

To address this, this paper selects private and foreign-funded enterprises, which are not subject to government intervention, as the control group to more cleanly assess the economic consequences of the EVA performance evaluation system for central state-owned enterprises. Specifically, the variable *Central2* is defined as 1 if the enterprise is a central state-owned enterprise and 0 if it is a private or foreign-funded enterprise. According to the regression results presented in Table 5-9, the coefficient for the variable *Post×Central2* is significantly positive at the 1% statistical level, indicating that the study's conclusions remain robust even after accounting for potential policy spillover effects.

Table 5-9 Robustness Test Results with Alternative Control Groups

Variable	Dependent Variable: *Eff*	
	Coefficient	T-value
Post×Central2	0.037***	(4.359)
Size	0.025***	(9.710)
Lev	0.000	(0.052)
Age	0.009**	(2.280)
Cash	-0.028*	(-1.744)
Capital	-0.000	(-0.128)
ROA	0.033	(1.392)
MB	0.008	(1.111)
Growth	0.002**	(2.083)
Board	0.012	(1.263)

Indratio	0.060**	(2.149)
Dual	0.006*	(1.843)
Constant	-0.489***	(-9.023)
Firm fixed effect	Control	
Year fixed effect	Control	
Observations	4408	
F	18.551	
Adj_R^2	0.675	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

(5) Eliminate the impact of abnormal year values

First, due to the global financial crisis in 2008, incorporating data from that year in the empirical analysis might interfere with the model evaluation. Therefore, this study excludes the 2008 data and reexamines the results using data from the remaining years. As shown in Table 5-10 Model 1, after removing the influence of the outlier year, the coefficient of *Post×Central* remains significantly positive at the 5% statistical level, which is robust and consistent with the baseline regression results. This indicates that the new performance evaluation method indeed helps improve the innovation efficiency of central state-owned enterprises after controlling for interference noise.

Second, to avoid the potential long-term interference of the policy implementation on the regression results, this study excludes the years after 2020 due to the impact of the public health crisis. Based on the regression results shown in Model 2, the variable *Post×Central* remains significantly positive, indicating that the implementation of the EVA performance evaluation system continues to have a positive effect on central SOEs' innovation efficiency even after excluding the post-2020 period.

Table 5-10 Robustness Test Results After Excluding the Outlier Year

Variable	Dependent Variable: *Eff*			
	Model 1		Model 2	
	Coefficient	T-value	Coefficient	T-value
Post×Central	0.006**	(2.180)	0.006*	(1.911)

Size	0.023***	(14.939)	0.022***	(11.857)
Lev	-0.003	(-0.564)	-0.002	(-0.224)
Age	0.003*	(1.832)	0.005**	(2.430)
Cash	-0.015	(-1.522)	-0.002	(-0.156)
Capital	-0.000	(-0.162)	-0.001	(-0.968)
ROA	0.033***	(2.606)	0.023	(1.596)
MB	0.009**	(2.375)	0.012***	(2.647)
Growth	0.001*	(1.770)	0.001	(1.295)
Board	-0.003	(-0.510)	0.003	(0.554)
Indratio	0.013	(0.840)	0.031*	(1.788)
Dual	0.003*	(1.854)	0.006***	(2.797)
Constant	-0.373***	(-10.925)	-0.362***	(-8.963)
Firm fixed effect	Control		Control	
Year fixed effect	Control		Control	
Observations	13544		10218	
F	0.674		0.697	
Adj_R^2	30.939		20.727	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

5.5 Extended Analysis

5.5.1 EVA Performance Evaluation System and Innovation Input

Based on the previously validated research hypotheses, the implementation of the EVA-centered performance evaluation system in central state-owned enterprises can enhance their innovation efficiency. However, a deeper and more critical question arises: whether this improvement in innovation efficiency stems from higher innovation quality or reduced innovation input. Grounded in principle-agent theory, managers may strategically cut R&D investments to reduce the denominator by leveraging the capital cost constraints of EVA evaluation, thereby creating an illusion of efficiency improvement. Particularly when evaluation pressure coincides with tenure cycles, managers tend to sacrifice long-term innovation capability for short-term EVA compliance (Bushee, 1998). While such opportunistic behavior may help managers meet EVA requirements in the short term, it undermines the long-term sustainable development of enterprises.

