



The effect of CPA Firms, Audit Fee and CPA Rotation on Earnings Quality (Case Study: IT Industry in China)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In recent years, there are many researches on the relationship between CPA firms and earnings quality. However, the manipulation of profit and loss by listed companies still exists. Different from previous studies, this paper selects all the information technology industry of Chinas listed companies in 2019 as the research object, and uses the fuzzy-set/ qualitative comparative analysis method (fs/QCA) to explore the impact of accounting firm size, audit fees and accounting rotation on earnings quality. The results show that regular rotation of accountants and separation of two rights are the key factors to improve earnings quality. On this basis, small-scale companies in the development stage need to pay more public audit fees to obtain professional advice, but they do not need to hire large-scale CPA firms; For large-scale companies with system, the public audit fee should not be too high, and whether to employ large-scale firms does not affect the earnings quality; For a company with poor financial structure, it is not necessary to employ large-scale CPA firms and the public audit fee should not be too high.

Keywords: Earnings quality; the scale of CPA firms; audit fee; CPA rotation.

1. INTRODUCTION

Since the reform and opening up, China's capitalization development has been advancing steadily. With the continuous growth of the market, the continuous improvement of enterprise system and government policy, the audit work has become an indispensable part of an enterprise in a year. In recent years, the audit quality of CPA firms has been paid more attention.

In recent years, financial fraud scandals are still heard from time to time, which also let us see the gray area of the audit industry. We can't help but think about a question: can large-scale firms provide better services? According to the official website of China Institute of Certified Public Accountants, the Top 10 CPA firms with the highest scores are PwC, Ruihua, Deloitte, BDO, Ernst & young, KPMG, Pan-China, ShineWing, BakerTilly and GrantThornton. Among them, PwC, Deloitte, Ernst & young and KPMG are recognized as the "Big 4" CPA firms in the world. The relationship between the size of CPA firms and the earnings quality has always been an important issue for some scholars. Referring to the relevant literature, most of the current studies use quantile regression or ordinary least square (OLS) method. However, many factors affect the earnings quality, that is, not a specific factor that will affect all enterprises. Different from the previous research, this study uses the fuzzy-set Qualitative Comparative Analysis (fs/QCA) method to explore the impact of the scale of CPA firms, the audit fee and CPA rotation on the earnings quality. We expect that the research results of this study can provide more valuable reference basis for the accounting industry regulators to improve the relevant system, and provide investors to make investment decisions by using financial statements.

1.1 Literature Review

Xing et al. [1] takes the local government as an example to study the audit adjustment and chain relationship between audit committee and CPA firm. They found that the larger the company is, the less likely the auditor will adjust the company's profit; the larger the company scale, the more dependent the CPA firm is on its economy, so the lower the possibility of adjusting its profit. Moreover, the corporate governance of the companies audited by the "Big 4" CPA firms is relatively perfect, and the earnings quality

before the provincial level is higher, so the possibility of accounting to adjust their profits decreases. Yu and Shen [2] mentioned in their research on the relationship between the scale of CPA firms, earnings quality and regulatory distance: the supervision of large-scale CPA firms is an effective supplementary mechanism for securities supervision. Therefore, compared with other institutions, domestic big chain companies are more likely to strengthen supervision on companies that are farther away, which shows that the earnings quality is relatively improved. However, there are other studies show that compared with large-scale CPA firms, small-scale CPA firms have fewer clients and concentrated audit risk. Therefore, in order to reduce their own audit risk, small-scale CPA firms may maintain independence in the audit process and increase audit investment, to improve the audit quality [3]. The research findings of Shi & Luo [4] shows that the reappointment of CPA after mandatory rotation lead to the audit quality decrease. However, the large-scale CPA firms can effectively reduce the effect of the reappointment of CPA on the audit quality.

