

Female CEOs and corporate agency costs——Microscopic evidence based on panel data of Chinese listed companies

Beibei Gui *

School of Economics and Management, Tianjin University of science and Technology, Tianjin, 300457, China

* Corresponding Author Email: Guibb2020@163.com

Abstract. Improving the status of women in the workplace and encouraging outstanding women to enter the board of directors, board of supervisors and management of enterprises has become a hot topic of concern in the new era. Based on the panel data of A-share listed companies in Shanghai and Shenzhen stock markets, this paper explores the impact of female CEOs on corporate agency costs from the perspective of high-level corporate theory, and examines the effects of female CEOs, female directors, and female general managers on the first and second types of agency. cost impact mechanism. The research results show that female CEOs can significantly reduce corporate agency costs; and the internal control quality of companies that appoint female CEOs is higher, and female managers are more capable, which has a more significant effect on reducing corporate agency costs. The conclusion of the article expands the research on female CEOs and corporate agency costs, and provides policy implications for how companies and society can further promote gender equality and grasp the capabilities of female talents.

Keywords: Female CEO, corporate agency cost, high-level theory of business.

1. Introduction

In recent years, with the improvement of women's status in the workplace, the Chinese government has issued a series of policies to promote women's employment and improve women's status. The "China Women's Development Plan (2020-2030)" clearly pointed out that promoting women's extensive participation in corporate decision-making Management, promoting outstanding women to enter the board of directors, board of supervisors and management of enterprises. Thirteen departments including the Ministry of Science and Technology issued "Several Measures on Supporting Female S&T Talents to Play a Greater Role in S&T Innovation", emphasizing that female S&T talents are an important driving force for building a technologically powerful country. In addition, the China Securities Regulatory Commission has also issued the "Opinions on Strengthening the Responsibilities of the Board of Directors of Listed Companies", requiring that the board of directors of listed companies should fully consider the participation of female directors when forming boards.

Against this background, the discussion has important practical significance for the important role played by women in enterprise development, operation and decision-making. Some studies have found that female CEOs tend to pay more attention to the company's social responsibility and long-term development than male CEOs, and are more able to positively promote the green innovation of enterprises [1]. Companies led by female executives perform better in environmental protection and comply with laws and regulations. It is also more stringent, which helps reduce environmental pollution and associated agency costs for businesses. In addition, another part of the research found that female CEOs have higher risk-taking ability, reduce the bargaining process on strategic changes, and promote corporate strategic changes [2]. However, most of the current academic research on female CEOs and corporate management focuses on the impact of female CEOs' heterosexual characteristics on management innovation and organizational performance, but does not directly focus on the impact of female CEOs on corporate agency costs.

To sum up, this article aims to deeply explore the impact of corporate female CEOs on agency costs and enrich research in this field. Based on the panel data of A-share listed companies in

Shanghai and Shenzhen stock markets from 2008 to 2020, this paper studies the impact of female CEOs on corporate agency costs, and further explores the impact of female CEOs, female directors, and female general managers on the first and second types of agency costs mechanism. The study found that female CEOs can significantly reduce the agency cost of enterprises, indicating that the better the internal control quality of female CEOs and the higher the ability of female managers, the more effective it is to increase labor income, improve corporate performance, and reduce corporate assets. Debt ratio and reduce the loss state of the enterprise, so it can effectively reduce the agency cost of the enterprise. Further research finds that the effect of female CEOs on the reduction of corporate agency costs is particularly significant in capital-intensive industries in the east.

Compared with the existing literature, the possible innovations and marginal contributions of this paper are mainly reflected in the following aspects: First, based on the high-level theory of enterprises and gender role theory, when the existing research discusses the impact of female executives on enterprises, the focus is on Focusing on corporate strategic change, risk taking, financial performance and corporate culture, there are few studies on the direct impact of female executives on corporate agency costs. This study expands the research on the economic consequences of female executives and enriches the discussion on female CEOs to a certain extent. Considering audit fees as one of the main influencing variables, internal control quality becomes an important intermediary between female executives and corporate agency costs, given the existing literature on female executives increasing corporate risk-taking. This study uses the Dibo Enterprise Internal Control Index to measure the internal control quality of enterprises, and finds that female CEO enterprises have better internal control quality than male CEO enterprises, and higher internal control quality can effectively alleviate the positive impact of corporate risk-taking on audit fees. directional effect, thereby reducing the agency cost of the enterprise and enriching the intermediary paths that affect the agency cost of the enterprise. Third, when discussing the influence of women in enterprises, existing studies start from gender role theory and compare female CEOs with male CEOs, ignoring the fact that the real decisive influence is actually the ability of managers. This paper is based on Zhang the research by Lu et al. demonstrated that the more capable female managers are, the lower the agency costs will be. This not only broadens the research perspective on female executives, but also helps encourage high-level women to make a difference in corporate management positions.