To examine whether managers of central state-owned enterprises would engage in opportunistic behavior under the pressure of EVA assessment by reducing R&D investment to improve innovation efficiency, this paper investigates the impact of the EVA performance evaluation system on corporate innovation investment. Specifically, innovation investment (*INNO_INPUT*) is measured as the ratio of R&D expenditure to operating revenue. According to the regression results in Table 5-11, the coefficient of the variable *Post×Central* is significantly positive at the 1% statistical level, indicating that after the implementation of the EVA performance evaluation, central state-owned enterprises significantly increased their R&D investment levels, rather than improving innovation efficiency by reducing R&D investment. This also suggests that the revision of the performance evaluation system has stimulated managers' focus on R&D innovation activities, thereby enhancing the innovation vitality and competitiveness of central state-owned enterprises.

Table 5-11 EVA Performance Evaluation System and Innovation Input

Variable	Dependent Variable: *INNO_INPUT*	
	Model 1	Model 2
	Coefficient	T-value
Post×Central	0.008***	(2.653)
Size	-0.001	(-0.893)
Lev	-0.023***	(-5.606)
Age	-0.003***	(-3.227)
Cash	-0.018***	(-3.516)
Capital	0.000	(0.705)
ROA	-0.102***	(-7.542)
MB	-0.014***	(-5.834)
Growth	-0.001	(-1.117)
Board	-0.002	(-0.707)
Indratio	0.007	(0.812)
Dual	-0.002*	(-1.690)
Constant	0.084***	(3.861)
Firm fixed effect	Control	
Year fixed effect	Control	
Observations	13797	
F	14.855	

Adj_R^2	0.654

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

5.5.2 EVA Performance Evaluation System and Innovation Quality

The previous analysis confirmed that EVA assessment is conducive to improving the innovation efficiency and innovation input levels of central state-owned enterprises, which implies an increase in the innovation output of these enterprises. However, the rise in innovation output may conceal two distinct mechanisms: on one hand, managers achieve a leap in innovation quality by selecting high-value R&D projects, leading to substantial improvements in innovation capabilities; on the other hand, managers may strategically opt for low-complexity innovations to quickly produce low-quality patents. To discern the essence of the improvement in innovation efficiency, we measure the innovation quality of enterprises from two perspectives: patent types and patent citations. Specifically, the study first categorizes enterprise patent applications into invention patent applications (*Patent1*) and utility model and design patent applications (*Patent2*), where *Patent1* equals the natural logarithm of the firm's invention patent applications plus one, and *Patent2* equals the natural logarithm of the total applications for utility model and design patents plus one. Secondly, referencing Bradley et al. (2017) and Hall et al. (2001), the firm's patent citations (*Citation*) reflect the knowledge spillover intensity and technological influence of innovation outcomes, serving as a core proxy variable for measuring patent quality, equal to the natural logarithm of the average number of citations received by the enterprise's patents in the following year plus one.

According to the regression results presented in Table 5-12, the coefficient of the variable *Post×Central* in Model 1 is significantly positive at the 1% statistical level, while in Model 2, although the coefficient of *Post×Central* is positive, it does not reach statistical significance. These results indicate that the implementation of the EVA oriented performance evaluation system in central

state-owned enterprises promotes the increase in the number of invention patent applications but has no significant impact on utility model and design patent applications. In Model 3, the coefficient of *Post×Central* is significantly positive at the 5% statistical level, suggesting that the performance evaluation system reform significantly enhances the patent quality of central state-owned enterprises. Collectively, these findings demonstrate that the EVA evaluation does not induce opportunistic behavior by managers to substitute quantity for quality. Instead, it improves the quality of innovative patents by refining innovation mechanisms and enhancing resource utilization efficiency, thereby better leveraging the innovation value leadership of central state-owned enterprises.