Louis [5] thinks that large-scale CPA firms can provide better training for employees and make their audit programs more professional, so large-scale CPA firms have stronger professional competence than small-scale ones. However, the small-scale CPA firms have strong rationality and better understanding of the local market, so the information advantage is better than that of the large-scale CPA firms when they carry out the audit work of local enterprises. Guo [6] concluded from the empirical research on the characteristics of signed CPA firms and the quality of independent audit that the "Big 4" CPA firms have better structured audit programs than the non-"Big 4" CPA firms. Since the auditing quality of the "Big 4" CPA firms' individual task forces has less impact and the consistency of audit quality is strong. Among the "Big 4" CPA firms, the CPA with more other certificates do not reduce their audit quality; and the "Big 4" CPA firms can better maintain their independence in the audit work than the small ones. In addition, supporting the system design of the "Big 4" CPA firms is conducive to providing better audit quality.

Chen et al. [7] indicate that there is no significant impact in earnings quality between client firms that received a fee cut during the Global Financial Crisis (GFC) and control firms consisting of firms that did not receive a fee cut

and firms that received a fee cut before the GFC. Further, there is no significant difference in the decision of a going concern option or a financial reservation. Moreover, for the aspect of audit quality, between client firms that received a fee cut during the GFC and control firms, due to the CPA firm uses low price to attract customers, its CPA may reduce the necessary audit programs in order to reduce the variable cost of audit, which makes it difficult to find some major misstatements of the audited customers, thus providing the management with space for earnings manipulation, thus affecting the earnings quality. In order to hesitate the "intimate relationship" between auditors and customers, which affects the earnings quality of audit work, China issued the "Provisions on the Periodic Rotation of Certified Public Accountants audit business in Securities and Futures" in 2003, which shows that the rotation of CPA can affect the earnings quality, so it makes special provisions on this. In addition, Adrian [8] examines the effect of CPA firm rotation on earnings quality in the context of local government in Australia. They found some evidence that audit firm rotation improves earnings quality. In the first year after the tenders, earnings quality is higher for councils that rotate auditors. Gao [9] argued that the rotation of one signature CPA can improve the audit quality of small and medium-sized board listed companies, the rotation of two signature CPA cannot improve the audit quality of small and medium-sized board listed companies, and the mandatory rotation of signature CPA can improve the audit quality of small and medium-sized board listed companies.

After summing up the relevant literature, this study proposes that the scale of CPA firms, audit fees and CPA rotation have a certain relationship with earnings quality. The following sections will elaborate the design of research methods and models, and analyze the empirical results.

2. METHODS

Based on the above research results of domestic and foreign scholars, this paper concludes that the scale of CPA firms, audit fee and CPA rotation are related to the degree of earnings management. In view of the different operating conditions of enterprises, this study adopts the fuzzy set Qualitative Comparative Analysis (fs/QCA) method and the ordinary least square (OLS) method for cross comparison to explore

the impact of the scale of CPA firms, audit fee and CPA rotation on the earnings quality.

Whereas the industry characteristics of information technology (IT) industry, the industry competition is fierce and the product life cycle is short, so the possibility of earnings manipulation is relatively higher than other industries. Therefore, this study selects the listed companies of China's A-share IT industry in 2019 as samples. The sample data were obtained from WIND and CSMAR databases. After all samples are downloaded, the incomplete samples are deleted first, and then the outliers are removed. A total number of samples is 344.

Considering that there are great differences in the operating conditions of the sample companies, this study uses fuzzy-set / qualitative comparative analysis (fs/QCA) method for empirical study. At present, there are less researchers adopt fs/QCA method in the field of social science, but this method has great significance for the research of social science. In the field of social science research, it is not only a single reason that commonly leads to a specific phenomenon, but also the combination of multiple causal variables. That is, one or a set of specific causes is not enough to explain the complete causal relationship, the traditional linear regression statistical analysis method is difficult to analyze the complete and effective research conclusions. Fuzzy qualitative comparative analysis (fs/QCA) makes up for the shortcomings of this traditional linear regression, and can systematically and effectively analyze the relationship between specific results and multiple groups of multi factor combinations, and has been widely used in the field of social struggle research. Ragin [10] developed the QCA theory foundation, and then developed fs/QCA theory. In 2000, it demonstrated how to use fuzzy sets to deal with phenomena that vary by level or degree [11]. Then, in 2008, it further revealed the complexity of causal factors, and elaborated the set theory foundation that links variable oriented and case oriented thinking [12]. The characteristic of fs/QCA is to make up the weakness of the traditional regression methods. It systematically explores the causes of events and the interaction and possible relationship between internal factors, trying to explain the key factors leading to the event, combining the relationship between various factors and the complex causes of the stimulation event, to deepen the understanding of complex causal relationship of the event.

