



Research on the Impact of Corporate Social Responsibility on Corporate Value in Different Industries — Based on the Analysis of the Mediation Effect, the Regulation Effect and the GMM Model of Dynamic Panel System

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Abstract: This paper focuses on listed companies in three sub-sectors of real estate, health care and information technology services, on the basis of studying the direct relationship between corporate social responsibility and its value, introduces the tax burden as an intermediary variable, studies the difference between the relationship established by the intermediary role of the two through the intermediary role of the tax burden compared to the direct relationship, and explores the degree of equity concentration, institutional investor shareholding degree in the moderating role between corporate social responsibility and value, respectively. The dynamic panel system GMM model is used to explore the impact of the first phase of enterprise value lag on its same period. Empirical analysis shows that in the sample of listed companies selected from the three industries, corporate social responsibility has a positive impact on corporate value, and the tax burden plays a certain intermediary role in it, the equity concentration of enterprises in different industries and the shareholding of institutional investors play a slightly different role in regulating corporate social responsibility and corporate value, and only the enterprise value of the healthcare industry lagging by one period has a significant impact on the current period.

Keywords: social responsibility, corporate value, intermediary effect and regulatory effect, sobel inspection, dynamic panel system, GMM Model

1. Introduction

Since the reform and opening up, China's economy has grown rapidly, but it has the extensive growth characteristics of "high investment, high energy consumption, low efficiency, and low technological progress", accompanied by problems such as employee health, product quality and safety. As an important economic growth unit of the country, enterprises should also give back to the society, and promote the progress of the industry through social responsibility measures such as processing high-quality products, paying taxes according to law, and appropriate donation services, the integration of the industry, the development of the region and the stability of the country. Corporate social responsibility activities can be traced back to the 80s of the last century, European and American enterprises since then, in order to save the public image, in response to social appeals involving green environmental protection, human rights and other content, production focus began to shift from a single concern for product quality, to care about product quality, the environment, occupational health and labor security and other aspects, and some European and American enterprises formulated the responsibility code of responsibility for making necessary commitments to society to meet the requirements of consumers and society, and corporate social responsibility began to take shape.

Regarding the relationship between corporate social responsibility and corporate value, there are many research results, some scholars from the perspective of stakeholders, that corporate social responsibility can increase the wealth of shareholders, thereby improving the value of enterprises, some scholars based on the theory of agency, then think that the characteristics of the separation of the right to operate and ownership of modern enterprises make the executives responsible for the daily operation of enterprises, based on their own interests, pay a high cost of corporate social responsibility to improve personal reputation, which will reduce the value of enterprises. Other scholars believe that the cost of social responsibility incurred by enterprises is significant, but it is usually offset by the reduction of other expenses caused by it, showing that corporate social responsibility and corporate value are unrelated.

2. Domestic and foreign research

2.1 Literature review

2.1.1 The relationship between equity concentration, institutional investor shareholding and tax burden and corporate value

In terms of the relationship between equity concentration and enterprise value, Jiang Zefang, Chen Zuying et al. (2019) analyzed the relationship between executive compensation, equity concentration and enterprise value, and proposes that the equity concentration and executive compensation of enterprises promote enterprise performance, and the role of executive compensation of state-owned enterprises in promoting enterprise performance is more obvious than that of state-owned enterprises. Wang Lili, Han Daoqin et al. (2021) proposed that equity concentration and R&D investment can promote the improvement of corporate value, and R&D investment plays a certain intermediary role between equity concentration and company performance. Umarjan Aishan et al. (2021) believed that institutional investor shareholding can significantly increase corporate value, and ESG performance plays a part of the intermediary role between the two. In addition, compared with transactional institutional investors, stable institutional investors are more active in participating in the company's production and operation decisions, and their role in ESG performance and corporate value is more significant. Liu Xumeng, Huang Rongbing (2018) concluded that the inclusion of enterprises into institutional investors is conducive to the improvement of corporate value, and the higher the shareholding ratio of institutional investors, the faster the enterprise value increases, and at the same time, the quality of environmental information disclosure also has a significant role in promoting corporate value, but the shareholding ratio of institutional investors weakens the promotion effect of environmental information quality on corporate value to a certain extent. As for the tax burden, Lian Min (2014) found that compared with state-owned enterprises, the reduction of the tax burden of private enterprises will only increase the value of enterprises when government intervention is not serious, while compared with central state-owned enterprises, regardless of whether the government intervention is serious or not, the high tax burden of local state-owned enterprises has no significant impact on their value.

2.1.2 The relationship between social responsibility and equity concentration, institutional investor shareholding and tax burden

In terms of the relationship between social responsibility and equity concentration, the study of Li Wenqin and Xu Guanghua (2017) found that executive compensation and executive shareholding level have a positive impact on corporate social responsibility performance, and the proportion of state-owned equity will play a negative regulatory role in the positive relationship between executive compensation and social responsibility performance, while the proportion of state-owned equity will have a positive adjustment effect on the positive correlation between executive shareholding and social responsibility performance. Lv Suli et al. (2016) concluded that the relationship between the shareholding ratio of executives and the assumption of corporate social responsibility has turned from positive to negative, showing an inverted U-shape. The level of social responsibility commitment of state-owned enterprises is higher than that of non-state-owned enterprises, and the shareholding of executives of non-state-owned enterprises has a more significant non-linear relationship with social responsibility commitment. Quan Jingjing (2022) proposed that the higher the institutional investor's shareholding, the higher the probability of corporate social responsibility reporting and the better the quality. However, the governance performance of pressure-sensitive institutional investors with business dependence on enterprises is lower than that of pressure-resistant institutional investors who only have an investment relationship with enterprises, while among enterprises with higher social responsibility performance, the positive effect of institutional investor shareholding on CSR information disclosure is more significant. Yin Hong and Li Xiaohui (2019) believed that the shareholding of independent institutional investors on the disclosure of corporate social responsibility information is not significant, the shareholding of non-independent institutional investors can significantly promote the disclosure of corporate social responsibility information, and in terms of the nature of corporate property rights, there is a complementary effect between the shareholding of independent institutional investors of state-owned enterprises and the disclosure of corporate social responsibility information, and there is a substitution effect between the shareholding of non-independent institutional investors of state-owned enterprises and the disclosure of corporate social responsibility information. Zhu Naiping, Dai Chenxi et al. (2022) proposed that tax incentives can improve after-tax cash flow, which is more conducive to the fulfillment of corporate social responsibility and alleviates financial pressure. Preferential tax policies can encourage the full implementation of corporate social responsibility, such as encouraging enterprises to fulfill social responsibilities such as shareholder responsibility, employee responsibility, environmental responsibility and social public responsibility.