Table 5-12 EVA Performance Evaluation System and Innovation Quality

Variable	*Patent1*	*Patent2*	*Citation*
	Model 1	Model 2	Model 3
Post×Central	0.225***	0.023	0.092**
	(4.832)	(0.510)	(2.399)
Size	0.559***	0.465***	0.412***
	(21.903)	(17.425)	(18.169)
Lev	-0.057	-0.161*	-0.026
	(-0.657)	(-1.698)	(-0.337)
Age	-0.074**	0.075**	0.277***
	(-2.453)	(2.428)	(9.536)
Cash	-0.190	-0.158	-0.236*
	(-1.264)	(-0.964)	(-1.789)
Capital	0.000	0.009	0.020***
	(0.045)	(1.059)	(2.831)
ROA	0.266	0.658***	-0.416***
	(1.363)	(3.104)	(-2.680)
MB	-0.142**	0.243***	-0.267***
	(-2.192)	(3.493)	(-4.909)
Growth	0.023**	0.011	-0.009
	(2.062)	(0.931)	(-0.857)
Board	0.057	-0.139	0.130*
	(0.698)	(-1.556)	(1.868)
Indratio	0.519**	-0.113	0.594***
	(2.098)	(-0.413)	(2.851)

Dual	0.089***	0.038	0.043*
	(3.263)	(1.295)	(1.857)
Constant	-10.564***	-8.168***	-7.577***
	(-18.740)	(-13.827)	(-15.006)
Firm fixed effect	Control	Control	Control
Year fixed effect	Control	Control	Control
Observations	13797	13797	11469
F	56.625	44.610	52.952
Adj_R^2	0.757	0.726	0.882

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

5.5.3 Further Revisions to the EVA Performance Evaluation System for Central state-owned enterprises

On December 29, 2012, the State-owned Assets Supervision and Administration Commission revised the *Interim Measures for the Performance Evaluation of Central Enterprise Leaders*. This revision marked the first time the principle of de-emphasizing scale and emphasizing quality was introduced, highlighting the policy direction of state-owned enterprise reforms since the 18th National Congress of the Communist Party of China, which focused on strengthening core businesses and improving quality and efficiency. It explicitly stated the need to further enhance the evaluation of independent innovation and transformation and upgrading, implement differentiated assessments, and apply different evaluation standards to enterprises with varying functions, positioning, and roles. This aims to improve the scientific nature, relevance, and effectiveness of performance evaluations, adhering to the evaluation orientation of profitability and efficiency, core business operations, and innovation-driven development. We anticipate that the revision of the performance evaluation measures for central state-owned enterprises will further motivate and enhance their capacity to engage in R&D activities, thereby promoting further improvements in innovation efficiency.

Thus, we construct a time dummy variable *Post2* for the policy implementation phases to more accurately reflect the phased impact of the policy. Specifically,

Post2 takes the value 0 for sample years from 2007 to 2009, 1 for sample years from 2010 to 2012, and 2 for sample years from 2013 to 2023. The regression results presented in Table 5-13 show that the coefficient of the variable *Post2*×*Central* is significantly positive at the 1% statistical level, indicating that the revised Assessment Measures in 2012 further enhanced the innovation efficiency of central state-owned enterprises, driving them to achieve high-quality development through innovation.

Table 5-13 Based on the 2012 Revised EVA Performance Evaluation System for Central state-owned enterprises

Variable	Dependent variable: *Eff*	
	Coefficient	T-value
Post2×*Central*	0.004***	(3.366)
Size	0.023***	(15.359)
Lev	-0.004	(-0.735)
Age	0.004**	(2.250)
Cash	-0.013	(-1.338)
Capital	-0.000	(-0.547)
ROA	0.025**	(2.006)
MB	0.009**	(2.368)
Growth	0.001*	(1.843)
Board	-0.001	(-0.185)
Indratio	0.019	(1.237)
Dual	0.003**	(2.020)
Constant	-0.379***	(-11.364)
Firm fixed effect	Control	
Year fixed effect	Control	
Observations	13797	
F	32.518	
Adj_R2	0.672	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

5.5.4 Heterogeneity Analysis

The effectiveness of the EVA-based performance evaluation system is influenced by the external governance environment. Drawing on incentive theory and agency theory, this paper argues that differences in the level of

marketization may affect the policy's impact through channels such as factor allocation efficiency and institutional completeness. Specifically, incentive theory suggests that a well-functioning external environment enhances the responsiveness of agents (i.e., corporate managers) to performance-based incentives, while agency theory highlights that a sound market mechanism can better align the interests of managers and shareholders. In regions with a higher degree of marketization, where factor markets are more efficient and institutional constraints are stronger, the external pressure on managers increases, thus reinforcing the incentive effects embedded in the performance evaluation system.

