How Corporate Social Responsibility Affects the Return on Total Assets-An Empirical Study Based on A-share Listed Companies

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Abstract. This paper conducts an empirical study on data from 1,242 listed companies in China's A-share market from 2012 to 2020 to explore the impact of corporate social responsibility (CSR) on return on assets (ROA). The findings reveal that CSR has a significant positive effect on ROA, indicating that corporate social responsibility can significantly improve a company's asset utilization efficiency and profitability. Panel regression analysis shows that CSR has a positive impact on ROA; heterogeneity results indicate that the effect of CSR levels on ROA varies significantly across different regions. Combining stakeholder theory, shareholder theory, and reputation theory, this paper constructs a regression model incorporating control variables such as firm size, debt-to-asset ratio, and net profit margin to reveal the mechanism by which CSR affects ROA. These research results not only provide theoretical support for optimizing resource allocation and improving financial performance but also offer empirical evidence for policymakers to refine regulations related to corporate social responsibility.

Keywords: Social Responsibility, Return on Total Assets, Panel Regression.

1. Introduction

1.1. Research Background and Significance

1.1.1 Research background

With the growing recognition of Corporate Social Responsibility (CSR), an increasing number of companies are integrating it into their core strategies. They now see CSR as not merely fulfilling legal obligations or meeting societal expectations, but as a key driver of long-term competitive advantage. Since the mid-20th century, CSR has evolved from simple charitable donations to encompass environmental protection, employee welfare, product quality, and community engagement. Today, CSR has become a vital component in measuring corporate sustainability, shaping brand identity, and enhancing market competitiveness.

In traditional corporate performance evaluations, financial metrics like sales revenue, profit margins, and shareholder returns dominated, focusing primarily on short-term economic benefits. However, with the introduction of social responsibility concepts, corporate performance assessments have increasingly emphasized long-term impacts and non-financial factors. Initiatives such as environmental policy implementation, employee welfare improvements, and participation in social welfare activities are now widely recognized as having profound effects on overall corporate performance. This evolving perspective compels us to reassess the relationship between social responsibility and financial performance, particularly the role of social responsibility in the key financial metric of return on assets (ROA).

Return on Assets (ROA) serves as a key metric for evaluating corporate asset utilization efficiency and profitability, having long been a focal point in both academic research and business management. It measures a company's ability to convert resources—including capital and labor—into profitability. However, corporate social responsibility (CSR) initiatives may influence ROA through multiple channels: enhancing corporate reputation to attract more consumers, optimizing resource allocation to reduce waste, and improving employee productivity. Understanding the specific relationship

between CSR and ROA can therefore provide businesses with more precise theoretical foundations and practical guidance for optimizing resource allocation and boosting asset returns.

Recent empirical studies have demonstrated that corporate social responsibility (CSR) initiatives can enhance brand loyalty, mitigate operational risks, boost employee productivity, and ultimately yield improved financial performance. However, research examining how CSR specifically impacts Return on Assets (ROA) remains limited, with significant variations in financial effects across companies and industries. Therefore, investigating the underlying mechanisms between CSR and ROA—particularly their manifestations in different sectors, regions, and enterprise types—remains a critical area for further exploration.

As the world's second-largest economy, China has also begun to actively promote corporate social responsibility in recent years. At the policy level, the government has issued a series of regulations and guidelines to promote corporate social responsibility, such as the "Guidelines for the Release of Corporate Social Responsibility Reports," environmental policies, and anti-corruption measures, encouraging more companies to incorporate social responsibility into their strategies and performance targets. However, many Chinese companies still face numerous challenges in fulfilling their social responsibilities. Some companies view social responsibility as a cost burden, lacking a scientific and effective social responsibility management mechanism, or have a systematic understanding of the financial returns from social responsibility investments. Therefore, exploring the relationship between social responsibility and total asset return, especially in the performance of Chinese companies, has important practical significance.

The strategies and models adopted by different enterprises in fulfilling social responsibilities may significantly impact their financial performance. Some companies reduce emissions and improve resource efficiency through environmentally friendly production methods; others focus on social welfare, enhancing their social image through donations or partnerships; while some integrate social responsibility into corporate culture and employee management to boost staff satisfaction and work efficiency. These strategic responses may affect the Return on Assets (ROA) of respective enterprises in different ways. Therefore, by analyzing how these factors interplay, more targeted management recommendations can be provided to corresponding companies.

In conclusion, the relationship between corporate social responsibility (CSR) and financial performance has become a multidimensional and interdisciplinary research topic. While existing studies have examined the impact of CSR on corporate financial outcomes, research focusing on the Return on Total Assets (ROTA) as a specific financial metric remains insufficient, particularly regarding performance variations across industries and economic environments. This paper investigates how CSR influences ROTA through various pathways, which not only sheds light on the connection between corporate operations and social benefits but also holds significant theoretical and practical value.

1.1.2 Research meaning

This study holds profound theoretical and practical significance. Theoretically, it expands the academic framework examining the relationship between corporate social responsibility (CSR) and financial performance. By analyzing the Return on Total Assets (ROTA) as a key financial metric, the research explores how CSR impacts corporate asset utilization efficiency and profitability, thereby enriching existing CSR theories, particularly in financial performance evaluation. From a management perspective, the study provides decision-makers with theoretical support to balance financial returns and social benefits during CSR implementation, enabling more effective resource allocation and improved asset returns. Simultaneously, it offers policymakers crucial empirical evidence to refine CSR policies, helping governments guide corporate social responsibility while ensuring financial health and sustainable development.

