

Audit Committee Chair's Geographic Distance and Cost of Equity Capital

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Abstract. Using a sample of A-share listed companies in China for the period of 2007-2018, this paper empirically tests the impact of the geographical distance of the audit committee chair (ACC) on the company's cost of equity capital. The study found that there is a significant positive correlation between the geographical distance of ACC and the company's cost of equity capital, and the regulatory strength will weaken the positive relationship between the two. This conclusion still holds after a series of robustness tests. The research conclusion of this paper not only enriches the research on the characteristics of audit committee chairs, expands the research extension of geographical economics in the field of financial accounting, but also provides certain theoretical support and test evidence for listed companies to select ACC and reduce the cost of equity capital. It is of great significance to improve the performance level of the audit committee and protect the interests of investors. **Keywords:** Audit committee chair, Geographic distance, Cost of equity capital, Regulatory strength.

1 Introduction

The cost of capital has always been one of the important concepts in the field of financial management. On the one hand, if a company wants to achieve the goal of maximizing shareholder wealth, it must minimize all input costs, including the cost of capital. Therefore, reasonable reduction of capital cost is the basis for making financing decisions. On the other hand, shareholder wealth increases only when a company invests in projects with a rate of return higher than the cost of capital. Therefore, correct estimation of the capital cost of the project is the basis for making investment decisions[1].

In January 2002, the China Securities Regulatory Commission (hereinafter referred to as the CSRC) and the former State Economic and Trade Commission jointly issued the "Code of Corporate Governance for Listed Companies". It is proposed that the board of directors can set up special committees such as strategy, audit, nomination, remuneration and assessment, and independent directors in the audit committee should account for the majority and serve as the convener. In 2018, the "Code of Corporate Governance for Listed Companies" was revised, and the responsibilities of the audit committee were explained in more detail. According to the China Stock Market and Accounting Research Data Base (CSMAR), by

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the end of 2020, among 4,823 Chinese listed companies, 4,734 disclosed that they had established audit committees, accounting for 98.15 % of the total sample size. That is, listed companies have basically established audit committees.

The perfect audit committee system plays an important role in supervising the company's management and major shareholders, ensuring the quality of information disclosure and protecting the interests of small and medium-sized shareholders. A large amount of literature studies the role of audit committee membership characteristics on enterprise innovation [2], bank stability [3], and risk information disclosure [4]. With the continuous expansion of related research, scholars began to pay attention to the influence of the geographical location of the audit committee on the quality of internal control and earnings [5].

Geographical economics is an important branch of economics research, and it has been gradually introduced into the financial field to combine with traditional corporate governance and financial decision-making. The interdisciplinary research of geographic economics and finance mainly focuses on the influence of the geographical location of enterprises on their investment and financing decisions. The economic consequences of geographical distance between major customers, independent directors, institutional investors, auditors and listed companies are also involved[[2],[6]].

The follow-up arrangement of this paper is as follows. The second part 2proposes the research hypothesis. The third part 3is the research design, including sample selection and model construction. The fourth part 4 is the empirical result analysis. The fifth part 5draws the research conclusion.

2 Development of Hypotheses

As a professional committee of the board of directors, the audit committee has the function of supervising the company's management, internal and external audit work and internal control. At the same time, it plays an increasingly important role in ensuring the accuracy and effectiveness of information disclosure, restraining the abuse of power by the management and protecting the interests of minority shareholders of the company. According to the Code of Corporate Governance for Listed Companies, the audit committee shall have a chairman, who must be an independent director with professional experience in accounting or financial management.

Increased geographic distance reduces independent directors' motivation to oversee. The reputation mechanism is the primary mechanism for independent directors to play a role. When the geographical distance is close, the reputation and influence of independent directors in the location of listed companies are easier to accumulate. They will also value the reputation of the place where they work more. Strict supervision and self-discipline to enhance their reputation in the human capital market. When the geographical distance is far away or the location is different, it is not easy for independent directors to establish reputation in the place where the listed company is located. At the same time, they will be at a disadvantage of information and resources. The lack of incentives will weaken the supervision and restriction of reputation on independent directors, thus weakening their supervision motivation.