Based on this reasoning, the sample is divided into two groups according to the median value of the regional marketization index. A subgroup regression model is constructed to examine whether the impact of the new performance evaluation system differs across institutional environments.

Table 5-14 reports the results. In regions with higher levels of marketization, the coefficient of *Post×Central* is significantly positive at the 5% level, indicating that the new EVA evaluation system significantly promotes innovation efficiency in central SOEs. In contrast, in regions with lower levels of marketization, although the coefficient of *Post×Central* remains positive, it is statistically insignificant.

These findings suggest that the new performance evaluation system exerts stronger governance effects in more market-oriented environments. In high-marketization regions, a mature institutional environment fosters an innovation tournament mechanism (Aghion et al., 2005), creating external competitive pressure that compels central SOEs to allocate R&D resources toward high-value patent portfolios and critical technological breakthroughs. However, in low-marketization regions, central SOEs enjoy privileged access to resources, weaker market competition, and stronger political connections. These conditions reduce the necessity for enterprises to engage in high-risk innovative activities to enhance EVA performance, thereby weakening the incentive effects

of the performance evaluation system and exacerbating agency problems between managers and the state as the principal.

Table 5-14 Heterogeneity Analysis of Marketization Progress

Variables	Dependent variable: *Eff*			
	High marketization process		Low marketization process	
	Coefficient	T-value	Coefficient	T-value
Post×Central	0.007**	(2.527)	0.007	(1.156)
Size	0.023***	(13.664)	0.026***	(7.573)
Lev	-0.010	(-1.581)	0.014	(1.038)
Age	0.005**	(2.396)	0.005	(1.019)
Cash	-0.019*	(-1.852)	0.015	(0.674)
Capital	-0.001**	(-1.973)	0.002*	(1.925)
ROA	0.030**	(2.139)	-0.013	(-0.442)
MB	0.009**	(1.979)	0.009	(0.927)
Growth	0.002*	(1.918)	0.001	(0.519)
Board	0.003	(0.543)	-0.013	(-1.110)
Indratio	0.036**	(2.133)	-0.051	(-1.457)
Dual	0.003*	(1.706)	0.001	(0.282)
Constant	-0.379***	(-10.069)	-0.459***	(-6.057)
Firm fixed effect	Control		Control	
Year fixed effect	Control		Control	
Observations	10792		2806	
F	25.297		9.620	
Adj_R2	0.689		0.623	

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively; (2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

5.5.5 The Impact of EVA Performance Evaluation System and Innovation Efficiency on Enterprise Market Value

The core policy logic behind the implementation of the EVA evaluation lies in guiding enterprises to shift from scale expansion to value creation through capital cost constraints. Innovation, as a key driver of value, has its marginal contribution to enterprise value serving as the ultimate benchmark for assessing the system's effectiveness. Existing literature indicates that innovation is crucial for enterprises to develop new products, provide innovative services, and

innovate production processes. It not only enhances export potential but also improves the efficiency of utilizing human capital and tangible assets, thereby boosting labor productivity, sales scale, profitability, and market value (Cho & Pucik, 2005). Furthermore, Peters et al. (2017) argue that technological innovation grants enterprises valuable monopolistic power. However, central state-owned enterprises, burdened with policy responsibilities and debates over innovation efficiency, may follow unique pathways in converting their innovation activities into value. Therefore, this paper employs Tobin's Q as the core proxy variable to examine whether the improvement in innovation efficiency under the EVA evaluation truly translates into market-recognized value increments.

Table 5-15 presents the relevant regression results. Models 1 and 3 reflect the impact of the 2009 revised EVA performance evaluation system, while Models 2 and 4 reflect the impact of the 2012 revised EVA performance evaluation system. It can be observed that in Model 1, the regression coefficient of the variable *Post×Central* is positive but not statistically significant. In Model 2, the regression coefficient of the variable *Post2×Central* is significantly positive at the 5% level, indicating that the implementation of the EVA-oriented performance evaluation system benefits the market value management of central state-owned enterprises. In Models 3 and 4, the regression coefficients of the variable *Eff* are significantly negative at the 10% level, suggesting that improvements in innovation efficiency do not contribute marginally to enterprise value creation. These results collectively demonstrate that while the EVA performance evaluation system generally enhances enterprise value for central state-owned enterprises, and further revisions to the evaluation measures lead to additional value improvements, the innovation activities of these enterprises fail to deliver value-creating effects. This paradox may stem from the capital market's systemic skepticism toward central state-owned enterprises' innovation, perceiving their efforts as more aligned with administrative tasks

than market demands (Berkowitz et al., 2017), thereby interpreting efficiency gains as signals of resource misallocation.