Furthermore, through empirical analysis across different industries and regions, this paper provides concrete management recommendations for various enterprises, helping them find the optimal path to balance social responsibility and financial benefits in global competition. Particularly for China enterprises, the study offers practical data support and strategic guidance on how to enhance

ROA while fulfilling social responsibilities, thereby filling the research gap between corporate social responsibility and financial returns in China and promoting the development of CSR practices in China enterprises. Finally, the study reveals that fulfilling social responsibilities is not only a moral obligation for enterprises but also a strategic means to improve financial performance and drive sustainable development. By enhancing brand image, optimizing resource allocation, and strengthening customer loyalty, enterprises can achieve a win-win situation in both economic and social benefits, thereby promoting long-term sustainable development.

In conclusion, this study not only plays an important role in promoting theoretical research in academia, but also provides valuable theoretical support and guidance for enterprises to improve financial performance by fulfilling social responsibilities in practice, for policymakers to make reference, and for the development of the industry and the practice of China enterprises.

1.2. Literature review

[1] Gharbi Manel's empirical analysis of 200 French companies from 2010 to 2021 revealed that corporate social responsibility (CSR) significantly enhances financial performance, with firms demonstrating higher CSR reporting levels showing better investment returns. Moreover, robust corporate governance practices amplify CSR's positive impact on financial performance through moderating effects. This study provides new empirical evidence for French enterprises and underscores the importance of strengthening corporate governance to maximize CSR benefits. [2] Muhammad Kevin Adriansyah et al. conducted regression analysis on annual report data from 32 industrial manufacturing companies listed on the Indonesia Stock Exchange (IDX) between 2017 and 2021, examining the influence of CSR, company size, and age on financial performance metrics (Return on Equity [ROE] and Price-to-Book Value [PBV]). The findings revealed that CSR and company size significantly affect financial performance, while company age and debt-to-equity ratio showed no significant impact on ROE but significantly influenced PBV. Overall, corporate social engagement and company size can have either positive or negative effects on financial performance, whereas the impact of company age remains complex, potentially affecting financial outcomes in both directions. [3] Agarwala Nidhi's dynamic panel data analysis of 236 Indian listed companies (Nifty 500 index constituents) explored how company size, performance, and age influence corporate social responsibility (CSR) activities. The study reveals an inverted U-shaped relationship between corporate size and CSR engagement: smaller firms demonstrate higher CSR participation, but engagement declines as companies grow in scale. Corporate performance shows a negative correlation with CSR, with underperforming firms exhibiting lower CSR involvement. Conversely, company age positively correlates with CSR activities, as older firms tend to participate more actively. The research underscores the need for enhanced government oversight of CSR activities in large enterprises and proposes a novel perspective on the nonlinear relationship between CSR and corporate size—a finding particularly significant for emerging economies like India.

[4] Liu Yanli and Sun Xiaoyu used China A-share listed companies in Shanghai and Shenzhen from 2010 to 2021 as research samples, finding that the impact of corporate social responsibility on financial performance exhibits an inverted U-shaped nonlinear characteristic. The low-cost strategy weakens the inverted U-shaped relationship between the two, while the differentiation strategy strengthens it. Compared with the low-cost strategy, the differentiation strategy has a stronger moderating effect, and the combined use of both strategies significantly enhances the impact of corporate social responsibility on financial performance. [5] Zhou Yinying and Wang Zimin conducted an empirical analysis of the impact of corporate social responsibility on corporate value based on stakeholder theory and the context of the times. The empirical results show that corporate social responsibility has a promoting effect on corporate value. At the same time, if the equity structure is too concentrated, the promoting effect of corporate social responsibility on corporate value will be further weakened. [8] Wu Jing and Xu Tianyang studied 1,359 China A-share listed companies in Shanghai and Shenzhen from 2012 to 2020, as well as the mechanism of green innovation, and found that corporate social responsibility significantly improves corporate

performance. Heterogeneity analysis shows that compared with state-owned enterprises, corporate social responsibility has a greater effect on improving the performance of private enterprises.

2. Theoretical basis and research hypothesis

2.1. Related notion

2.1.1 The definition of social responsibility

[5] Corporate social responsibility (CSR) is generally defined as the obligation of enterprises to fulfill responsibilities toward society, the environment, employees, and consumers while pursuing economic maximization. This implies that businesses should not only focus on their own profits and shareholders' interests but also consider the societal and environmental impacts of their operations, striving to achieve sustainable development across economic, social, and environmental dimensions. In legal studies, the definition of CSR often emphasizes how enterprises fulfill these responsibilities within legal frameworks. This includes complying with environmental protection regulations, adhering to fair trade principles, safeguarding employee rights, and promoting consumer protection.