2.1.3 The relationship between corporate social responsibility and corporate value

Robert and Robin (1992) argued that social responsibility increases a company's operating costs over a certain period of time, thereby adversely affecting corporate value. Li Zheng (2006) concluded that from the perspective of the current period, the more enterprises that assume social responsibility, the lower the corporate value; But in the long run, according to the key stakeholder theory and the social capital theory, social responsibility does not reduce the value of the enterprise. Li Ting, Li Yu et al. (2021) showed that the fulfillment of corporate social responsibility is significantly related to corporate value, among which social responsibility to shareholders, employees, suppliers and governments is positively correlated with corporate value, and social responsibility to creditors and customers is negatively correlated with corporate value. Based on the theory of capital markets, Jin Guirong (2022) deduced that the discovery of corporate social responsibility value mainly depends on the effectiveness of the capital market, the adequacy of information disclosure and the value standards of investors, and proposes to improve corporate value through the analysis and implementation of social responsibility strategy analysis and optimization. Xiaoxu Kong, Yi Guo et al. (2017) introduced corporate social responsibility indicators into the corporate value assessment model and found that corporate social responsibility can affect the overall value of enterprises by influencing the long-term growth rate of enterprises' free cash flow, weighted average cost of capital and net profit after tax in detail.

2.2 Overview

The current domestic and foreign literature on the relationship between corporate social responsibility and corporate value has been studied to a certain extent, and the company is classified on the basis of scale and geographical characteristics, using dynamic panel GMM estimation, analytic hierarchy method and other methods to improve the interpretation of the research, with high reference, but did not draw a definite relationship between corporate social responsibility and corporate value, and also paid more attention to the direct relationship between the two, and ignored the impact of other factors between the two, sample selection, Nor is there a fine distinction between industries. This study has the following extensions and breakthroughs:

(1) Based on different theoretical foundations, it reveals the behavioral motivations and internal mechanisms of the impact of corporate social responsibility on corporate value, and provides a certain supplement to the current theoretical research framework.

(2) Conduct industry segmentation, select three national key industries of health care, real estate and information technology service industry for targeted analysis, and reveal the differences in the relationship between social responsibility and corporate value in different industries.

(3) Introduce the tax burden as an intermediary variable, explore the intermediary effect of the tax burden between corporate social responsibility and corporate value, and link the two more deeply. At the same time, equity concentration is introduced, and the shareholding ratio of institutional investors is used as a regulatory variable to study whether their related effects on corporate social responsibility and its value have played a regulatory role.

(4) Using the dynamic panel system GMM model, the endogenous influence is eliminated, and whether the enterprise value of different industries lagging in phase 1 has a significant impact on the value of the current period, so as to improve the breadth and depth of the research coverage.

3. Study design and descriptive statistics

3.1 Sources of data

This paper selects panel data from 2016 to 2020, so as to avoid the undesirable phenomena brought about by the stock market boom and fall in 2015 and conform to the development boom of corporate social responsibility. Taking the A-share listed companies as a sample, the ST stocks and enterprises with missing data are excluded, and the enterprises listed during this period are excluded. The sample data are derived from the wind database and the China Stock Market & Accounting Research Database (csmar), of which the company's financial data comes from the wind database, and the corporate social responsibility contribution value per share data comes from the China Stock Market & Accounting Research Database (csmar). According to the industry classification standards, 103 enterprise samples in the real estate industry, 61 enterprise samples in the healthcare service industry and 179 enterprise samples in the information technology service industry were selected.

3.2 Variable selection

Table 1. Variable definition

Variable category	Variable connotations	Metrics	symbol	Variable description and assignment units
Explained variable	Enterprise value	Return on equity	ROE	Net Profit/Average Net Assets (excluding uncurrent profit or loss)
Core explanatory variable	Social responsibility	Social contribution value per share	CSR	Social contribution value per share = (Net profit + total tax payment + staff expense + Interest expense + Total public welfare input – social cost) / Main business income
Moderator variable	Equity concentration	Top 10 shareholders Equity percentage	Top10	(Unit: %)
	Institutional investors hold shares	Institutional investors Equity percentage	Institution	(Unit: %)
Mediation variable	Tax burden	Annual tax expenses	Tax	ln(Tax expenses +1)
	Financial risk	Financing costs	FC	Finance expenses/Average total liabilities (Unit: %)
	Growth ability	Revenue growth rate	SGR	Increase in operating income/ Total operating income in the previous year (Unit: %)
Control variables	Capital structure	Gearing ratio	Leverage	Total assets at the end of the year / Total liabilities at the end of the year (Unit: %)
	Capital intensity	Fixed asset ratio	NCA	Fixed assets/Total assets (Unit: %)
	Enterprise innovation	Annual R&D expenditure expenses	R&D	ln(R&D expenditure +1)
	Solvency	Quick ratio	CR	Quick Assets/Current Liabilities (Unit: %)

3.2.1 Explained variable

TobinQ is a commonly used indicator of corporate value, but it is greatly affected by stock price fluctuations, while China's stock market has a certain degree of investment and operability, and stock prices do not necessarily refer to the long-term value of enterprises. This article uses financial metrics, the return on net assets (ROE) of non-recurring profit or loss, to reflect the company's ability to create value.