Table 5-15 Central state-owned enterprises' EVA Performance Evaluation System, Innovation Efficiency, and Enterprise Market Value

Variables	Dependent variable: *Tobin's Q*			
	Model 1	Model 2	Model 3	Model 4
Post×Central	0.043		0.045	
	(1.346)		(1.398)	
Post2×Central		0.039**		0.041**
		(2.429)		(2.498)
Eff			-0.244*	-0.249*
			(-1.904)	(-1.947)
Size	-0.656***	-0.656***	-0.650***	-0.650***
	(-29.729)	(-29.735)	(-29.194)	(-29.195)
Lev	0.600***	0.601***	0.598***	0.600***
	(6.820)	(6.844)	(6.802)	(6.827)
Age	0.278***	0.279***	0.279***	0.280***
	(10.950)	(10.990)	(10.994)	(11.037)
Cash	0.616***	0.614***	0.613***	0.610***
	(4.266)	(4.252)	(4.246)	(4.231)
Capital	0.017**	0.017**	0.017**	0.017**
	(2.540)	(2.558)	(2.529)	(2.548)
ROA	2.736***	2.734***	2.740***	2.739***
	(13.218)	(13.216)	(13.249)	(13.248)
Growth	-0.024**	-0.024**	-0.023**	-0.024**
	(-2.252)	(-2.278)	(-2.219)	(-2.244)
Board	0.000	0.001	-0.000	0.001
	(0.002)	(0.012)	(-0.002)	(0.008)
Indratio	0.469**	0.469**	0.473**	0.473**
	(2.344)	(2.345)	(2.365)	(2.366)
Dual	-0.024	-0.024	-0.023	-0.023
	(-0.998)	(-1.002)	(-0.964)	(-0.967)
Constant	15.281***	15.277***	15.183***	15.177***
	(30.971)	(30.945)	(30.682)	(30.652)
Firm fixed effect	Control	Control	Control	Control
Year fixed effect	Control	Control	Control	Control
Observations	13797	13797	13797	13797
F	114.249	114.475	105.051	105.291
Adj_R^2	0.656	0.656	0.656	0.656

Note: (1) ***, **, * indicate statistical significance levels of 1%, 5%, and 10% in two-tailed tests, respectively;(2) Numbers in parentheses are T-values adjusted for heteroscedasticity.

5.6 Chapter Summary

This study systematically examines the impact of the EVA performance evaluation system on the innovation activities of central state-owned enterprises from an efficiency perspective. The findings reveal that the EVA evaluation system significantly enhances the efficiency of innovation resource allocation and improves corporate innovation efficiency by reconstructing the micro-governance framework for innovation incentives in central state-owned enterprises. Further research indicates that after the implementation of the evaluation policy, central state-owned enterprises exhibited structural improvements in R&D investment intensity and patent output quality, demonstrating that the capital cost constraint mechanism effectively reversed short-term innovation behaviors driven by traditional scale orientation, prompting management to integrate innovation activities into the long-term strategic framework of corporate value creation. Additionally, regional marketization processes significantly empower the innovation-driven effects of the evaluation policy, with the positive impact of the performance evaluation system on corporate innovation efficiency being more pronounced in regions with higher marketization levels. Notably, although the market has responded positively to the evaluation system itself, the valuation premium for the innovation activities of central state-owned enterprises has yet to fully materialize. This may stem from capital market concerns that the innovation activities of central state-owned enterprises could be influenced by non-economic objectives, leading to a systematic undervaluation of their innovation potential.