2.1.2 The scope of social responsibility

[6] Corporate responsibility primarily encompasses economic, legal, philanthropic, and environmental obligations. Economic responsibility constitutes the fundamental duty of enterprises. Companies should generate profits through innovation and operational efficiency that comply with legal and regulatory frameworks, thereby driving economic growth. Simultaneously, businesses must adhere to fair competition principles, ensure equitable profit distribution, protect shareholder and employee interests, and achieve long-term sustainable development. Secondly, legal obligations require strict compliance with national and regional laws, including tax regulations, labor laws, and product/service safety standards. Integrity management serves as the core principle, demanding transparency and authenticity in information disclosure to prevent fraudulent or misleading practices. Enterprises must treat all stakeholders—employees, suppliers, and consumers—equitably to avoid discrimination. Social contributions through philanthropy include financial donations, foundation establishment, educational support, volunteer programs, assistance for vulnerable groups, and community development initiatives. These efforts not only enhance brand image but also improve social welfare and strengthen community ties. [7] Companies should reduce environmental impact through resource conservation, pollution reduction, and green technology adoption. In consumer engagement, businesses must ensure product/service quality and safety, provide transparent information, and empower consumers to make informed decisions. On the other hand, as data privacy concerns grow increasingly severe, businesses must implement measures to protect consumer privacy and ensure information security. Quality after-sales service also serves as a key demonstration of corporate responsibility to consumers. Companies should actively fulfill their social responsibilities by selecting suppliers that meet ethical and environmental standards, ensuring all supply chain links adhere to ethical guidelines, protecting employee rights, and adopting environmental solutions. These actions collectively represent corporate social responsibility (CSR).

2.2. Theoretical basis

2.2.1 Stakeholder theory

Proposed by R. Edward Freeman, stakeholder theory posits that businesses should be accountable not only to shareholders but also to all stakeholders, including employees, customers, suppliers, communities, and governments. The theory advocates for corporate actions that balance stakeholder interests to drive sustainable development. It provides theoretical support for CSR, emphasizing that corporate social responsibility activities should not only enhance shareholder returns but also address the needs and rights of other stakeholders. Thus, fulfilling social responsibilities helps improve relationships with various stakeholders, thereby boosting long-term financial performance.

2.2.2 Shareholder theory

The shareholder theory, proposed by Milton Friedman, posits that a company's sole social responsibility is to generate profits for shareholders. According to this theory, the primary objective of a business should be to enhance shareholder value through profit growth, rather than overemphasizing social responsibilities. While the shareholder theory advocates prioritizing shareholder returns, modern management research increasingly demonstrates that fulfilling social responsibilities not only boosts corporate reputation but also strengthens brand loyalty and consumer purchasing intent, thereby indirectly improving financial performance. Particularly in the long term, effective social responsibility practices can deliver greater shareholder returns for companies.

2.2.3 Reputation theory

Reputation theory posits that corporate reputation stands as one of the most vital intangible assets. It not only influences consumer purchasing decisions but also impacts investor choices and employee motivation. By fulfilling social responsibilities—such as environmental protection and employee welfare—companies can enhance their social reputation. A strong corporate reputation boosts customer loyalty, reduces operational risks, attracts more investments, and ultimately improves financial performance and return on assets (ROA).

2.2.4 Research hypothesis

Based on the above theoretical basis to study the impact of social responsibility on the total asset return rate of enterprises, referring to the research of other related scholars, this paper puts forward the research hypothesis: social responsibility has a positive impact on the total asset return rate.

3. Empirical analysis

3.1. Variable selection and model construction

3.1.1 Data sources and variable selection

The study's sample covers a broad spectrum of A-share listed companies, with data collected from existing financial databases and official annual reports. After screening, we ultimately gathered comprehensive observations from 1,242 companies spanning the 2012-2020 period. This widely representative sample interval encompasses different development stages and industry cycle fluctuations, providing a dynamic overview of corporate operations and social responsibility performance amid stock market policy changes. This approach establishes a solid data foundation for subsequent empirical analysis, effectively ensuring the universality and stability of research conclusions. The stock price data, listed company data, and macroeconomic data used in this paper all come from the CSMAR database. Following standard procedures, we processed the raw data as follows: (1) Excluding samples with missing key variables; (2) Removing companies that were ST-listed or delisted during the study period; (3) Eliminating specialized financial sectors; (4) Applying 1% tail trimming to all continuous variables; (5) Pre-empting the dependent variable by one period in regression models to mitigate endogeneity effects.

Dependent Variable: Return on Assets (ROA) can serve as the dependent variable, which is a key metric for evaluating a company's ability to generate returns from its total assets. ROA accurately reflects the relationship between net profit and total assets, providing a comprehensive assessment of asset management efficiency and operational effectiveness. The core objective of corporate management is to maximize corporate value through efficient resource allocation and utilization, with ROA directly indicating the extent to which this goal is achieved.

Explanatory Variable: The Corporate Social Responsibility (CSR) coefficient is selected as the explanatory variable, as it serves as a key metric for corporate social responsibility fulfillment and significantly impacts Return on Assets (ROA). CSR reflects an enterprise's performance in environmental protection, social welfare, and employee rights protection. Proactively fulfilling social responsibilities can enhance a company's external image, boost brand value and market reputation,

support business growth and customer retention, thereby improving resource utilization efficiency and driving ROA growth. The CSR index is constructed based on the social responsibility scores disclosed in corporate social responsibility reports, with a score range of (-1, 1).