The follow-up structure of this paper is arranged as follows: the second part is the combing and discussion of relevant literature and the proposal of theoretical hypotheses; the third part introduces the data structure and research design of this paper; the fourth part is the basic empirical results; the fifth part further discusses the mechanism; The last part is the concluding comments and policy implications of the full text.

2. Literature review and theoretical hypothesis

Since Jensen and Meckling (1976) put forward the agency theory [3], the agency cost of enterprises has been widely concerned as an important economic phenomenon. Corporate agency costs will not only affect the interests of shareholders and investors, but also have an important impact on the company's operating performance. Previous studies have shown that agency costs mainly include three aspects: supervision costs, contract costs and information asymmetry costs. Regulatory costs include the cost of the agent's self-monitoring and shareholders' monitoring of the agent; contract costs include the cost of contract formulation, execution, and revision; information asymmetry costs are the cost caused by the agent having more information. Enterprise agency cost is not only a theoretical issue, but also an important issue in the practice of enterprise management. Therefore, how to reduce the agency cost of enterprises is an important topic of enterprise management.

The current academic research on the agency cost of enterprises is mainly divided into two directions. On the one hand, scholars have conducted in-depth discussions on the internal mechanism and formation reasons of agency costs. For example, Hermalin and Weisbach (2012) proposed a classic agency model, explaining the causes and solutions of agency costs [4]; Kanodia et al. (2016)

explained the agency costs from the perspective of contract formulation and corporate governance. Formation mechanism [5]. On the other hand, scholars are committed to exploring effective methods and strategies to reduce corporate agency costs. For example, Wang et al. (2020) studied the relationship between entrepreneurial family governance structure and agency costs, and proposed the advantages and disadvantages of family businesses [6]; Chen et al. (2018) discussed corporate social responsibility and information disclosure. An effective way to reduce agency costs [7]. In short, the current academic research on enterprise agency costs is deepening and expanding, which has important guiding significance for the management and operation of actual enterprises.

Agency cost refers to the cost caused by information asymmetry in the principal-agent relationship of an enterprise. Businesses need to establish an agency relationship between an agent and a trustee, and the agent usually has more information and may use this information for personal gain. Therefore, firms need to pay agency costs to limit the behavior of agents. Female CEOs may reduce firm agency costs through two possible mechanisms. First, female CEOs can improve the quality of corporate internal control, thereby reducing agency costs. Female leaders are generally considered to have higher moral standards and a stronger sense of internal control. This awareness of internal control may prompt female CEOs to pay more attention to corporate governance and internal control, thereby reducing agency costs.

Second, female CEOs may have better managerial skills and thus be able to control agency costs more effectively. Women's talents and skills in leadership have been debated, but there is growing evidence that women excel in management. For example, Adams and Ferreira's (2009) study found that female board members in Canadian companies work harder and more conscientiously than male board members, thereby improving corporate performance [8]. Other studies have shown that female managers usually pay more attention to corporate social responsibility and corporate governance than male managers. Research by Dou Chao et al. (2022) shows that female managers usually pay more attention to employee welfare and career development than male managers, thus improving employee satisfaction and corporate performance [9]. At the same time, more and more studies have begun to explore the impact of female CEOs on corporate performance and governance. For example, the research of Carter, Simkins and Simpson (2003) shows that companies with female CEOs usually show better financial performance [10]. Research by Zhou Xuan et al. (2023) and Lu Ying et al. (2007) found that female CEOs can improve corporate social responsibility [11] and moral standards [12]. The research of Pan Zicheng et al. (2022) shows that female CEOs are more creative and flexible when dealing with corporate crises and conflicts [13].

However, relatively little research has been done on the impact of female CEOs on firm agency costs. Some previous studies have shown that female leaders may reduce agency costs for firms. For example, Seierstad and Opsahl's (2011) study found that Norwegian companies have a higher proportion of female directors on the board, which can reduce their agency costs [14]. Research by Lücknerath-Rovers (2013) also shows that Dutch companies with female board members have lower agency costs. Agency theory believes that the participation of female directors improves the independence of the board of directors, reduces agency costs, and can better promote the improvement of corporate performance [15]; while the stakeholder theory believes that women's participation in the board of directors is conducive to the interests of all parties Maintenance of stakeholder interests. Francoeur, Labelle, and Sinclair-Desgagné (Francoeur, Labelle, and Sinclair-Desgagné) mainly analyzed the relationship between gender diversity on the board of directors and the achievement of various corporate performance goals from an instrumental level [16]. The diversity of the board of directors represents different stakeholders and embodies the principles of fairness and justice. Therefore, under the same conditions, companies that implement stakeholder management will support the management of female members more.