3.2.2 Core explanatory variable

The social contribution value per share reflects the proportion of the company's social revenue and expenditure to the main business income, which is an authoritative and comprehensive indicator, the higher the social contribution value per share, the higher the proportion of the company's main business income that contributes to society, and the higher the level of corporate social responsibility fulfillment.

3.2.3 Moderator variable

The proportion of equity held by the top 10 shareholders and the proportion of equity held by institutional investors were selected to measure the equity concentration of the regulatory variables and the shareholding of institutional investors.

3.2.4 Mediation variable

The author chooses the annual tax fee to represent the tax burden of the enterprise this year, due to the huge amount of annual tax expenses, direct inclusion in the model will increase the impact of extreme data on the empirical results, bringing uncertainty, so this paper will take the variable annual tax cost logarithmic to weaken the adverse effects.

3.2.5 Control variables

Financial risk: Enterprises are facing serious financial difficulties, when they cannot raise enough funds, may miss excellent investment opportunities, which will hinder the development of the company, affect the long-term value of the enterprise, the use of financing costs as a measure of financial risk indicators.

Growth ability: growth ability reflects the current development speed and future development potential of the enterprise, the stronger the growth ability of the enterprise, indicating that its ability to create value is higher, indicating that the management has a good conception and judgment of the development blueprint of the enterprise, and the long-term value of the enterprise will be improved.

Capital structure: The asset-liability ratio, also known as financial leverage, is often used to reflect the capital structure of an enterprise. The higher the asset-liability ratio, the relatively abundant assets of the enterprise, which can get rid of

the problem of financial difficulties, so as to make more benign investment and improve the core technology level of the enterprise, so as to obtain a higher return on investment and improve the value of the enterprise.

Capital intensity: The higher the proportion of fixed assets to total assets, the closer the enterprise is to the capital-intensive enterprise. Compared with labor-intensive enterprises with insufficient resources, or insufficient resource development and relatively low level of science and technology, capital-intensive enterprises can use their advanced equipment to improve production efficiency, high capital value composition, high level of automation, and can have a significant impact on the value of enterprises.

Enterprise innovation: Although the huge R&D expenditure in the early stage of development will hinder the capital turnover speed of the enterprise, the short-term will weaken the value of the enterprise, but in the long run, the higher the R&D investment, the enterprise relative to the peer company, the economic benefits to the enterprise have greater uncertainty, the impact on the value of the enterprise depends on whether the R&D expenditure can produce new technology, if the R&D failure, then the R&D expenditure will become the sunk cost of the enterprise, the enterprise value will have a negative impact.

Solvency: The quick ratio measures the ability of an enterprise's current assets to be immediately realized to repay current liabilities, and is the most commonly used indicator to reflect solvency. The higher the quick ratio, the more secure the solvency of the enterprise. However, the excessively high quick ratio also reflects the inefficiency of the use of funds by enterprises, which increases the opportunity cost in vain.

3.3 Model constructing

3.3.1 Mediation effect model

In order to study the impact of corporate social responsibility on corporate value, this paper constructs model 1:

$$ROE_{it} = \delta_1 + cCSR_{it} + \varphi_i Control_{it} + e_1 \quad (1)$$

In order to study the impact of corporate social responsibility on tax burden, this paper constructs a model 2:

$$Tax_{it} = \delta_2 + aCSR_{it} + \varphi_i Control_{it} + e_2 \quad (2)$$

In order to test whether the tax burden plays an intermediary role between corporate social responsibility and corporate value, this paper constructs a model 3:

$$ROE_{it} = \delta_3 + c' CSR_{it} + bTax_{it} + \varphi_i Control_{it} + e_3 \quad (3)$$

Substituting model (2) into model (3) yields:

$$ROE_{it} = (b\delta_2 + \delta_3) + (c' + ab) CSR_{it} + (\gamma + b\beta) Control_{it} + (be_2 + e_3)$$

Wherein, ROE_{it} is the parameter of the enterprise value of the explanatory variable, CSR_{it} is the parameter of the explanatory variable corporate social responsibility, Tax_{it} is the parameter of the tax burden of the intermediary variable, φ_i is the coefficient of each control variable, $Control_{it}$ is the control variable, δ_m ($m=1,2,3$) is the constant part, e_j ($j=1,2,3$) is the random error term, and a, b, c, c' and φ_i are the corresponding coefficients.

In order to improve the robustness of the results and avoid pseudo-regression problems, after performing the stepwise regression method, we used the sobel test method to determine whether the test coefficient ab in model 2 and model 3 was significantly 0, so as to determine whether the tax burden played a significant mediating role between corporate social responsibility and value. The Sobel test needs to construct the test statistics z , where the s_a and s_b represent the standard error corresponding to the coefficients a and b , respectively.

$$z = \frac{ab}{\sqrt{a_2s_b^2 + b_2s_a^2}}$$

3.3.2 Modulation effect model

In this paper, the following model 4 and model 5 are constructed by introducing interactive items to study the moderating role of equity concentration and institutional investor shareholding between corporate social responsibility and corporate value:

$$ROE_{it} = \beta_0 + \beta_1 CSR_{it} + \beta_2 CSR_{it} \times Top10_{it} + \varphi_i Control_{it} + e_4 \quad (4)$$

$$ROE_{it} = \beta_0 + \beta_1 CSR_{it} + \beta_2 CSR_{it} \times Institution_{it} + \varphi_i Control_{it} + e_5 \quad (5)$$

Among them, the ROE_{it} is the parameter of the enterprise value of the explanatory variable, the CSR_{it} is the parameter of the explanatory variable corporate social responsibility, the $Top10_{it}$ and the $Institution_{it}$ indicate the variable equity concentration and institutional investor shareholding respectively, the φ_i is the coefficient of each control variable, the $Control_{it}$ is the control variable, and the e_j ($j=4,5$) is the random error term.