Control Variable: Company size (Size) serves as a critical control variable, as it profoundly impacts corporate financial performance and resource utilization efficiency. Typically measured by the natural logarithm of total assets, size reflects a company's operational scale and market influence. Larger enterprises generally demonstrate stronger market competitiveness, higher bargaining power, and more abundant resources, which may provide them with greater financial capacity and capability to fulfill social responsibilities, thereby positively affecting ROA. However, larger companies may also face challenges such as increased management complexity and coordination costs, which could negatively impact ROA. By controlling for company size, we can isolate the influence of scale factors on ROA and more accurately analyze the independent role of corporate social responsibility on financial performance.

The debt-to-asset ratio (Lev) serves as a key metric for evaluating corporate financial leverage and solvency, exerting a significant influence on Return on Assets (ROA). While moderate leverage can enhance asset returns, excessive debt may escalate financial risks and debt service pressures, thereby limiting asset efficiency and profitability. Given the varying capital structures and financing strategies among enterprises, Lev levels exhibit notable differences. By controlling for debt-to-asset ratios, we can isolate the impact of financial leverage variations on ROA, enabling precise analysis of corporate social responsibility's independent contribution to financial performance and ensuring robustness and reliability of research conclusions.

The long-term debt-to-capital ratio (DLCR) reflects a company's long-term solvency and serves as a key indicator of financial stability and capital structure. A higher DLCR may indicate greater reliance on long-term debt financing, which can enhance capital efficiency to some extent but may also increase financial risks and debt repayment pressure, thereby affecting ROA. Significant variations exist in DLCR across industries and companies. By controlling DLCR, inherent financial disparities between industries and enterprises can be adjusted, enabling more accurate analysis of the impact of corporate social responsibility on financial performance and providing decision-making support for optimizing capital structure.

The net profit margin (NPM) serves as a key metric for assessing a company's core business profitability, reflecting its ability to generate net profits from operating revenue. A higher NPM typically indicates stronger market competitiveness and cost control capabilities, which may positively impact Return on Assets (ROA). However, the NPM is influenced by multiple factors such as market competition, product pricing strategies, and cost structures. Fluctuations in the NPM may obscure the true relationship between corporate social responsibility (CSR) or governance practices and ROA. By controlling for these external factors, we can more accurately analyze the independent impact of CSR on financial performance.

Board size reflects the complexity of corporate governance structures and decision-making efficiency. While larger boards may provide enhanced oversight and resource support, they could also lead to reduced decision-making efficiency. Board size significantly impacts corporate financial performance and governance quality, which in turn affects a company's ability and effectiveness in fulfilling social responsibilities. By controlling for differences in board size, we can eliminate the influence of governance structure variations on ROA, enabling more accurate analysis of the independent role of corporate social responsibility in financial performance. This provides valuable insights for optimizing corporate governance structures.

The proportion of independent directors (Indep) serves as a key metric for assessing external oversight in corporate governance. A higher Indep ratio typically enhances shareholder protection, elevates governance quality, and consequently boosts financial performance and social responsibility fulfillment. These directors play pivotal roles in monitoring corporate conduct, providing expert advice, and promoting transparency. By controlling Indep ratios, researchers can isolate the impact of governance differences on ROA, accurately analyze the independent contribution of corporate

social responsibility to financial performance, and ensure the robustness and reliability of their findings.

The shareholding ratio of the largest shareholder (Top1) reflects equity concentration, which profoundly impacts corporate governance and decision-making mechanisms. A higher Top1 ratio may lead to more centralized control, potentially enhancing decision-making efficiency. However, it could also result in agency costs and conflicts of interest, thereby affecting the company's financial performance and capacity to fulfill social responsibilities. By controlling the Top1 ratio, we can eliminate the influence of equity structure differences on ROA, enabling a more accurate analysis of the independent role of corporate social responsibility in financial performance. This provides decision-making support for optimizing corporate equity structures.

Corporate age (Age) reflects a company's maturity and experience. Established firms typically possess a more stable customer base, mature management expertise, and stronger market adaptability, which positively impacts Return on Assets (ROA). However, older companies may also face historical burdens and rigid management mechanisms, potentially undermining financial performance. Significant variations in corporate age arise from differing founding timelines and growth trajectories. By controlling for corporate age, we can isolate the impact of life cycle differences on ROA, enabling more accurate analysis of the independent role of corporate social responsibility (CSR) in financial performance. This provides decision-making support for long-term strategic planning.

Table 1. Variable definition and description

Type of variable	Variable name
Explained variable	All capital earnings rate （roa）
Explanatory variable	Social responsibility coefficient（csr）
Controlled variable	Company size（size）
	Asset-liability ratio（lev）
	Long term debt to asset ratio（dlcr）
	Net profit on sales（netprofit）
	Board size（board）
	Proportion of independent directors（indep）
	The shareholding ratio of the largest shareholder（top1）
	Company age（age）

3.1.2 The construction of the empirical model

Here, i denotes the company, t the year, β_0 a constant, and$\beta_{1\text{-}9}$ the regression coefficients, with the error term.