Increased geographic distance can also weaken the oversight capabilities of independent directors. In the process of corporate practice, independent directors must have sufficient and objective information related to the management in order to become the real supervisor of the management. However, based on the comprehensive control of the production and operation activities, the management often selectively shares information with independent directors. In the case of information acquisition disadvantage, the independent director's supervision

function cannot be effectively performed, and the agency cost increases accordingly [7]. Existing research has confirmed that nonlocal independent directors have obvious disadvantages in information acquisition, which leads to the weakening of their supervision ability. The increase in the geographical distance between independent directors and the company not only reduces the possibility and convenience of on-the-spot research, but also is not conducive to the communication and information transfer. As a result, nonlocal independent directors cannot have a deep understanding of the company's real operating conditions, the supervision function cannot be fully exerted, and the problem of information asymmetry between external investors and the company is exacerbated [8].

As the geographical distance of the Chairman of the Audit Committee (hereinafter referred to as ACC) increases, its supervision motivation and supervision ability weaken. This leads to an increase in the degree of information asymmetry between investors and companies, and a corresponding increase in the severity of agency problems [9]. For enterprises with a higher degree of information asymmetry, investors with information disadvantage face higher investment uncertainty, estimated risk and non-diversifiable risk. Therefore, higher risk premium and equity capital cost are required [10].

To sum up, the increase of geographic distance weakens the supervisory motivation and supervisory ability of the ACC, which leads to aggravation of information asymmetry and agency problems, and the cost of equity capital of the company increases accordingly. Therefore, our first hypothesis is stated as follow:

Hypothesis 1. The greater the geographical distance of ACC from the company, the higher the cost of equity capital.

Kedia and Rajgopal found that the closer a company is to the SEC, the lower the probability of a company's financial misstatement[11]. This is due to resource constraints, and the SEC is more inclined to investigate neighboring companies in order to facilitate regulatory activities, prompting neighboring companies to increase their efficiency under high regulatory intensity. The supervision distance is an important factor affecting the strength of the supervision institution. It may affect the behavior of listed companies and audit committees, and then affect the cost of equity.

The CSRC, as the main body of unified supervision of the national securities market, is endowed with corresponding administrative enforcement and punishment powers by laws and regulations. When the listed company is close to the CSRC, the intangible pressure under the supervision and restriction of the regulatory authority is large. The CSRC will be more strict in reviewing the accounting information disclosed by listed companies [12], and the independent directors will suffer more serious losses in reputation and punishment for dereliction of duty.

For the purpose of maintaining his own reputation and ensuring subsequent appointments, the ACC will also try his best to perform his duties, supervise the daily operation of the company more. This not only helps to strengthen the supervisory motivation of the ACC, but also helps to ensure the accurate disclosure of financial information, reduces the degree of information asymmetry between external investors and the company, and can more inhibit the occurrence of agency conflicts under investor protection. A good investor protection mechanism can also help companies obtain more external financing and reduce the cost of external financing [10].

To sum up, the closer a listed company is to the CSRC, the stronger the supervision will be. The reputation and punishment system will enable the ACC to better perform the supervisory function, and restrain the occurrence of agency conflicts. To some extent, it will weaken the positive relationship between the geographical distance of ACC and the cost of equity capital. Therefore, our second hypothesis is stated as follow:

*Hypothesis 2.*Regulatory intensity weakens the positive relationship between geographic distance of ACC and cost of equity capital.

3 Research Design

3.1 Sample and Data

Our initial sample is from 2007 to 2018 and includes all A-share listed companies in China. We screen the samples as follows: (1) excluding companies that did not disclose information about the ACC; (2) excluding companies with ST and *ST; (3) excluding financial listed companies; (4) excluding the remaining sample with missing data. After the selection our final sample consists of 13,010 firm-year observations. To avoid the influence of extreme values on the results, Winsorize tail processing was performed on continuous variables at the 1% and 99% levels. We manually collect the information of the ACC and the location of his main work in the company's announcement. The internal control data adopts the Dibo-Internal Control Index. Other data including firm's financial data and corporate governance data are obtained from the CSMAR.

3.2 Variable Definition and Model Setting

(1) Cost of equity capital

This paper refers to the practice of Easton and uses the PEG model to measure the cost of equity capital [13]. In order to narrow the gap in the magnitude of the dependent variables, the calculated cost of equity capital is multiplied by 100 as the final dependent variable (coc_1). The specific calculation process is shown in formula (1)

$$coc_1 = \sqrt{\frac{eps_{t+2} - eps_{t+1}}{P_t}}. \quad (1)$$

Among them, coc_1 is the cost of equity capital calculated under the PEG model; eps_{t+2} and eps_{t+1} are the average earnings per share predicted by analysts in periods $t + 1$ and $t + 2$, and P_t is the price per share at the end of period t .