Catalyst, a well-known non-profit survey organization for business women in the United States, conducted four groups of 353 companies in the world's top 500 from 1996 to 2000 according to the participation ratio of female directors, and the results confirmed that the participation ratio of female directors The company with the highest return on shareholders' equity (ROE) is 53% higher than the

company with the lowest proportion of female directors; and when there are more than 3 women on the board of directors, its average return on shareholders' equity is significantly higher than the average of all companies [17]. Dutta and Bose used the data of 15 commercial banks in Bangladesh from 2002 to 2005 to empirically test the impact of gender diversity on bank performance, and the results confirmed the positive impact of female directors on bank performance [18].

Another part of the research focuses on overconfidence and willingness to take risks. Overconfidence refers to the individual's belief that the accuracy of his knowledge is higher than the fact. Some studies believe that overconfident managers often lead to a higher debt ratio [19], because overconfident managers often overestimate the value of the project when evaluating the project, resulting in a large amount of investment, and overconfident Managers believe that the value of the enterprise is underestimated, and they are unwilling to issue shares for financing, which makes the enterprise's debt relatively high. Because female managers have lower levels of overconfidence than male managers, the companies they manage have lower debt-to-asset ratios. Johnson and Powell (1994) found that women are more risk-averse than men when studying betting decisions [20]. Debt is a hard constraint for companies, which must pay interest on a regular basis and repay the principal when it is due. Otherwise, the company will face the danger of being sued and bankrupt. Moreover, the listed companies on the SME Board are small in size, facing fierce market competition and operating risks. Relatively large, if you take on higher debt, it will make the enterprise riskier. In order to avoid high corporate risks and lead to difficulties, female managers are often unwilling to take on higher debts, which reduces the corporate debt ratio and reduces corporate agency costs. In summary, based on previous research and understanding of female leaders, this paper proposes the following core hypothesis H1:

H1: Compared with male CEOs, female CEOs have a more significant effect on reducing agency costs.

3. Sample descriptive statistics and empirical model setting

3.1. Sample selection and data sources

Considering the availability of various indicators of enterprises and sample representativeness, this paper uses all A-share listed companies in the Shanghai and Shenzhen stock markets from 2008 to 2020 as the original sample, and the original sample data of listed companies comes from the Guotaian CSMAR database. First, screen according to the industry code of the China Securities Regulatory Commission in 2012, and exclude the financial industry; second, in order to obtain more accurate corporate financial data and avoid interference with various indicators due to poor business operations, eliminate the samples of ST companies during the research period; Third, remove samples with asset-liability ratios greater than 1; finally, in order to eliminate the impact of extreme values on empirical analysis, this paper winsorize all continuous variables up and down by 1%.

3.2. Female CEOs

In order to discuss the role of corporate female CEOs in promoting corporate labor income. This paper constructs the dummy variable Female CEO of female CEO characteristics based on the CSMAR listed company character database: if the CEO of the listed company in the year is a female, it is assigned a value of 1, otherwise it is 0. In the robustness discussion, a female chairman and a female general manager were also used in the robustness discussion.

3.3. Empirical model setting

In order to test the theoretical assumptions proposed above, this paper will use the panel data of listed companies to construct a two-way fixed effect model for empirical analysis. The specific empirical model is shown in formula (1):

$$MFR_{it} = \alpha_0 + \alpha_1 FemaleCEO_{it} + \alpha_2 X_{it} + Year_FE + Industry_FE + \varepsilon_{it} \quad (1)$$

Where The Subscripts i, T Denote the Firm as Well As The Year, respectively. The Explanatory Variables Are The agency costs of the firm. Since two types of agency costs are considered in this paper, the explanatory variables are selected as management expense ratio (MFR) for the main analysis and other receivables as a percentage of total assets (Otherratio) is selected to measure the first type of agency costs between shareholders and management of the firm and the second type of agency costs between major shareholders and small and medium shareholders. is the core explanatory variable in this paper, indicating whether the CEO of listed company i is a woman in year t . Therefore, is the core parameter to be estimated in this paper, which is expected to be significantly negative by the theoretical hypothesis. In addition, are a series of control variables to control for various firm-level financial and governance characteristics to ensure the accuracy of the core to-be-estimated parameters. and are year fixed effects and industry fixed effects, respectively. are the disturbance terms of the model. To prevent the heteroskedasticity problem from affecting the reliability of the empirical results in this paper, all statistical inferences in this paper are discussed based on heteroskedasticity robust standard errors. In summary, this paper will use a two-way fixed effects model to rigorously analyze the theoretical hypotheses proposed in the previous paper empirically.