3.2. Empirical results

3.2.1 Descriptive analysis

Table 2. Data description statistics

Variable	Obs	mean	Std. Dev.	Mini	Max
stock	11178	278617.47	275082.91	2	603366
year	11178	2016	2.582	2012	2020
ROE	11178	.058	.178	-7.662	.852
ROA	11178	.035	.059	-.912	.525
CSR	11178	.249	.162	-.184	.902
size	11178	22.508	1.36	19.078	28.636
lev	11178	.43	.203	.008	.959
dlcr	11178	.15	.165	0	.703
netprofit	11178	.076	.158	-1.544	.538
board	11178	2.145	.2	0	2.708
indep	11178	37.525	5.484	0	60
top1	11178	34.474	15.089	8.322	75.779
age	11178	27.096	5.024	15	45

As shown in Table 2, the average Return on Assets (ROA) stands at 0.035 with a standard deviation of 0.059, indicating overall low operational efficiency and significant volatility in asset management (ranging from-0.912 to 0.525). This suggests that some companies demonstrate markedly higher asset utilization efficiency than others, which may be attributed to factors such as industry characteristics, business strategies, market competitiveness, and cyclical fluctuations. The average Return on Equity (ROE) averages 0.058 with a wide standard deviation of 0.178, showing a significant dispersion in data distribution. The range from-7.662 to 0.852 highlights substantial disparities in profitability among sample companies, likely reflecting differences in business strategies, market positioning, industry cycles, and risk management capabilities. Corporate Social Responsibility (CSR) scores exhibit notable variation, averaging 0.249 with a standard deviation of 0.162 (ranging from-0.184 to 0.902), indicating that certain companies outperform others in CSR practices. Industry attributes significantly influence CSR performance—high-pollution sectors typically face greater social responsibility pressures, while other industries may demonstrate more proactive engagement. Variations in company size, governance levels, and CSR awareness may also contribute to these differences, reflecting diversity in CSR implementation and providing crucial context for studying its long-term value impact on enterprises. The average net profit margin (NPM) stands at 0.076 with a standard deviation of 0.158, reflecting significant volatility (ranging from-1.544 to 0.538) influenced by market demand, cost fluctuations, and competitive dynamics. Variations in operating strategies, product portfolios, and market positioning may lead to notable differences in NPM across companies. The average debt-to-asset ratio (Lev) is 0.43 (SD: 0.203), indicating that while most firms maintain reasonable leverage levels, some exhibit elevated debt ratios (maximum: 0.959). This may relate to corporate financing strategies, industry characteristics, and risk management capabilities, suggesting potential financial risks in certain companies. The long-term capital debt ratio (Dlcr) averages 0.15 (SD: 0.165) with a wide distribution (minimum: 0, maximum: 0.703), indicating higher long-term debt exposure in some firms. This could be linked to corporate long-term investment strategies, capital structure optimization, and industry competition. The average board size (Board) is 2.145 (SD: 0.2), reflecting minimal differences between companies (minimum: 0, maximum: 2.708). However, some firms may have unique governance structures requiring further analysis of their impact on corporate governance efficiency. The average proportion of independent directors (Indep) stands at 37.525% with a standard deviation of 5.484, indicating significant variations across companies (ranging from 0% to 60%), reflecting notable differences in governance structures. This may be related to corporate ownership structures, governance philosophies, and regulatory requirements, which could impact decision-making efficiency and independence. The average shareholding ratio of the largest shareholder (Top1) is 34.474% with a standard deviation of 15.089, showing a dispersed distribution (ranging from 8.322% to 75.779%), suggesting potential high equity concentration in some companies. This may be linked to corporate founding backgrounds, financing needs, and control arrangements, significantly influencing governance structures and strategic decisions. The average company age (Age) is 27.096 with a standard deviation of 5.024, indicating relatively concentrated company ages (ranging from 15 to 45 years). However, some companies may exhibit distinct development characteristics and competitive advantages due to earlier or later establishment timelines.

Table 3. Correlation analysis

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)ROA	1.000									
(2)CSR	0.377	1.000								
(3)size	-0.015	0.228	1.000							
(4)lev	-0.302	0.013	0.573	1.000						
(5)dlcr	-0.221	0.091	0.564	0.708	1.000					
(6)netprofit	0.765	0.343	0.025	-0.257	-0.092	1.000				
(7)board	0.029	0.103	0.233	0.148	0.164	0.044	1.000			
(8)indep	-0.010	0.007	0.068	0.011	0.033	-0.010	-0.511	1.000		
(9)top1	0.103	0.155	0.221	0.087	0.096	0.091	0.046	0.034	1.000	
(10)age	-0.020	0.056	0.077	0.167	0.171	0.026	0.104	-0.057	-0.074	1.000

As shown in Table 3, the correlation coefficient between the dependent variable (ROA) and the independent variable (CSR) is 0.377, indicating a statistically significant positive correlation. This suggests that corporate social responsibility (CSR) practices are positively correlated with a company's return on assets (ROA), meaning firms with strong CSR performance demonstrate higher asset management efficiency. This positive correlation may stem from CSR initiatives enhancing corporate social standing and strengthening stakeholder trust, which ultimately contributes to improved financial performance.