(2) Geographic Distance of ACC

This paper refers to the measurement of geographic distance by Yuan and Zhou [7]. We use the latitude and longitude distance between the administrative center where the ACC works and the company's business location (Dis_j) as a proxy variable for the geographical distance of the ACC. The larger the value of , the greater the geographic distance between the two. The specific calculation process is as follows :

$$Dis_j = 6371.4 * Across(C) * \frac{\pi}{180}. \quad (2)$$

$$C = \cos(latitude_i) * \cos(longitude_i) * \cos(latitude_j) * \cos(longitude_j) + \cos(latitude_i) * \sin(longitude_i) * \sin(latitude_j) + \sin(latitude_i) * \sin(longitude_j). \quad (3)$$

If a listed company has multiple ACCs at the same time in a certain year, the average of the calculated distances is used as a proxy variable for the geographical distance of ACC. In order to narrow the gap in the magnitude of the independent variables, the natural logarithm is taken as the final explanatory variable ($LnDis_j$).

Table 1. Variable Definition.

Type	Name	Description
Dependent variable	COC1	Cost of equity capital, calculated with reference to Easton [13] using the PEG model
Independent variables	LnDis _j	Natural logarithm of the distance of the geographic location of ACCs from the company's operating place
Moderator variable	Regulation	Supervision intensity, the negative value of the natural logarithm of the geographical distance between the listed company's operating location and the CSRC
Control variables	Size	Company size, natural logarithm of total annual assets
	Lev	Leverage, total liabilities at year-end divided by total assets at year-end
	Roe	Return on equity, net profit divided by average balance of shareholders' equity
	Cashflow	Cash flow ratio, net cash generated from operating activities divided by total assets
	Board	Number of directors, natural logarithm of the number of BODs
	Indep	Percentage of independent directors, independent directors divided by the number of directors
	Dual	Duality, if the chairman and CEO is the same person, the number is 1, otherwise 0
	ListAge	Years on market, Ln (current year - year on market + 1)
	Dturn	Average monthly excess turnover rate, The average monthly stock turnover rate of the current year minus the average monthly stock turnover rate of the previous year
	Year	Year dummy variables, with 11 dummy variables taken for the 12-year study sample year
Ind	Industry dummy variables, with the SEC's 2012 industry classification, manufacturing takes two codes and other industries use major categories	

(3) Regulatory strength

The geographical distance between a listed company's business location and the CSRC will affect the company's supervision intensity and the supervisory function of the ACC. Referring to models (2) and (3), we use the latitude and longitude distance between the listed company's business location and the CSRC as a proxy variable for regulatory strength (*Reg*). In order to adjust the magnitude and change direction of the variable, the negative value of its natural logarithm is taken as the final regulatory strength variable (*Regulation*). The larger the value of "*Regulation*", the smaller the distance between the listed company's business location and the CSRC, and the higher the regulatory intensity that the company faces.

(4) Model Specification

H1 predicts that the farther the ACC is from the company, the higher the company's cost of equity capital. We test this hypothesis by employing the following linear regression model:

$$COC_1 = \beta_0 + \beta_1 * LnDis_j + \beta_2 * Controls + \beta_3 * Year + \beta_4 * Ind + \epsilon. \quad (4)$$

H2 predicts that regulatory intensity will weaken the positive relationship between the geographical distance of ACC and the cost of equity capital. We test this hypothesis by employing the following linear regression model:

$$COC_1 = \beta_0 + \beta_1 * LnDis_j + \beta_2 * Regulation + \beta_3 * LnDis_j * Regulation + \beta_4 * Controls + \beta_5 * Year + \beta_6 * Ind * \epsilon. \quad (5)$$

The dependent variable is COC_1 (the cost of equity capital of listed company) in both Model (4) and Model (5). The independent variable in Model (4) is $LnDis_j$. If the geographical distance of the ACC increases the cost of equity capital as predicted in H1, we expected in Model (4) to be significantly positive. Besides the $LnDis_j$, we also include "Regulation" and its interaction with $LnDis_j$ as independent variables in Model (5). According to H2, we expect β_3 in Model(5) to be significantly negative.