3.4. Selection of control variables

Considering that other factors of the firm may also have potentially important effects on firm innovation, a series of firm characteristics indicators are selected as control variables in this paper in order to prevent endogeneity problems caused by omitted variables. Drawing on the existing literature, the firm-level control variables in this paper are shown in Table 1. Table 2 shows the descriptive statistics of each variable.

Table 1. Detailed definition of variables

Variable Type	Variable Name	Letters indicate	Variable Definition Description
Explained variables	Agency Costs	MFR	Listed companies' overhead expenses as a percentage of operating revenue for the year
Core explanatory variables	Female CEOs	FemaleCEO	The CEO of the listed company in the year is female take 1, otherwise 0
Enterprise control variables	Enterprise size	Size	\ln (Total assets of the enterprise at the end of the year)
	Corporate gearing	Leverage	Total liabilities of the enterprise as a percentage of total assets for the year
	Business Age	Age	Number of years a company has been listed
	Business Performance	ROA	Return on assets of the enterprise for the year
	Board Independence	Indratio	Percentage of independent directors in the year
	Audit Quality	Audit	Dummy variable: 1 if the company is audited by a Big 4 firm, 0 otherwise
	Two jobs in one	Dual	Dummy variable: 1 if the chairman and the general manager are the same person, otherwise take 0
	Corporate loss status	Loss	Dummy variable: 1 if the company has a loss for the year, 0 otherwise
	Corporate Ownership	SOE	Dummy variable: If the enterprise belongs to the state-owned enterprise, the value is 1, otherwise it takes 0.

Table 2. Descriptive statistics of the variables

	Sample size	Average value	Standard deviation	Minimum value	Median	Maximum value
MFR	31711	10.588	8.387	0.92	8.68	64.66
FemaleCEO	31711	0.063	0.244	0	0	1
Size	31711	22.075	1.289	19.35	21.887	26.43
Leverage	31711	0.421	0.208	0.027	0.413	0.936
Age	31711	2.001	0.931	0	2.197	3.332
ROA	31711	0.435	0.461	-0.581	0.349	3.037
Indratio	31711	38.933	9.934	0	37.5	66.667
Audit	31711	0.057	0.233	0	0	1
Dual	31711	0.267	0.442	0	0	1
Loss	31711	0.039	0.194	0	0	1
SOE	31711	0.356	0.479	0	0	1

Before conducting the empirical regression analysis, the results of the correlation analysis between the main study variables are also required, and the results of the Person correlation test for the control variables are shown in Table 3. As can be seen from Table 3, the correlation coefficients among the control variables are not large, so there is no systematic bias caused by the highly co-linear problem that leads to statistical inference in this paper.

Table 3. Person correlation test for control variables

	FemaleCEO	Size	Leverage	Age	ROA	Indratio	Audit	Dual	Loss	SOE
FemaleCEO	1									
Size	-0.04*	1								
Leverage	-0.03*	0.50*	1							
Age	-0.03*	0.40*	0.41*	1						
ROA	-0.03*	-0.04*	0.10*	-0.01*	1					
Indratio	0.02*	-0.05*	-0.04*	-0.05*	0.10*	1				
Audit	-0.00	0.35*	0.11*	0.06*	0.02*	-0.01	1			
Dual	-0.02*	-0.20*	-0.17*	-0.25*	-0.11*	-0.01*	-0.09*	1		
Loss	0.01	-0.01*	0.10*	0.09*	-0.25*	-0.06*	-0.02*	0.04*	1	
SOE	-0.07*	0.35*	0.30*	0.41*	0.13*	-0.05*	0.14*	-0.26*	-0.06*	1

4. Basic empirical results

4.1. Basic results

Table 4 shows the baseline empirical results of this paper. The explanatory variable is the firm's overhead rate, which represents the severity of the firm's Type I agency problem. All column regressions control for firm-level control variables; further, column (1) does not control for two-way fixed effects and column (2) adds controls for two-way fixed effects.

First, it can be seen from column (1) that the overhead rate decreases by 0.576% on average when the president of the company is female compared to the male president, and this result is significantly negative at the 1% statistical level; similarly, column (2) can conclude that the overhead rate decreases by 0.453% on average when the general manager of the company is female compared to the male general manager, and this result also passes the 1% statistical level significance test. These results show that the reduction of agency costs by female executives is both economically and statistically significant, and confirm the theoretical hypothesis H1 of this paper.