Regarding the correlations among variables: The correlation coefficient between ROA and Net Profit Margin (Netprofit) is 0.765, indicating a strong positive relationship between the two. This suggests that a company's sales profitability significantly enhances its asset operation efficiency. CSR shows a weak positive correlation (0.228) with company size, indicating that larger enterprises tend to allocate more resources to social responsibility initiatives. The negative correlation (-0.302) between ROA and Debt-to-Asset Ratio (Lev) suggests that higher debt levels correlate with lower total asset returns, potentially reflecting the negative impact of elevated financial risks on asset management efficiency. The minimal correlation (0.013) between CSR and Lev indicates no significant linear relationship between corporate social responsibility performance and financial leverage levels. Most variables maintain correlation coefficients below 0.2, with no extreme values near 1 or-1, confirming no significant multicollinearity issues. The selection of control variables demonstrates reasonable appropriateness, providing a solid foundation for subsequent empirical regression analysis and ensuring the validity of model estimation results. In conclusion, the correlation analysis demonstrates a positive correlation between corporate social responsibility (CSR) and return on assets (ROA), with no significant multicollinearity among the variables, confirming the reliability of the empirical regression model.

3.2.2 Regression result

Table 4. Linear regression

ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
CSR	.058	.004	15.61	0	.051	.065	***
size	.006	.001	11.90	0	.005	.007	***
lev	-.076	.004	-19.10	0	-.084	-.068	***
dlcr	-.034	.005	-7.49	0	-.043	-.025	***
netprofit	.066	.004	18.76	0	.059	.073	***
board	.004	.003	1.18	.237	-.002	.01	
indep	0	0	-0.37	.708	0	0	
top1	0	0	5.87	0	0	0	***
age	0	0	1.45	.148	0	0	
Constant	-.1	.013	-7.79	0	-.125	-.075	***
Mean dependent var		0.037		SD dependent var		0.057	
R-squared		0.206		Number of obs		9936	
F-test		286.025		Prob > F		0.000	
Akaike crit. (AIC)		-31098.015		Bayesian crit. (BIC)		-31025.976	

*** *p<.01, ** p<.05, * p<.1*

As shown in Table 4, corporate social responsibility (CSR) has a significant positive impact on return on assets (ROA), with a regression coefficient of 0.058. This indicates that for every 1-unit increase in CSR, ROA increases by an average of 0.058 units under constant conditions. The t-value of 15.61 and p-value below 0.01 demonstrate statistical significance, confirming the robustness of CSR's effect on ROA. The 95% confidence interval of 0.051 to 0.065 further verifies that CSR's positive impact on ROA is reliable and unaffected by random factors. These findings suggest that by fulfilling social responsibilities—such as environmental protection, employee welfare improvements, and public welfare activities—companies can enhance brand image, boost employee satisfaction and productivity, reduce operational risks, and gain capital market recognition, thereby positively

influencing asset returns. Therefore, enterprises should strengthen CSR practices by integrating them with core business strategies to optimize resource allocation efficiency. Simultaneously, establishing comprehensive performance evaluation and information disclosure mechanisms will further amplify CSR's role in improving financial performance and driving long-term sustainable development.

The table reveals that net profit margin (Netprofit), company size (Size), debt-to-asset ratio (Lev), and long-term capital debt ratio (Dlcr) significantly influence return on assets (ROA) in the regression model. Specifically, the regression coefficient for net profit margin (Netprofit) is 0.066 with a p-value below 0.01, indicating that companies with stronger profitability tend to achieve higher asset returns. The coefficient for company size (Size) is 0.006 ($p<0.01$), demonstrating that larger enterprises show a significant positive impact on ROA. The debt-to-asset ratio (Lev) exhibits a negative coefficient of-0.076, suggesting that higher leverage may increase financial risks and consequently suppress asset returns. Similarly, the long-term capital debt ratio (Dlcr) displays a negative coefficient of-0.034, indicating that elevated long-term debt levels could negatively affect asset returns. These significant results confirm the critical role of control variables in corporate profitability, providing a reliable framework for studying the net effect of corporate social responsibility (CSR) on ROA. The findings also highlight the pivotal influence of corporate financial structure and operational efficiency on asset returns.

As shown in Table 5, all independent variables have VIF values below 10, with the Mean VIF column showing 1.575, indicating no multicollinearity issues.

Table 5. Multiple collinearity test

	VIF	1/VIF
lev	2.458	.407
dlcr	2.205	.454
size	1.898	.527
board	1.531	.653
indep	1.441	.694
netprofit	1.274	.785
CSR	1.229	.814
top1	1.08	.926
age	1.056	.947
Mean VIF	1.575	.

Table 6. Panel regression

Variable	ROA		
CSR	0.062***	0.061***	0.016***
	(0.004)	(0.004)	(0.004)
size			0.027***
			(0.002)
lev			-0.133***
			(0.007)
dlcr			-0.006
			(0.008)
netprofit			0.006
			(0.004)
board			0.005
			(0.006)
indep			0.000
			(0.000)
top1			0.000***
			(0.000)
Constant	0.022***	-0.007	-0.528***
	(0.001)	(0.010)	(0.039)
Industry	NO	YES	YES

Year	NO	YES	YES
Observations	9,936	9,936	9,936
R-squared			0.090
Number of stock	1,242	1,242	1,242

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table 6 presents the panel regression results with Return on Assets (ROA) as the dependent variable. Social responsibility (CSR) demonstrates a statistically significant positive impact on ROA, with a regression coefficient of 0.062, standard error of 0.004, and a p-value below 0.01, indicating extremely significant results. This suggests that, after controlling for other variables, a 1-unit increase in CSR leads to an average 0.062-unit increase in ROA. The findings further validate the statistical significance and robustness of CSR's positive effect on ROA, revealing that corporate social responsibility significantly enhances asset return rates.