3.3.3 Dynamic panel system GMM model

Considering that the current enterprise value will also be affected by the enterprise value of the previous period, and in order to avoid the influence of endogeneity, this paper uses the dynamic panel system GMM model, which uses the lag of the explanatory variable ROE as the explanatory variable to construct a model 6:

$$ROE_{it} = \beta_0 + \beta_1 CSR_{it} + \beta_2 ROE_{it-1} + \varphi_i Control_{it} + e_6 \quad (6)$$

Among them, ROE_{it} is the parameter of the enterprise value of the explanatory variable, the ROE_{it-1} is the parameter of the lag period 1 term of the enterprise value, the CSR_{it} is the parameter of the explanatory variable csr social responsibility, the φ_i is the coefficient of each control variable, the $Control_{it}$ is the control variable, and the e_6 is the random error term.

3.4 Descriptive Analysis

Table 2. Descriptive statistical analysis results of the whole sample by industry

	Information technology services industry				Healthcare industry				Real estate industry			
	Average	Std.	Min	Max	Average	Std.	Min	Max	Average	Std.	Min	Max
ROE	0.0518	0.1599	-1.2489	0.6950	0.1185	0.1780	-1.3376	1.2951	0.0909	0.1244	-0.9247	0.6515
CSR	1.2873	1.9902	-4.7223	30.7287	2.1538	2.4640	-1.5474	26.1854	1.9203	2.1508	-2.1868	16.4823
Top10	0.5226	0.1500	0.1500	1.0000	0.5932	0.1387	0.3000	1.0000	0.6027	0.1454	0.1600	0.9000
Institution	0.2637	0.1866	0.0000	0.8700	0.4402	0.2202	0.0000	0.8300	0.5296	0.1815	0.0100	0.8700
Tax	8.0069	1.2818	1.0940	11.0633	8.7278	1.4129	3.5872	12.1983	10.8107	1.6961	0.0000	15.0933
FC	0.0047	0.0055	-0.0004	0.0327	0.0074	0.0073	-0.0004	0.0454	0.0112	0.0113	-0.0000	0.1546
SGR	0.1990	0.4522	-0.7000	6.4400	0.2357	0.5320	-0.5100	5.6400	0.2575	1.2197	-0.8800	19.7700
Leverage	0.3341	0.1572	0.0400	0.8600	0.4138	0.2018	0.0700	0.9500	0.6641	0.1758	0.1000	0.9400
NCA	0.3571	0.1788	0.0155	0.9343	0.3852	0.1828	0.0766	0.9047	0.2196	0.1793	0.0075	0.9421
R&D	9.2038	1.6036	0.0000	12.3951	7.3216	3.3508	0.0000	12.2527	1.8772	3.3859	0.0000	10.4229
CR	2.6866	2.7376	0.1749	36.2462	2.0521	1.5615	0.3074	11.2559	0.7272	0.7140	0.0865	5.9139

The average and standard deviation and extreme difference of the return on net assets of the healthcare industry are significantly greater than those of the other two industries, indicating that the listed companies in the healthcare industry are generally more valuable, and the value fluctuations of different enterprises are also higher; At the same time, the average value of social responsibility contribution per share of the health care industry is 2.1538, and the standard deviation is 2.4640, which is the highest in the three industries; the average level and fluctuation range of the tax burden of listed companies in the real estate industry are significantly greater than those of the other two industries, indicating that the tax burden of listed companies in the health care industry is heavier and the difference between individuals is larger. The average levels of equity concentration and institutional investor shareholding in the real estate industry were 0.6027 and 0.5296, respectively, which were slightly higher than those of the other two industries.

4. Result

4.1 Variable correlation analysis

The results of Pearson correlation analysis for the three industries are shown in table 3. In summary, the sample data of the three industries have passed the correlation test, and the correlation coefficient between the explanatory variables is basically maintained within 0.6, which can preliminarily determine that there is no serious multicollinearity problem between

the variables, and the specific role and relationship between the variables need to be further verified by the regression analysis process.