This study adopts fs/QCA method supplemented by ordinary least square (OLS) method for empirical research, in order to enhance the practical reference value, in addition, compare and analyze the correlation between the two results to improve the robustness of the research results. The followings are the research models of this study.

The model of OLS is as follows:

$$EQ_{it} = \alpha_0 + \alpha_1 BIG10_{it} + \alpha_2 FEE_{it} + \alpha_3 ROTATION_{it} + \alpha_4 SEPARATE_{it} + \alpha_5 LIAB_{it} + \alpha_6 EPS_{it} + \alpha_7 SCALE_{it} + \varepsilon_{it}$$

The model of fs/QCA is as follows:

$$EQ = f (BIG10, FEE, ROTATION, SEPERATE, LIAB, EPS, SCALE)$$

2.1 Variable Description

1. Dependent variable: the dependent variable used in this study is earnings quality (EQ). The real earnings management index in CSMAR database is the discretionary accruals calculated by the modified Jones model developed by Dechow and Sloan [13] based on Jones model [14]. Therefore, the larger the absolute value is, the worse the earnings quality is. This study uses the negative number of the absolute value of the figure as the sample data, that is, the larger the value is, the better the earnings quality is. The calculation model of real earnings management coefficient is as follows:

$$\begin{aligned} \frac{TA_{i,t}}{A_{i,t-1}} &= \alpha_1 \frac{1}{A_{i,t-1}} + \alpha_2 \frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}} \\ &\quad + \alpha_3 \frac{PPE_{i,t}}{A_{i,t-1}} + \varepsilon_{i,t} \\ \frac{NDA_{i,t}}{A_{i,t-1}} &= \alpha_1 \frac{1}{A_{i,t-1}} + \alpha_2 \frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}} + \alpha_3 \frac{PPE_{i,t}}{A_{i,t-1}} \\ &\quad + \varepsilon_{i,t} \\ DA_{i,t} &= \frac{TA_{i,t}}{A_{i,t-1}} - \frac{NDA_{i,t}}{A_{i,t-1}} \end{aligned}$$

Among them, It is the operating profit of the company in year t minus the cash flow from operating activities, It is the total assets of the company at the end of t-1, It is the change of the company's main business income in the tth year minus the change of accounts receivable, It is the total fixed assets of the company in year t. Its discretionary accruals, its non-operational accruals. Is the regression residual value.

Independent variables: This study uses three independent variables: Big 10 CPA firms in China, audit fee and CPA rotation.

Big10 in China (Big10): This variable is set as a dummy variable. If it is the Big 10 CPA firm in China, it is set as "1". Otherwise, it is set as "0".

Audit fees (FEE) : Referring to the previous literature, the audit fee generally have proper measurement standards. If it is not reasonable, it may be related the risk of the earnings manipulation. This study takes the proportion of audit fee in sales revenue of sample companies as one of the independent variables.

CPA rotation (ROTATION) : Apart from the statutory provisions that the CPA needs to rotate the same listed company after five years, it also has the possibility that the listed company voluntarily change other CPAs. The possible causes contain that the former CPA consider the audit risk of the case is high, or the company wants to seek more professional CPA firms to help the company improve the accounting related quality. Therefore, this study takes the CPA rotation as one of the independent variables. It is a dummy variable. If there is a rotation situation, it is set to "1", if not, set as "0". Due to the limitation of the database, only the latest year's information is available, so the sample data in this study is only in 2019.

Control variables : This study selects the company size, separation of two rights, earnings per share and debt ratio as the control variables.

The separation between ownership and control (SEPARATE): This is an index to measure the degree of separation between ownership and management. The greater the degree of separation, the stronger the ability of balance between ownership and management, and the lower the possibility of earnings manipulation. Therefore, this study takes the index as one of the control variables.

Earnings per share (EPS) : The calculation method of earnings per share is to divide the net profit by the total number of shares of the company, which represents the profitability of the company. Generally, the purpose of earnings manipulation of listed companies is to increase earnings to attract the favor of investors, so earnings per share may also be the result of earnings manipulation. Therefore, this paper lists

earnings per share as one of the control variables.