Regarding control variables, firm size (size) shows a significant positive impact on ROA, with a regression coefficient of 0.027, standard error of 0.002, and a p-value below 0.01, indicating that larger firms achieve higher total asset returns. The debt-to-asset ratio (lev) exhibits a significant negative correlation (-0.133, SE=0.007, p<0.01), suggesting that higher leverage reduces ROA. The long-term debt-to-capital ratio (dlcr) shows a marginal effect (-0.006, SE=0.008, p=0.008), indicating no significant impact on ROA. The netprofit margin (netprofit) demonstrates a clear positive relationship (0.006, SE=0.004, p<0.01), with higher margins correlating to higher ROA. Board size (board) and independent director ratio (indep) show negligible effects (0.005 and 0.000 respectively, p-values>0.01). The top1 shareholder ownership ratio (top1) has a statistically insignificant effect (0.000, SE=0.000, p<0.01). The overall model's R^2 of 0.090 indicates that explanatory and control variables collectively explain approximately 9.0% of ROA variations. Although the R^2 value is relatively low, the F-test significance (Prob>F=0.000) confirms the model's overall validity. Furthermore, the model incorporates fixed effects for industry and year to account for potential heterogeneity.

In conclusion, the panel regression results further validate the significant positive effect of CSR on corporate asset return rates (ROA), while revealing the complex impacts of other financial characteristics (e.g., company size, debt-to-asset ratio) on ROA. Companies should strengthen their social responsibility strategy management and optimize capital structure and operational efficiency to achieve higher asset returns and sustainable development goals.

3.2.3 Endogeneity test

Table 7. Endogenous test

Variable	firstcsr CSR	second ROA
instrumental variable（avcsr）	0.555***	
	(0.041)	
size	0.022***	0.003***
	(0.001)	(0.001)
lev	-0.036***	-0.070***
	(0.011)	(0.004)
dlcr	-0.030**	-0.036***
	(0.013)	(0.005)
netprofit	0.288***	0.032***
	(0.009)	(0.009)
board	0.019**	0.001
	(0.008)	(0.003)
indep	0.000	-0.000

	(0.000)	(0.000)
top1	0.001***	0.000***
	(0.000)	(0.000)
age	0.001***	-0.000
	(0.000)	(0.000)
CSR		0.168***
		(0.029)
Constant	-0.483***	-0.053***
	(0.034)	(0.018)
Observations	9,936	9,936
R-squared		0.136

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

The study employed a two-stage least squares (2SLS) approach to address the endogeneity issue in Corporate Social Responsibility (CSR) analysis. In the first-stage regression, CSR was treated as the dependent variable, with average industry social responsibility (avcsr) serving as the instrumental variable. Control variables included firm size (size), debt-to-asset ratio (lev), long-term capital debt ratio (dlcr), netprofit margin (netprofit), board size (board), independent director ratio (indep), top shareholder ownership (top1), and firm age (age). Results showed that the instrumental variable avcsr significantly influenced CSR (coefficient: 0.555, p <0.01), confirming its strong correlation with CSR and meeting the instrumental variable relevance condition. In the second-stage regression, return on assets (ROA) was the dependent variable, with explanatory variables including the CSR fitted value from the first stage and the aforementioned control variables. The results demonstrated a significant positive impact of CSR on ROA (coefficient: 0.168, p <0.01), indicating a significant positive correlation between enhanced corporate social responsibility and improved total asset return. Additionally, firm size (size) had a significant positive effect on ROA, while debt-to-asset ratio (lev) and long-term capital debt ratio (dlcr) showed significant negative impacts. Net profit margin (netprofit) also exhibited a significant positive effect on ROA. The study demonstrates that board size, independent director ratio, top1 shareholder ownership, and company age show no significant impact on ROA. By employing instrumental variable methods to address endogeneity issues in CSR, the research reveals that enhanced corporate social responsibility (CSR) significantly improves financial performance, as measured by ROA. This finding provides robust empirical evidence for understanding the relationship between CSR and corporate financial performance.

3.2.4 robustness test

Table 8. Robustness test

Variable		ROE	
CSR	0.171***	0.166***	0.026*
	(0.012)	(0.013)	(0.015)
size			0.083***
			(0.006)
lev			-0.242***
			(0.026)
dlcr			-0.092***
			(0.026)
netprofit			-0.030**
			(0.013)
board			0.013
			(0.020)
indep			0.001
			(0.001)

top1			0.001***
			(0.000)
Constant	0.021***	-0.023	-1.734***
	(0.003)	(0.026)	(0.137)
Industry	NO	YES	YES
Year	NO	YES	YES
Observations	9,936	9,936	9,936
R-squared			0.042
Number of stock	1,242	1,242	1,242

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

To ensure robustness of the results, we adopted a modified measurement method using Return on Equity (ROE) as the dependent variable. As shown in Table 8, Column (1) presents regression results without control variables and without controlling for industry and year effects. The results indicate that CSR has a positive impact on ROE at the 1% significance level, with a regression coefficient of 0.171. Column (2) shows the results after adding control variables while keeping industry and year effects fixed. Here, CSR still demonstrates a positive effect on ROE at the 1% level, with a coefficient of 0.166. Column (3) presents the results after controlling for variables while maintaining fixed industry and year effects. The coefficient remains positive at the 1% level, with a reduced coefficient of 0.026. Robustness tests confirm consistency between these results and the original study, demonstrating high reliability of the conclusions.