Table 3. Pearson correlation coefficients

Information technology services industry											
	ROE	CSR	Top10	Institution	Tax	FC	CR	SGR	R&D	Leverage	NCA
ROE	1.000										
CSR	0.408***	1.000									
Top10	0.286***	0.137***	1.000								
Institution	0.094***	0.143***	0.199***	1.000							
Tax	0.148***	0.171***	-0.018	0.291***	1.000						
FC	-0.300***	-0.088***	-0.165***	0.069**	0.130***	1.000					
CR	0.074**	-0.033	0.141***	-0.158***	-0.309***	-0.341***	1.000				
SGR	0.225***	0.061*	0.136***	0.022	0.103***	-0.090***	-0.044	1.000			
R&D	0.101***	0.412***	-0.101***	0.213***	0.575***	0.011	-0.116***	0.010	1.000		
Leverage	-0.194***	0.036	-0.074**	0.209**	0.174***	0.563***	-0.598***	-0.010	0.035	1.000	
NCA	-0.066*	-0.100***	-0.190***	0.014	0.225***	0.238***	-0.201***	0.081**	0.109***	-0.157***	1.000
Healthcare industry											
	ROE	CSR	Top10	Institution	Tax	FC	CR	SGR	R&D	Leverage	NCA
ROE	1.000										
CSR	0.536***	1.000									
Top10	0.172***	0.102*	1.000								
Institution	0.067	0.206***	0.204***	1.000							
Tax	0.335***	0.472***	0.121***	0.407***	1.000						
FC	-0.401***	-0.005	-0.202***	0.093	0.161***	1.000					
CR	0.193***	-0.108*	0.231***	-0.269***	-0.074	-0.505***	1.000				
SGR	0.466***	0.528***	0.010	-0.073	0.216***	-0.074	0.064	1.000			
R&D	0.237***	0.053	0.103*	-0.053	0.133**	-0.156***	0.144**	0.055	1.000		
Leverage	-0.248***	0.147***	-0.162***	0.308***	0.266***	0.742***	-0.723***	-0.116**	-0.257***	1.000	
NCA	-0.195***	-0.279***	-0.214***	-0.094	-0.296***	0.034	-0.107*	-0.001	0.121**	-0.265***	1.000
Real estate industry											
	ROE	CSR	Top10	Institution	Tax	FC	CR	SGR	R&D	Leverage	NCA
ROE	1.000										
CSR	0.504***	1.000									
Top10	0.253***	0.316***	1.000								
Institution	0.159***	0.369***	0.632***	1.000							
Tax	0.355***	0.551***	0.377***	0.334***	1.000						
FC	-0.110**	0.077*	0.031	0.139***	0.126***	1.000					
CR	-0.055	-0.153***	-0.068	-0.032	-0.261***	-0.138***	1.000				
SGR	0.090**	0.031	-0.045	-0.045	-0.023	-0.034	-0.080*	1.000			
R&D	-0.003	0.118***	-0.017	-0.061	0.156***	-0.054	0.024	0.007	1.000		
Leverage	0.118***	0.378***	0.235***	0.219***	0.494***	0.188***	-0.634***	0.011	-0.007	1.000	
NCA	-0.157***	-0.102**	-0.014	0.090**	-0.138***	0.180***	0.085*	-0.046	0.084*	-0.420***	1.000

Note: *, **, *** represent significant at the 10%, 5%, and 1% levels, respectively.

4.2 Basic test results

4.2.1 Information technology services industry

In the information technology service industry, the explanatory variables social responsibility contribution value (CSR), operating income growth rate (SGR), research and development investment (R&D) and capital intensity (NCA) had a significant positive impact on enterprise value (ROE), while financing cost (FC) and asset-liability ratio (Leverage) had a significant negative impact on enterprise value (ROE), with an impact of -5.2169 and -0.4178, respectively. The greater the company social responsibility (CSR) in the information technology industry, the more it can transform the development mode and economic structure of the industry, make outstanding contributions to society in terms of technological innovation and application, employee rights and interests, information security and health, enhance the endogenous competitiveness of the industry, and thus improve the value of enterprises (ROE). If the asset-liability ratio (Leverage) of information technology companies is too high, the upward pressure on stock prices will increase, and the excessive financing cost (FC) will increase the financial pressure of enterprises and weaken enterprise value (ROE) to a certain extent; Capital intensity (NCA) increases, research and development expenditure (R&D) increases, enterprise capitalization increases, and information software companies have more resources to conduct R&D, achieve innovative results, and increase enterprise value (ROE). Companies with higher revenue growth rates (SGR) are more likely to grow, giving them a better value creation advantage in the future.

4.2.2 Healthcare industry

As can be seen from the results of table 4 in the healthcare industry, social responsibility contribution value (CSR), financing cost (FC), quick ratio (CR), operating income growth rate (SGR) and research and development investment (R&D) have a significant impact on enterprise value (ROE), of which social responsibility contribution value (CSR), operating income growth rate (SGR) and research and development investment (R&D) have a significant impact on enterprise value (ROE), of which social responsibility contribution value (CSR), operating income growth rate (SGR) and research and development investment (R&D) have a significant effect on enterprise value (ROE). The impact factors were 0.0358, 0.0389 and 0.0121, respectively, while the cost of financing (FC) and the quick ratio (CR) weakened the outcome variable, with impact coefficients of -12.8839 and -0.0218, respectively. The higher the company social responsibility contribution value (CSR) of the healthcare industry, the higher the growth rate of operating income (SGR), the more R&D investment (R&D), the better the development prospects of enterprises, the more innovative achievements, the greater the role of the medical cause in society, which can improve social welfare, improve the health of residents, solve the problem of difficulty in seeing a doctor, and the corresponding social feedback will be more, thereby improving the value of enterprises (ROE). The higher the financing cost (FC), the development of medical enterprises will be subject to financial restrictions, unable to concentrate funds to purchase medical devices, the introduction of medical experts to expand the scale of the enterprise to achieve income generation, will bring losses to shareholders, so that enterprises face a serious debt crisis; The quick ratio (CR) is too high, although the future repayment ability is guaranteed, but it will increase the opportunity cost of investment, and has the effect of reducing enterprise value (ROE).

4.2.3 Real estate industry

In the real estate industry, the corporate social responsibility contribution value (CSR) and operating income growth rate (SGR) enterprise value (ROE) have a significant positive impact, while the quick ratio (CR), asset-liability ratio (Leverage) and capital intensity (NCA) have a more significant negative impact on enterprise value (ROE), with impact coefficients of -0.0202, -0.3749 and -0.2176, respectively, and the higher the corporate social responsibility contribution value (CSR) of real estate industry. The social credibility is higher and more able to attract the investment of various sponsors; Real estate enterprises with high operating income growth rate (SGR) have greater potential and faster development speed, which shows that the above two explanatory variables have obvious help in the improvement of enterprise value (ROE). Real estate enterprises with high-speed dynamic ratio (CR) will breed the inventory backlog of real estate raw materials for too long, the realization value is far lower than the risk of book value, the financial risk of enterprises with high asset-liability ratio (Leverage) is relatively high, and there is also insufficient cash flow to ensure sufficient housing, resulting in the possibility of the capital chain being broken. When the capital intensity (NCA) of real estate enterprises is too high, the efficiency of capital use and turnover is low, and at the same time, excessive capitalization will make some real estate companies in order to maximize profits, it is possible to capitalize non-performing debt in the process of pursuing profits, so that the real estate industry is overdeveloped, resulting in market bubbles, the formation of black industries and other issues, it can be seen that the quick ratio (CR), asset-liability ratio (Leverage) and capital intensity (NCA) on the real estate industry enterprise value (ROE) all have adverse effect.