Table 4. Benchmark results: female CEOs and corporate agency costs

	(1)	(2)
Explained variables:	MFR	MFR
FemaleCEO	-0.576***	-0.452***
	(0.170)	(0.162)
Size	-2.079***	-1.900***
	(0.051)	(0.052)
Leverage	-5.973***	-4.598***
	(0.299)	(0.310)
Age	1.008***	0.966***
	(0.059)	(0.056)
ROA	-5.549***	-6.762***
	(0.081)	(0.122)
Inratio	0.023***	-0.002
	(0.004)	(0.004)
Audit	1.946***	2.043***
	(0.186)	(0.176)
Dual	0.131	0.136
	(0.101)	(0.097)
Loss	5.071***	5.608***
	(0.388)	(0.385)
SOE	-0.671***	-0.278***
	(0.094)	(0.095)
Constant term	58.434***	55.287***
	(1.054)	(1.088)
Fixed effects	Uncontrolled	Control
Observations	31, 711	31, 711
R-squared	0.271	0.349

Note: Observations are at the firm panel level, and fixed effects include year fixed effects and industry fixed effects. ***, **, and * indicate significant at the 1%, 5%, and 10% statistical levels, respectively. "Not controlled" means that the fixed effect is not controlled, and "controlled" means that the fixed effect is controlled.

4.2. Robustness discussion

In order to verify the robustness of the core results of this paper, various robustness tests need to be performed for detailed validation.

First, consider how other female executives affect the firm's agency problem. The paper further constructs two variables, Female1, a female chairman, and Female2, a female managing director, for detailed discussion. The results are shown in Table 5: all columns control for the aforementioned control variables as well as for two-way fixed effects. The explanatory variable is the firm's agency cost MFR. the estimated coefficients of Female1 in column (1) and Female2 in column (2) are both statistically significant negative at the 1% level, i.e., the findings of this paper remain.

Table 5. Robustness test I: Considering female chairman and female general manager

	(1)	(2)
Explained variables:	MFR	MFR
Female1	-0.520***	
	(0.169)	
Female2		-0.591***
		(0.179)
Size	-1.898***	-1.902***
	(0.052)	(0.052)
Leverage	-4.603***	-4.600***
	(0.310)	(0.310)
Age	0.969***	0.964***
	(0.056)	(0.056)
ROA	-6.754***	-6.764***
	(0.121)	(0.122)
Indratio	-0.002	-0.002
	(0.004)	(0.004)
Audit	2.031***	2.049***
	(0.176)	(0.176)
Dual	0.146	0.139
	(0.097)	(0.097)
Loss	5.606***	5.601***
	(0.385)	(0.385)
SOE	-0.274***	-0.277***
	(0.095)	(0.095)
Constant term	55.238***	55.349***
	(1.089)	(1.087)
Fixed effects	Control	Control
Observations	31,711	31,711
R-squared	0.349	0.349

Note: Observations are at the firm panel level, and fixed effects include year fixed effects and industry fixed effects. ***, **, and * indicate significant at the 1%, 5%, and 10% statistical levels, respectively. "Not controlled" means that the fixed effect is not controlled, and "controlled" means that the fixed effect is controlled.

The second type of agency cost is further considered. In Table 6, the explanatory variable is other receivables as a share of total assets *Otherratio*, which represents the intensity of the appropriation of minority shareholders' equity by major shareholders in the form of appropriation of funds from listed companies, thus measuring the second type of agency costs of the firm. All column regressions control for firm-level control variables, as well as fixed effects. The core explanatory variables in columns (1) - (3) are the dummy variables for female CEO, female chairman and female managing director, respectively. All columns core explanatory variables are significantly negative, thus female executives have the same mitigating effect on Type II agency costs.

Table 6. Robustness test II: Considering the second type of agency costs

	(1)	(2)	(3)
Explained variables:	Otherratio	Otherratio	Otherratio
FemaleCEO	-0.001*** (0.000)		
Female1		-0.001* (0.001)	
Female2			-0.001** (0.001)
Size	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)
Leverage	0.022*** (0.001)	0.022*** (0.001)	0.022*** (0.001)
Age	0.003*** (0.000)	0.003*** (0.000)	0.003*** (0.000)
ROA	-0.001* (0.000)	-0.001* (0.000)	-0.001* (0.000)
Indratio	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Audit	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Dual	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Loss	0.010*** (0.001)	0.010*** (0.001)	0.009*** (0.001)
SOE	-0.004*** (0.000)	-0.004*** (0.000)	-0.004*** (0.000)
Constant term	0.039*** (0.003)	0.038*** (0.003)	0.039*** (0.003)
Fixed effects	Control	Control	Control
Observations	31,586	31,586	31,586
R-squared	0.133	0.132	0.133

Note: Observations are at the firm panel level, and fixed effects include year fixed effects and industry fixed effects. ***, **, and * indicate significant at the 1%, 5%, and 10% statistical levels, respectively. "Not controlled" means that the fixed effect is not controlled, and "controlled" means that the fixed effect is controlled.