The proportion of total liabilities to total assets (LIAB): The debt ratio represents the solvency of a company. Generally, companies with high debt ratio are easy to cause investors to have a bad impression. If they want to apply for bank loans, they are also difficult to pass. Therefore, the possibility of earnings manipulation is relatively high. This variable is calculated as total liabilities divided by total assets.

The scale of a company (SCALE): We take the total assets as the substitution variable of company size. Because the amount of consideration is too large compared with other variables, this study takes its natural logarithm in order to reduce the absolute value of the data and not change the nature and correlation of the data.

3. RESULTS

From the high and low distribution of the variables in Table 1, the range is quite wide, such as earnings quality, separation of ownership and management, debt ratio and earnings per share, which shows that there are great differences in the profitability, financial structure and operating environment of the sample companies, In order to be able to in-depth analysis of different conditions of the company is affected by different factors. In addition, from the perspective of the average value and standard deviation of each variable, many variables are not normally distributed, such as earnings management coefficient, whether CPA firms are BIG 10, the proportion of public audit fees and the separation of two rights, etc... In this paper, we use WINSORIZE approach to

delete the extreme value, which can keep the number of samples unchanged.

Table 2 shows the empirical results of the OLS method. Firstly, we check the rationality of the linear regression model design. The collinearity index is no more than 2, which shows that there is no obvious homogeneity in the selection of variables in the regression model. In addition, the F value is 3.949, which indicates that the sample variances of the linear regression model have significant differences, indicating that the design of the regression model has appropriate predictability for the whole.

In the empirical results of the OLS method, it shows that it is helpful to improve the earnings quality of financial statements for listed companies to employ non-BIG 10 CPA firms for financial statement certification. However, the audit fee and CPA rotation have no significant impact on earnings quality. In this study, fs/QCA method will be used for more in-depth discussion, and the results are shown in Table 3 to Table 5.

There are three steps to implement FS / QCA. In the first step, the original data of each variable must be calibrated and converted into a fuzzy set between 0 and 1 based on 95%, 50% and 5%. Table 3 shows 95%, 50% and 5% of the original value of each variable.

The second step of fs/QCA is the analysis of necessary conditions. The purpose of this test is to test whether a certain variable in the model has necessary conditions, because if a certain variable is necessary in a certain result, it means that as long as there is a certain variable, it will lead to the expected specific result. That is to say, no matter how many solutions there are in the empirical result of the model, these

Table 1. the description statistics of each variable (n = 344)

	minimum value	Maximum	average value	standard deviation
EQ	-0.7449	-0.0045	-0.1382	0.1354
BIG10	0.0000	1.0000	0.5087	0.5007
FEE	0.0000	0.0043	0.0008	0.0008
ROTATION	0.0000	1.0000	0.2558	0.4370
SEPARATE	0.0000	23.6334	3.1743	5.8792
LIAB	0.0571	0.7293	0.3547	0.1726
EPS	-1.3700	2.1300	0.3627	0.5593
SCALE	10.8641	15.8352	12.7038	1.0883

Note: EQ: earnings quality; BIG10: whether the financial statements are certified by the BIG 10 CPA firms; FEE: the proportion of audit fee in the operating income; ROTATION: whether to rotate the CPA; SEPARATE: the separation between ownership and management; LIAB: the proportion of total liabilities to total assets; EPS: earnings per share; SCALE: company size

Table 2. the empirical results of OLS (n = 344)

Variable	Coef.	T value	P value	Vif.
Con_	0.2049	1.7953	0.0735*	
BIG10	-0.0275	-1.7884	0.0746*	1.177
FEE	9.7043	0.7947	0.4273	1.868
ROTATION	-0.0092	-0.5284	0.5976	1.147
SEPARATE	-0.0025	-2.0408	0.0420**	1.026
LIAB	0.1008	2.1389	0.0332**	1.314
EPS	0.0605	4.4474	0.0000***	1.150
SCALE	-0.0085	-0.9709	0.3323	1.804
F value	3.949***			

Note 1: please refer to table 1 for the definition of each variable; Note 2: $P < = 0.01$ is **, $0.01 < p < = 0.05$ is **, $0.05 < p < = 0.1$ is *

Table 3. the calibration basis of variables (n = 344)

	EM	BIG10	FEE	ROTATION	SEPARATE	LIAB	EPS	SCALE
95%	0.4567	1	0.0024	1	17.7452	0.6770	1.3858	14.8681
50%	0.1049	1	0.0006	0	0	0.3316	0.3000	12.5755
5%	0.0085	0	0.0001	0	0	0.0905	-0.7175	11.1654

Note 1: please refer to table 1 for the definition of each variable.