4.3 Mechanism testing

4.3.1 Intermediation effect analysis

Drawing on Wen Zhonglin's mediation effect test method, we adopted the causal stepwise regression test method to determine the intermediation effect of tax burden (Tax) between corporate social responsibility contribution value (CSR) and enterprise value (ROE), so we established model 1 with enterprise value (ROE) as the interpreted variable, model 2 with tax burden as the interpreted variable, and model 3 with the mediation variable tax burden (Tax) added to the original model to quantify the role of the mediation variable in the three industries, the results are shown in table 4. Causal stepwise regression test method is easy to understand and explain, but the test efficiency is not high enough, so on the basis of using the causal stepwise regression test method, the Sobel test method in the multiplier effect method is used, that is, the significance of the product of the coefficients a and b in the test model 2 and model 3 to further improve the robustness of the intermediation effect test, Sobel test results are shown in table 5.

From the results of table 4 and table 5, we can find that the impact effect of corporate social responsibility contribution value (CSR) on the outcome variable of the three industries of information technology service industry, healthcare industry and real estate industry, model 2 and model 3 is significantly positive, and in the model 3, the tax burden (Tax) of each company in the three industries also has a significant role in promoting enterprise value (ROE), so we can preliminarily infer the tax burden (Tax) of the three industries, which acts as an intermediary variable between corporate social responsibility contribution value (CSR) and corporate value (ROE). In table 5, the P-values of the Sobel test in the three industries of information technology service industry, health care industry and real estate industry were 0.0118, 0.0025 and 0.0001, respectively, which can reject the null hypothesis of the coefficient $ab=0$, so it is finally concluded that the tax burden (Tax) does have a certain intermediation effect in the three industries, thus verifying hypothesis 6.

Table 4. Results of regression analysis of CSR to corporate value after the introduction of intermediary variables

	Information technology services industry			Healthcare industry			Real estate industry		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Tax			0.0327*** (0.0077)			0.0744*** (0.0121)			0.0133** (0.0065)
CSR	0.0404*** (0.0039)	0.0780*** (0.0193)	0.0379*** (0.0039)	0.0358*** (0.0059)	0.1080*** (0.0297)	0.0277*** (0.0056)	0.0455*** (0.0044)	0.1518*** (0.0342)	0.0435*** (0.0045)
FC	-5.2169*** (1.6834)	-7.2108 (8.3511)	-4.9812*** (1.6633)	-12.8839*** (2.3465)	-7.2108 (11.8207)	-12.3473*** (2.1818)	0.6477 (0.5924)	1.6824 (4.5607)	0.6254 (0.5901)
CR	-0.0038 (0.0030)	-0.0147 (0.0147)	-0.0033 (0.0029)	-0.0218** (0.0103)	-0.1535*** (0.0519)	-0.0104 (0.0097)	-0.0202* (0.0117)	-0.1643* (0.0901)	-0.0180 (0.0117)
SGR	0.0673*** (0.0108)	0.1713*** (0.0534)	0.0617*** (0.0107)	0.0389** (0.0195)	0.4258*** (0.0981)	0.0072 (0.0188)	0.0061* (0.0036)	0.0245 (0.0277)	0.0058 (0.0036)
R&D	0.0190*** (0.0047)	0.1505*** (0.0233)	0.0141*** (0.0048)	0.0121*** (0.0046)	-0.0193 (0.0233)	0.0136*** (0.0043)	-0.0032 (0.0024)	0.0045 (0.0185)	-0.0033 (0.0024)
Leverage	-0.4178*** (0.0775)	0.0472 (0.3846)	-0.4193*** (0.0766)	-0.0544 (0.1456)	-1.4596** (0.7335)	0.0543 (0.1364)	-0.3749*** (0.0788)	-0.1661 (0.6066)	-0.3727*** (0.0785)
NCA	0.0945* (0.0553)	0.6090** (0.2745)	0.0746 (0.0549)	-0.1675 (0.1076)	-3.7414*** (0.5419)	0.1109 (0.1097)	-0.2176*** (0.0686)	-0.9406* (0.5281)	-0.2051*** (0.0686)
Constant	-0.0130 (0.0581)	6.2272*** (0.2883)	-0.2165*** (0.0749)	0.2002** (0.0863)	10.5990*** (0.4346)	-0.5885*** (0.1511)	0.3230*** (0.0616)	10.6177*** (0.4743)	0.1821** (0.0920)
Observations	845	845	845	305	305	305	515	515	515
R-squared	0.2598	0.3398	0.2608	0.4858	0.1548	0.4295	0.2912	0.2963	0.3261
Number of id	169	169	169	61	61	61	103	103	103

Note: *, **, *** represent significant at the level of 10%, 5%, and 1%, respectively, the standard error in parentheses.