We include other control variables (*Controls*) following prior literature [5] in both models. These variables include *Size*, *Lev*, *Roe*, *Cashflow*, *Board*, *Indep*, *Dual*, *ListAge*, and *Dturn*. We also include fixed effects for year (*Year*) and industry (*Industry*) in both models. The detailed definitions of all variables are shown in table 1.

Table 2. Descriptive statistics of main variables

Variables	N	Average	Standard deviation	Minimum	Maximum
COC_1	13010	10.791	4.046	3.088	24.855
$LnDis_j$	13010	3.582	1.498	-0.037	5.777
Regulation	13010	-4.878	1.141	-5.810	-1.109
Size	13010	22.275	1.266	20.047	26.086
Lev	13010	0.424	0.201	0.051	0.850
Roe	13010	0.103	0.078	-0.115	0.377
Cashflow	13010	0.051	0.070	-0.146	0.247
Board	13010	2.155	0.197	1.609	2.708
Indep	13010	0.372	0.052	0.333	0.571
Dual	13010	0.250	0.433	0.000	1.000
Listage	13010	2.035	0.808	0.000	3.219
Dturn	13010	-0.122	0.424	-1.758	0.888

4 Empirical Results

4.1 Descriptive Statistics

The descriptive statistics of the main variables are shown in table 2. The cost of equity capital (COC_1) of each company varies greatly, ranging from 3.088 percent to 24.855 percent, with an average value of 10.791 percent. The average geographical distance of the ACC ($LnDis_j$) is 3.582, and the average geographical distance after logarithmic reduction is about 82.847km. This shows that there is a certain distance between the working place of the ACC and the listed company. The average value of regulation intensity (*Regulation*) is -4.878, and the average geographic distance between listed companies and the CSRC after restoration is 187.316km. The average values of company size (*Size*), company leverage (*Lev*), return on equity (*Roe*), cash flow ratio (*Cashflow*) and monthly average excess turnover (*Dturn*) are 22.275, 0.424, 10.3 percent, 5.1 percent and -12.2 percent. The average company listing age is 10.017 years (*ListAge*). In 25 percent of sample, CEO is also the chair of the board (*Dual*). The average number of board members is 9 (*Board*), of which the proportion of independent directors is 37.2 percent (*Indep*).

4.2 Correlation Analysis

Table 3 shows the correlation matrix of the variables used in the regression analysis. The correlation coefficient between $LnDis_j$ and COC_1 is 0.029, which is significantly positive at the 1 percent level. This shows that geographic distance will affect a company's cost of equity capital. The greater the geographic distance, the greater the company's cost of equity capital. The result provides initial evidence that H1 is supported. *Regulation* and COC_1 are significantly negative at the 5 percent level, indicating that the greater the regulatory intensity, the lower the company's cost of equity capital. There are also significant correlations between *Size*, *Lev*, *Roe*, *Cashflow*, *Indep* and COC_1 . At the same time, the correlation coefficients between the variables are not large, and there is no serious multicollinearity problem in the multiple regression model.

Table 3. Pearson correlation matrix

Variables	COC_1	$LnDis_j$	Regulation	Size	Lev	Roe	Cashflow	Board	Indep
COC_1	1								
$LnDis_j$	0.029*** (0.001)	1							
Regulation	-0.017** (0.049)	0.031*** (0.001)	1						
Size	0.195*** (0.000)	0.032*** (0.000)	0.097*** (0.000)	1					
Lev	0.226*** (0.000)	-0.008 (0.383)	0.022** (0.011)	0.568*** (0.000)	1				
Roe	0.108*** (0.000)	0.020** (0.023)	-0.013 (0.133)	0.075*** (0.000)	0.016* (0.065)	1			
Cashflow	-0.091*** (0.000)	0.037*** (0.000)	-0.034*** (0.000)	-0.003 (0.750)	-0.161*** (0.000)	0.348*** (0.000)	1		
Board	0.013 (0.131)	0.021** (0.016)	0.012 (0.188)	0.247*** (0.000)	0.182*** (0.000)	0.028*** (0.001)	0.055*** (0.000)	1	
Indep	0.024*** (0.007)	-0.015* (0.096)	0.010 (0.246)	0.022** (0.012)	-0.020** (0.023)	-0.018** (0.037)	-0.026*** (0.003)	-0.479*** (0.000)	1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4.3 Multivariate Analysis