Chapter 6 Research Conclusions

6.1 Main Research Findings

This study examines the impact of the EVA performance evaluation system on market value management in Chinese central state-owned enterprises by analyzing two dimensions: corporate EVA performance and innovation efficiency, using a sample of state-owned A-share listed companies in China from 2007 to 2023. From the perspective of EVA performance, the findings reveal that the implementation of the EVA performance evaluation system significantly improves the per capita EVA performance of central state-owned enterprises, indicating its positive role in guiding managers to focus on long-term corporate development and value creation. Mechanism tests show that after the adoption of the EVA evaluation system, central state-owned enterprises experience a notable increase in investment return rates, while inefficient investment behaviors are effectively curbed. This suggests that the performance improvement primarily stems from enhanced genuine value creation capabilities rather than short-term opportunistic actions. Finally, a significant positive relationship exists between EVA performance and corporate market value, demonstrating that the EVA evaluation system can serve as a powerful tool for market value management in central state-owned enterprises. From the perspective of innovation efficiency, this study finds that the implementation of the EVA performance evaluation system significantly enhances the innovation efficiency of central state-owned enterprises. Post-implementation, structural improvements are observed in both innovation input and patent output quality, indicating that the capital cost constraint mechanism effectively reverses innovation myopia driven by traditional scale-oriented approaches, encouraging management to integrate innovation activities into the long-term strategic framework of corporate value creation. Additionally, regional marketization processes significantly amplify the innovation-driven effects of the evaluation policy, with the positive impact on innovation

efficiency being more pronounced in regions with higher marketization levels. Notably, while the market responds positively to the evaluation system itself, the valuation premium for central state-owned enterprises' innovation activities remains insufficiently reflected. This may stem from capital market concerns that central state-owned enterprises' innovation activities could be influenced by noneconomic objectives, leading to a systematic undervaluation of their innovation potential. This further suggests that the implementation of an EVA-oriented performance evaluation system might compensate for the market's short-sightedness towards the central SOEs, and motivate the managers of the SOEs to focus on innovative activities more conducive to the long-term development of the firms.

6.2 Research Implications

The findings of this study reveal that implementing an EVA-oriented performance evaluation system in central state-owned enterprises can enhance their EVA performance and investment efficiency, thereby improving market pricing and competitive capabilities. The relevant conclusions offer the following policy and practical implications.

First, the performance evaluation system for state-owned enterprises should be continuously deepened. The implementation of the performance evaluation system for central enterprise executives has not only improved operational efficiency but also significantly enhanced innovation efficiency. This indicates that through rational institutional design and incentive mechanisms, enterprises' innovation potential can be effectively stimulated, prompting a shift from scale expansion to quality improvement, thereby laying a solid value foundation for market value management. EVA not only accounts for the cost of debt capital but also explicitly includes the cost of equity capital, providing a more comprehensive reflection of a firm's capital cost and true value creation capability. This transformation helps enterprises optimize resource allocation, improve capital utilization efficiency, and enhance market value, offering

effective institutional support for the reform of state-owned enterprises from managing enterprises to managing capital. Meanwhile, the successful practices of central state-owned enterprises serve as a model for local state-owned enterprises, guiding local governments to promote high-quality development of state-owned enterprises through market-oriented incentive and evaluation mechanisms.

Second, market value management for state-owned enterprises should be thoroughly implemented. As key pillars of the national economy, the market value management of state-owned enterprises is not only related to their own value realization and shareholder interests but also has profound implications for national economic planning and industrial upgrading. Effective market value management can help state-owned enterprises optimize resource allocation, enhance market competitiveness, and strengthen the overall vitality and influence of the state-owned economy. This study demonstrates that the EVA performance evaluation system can significantly improve operational and innovation efficiency, thereby enhancing the intrinsic value of enterprises. By guiding managers to focus on long-term development and value creation, the EVA evaluation system effectively curbs shortsighted behavior and inefficient investments, encouraging them to prioritize long-term strategies and sustainable development.

Third, communication between state-owned enterprises and the capital market should be strengthened. Innovation is crucial for enterprises to build core competitiveness, especially under China's innovation-driven development strategy and catch-up strategy, where state-owned enterprises bear significant innovation responsibilities. However, in reality, state-owned enterprises face persistent skepticism about their innovation capabilities. Empirical findings in this study show that although the EVA performance evaluation system has achieved notable results in improving operational and innovation efficiency, the market has yet to fully recognize the valuation premium for central state-owned enterprises' innovation activities. This suggests that state-owned enterprises

need to further enhance communication with the capital market through timely and proactive information disclosure and interaction, boosting investor confidence and recognition to more fully realize their market value.