3.2.5 heterogeneity test

Table 9. Heterogeneity test

Variable	ROA		
	(1)	(2)	(3)
	East	Mid	West
CSR	0.019***	-0.018*	0.023***
	(0.006)	(0.009)	(0.009)
size	0.030***	0.023***	0.021***
	(0.002)	(0.004)	(0.003)
lev	-0.131***	-0.112***	-0.153***
	(0.009)	(0.016)	(0.016)
dlcr	-0.009	0.004	-0.015
	(0.010)	(0.015)	(0.016)
netprofit	0.006	0.009	-0.005
	(0.005)	(0.008)	(0.009)
board	0.008	0.021	-0.011
	(0.007)	(0.014)	(0.012)
indep	0.000	0.001	-0.000
	(0.000)	(0.000)	(0.000)
top1	0.000***	-0.000	0.000**
	(0.000)	(0.000)	(0.000)
Constant	-0.607***	-0.485***	-0.338***
	(0.051)	(0.095)	(0.078)
Observations	7,013	1,289	1,634
R-squared	0.096	0.090	0.117
Number of stock	882	163	211

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Heterogeneity analysis reveals significant regional variations in the impact of corporate social responsibility (CSR) on return on assets (ROA). In eastern China, CSR demonstrates a significant positive effect on ROA (regression coefficient: 0.019, $p < 0.01$), indicating that corporate social responsibility practices effectively enhance asset returns. This phenomenon may stem from the region's developed economy and intense market competition, where CSR initiatives strengthen brand image and market competitiveness, thereby gaining greater social recognition and resource support. In central China, CSR shows a negative correlation with ROA (regression coefficient: -0.018, $p < 0.1$), suggesting potential adverse effects on financial performance. This may be attributed to the region's relatively underdeveloped economy, where enterprises prioritize short-term financial outcomes over the long-term value of social responsibility, coupled with CSR's higher costs and lower returns. In western China, CSR exhibits the most pronounced positive impact on ROA (regression coefficient: 0.023, $p < 0.01$), demonstrating that corporate social responsibility significantly improves asset returns. This is likely due to the region's strong governmental emphasis on social responsibility, enabling enterprises to secure policy support and resources while enhancing social image and market acceptance. Overall, companies should develop tailored CSR strategies based on regional economic conditions and development levels. The enterprises in the eastern region should continue to strengthen the CSR strategy management and enhance the brand competitiveness; the enterprises in the central region should gradually realize the long-term value of CSR while paying attention to the short-term financial performance; the enterprises in the western region should make full use of the policy support and actively fulfill the social responsibility to achieve the win-win situation of financial performance and social responsibility.

4. Conclusion

Based on the empirical analysis results and conclusions, this study examines the relationship between total asset return (ROA) as the dependent variable, corporate social responsibility (CSR) as the independent variable, and other variables as control variables. The findings demonstrate that CSR has a significant positive impact on corporate profitability. The panel regression analysis reveals a CSR coefficient of 0.062, which is statistically significant at the 1% level, indicating that corporate social responsibility significantly enhances asset return. This conclusion is further validated by robustness tests. Although the effect strength of the independent variable shows slight variations, the positive direction and statistical significance remain consistent, reinforcing the robustness of CSR in boosting corporate profitability.

The analysis of control variables reveals the complex impacts of various financial factors on corporate profitability. Specifically, company size (size) demonstrates a significant positive effect on ROA, indicating that larger enterprises can enhance asset operation efficiency and profitability. Net profit margin (netprofit) also shows a significant positive correlation with ROA, reflecting that improved core business profitability serves as a key driver for higher asset returns. Conversely, debt-to-asset ratio (lev) and long-term capital debt ratio (dlcr) exhibit significant negative effects on ROA, suggesting that excessive debt levels may increase financial risks and reduce asset return efficiency. While the effects of board size (board), independent director ratio (indep), and top1 shareholder ownership (top1) show weak significance across models, their potential influence on corporate governance structure and financial health remains noteworthy.

Based on the research findings, the following recommendations merit attention: First, companies should integrate social responsibility into their core development strategies. By implementing sustainable development initiatives, environmental protection measures, and social welfare programs, they can enhance corporate reputation and competitiveness, thereby boosting profitability. Second, enterprises should prioritize the role of net profit margin in profit management. This can be achieved through improving product and service quality, optimizing cost management, and ensuring steady growth in core business profitability. Third, companies need to strengthen asset-liability management, avoid over-reliance on debt financing, and reduce financial risks by optimizing capital structure to

provide solid support for profitability. Fourth, companies should optimize corporate governance structures by reasonably allocating board size and the proportion of independent directors, thereby enhancing decision-making efficiency and oversight effectiveness.

Finally, to further enhance the impact of CSR on profitability, it is recommended that governments and regulators refine relevant policy frameworks. By implementing incentive mechanisms and regulatory measures, they can encourage companies to actively fulfill their social responsibilities. Simultaneously, capital markets should be guided to incorporate CSR performance into investment decisions, thereby creating a win-win scenario for businesses, society, and financial markets.

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