Based on model (4), H1 is tested for regression, and the results are shown in column (1) and column (2) of 4. The coefficient of $LnDis_j$ in column (1) is 0.077, which is significantly positive at the 1 percent level, and the coefficient of $LnDis_j$ in column (2) is 0.049, which is significantly positive at the 5 percent level. Therefore, H1 has been verified. The farther the geographical distance is, the weaker the supervisory motivation and supervisory ability of the director of the audit committee, the greater the management risk of the enterprise, and the greater the cost of the company's equity capital. That is, the increase in the geographical distance of the ACC significantly increases the cost of equity capital. From an economic point of view, for each standard deviation increase in $LnDis_j$, COC_1 increases by 7.34 percent.

Based on model (4), H2 is tested for regression, and the results are shown in column (3) and column (4) of table 4. The coefficients of $Regulation * LnDis_j$ in columns (3) and (4) are all significantly negative at the 1% level. So H2 is verified. Regulatory intensity has a negative moderating effect on the positive relationship between the geographical distance of ACC and the cost of equity capital. This suggests that with increasing regulatory intensity, reputation and penalty systems prompt audit committee directors to perform their supervisory functions better, thereby weakening the positive relationship between the geographic distance of ACC and the cost of equity capital.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4.4 Robustness Tests

(1) Heckman two-stage regression

We present Heckman two-stage regression with the IMR to address the self-selection concern. Model (6) is the first stage probit model, Dis_dum is a dummy variable of geographic distance (equal to 1 if $LnDis_j$ is numerically greater than the annual median and 0 otherwise).

As listed companies will consider the influence of regional transportation convenience when selecting and appointing the ACC. When the regional transportation is inconvenient, listed companies are more inclined to choose the ACC that is geographically adjacent. Therefore, this paper selects the standard deviation of elevation (sd_height) and standard deviation

Table 4. ACC geographical distance and cost of equity capital

Variables	COC ₁			
	H1		H2	
	(1)	(2)	(3)	(4)
<i>Lndis_j</i>	0.077*** (0.000)	0.049** (0.017)	-0.389*** (0.001)	-0.422*** (0.000)
Regulation* <i>Lndis_j</i>			-0.092*** (0.000)	-0.094*** (0.000)
Regulation			0.280*** (0.001)	0.245*** (0.004)
Constant	8.197*** (0.000)	-1.161 (0.173)	9.656*** (0.000)	-0.028 (0.977)
Control variables	No	Yes	No	Yes
Year	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes
N	13010	13010	13010	13010
<i>Adj - R</i> ²	0.239	0.287	0.240	0.289
F-value	132.818	132.109	125.558	126.812

of slope (*sd_slope*) of the prefecture-level city where the listed company is located as the instrumental variables of the first stage ¹.

$$\begin{aligned}
 Dis_dum = & \beta_0 + \beta_1 * sd_height + \beta_2 * sd_slope + \beta_3 * Size + \beta_4 * Lev + \beta_5 * Roe \\
 & + \beta_6 * Cashflow + \beta_7 * Board + \beta_8 * Indep + \beta_9 * Year + \beta_{10} * Ind + \varepsilon.
 \end{aligned}
 \tag{6}$$

We include the Inverse Mills Ratio (IMR) generated from the first stage regression in the model (6) to run the second stage regression. Table 5 reports the two-stage regression results. The coefficient on *Dis_dum* is significantly positive at the 5 percent level in Column (2). The previous conclusion for H1 is still robust.

(2) Propensity score matching

We implement a propensity score matching (PSM) approach to confront the endogeneity issue. We divide the sample into treatment group (*Dis_dum* =1) and control group (*Dis_dum* =0). Using the method of stepwise regression, we select *Size*, *Lev*, *Cashflow*, *Board* as matching variables. The density distributions before and after matching are shown in figure 1 and figure 2. It can be seen that the distributions of the control group and the treatment group after matching are very similar, the matching effect is ideal, and the common support hypothesis is satisfied.

After removing unmatched samples, we get a total of 12308 sample. Model (4) was regressed with matched samples, and the results are shown in table 6, where column 1 controls only industry and year, and column 2 adds all control variables. The results show that after PSM, the coefficient of *LnDis_j* is significantly positive at the 5 percent level. That is, the increase in the geographical distance of the ACC significantly increases the cost of equity capital. This suggests that the previous conclusions are still robust after controlling for selectivity bias caused by observable factors.