6.3 Research Contributions

This paper examines the impact of the EVA performance evaluation system on market value management in state-owned enterprises (SOEs) from the perspectives of corporate performance and innovation efficiency, based on principal-agent theory and incentive theory, using state-owned listed companies as the research subject. The potential contributions of this study are mainly reflected in the following aspects:

On one hand, it expands the literature on the economic consequences of performance evaluation systems in SOEs. Performance evaluation systems serve as institutional safeguards for achieving sustainable development and enhancing the competitiveness of SOEs. Since the implementation of these systems, their effectiveness has been questioned by both industry and academia. Some studies have found that the adoption of performance evaluation systems may lead to earnings management contagion or financial investment contagion among enterprises, negatively impacting long-term healthy development and shareholder returns, and even resulting in unfair evaluation outcomes (Du et al., 2012, 2018; Sparling & Turvey, 2003). This paper demonstrates that the implementation of the revised performance evaluation system can effectively improve EVA performance and innovation efficiency in enterprises, playing a positive role in value guidance and efficiency enhancement. Thus, it provides empirical support for central state-owned enterprises to deepen the implementation of EVA oriented performance evaluation systems.

On the other hand, it supplements research on the factors influencing market value management in SOEs. Strengthening market value management is an inevitable trend in capital market reforms, a clear requirement for deepening and enhancing SOE reforms, and an essential aspect of high-quality

development for listed companies. However, in practice, the market value of central and state-owned listed companies has long been undervalued. How to improve investor recognition of these enterprises has been a shared goal for both industry and academia. Existing literature has identified corporate governance mechanisms, managerial characteristics, and investment decisions as key factors affecting the market valuation of SOEs (Bai et al., 2004; Carpenter et al., 2021; Guo et al., 2017). From the perspective of performance evaluation, this paper proposes that an EVA-oriented evaluation system is a powerful tool for improving market value management in state-owned listed companies. By enhancing operational efficiency and innovation capabilities, it integrates the concept of market competitiveness throughout the entire management process, shifting enterprises from pursuing profits to creating value for shareholders, thereby improving the level of intrinsic value creation in SOEs.

6.4 Limitations and Future Research Directions

Firstly, numerous factors influence the market value of state-owned enterprises. This study primarily focuses on the impact of overall EVA performance and innovation efficiency, without delving into other financial decisions. Market value management is a systematic endeavor involving both internal and external corporate strategies, including financial decision-making, corporate governance structures, investor relations, and market communication. Given the operational objectives and evaluation methods of SOEs, their strategic deployments in areas such as labor employment, mergers and acquisitions, and overseas investments can significantly affect market value. Furthermore, with the government's introduction of the carbon peak and carbon neutrality environmental goals, it remains a pertinent question whether the performance evaluation system can guide SOEs to take the lead in energy conservation and emission reduction, given their pivotal role in the national economy. Therefore, future research could expand into these underexplored areas to provide a more comprehensive

understanding of the factors influencing SOEs' market value and pathways for enhancement.

Secondly, the empirical analysis in this study is limited to selected indicators, resulting in a constrained scope. For instance, in testing the effect of performance evaluation system on EVA performance, we use per capita EVA performance, which might exaggerate EVA performance due to firms outsourcing their personnel and not counting them as employees of the firm. Therefore we measures EVA performance in terms of asset-based EVA performance in the robustness test. And, when examining the impact of the performance evaluation system on innovation efficiency, the analysis primarily focuses on innovation input and patent citations, without addressing other aspects of innovation quality, such as patent knowledge breadth, diversity of technological innovation, and practical application outcomes. These limitations suggest that future research could broaden the indicator system to more comprehensively assess the multifaceted effects of the performance evaluation system on corporate development.

Finally, this study employs a large-sample quantitative analysis method to investigate the market value management pathways of state-owned enterprises, lacking in-depth analysis of specific cases. Although the case of CRRC is selected for analysis, the focus is solely on the relationship between EVA performance evaluation and R&D investment. More critically, this study may have overlooked the influence of other factors such as corporate internal culture and the personal style of senior executives, potentially resulting in policy implications that are not sufficiently targeted. Future research could integrate qualitative and quantitative analyses, on one hand exploring universal patterns at the empirical level using large-sample data, and on the other hand conducting in-depth case studies to validate these patterns, thereby revealing the specific mechanisms and heterogeneous effects of the EVA performance evaluation system in different corporate contexts.

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