The third robustness test conducted in this paper is to replace the estimated model. Since propensity score matching (PSM) plays an important role in reducing the correlation between treatment variables and observable variables, this paper proposes to make the causal inference of the article more accurate by means of PSM, as there may be systematic differences between male and female CEO firms. In PSM matching, propensity score values are obtained by logit regression of the control variables with Treat variables. The control group with the closest propensity score is the paired sample of the experimental group, which minimizes systematic differences between the experimental group and the control group and thus reduces estimation bias. In the framework of the empirical analysis in this paper, the treatment group (Treatment Group) is the listed companies employing female CEOs and the control group (Control Group) is the listed companies employing male CEOs.

The PSM estimation results are shown in Table 7, with the explanatory variable MFR in column (1) and Otherratio in column (2). all columns control for all control variables and two-way fixed effects. The core explanatory variable Female CEO remains significantly negative, in line with the basic findings of the previous section. Therefore, the findings remain after estimation using PSM.

Table 7. PSM estimation results

	(1)	(2)
Explained variables:	MFR	Otherratio
FemaleCEO	-0.495*** (0.154)	-0.001** (0.000)
Size	-2.102*** (0.116)	-0.002*** (0.000)
Leverage	-5.108*** (0.649)	0.019*** (0.002)
Age	1.168*** (0.115)	0.003*** (0.000)
ROA	-6.996*** (0.287)	0.001 (0.001)
Indratio	-0.007 (0.010)	-0.000* (0.000)
Audit	2.105*** (0.483)	0.001 (0.001)
Dual	0.171 (0.186)	-0.000 (0.001)
Loss	5.877*** (0.793)	0.010*** (0.002)
SOE	-0.161 (0.211)	-0.006*** (0.001)
Constant term	59.764*** (2.447)	0.040*** (0.007)
Fixed effects	Control	Control
Observations	31,705	31,580
R-squared	0.342	0.140

Note: Observations are at the firm panel level, and fixed effects include year fixed effects and industry fixed effects. ***, **, and * indicate significant at the 1%, 5%, and 10% statistical levels, respectively. "Not controlled" means that the fixed effect is not controlled, and "controlled" means that the fixed effect is controlled.

4.3. Heterogeneity analysis

The differences in economic development, governmental control approaches, and marketization processes among regions may lead to regional heterogeneity in the impact of female CEOs on the reduction of corporate agency costs among different regions. Therefore, in this paper, we have to specifically divide China's provinces (districts and cities) into four regions, namely, East, Central, West and Northeast, for discussion. According to the results of the analysis, it can be seen that female CEOs have the most significant effect on the reduction of corporate agency costs among firms in the eastern region, while in the northeastern region, it even presents a situation that female CEOs increase agency costs.

Table 8. Discussion of regional heterogeneity

	(1)	(2)	(3)	(4)
Explained variables:	MFR	MFR	MFR	MFR
	Eastern Region	Central Region	Western Region	Northeast Region
FemaleCEO	-0.635*** (0.181)	-0.176 (0.508)	-0.620 (0.438)	0.638 (0.915)
Size	-1.792*** (0.065)	-2.096*** (0.144)	-2.293*** (0.128)	-1.901*** (0.220)
Leverage	-5.706*** (0.384)	-3.470*** (0.795)	-1.109 (0.840)	-5.217*** (1.424)
Age	0.950*** (0.067)	0.854*** (0.161)	1.117*** (0.159)	0.957*** (0.270)
ROA	-6.607*** (0.153)	-5.922*** (0.245)	-7.985*** (0.421)	-7.467*** (0.539)
Indratio	-0.015*** (0.005)	0.037*** (0.011)	0.025* (0.014)	0.006 (0.021)
Audit	2.173*** (0.210)	0.412 (0.356)	2.916*** (0.685)	0.148 (0.767)
Dual	0.026 (0.112)	0.325 (0.253)	0.238 (0.331)	0.922* (0.523)
Loss	5.534*** (0.462)	4.530*** (1.009)	7.057*** (1.132)	5.641*** (1.487)
SOE	-0.400*** (0.125)	-0.146 (0.230)	-0.564** (0.238)	0.995** (0.417)
Constant term	54.023*** (1.370)	57.034*** (2.913)	61.358*** (2.694)	55.153*** (4.462)
Fixed effects	Control	Control	Control	Control
Observations	21,433	4,398	4,376	1,503
R-squared	0.360	0.394	0.336	0.346

Note: Observations are at the firm panel level, and fixed effects include year fixed effects and industry fixed effects. ***, **, and * indicate significant at the 1%, 5%, and 10% statistical levels, respectively. "Not controlled" means that the fixed effect is not controlled, and "controlled" means that the fixed effect is controlled.