¹The source of elevation and slope data is the SRTM data (DEM spatial distribution data of altitudes in China) downloaded from the website of the Chinese Academy of Sciences. Based on this data, we process the elevation and slope data of each city separately in arcgis software.

Table 5. Heckman two-stage regression.

Variables	(1)First Stage	(2)Second Stage
	<i>Dis_dum</i>	<i>COC_1</i>
<i>Dis_dum</i>		0.143** (0.020)
<i>sd_height</i>	-0.000** (0.010)	
<i>sd_slope</i>	-0.001 (0.871)	
IMR		-2.246** (0.023)
Constant	-0.732** (0.019)	1.772 (0.245)
Control variables	Yes	Yes
Year	Yes	Yes
Ind	Yes	Yes
N	13010	13010
<i>Adj - R²</i>	0.032	0.288
F-value	570.180	129.058

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

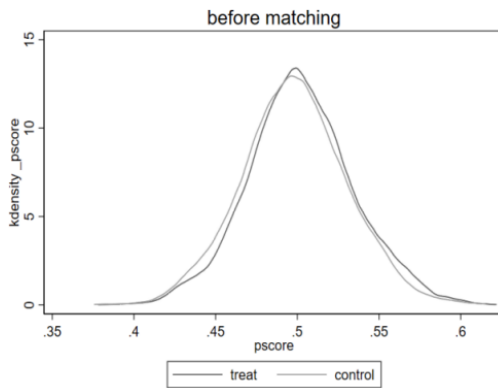


Figure 1. Distribution of P-Score Before PS Matching

[t]

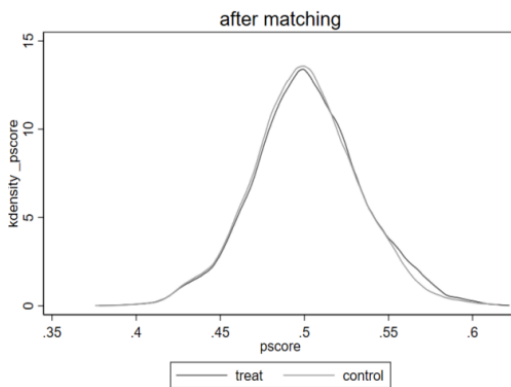


Figure 2. Distribution of P-Score After PS Matching

[t]

Table 6. ACC geographical distance and cost of equity capital (PSM).

Variables	COC ₁	
	1	2
<i>Lndis_j</i>	0.065*** (0.003)	0.050** (0.017)
Constant	8.094*** (0.000)	-1.060 (0.247)
Control variables	No	Yes
Year	Yes	Yes
Ind	Yes	Yes
N	12308	12308
<i>Adj - R²</i>	0.239	0.286
F-value	125.310	123.962

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5 Conclusions

Using a sample of A-share listed companies in China for the period of 2007-2018, this paper empirically tests the impact of the geographical distance of the ACC on the cost of equity capital. The study draws the following conclusions: the geographical distance of ACC is significantly positively related to the cost of equity capital; the regulatory strength will weaken the positive relationship between the two.

The main contributions of this paper are: (1) Promote the development of interdisciplinary disciplines of geographical economics and finance, and incorporate geographical location factors into the financial accounting research system. This will enrich the study of ACC characteristics and expand the research scope of geographical economics in the field of financial accounting; (2) The existing literature mainly studies the cost of equity capital from the perspectives of information disclosure, tax avoidance and internal characteristics of the company. This paper enriches the relevant research from the perspective of geographical distance; (3) The conclusions of this paper provide some theoretical support and empirical evidence for the improvement of the audit committee system, the selection mechanism of the ACC and the reduction of the cost of equity capital.

The inspiration of this paper is: (1) The geographical distance of the ACC can significantly increase the cost of equity capital. When a listed company selects and appoints the ACC, in addition to examining from the aspects of professional quality, diligence, reputation, etc. The geographical location factor is included in the scope of investigation; (2) As an independent and professional financial expert, the ACC should give full play to the supervisory function, which not only helps to reduce the cost of equity capital, but also helps to optimize the company's resource allocation efficiency and capital flow; (3) For the government and regulatory agencies, it is necessary to establish and improve relevant laws and regulations, strengthen the supervision of independent directors' performance of duties, and maintain the healthy development of the capital market.

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