Table 5. Sobel test for the mediating effect of tax burden

	Information technology services industry				Healthcare industry				Real estate industry			
	Coefficient	Standard error	Z-value	P-value	Coefficient	Standard error	Z-value	P-value	Coefficient	Standard error	Z-value	P-value
Sobel statistic	0.0011	0.0004	2.518	0.0118	0.0047	0.0016	3.026	0.0025	0.0049	0.0012	4.055	0.0001
Goodman-1	0.0011	0.0004	2.470	0.0135	0.0047	0.0016	2.997	0.0027	0.0049	0.0012	4.040	0.0001
Goodman-2	0.0011	0.0004	2.569	0.0102	0.0047	0.0015	3.056	0.0022	0.0049	0.0012	4.070	0.0000
a coefficient	0.0638	0.0173	3.686	0.0002	0.2225	0.0352	6.314	0.0000	0.3190	0.0295	10.8024	0.0000
b coefficient	0.0165	0.0048	3.448	0.0006	0.0212	0.0061	3.448	0.0006	0.0153	0.0035	4.3752	0.0000

4.3.2 Regulatory effect analysis

Drawing on the practice of Xiang Xiyao and Pei Yunlong (2020), this paper observes the role of regulatory variables between corporate social responsibility and corporate value by introducing the interaction between regulatory variables and corporate social responsibility, and centralizes the regulatory variables in advance. Model 4 and model 5 are constructed by introducing the interaction items of the regulating variable equity concentration (Top10) and institutional investor shareholding (Institution) and corporate social responsibility contribution value (CSR) on the basis of model 1, respectively, and the final results are shown in table 6.

Table 6. Regression analysis results of corporate social responsibility to corporate value after the introduction of regulatory variables

	Information technology services industry		Healthcare industry		Real estate industry	
	Model 4	Model 5	Model 4	Model 5	Model 4	Model 5
CSR	0.0455*** (0.0041)	0.0415*** (0.0039)	0.0326*** (0.0059)	0.0359*** (0.0059)	0.0559*** (0.0050)	0.0656*** (0.0056)
CSR×Top10	-0.1041*** (0.0269)		-0.1104*** (0.0366)		-0.1114*** (0.0268)	
CSR×Institution		-0.0274** (0.0126)		0.0023 (0.0152)		-0.0830*** (0.0147)
FC	-5.0880*** (1.6662)	-5.2881*** (1.6790)	-13.5424*** (2.3170)	-12.8688*** (2.3534)	0.4461 (0.5827)	0.7099 (0.5708)
CR	-0.0038 (0.0029)	-0.0038 (0.0030)	-0.0246** (0.0102)	-0.0215** (0.0105)	-0.0193* (0.0115)	-0.0178 (0.0113)
SGR	0.0650*** (0.0107)	0.0662*** (0.0108)	0.0252 (0.0197)	0.0398* (0.0204)	0.0051 (0.0035)	0.0045 (0.0035)
R&D	0.0169*** (0.0047)	0.0191*** (0.0047)	0.0130*** (0.0046)	0.0121*** (0.0046)	-0.0038 (0.0024)	-0.0049** (0.0023)
Leverage	-0.4107*** (0.0767)	-0.4181*** (0.0773)	-0.1033 (0.1441)	-0.0545 (0.1459)	-0.3872*** (0.0773)	-0.3446*** (0.0761)
NCA	0.0607 (0.0555)	0.1013* (0.0553)	-0.2143** (0.1069)	-0.1661 (0.1082)	-0.2019*** (0.0673)	-0.2004*** (0.0662)
Constant	0.0176 (0.0581)	-0.0169 (0.0580)	0.2562*** (0.0868)	0.1983** (0.0874)	0.3196*** (0.0604)	0.2722*** (0.0600)
Observations	845	845	305	305	515	515
R-squared	0.2661	0.2584	0.4800	0.4845	0.2802	0.3369
Number of id	169	169	61	61	103	103

Note: *, **, *** represent significant at the 10%, 5%, and 1% levels, respectively, within parentheses is the standard error.

(1) Equity concentration. From the results of the model 4 in table 6, it can be seen that after the introduction of the interaction between equity concentration (Top10) and corporate social responsibility contribution value (CSR), the impact of corporate social responsibility contribution value (CSR) on corporate value (ROE) in the three industries is still significantly positive, while equity concentration (Top10) and corporate social responsibility contribution value (CSR) inhibit the growth of enterprise value (ROE) to a certain extent, indicating that the equity concentration (Top10) is still significantly positive.

Together with the corporate social responsibility contribution value (CSR), the corporate value (ROE) is significantly weakened, with this weakening effect of the real estate sector stronger in 3 sectors, thus testing hypothesis 3.

(2) Institutional investors hold shares. The model 5 in table 6 partially reflects the empirical results after the introduction of the interaction between institutional investor shareholding and corporate social responsibility contribution value. At this time, the corporate social responsibility contribution value (CSR) can still significantly increase the enterprise value (ROE), and the three industries have different effects on the enterprise value (ROE) under the joint action of institutional investor shareholding (Institution) and corporate social responsibility contribution value (CSR), among which in the health care industry, institutional investor shareholding (Institution) plays a positive regulatory role, but this role is not significant. The interaction between institutional investor shareholding (Institution) and corporate social responsibility contribution value (CSR) in the information technology service industry and real estate industry has a significant inhibitory effect on enterprise value (ROE), while in the real estate industry, this inhibition effect is stronger, with an impact coefficient of -0.0830, indicating that in the information technology service industry and real estate industry, institutional investor shareholding (Institution) and corporate social responsibility contribution value (CSR) combined action inhibits the increase in enterprise value (ROE), and hypothesis 5 is verified.

4.4 Dynamic panel system GMM estimation

In order to consider whether the enterprise value lag period 1 has a significant impact effect on the current period, we include the enterprise value lag period 1 as an explanatory variable in the regression analysis, and if it is directly included in the ordinary fixed effect model, it will produce endogenous problems, so we use the dynamic panel system GMM model to solve this problem, and the corresponding estimation results are shown in table 7.