With regard to the delineation of capital-intensive and labor-intensive, referring to the relevant practice of Lu Tong and Dang Yin (2014), according to the two indicators of the proportion of fixed assets and R&D expenditure, enterprises are classified into labor-intensive enterprises as well as capital-intensive enterprises according to their industries by the clustering method according to the 2012 SEC Industry Classification Guidelines for Listed Companies, and dummy variables are constructed for discussion: if the enterprise is capital-intensive, the value assigned is 1, otherwise is 0.

Table 9. Industry Heterogeneity Discussion

	(1)	(2)
Explained variables:	MFR	MFR
	Capital-intensive industries	Labor-intensive industries
FemaleCEO	-0.849*** (0.198)	-0.188 (0.296)
Size	-2.068*** (0.072)	-1.727*** (0.085)
Leverage	-3.993*** (0.389)	-3.351*** (0.561)
Age	1.211*** (0.071)	1.099*** (0.094)
ROA	-8.416*** (0.177)	-4.953*** (0.165)
Inratio	-0.000 (0.005)	0.008 (0.009)
Audit	2.624*** (0.246)	1.031*** (0.226)
Dual	0.109 (0.116)	0.010 (0.206)
Loss	4.070*** (0.512)	4.705*** (1.029)
SOE	-0.153 (0.116)	-0.490*** (0.178)
Constant term	59.569*** (1.488)	48.451*** (1.870)
Fixed effects	Control	Control
Observations	19,924	8,116
R-squared	0.355	0.339

Note: Observations are at the firm panel level, and fixed effects include year fixed effects and industry fixed effects. ***, **, and * indicate significant at the 1%, 5%, and 10% statistical levels, respectively. "Not controlled" means that the fixed effect is not controlled, and "controlled" means that the fixed effect is controlled.

5. Mechanism analysis

Why do female corporate CEOs have a significant reduction effect on agency costs? In order to verify the mechanism of the effect, the following mediating effect model is set up for detailed empirical analysis:

$$Z_{ct} = \gamma_0 + \gamma_1 FemaleCEO_{it} + \gamma_2 X_{ct} + Year_FE + Industry_FE + \varepsilon_{ct} \quad (2)$$

$$MFR_{it} = \delta_0 + \delta_1 FemaleCEO_{it} + \rho Z_{ct} + \delta_2 X_{ct} + Year_FE + Industry_FE + \varepsilon_{ct} \quad (3)$$

Where Z_{it} is the mediating variable. Eq. (2) is the first step of the mediating effect model, the γ_1 mainly examines the effect of the core explanatory variables on the mediating variables; Eq. (3) is the second step of the mediating effect model. ρ It measures the effect of mediating variables on MFR_{it} . The second step of the mediating effect model is equation (3). If the model satisfies both equation (2) γ_1 is significant and equation (3) ρ is significant, then it indicates that Z_{it} there is a mediating effect. Based on the previous literature review and theoretical analysis, this paper intends to discuss the mechanism from two paths: internal control quality and managerial competence.

5.1. Quality of internal control

First, this paper uses the Diebold Corporate Internal Control Index to measure the quality of a firm's internal control. In Table 10, the models all control for all control variables as well as two-way fixed effects. Firstly, it can be seen from column (1) that the estimated coefficient of FemaleCEO is significantly positive at the 5% statistical level, i.e., the quality of internal control is better in female CEO firms compared to male CEOs; further observe the estimated result in column (2): the estimated coefficient of ICI is -0.003, which is significantly negative at the 1% statistical level, which indicates that the higher the quality of internal control in firms, the the lower the agency costs. Therefore, this mediating path is verified: female CEOs effectively reduce the agency problem by improving the quality of internal control of the firm.

Table 10. Discussion of mechanisms for the quality of internal control in enterprises

Explained variables:	(1) ICI	(2) MFR
ICI		-0.003*** (0.000)
Female CEO	5.737** (2.898)	-0.400** (0.182)
Size	35.385*** (0.915)	-1.861*** (0.057)
Leverage	-113.068*** (5.622)	-4.732*** (0.338)
Age	-30.891*** (1.425)	0.920*** (0.086)
ROA	27.784*** (2.315)	-6.719*** (0.130)
Indratio	0.505*** (0.088)	0.002 (0.005)
Audit	13.642*** (3.261)	1.852*** (0.175)
Dual	2.680 (1.811)	0.172 (0.112)
Loss	-54.512*** (5.835)	5.105*** (0.371)
SOE	4.142** (1.911)	-0.442*** (0.100)
Constant term	-46.514** (18.926)	56.299*** (1.156)
Fixed effects	Control	Control
Observations	26,890	26,890
R-squared	0.171	0.355

Note: Observations are at the firm panel level, and fixed effects include year fixed effects and industry fixed effects. ***, **, and * indicate significant at the 1%, 5%, and 10% statistical levels, respectively. "Not controlled" means that the fixed effect is not controlled, and "controlled" means that the fixed effect is controlled.

5.2. Managerial capacity

Referring to Zhang Lu et al. (2019), the managerial competence indicator MA_Score is calculated based on the effect of managers on firm efficiency separated from the full efficiency of the firm. In Table 10, the models are controlled for all control variables as well as two-way fixed effects. Firstly, the first step of the mediating effect, column (1), shows that the estimated coefficient of female CEO

FemaleCEO is significantly positive, i.e., female CEOs are more competent managers compared to male CEOs; further, the estimated result of column (2) is observed: the estimated coefficient of MA_Score is significantly negative at the 1% statistical level, which indicates that the stronger the managerial competence of the firm, the lower the agency cost. Therefore, this mediating path is verified: higher managerial competency of female CEOs helps to reduce agency problems in the firm.

Table 11. Discussion of the mechanisms of corporate managerial competence

Explained variables:	(1) MA_Score	(2) MFR
MA_Score		-13.027*** (0.411)
FemaleCEO	0.007* (0.004)	-0.469*** (0.175)
Size	0.001 (0.001)	-1.891*** (0.059)
Leverage	-0.034*** (0.006)	-4.233*** (0.338)
Age	-0.007*** (0.001)	0.913*** (0.061)
ROA	0.106*** (0.003)	-5.691*** (0.139)
Indratio	0.000 (0.000)	0.001 (0.005)
Audit	-0.023*** (0.005)	1.648*** (0.196)
Dual	0.005** (0.002)	0.209** (0.103)
Loss	-0.066*** (0.006)	3.289*** (0.438)
SOE	-0.008*** (0.002)	-0.285*** (0.103)
Constant term	-0.042* (0.022)	54.759*** (1.234)
Fixed effects	Control	Control
Observations	23,886	23,886
R-squared	0.205	0.400

Note: Observations are at the firm panel level, and fixed effects include year fixed effects and industry fixed effects. ***, **, and * indicate significant at the 1%, 5%, and 10% statistical levels, respectively. "Not controlled" means that the fixed effect is not controlled, and "controlled" means that the fixed effect is controlled.

6. Conclusions and Policy Implications

This paper investigates the effect of female CEOs on corporate agency costs using panel data of A-share listed companies in Shanghai and Shenzhen from 2008 to 2020. Through extensive empirical research, it is demonstrated that female CEOs can significantly reduce corporate agency costs, and this finding has important implications for corporate governance. This finding has important implications for corporate governance. Then, the empirical analysis is conducted on female managers and female chairpersons to verify that they also have a reducing effect on corporate agency costs. The effect of female executives on agency costs is particularly pronounced in the eastern region and in capital-intensive firms. Finally, this paper proposes two mechanisms, namely internal control quality and female managerial competence, to explain why female CEOs reduce corporate agency costs. First,

the higher the quality of internal controls, the lower the agency costs. Female CEOs usually pay more attention to corporate governance and social responsibility, thus improving the quality of internal controls. Second, female managers are more capable than male CEOs and have a more significant effect on the reduction of agency costs in the firm. This can be reflected by the fact that female CEOs are more creative and flexible in dealing with corporate crises and conflicts, etc.

From the above findings, the following insights are obtained from this paper: (1) It is very important to increase the proportion of women at the corporate management level. By increasing the proportion of women in positions such as CEO, general manager, and board members, corporate agency costs can be effectively reduced and corporate performance can be improved. Policies can promote women to play a more important role in corporate management by encouraging companies to hire female executives and establishing a quota system for female leaders. (2) Internal controls and supervision must be strengthened. Enterprises should develop a more stringent internal control system and reduce the agency costs of enterprises by improving the quality and effectiveness of internal audits. The policy can strengthen the supervision of the internal control of enterprises, and promote enterprises to strengthen internal audit and risk management. (3) Focus on developing the management capabilities of female executives. Female executives should receive more comprehensive and systematic management training to improve their management capabilities so that they can better play their roles in corporate management. Policies can increase support for training and education of female executives and encourage enterprises to provide more career development opportunities and promotion space for female executives. (4) Enterprises and society should pay more attention to gender equality and diversity. Gender equality and diversity is one of the basic values of enterprises and society, which should be more widely recognized and promoted. The policy can increase the publicity and promotion of gender equality and diversity, and encourage enterprises to develop more gender equality and diversity friendly policies. (5) Women need to be encouraged to enter traditionally male-dominated industries and fields. Many industries that are traditionally considered male domains, such as technology, finance, and manufacturing, still have gender inequality issues. Governments and businesses should take proactive measures to encourage women to enter these fields and to provide more training and development opportunities.

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