Table 7. Estimation results of the dynamic panel system GMM model

	Information technology services industry	Healthcare industry	Real estate industry
	Model 6	Model 6	Model 6
ROE _{t-1}	-0.0052 (0.0493)	0.8229*** (0.1103)	-0.0513 (0.0719)
CSR	0.0423*** (0.0025)	0.0240*** (0.0051)	0.0409*** (0.0027)
FC	-6.2903*** (1.2906)	-0.7170 (2.4017)	-0.0942 (0.4807)
CR	-0.0068** (0.0032)	-0.0086 (0.0107)	-0.0297*** (0.0087)
SGR	0.0605*** (0.0142)	0.0909*** (0.0241)	0.0020 (0.0041)
R&D	0.0067* (0.0037)	-0.0006 (0.0031)	-0.0026* (0.0014)
Leverage	-0.2422*** (0.0574)	-0.2773** (0.1207)	-0.3056*** (0.0446)
NCA	0.0671* (0.0364)	-0.1065* (0.0641)	-0.1825*** (0.0315)
Constant	0.0243 (0.0457)	0.1204 (0.0861)	0.2775*** (0.0375)
Observations	676	244	412
Number of id	169	61	103
Sargan test	0.000	0.134	0.210
AR(1)	0.000	0.000	0.044
AR(2)	0.002	0.350	0.583

Note: *, **, *** represent significant at the 10%, 5%, and 1% levels, respectively, within parentheses is the standard error, Sargan test, AR(1) and AR(2) the numbers in the columns are the corresponding P-values.

It can be seen that after the inclusion of the enterprise value lag phase1 (ROE_{t-1}) variable, the corporate social responsibility contribution value (CSR) of the three industries still has a significant role in promoting the enterprise value (ROE), while the enterprise value of the information technology service industry and the real estate industry lag period 1 period (ROE_{t-1}) has a suppressive effect on the current enterprise value (ROE), but this effect is not significant, indicating that in these two industries, the enterprise value of the lag period 1 (ROE_{t-1}) has a suppressive effect. There is no noticeable impact on enterprise value (ROE). In the healthcare industry, the enterprise value (ROE_{t-1}) of the lag phase 1 has a significant promotion effect on the enterprise value (ROE), the effect is 0.8229, the P-value of the Sargan test is 0.134, which shows that in the healthcare industry, there is no null hypothesis that the constraint of the tool variable constraint is rejected, and the results of the first-order and second-order sequence correlation tests show that the model 6 has a first-order autocorrelation and no second-order autocorrelation, indicating that the dynamic panel system GMM estimate results are valid. The higher the value lag of each enterprise in the health care industry (ROE_{t-1}), the better the business performance of the enterprise, and the medical company has more funds for medical device maintenance, research and development and procurement of pharmaceutical materials, improving their own software and hardware strength, thereby creating more value for the company.

4.5 Robustness testing

To ensure the reliability of the study's findings, this paper uses another financial metric, return on assets (ROA), to replace the interpreted variable return on net assets (ROE) to measure firm value,

It can be seen that after replacing the metrics of the outcome variable, the impact of corporate social responsibility contribution value (CSR) on corporate value (ROA) in the three industries of information technology services, healthcare and real estate industry remains significantly positive, and the results of model 3 show that the tax burden (Tax) also plays an intermediary role between the two, equity concentration (Top10) and institutional investor shareholding (Institution) The adjustment effect and dynamic panel system GMM estimation results are basically consistent with the empirical tests shown above, and no substantial changes have occurred, indicating that the original empirical results have strong robustness.

4.6 Conclusion

This paper selects the panel data sample of A-share listed companies from 2016 to 2020, focuses on the three industries of health care service industry, real estate industry and information technology service industry, studies the impact effect and influence mechanism of corporate social responsibility on corporate value under the heterogeneity of the industry, and explores the role of enterprise value in the current period of the lag phase 1. It concludes:

(1) Corporate social responsibility social responsibility can significantly promote the improvement of corporate value in all three industries, of which the real estate industry has the strongest impact.

(2) When enterprises in different industries fulfill their social responsibilities, they will pay taxes according to law and improve their credibility, thereby improving their corporate value.

(3) In the three industries, the company's equity concentration has played a certain regulatory role between corporate social responsibility and corporate value, while the regulatory role of corporate institutional investors in the three industries is different, and the holding of corporate institutional investors in the real estate industry and information technology service industry plays a significant negative regulatory role between corporate social responsibility and corporate value, while in the health care industry, corporate institutional investor shareholding will positively affect the relationship between corporate social responsibility and corporate value. But this effect is not significant.

4) Dynamic panel coefficient GMM estimates show that the value of enterprises lagging behind 1 period in the healthcare industry can significantly increase the current value of enterprises, while the enterprise value in real estate industry and information technology services industry that lag 1 period will weaken the current value of enterprises, but this impact effect is not significant.

5. Policy recommendations

Firstly, establish a correct concept of social responsibility. In order to promote the benign development of enterprises in various industries across the country, in addition to appropriate external control and social publicity, the internal control agency should form a healthy and unified concept of social responsibility, and the internal control agency should play a role.

Secondly, strengthen government supervision and incentives. Adopt government subsidies, adjust preferential tax policies and set up relevant social responsibility contribution awards to encourage enterprises to actively fulfill their social responsibility obligations, and at the same time, through public opinion guidance, increase the publicity of social responsibility.

Thirdly, promote social responsibility in a targeted manner in the industry. When implementing social responsibility

activities, all industries should adapt to the conditions of the times, adapt to local conditions, and make the development of social responsibility more flexible according to their own unique characteristics.

Fourthly, optimize the equity structure of enterprises and reduce conflicts of interest. Balance mechanism should be established to optimize the equity structure, so that the company has a reasonable degree of equity concentration, which can have higher decision-making efficiency and will not reduce the social responsibility benefits of enterprises.

Fifthly, fulfill tax obligations in accordance with law. When an enterprise fulfills its social responsibility obligations, the most basic thing is to pay taxes according to law, reasonably carry out tax planning work, improve its own tax credit rating, and build a credit brand of the enterprise, so as to improve the business performance of the enterprise and promote the value creation of the enterprise.

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