Table 4. the analysis of necessary conditions (n = 344)

Variable	Consistency	Variable	Consistency
BIG10	0.5683	~BIG10	0.5173
FEE	0.5868	~FEE	0.6979
ROTATION	0.7892	~ROTATION	0.5625
SEPARATE	0.7989	~SEPARATE	0.5911
LIAB	0.6241	~LIAB	0.6524
EPS	0.6960	~EPS	0.6502
SCALE	0.6281	~SCALE	0.6532

Note 1: please refer to table 1 for the variable definition; Note 2: "~" means "negative"

Table 5. the empirical results of fs/QCA (n = 344)

Type	Solutions	Raw coverage	Unique coverage	Consistency
A-1	~SCALE*SEPARATE*ROTATION*FEE*~BIG10	0.29	0.06	0.84
A-2	~SCALE*LIAB*SEPARATE*ROTATION*FEE	0.35	0.05	0.88
B-1	SCALE*EPS*SEPARATE*ROTATION*~FEE	0.45	0.03	0.85
B-2	SCALE*LIAB*SEPARATE*ROTATION*~FEE	0.42	0.01	0.84
C-1	LIAB*SEPARATE*ROTATION*~FEE*~BIG10	0.26	0.00	0.84

Note 1: please refer to table 1 for the definition of each variable; Note 2: "*" means "and". "~" means "negative "

combinations are meaningless, because the determinant has only the necessary variable, the model will lose its meaning. According to the analysis results of the necessary conditions in Table 4, the consistency of each variable is no more than 0.8, indicating that no variable has the necessary conditions.

Table 5 shows the final analysis results of fs/QCA method, and five groups of solutions are obtained

Type A: small-scale companies in the development period: these companies usually have high debt and do not need to hire large-scale CPA firms to certificate financial statements. However, if they have a good governance concept, they should separate the management right from the ownership, hire professional managers to operate the company, and pay more audit fee to get more professional advice. As well as in accordance with the provisions of the law on time rotation of certified

accountants, are conducive to the improvement of earnings quality.

Type B: large scale and well-established companies: due to their good governance concept, these companies have professional managers who are responsible for the operation of the company. Under the normal operation of the company, they do not need to pay too much audit fee, and the CPA rotation is usually based on the signing period stipulated by laws and regulations. This kind of company has stable operation and professional managers give professional advice, so the earnings quality is relatively good.

Type C: the company with poor financial structure but good governance concept: the company with poor financial structure will not pay too much cost. The expenditure ratio of employing CPA firms and audit fee is usually low. However, the company with good governance concept and employing professional managers to run the company will also help to improve the quality of earnings.

The above research results show that the combination of five groups of causality is conducive to the improvement of earnings quality. Compared with the research results of the OLS method that only non-big 10 CPA firms have a significant positive impact on earnings quality, it increases more practical reference value.

It is noteworthy that the above empirical results, although the five groups of solutions include the CPA rotation and the separation of ownership and management, these two variables do not meet the necessary conditions, and these two variables need to work together with other variables to lead to specific consequences.

4. CONCLUSION

This study takes the IT industry of China's Listed Companies in 2019 as a sample to probe the impact of the scale of CPA firms, audit fees and CPA rotation on earnings quality. The results show that both regular rotation of CPA and separation of ownership and management are the key factors to enhance earnings quality. On this basis, small-scale companies in the development stage need to pay more audit fee to obtain professional advice. Nevertheless, they do not need to hire large-scale CPA firms; for large-scale companies with system, the audit fee should not be too high, and whether to employ

large-scale firms does not affect the earnings quality; for a company with poor financial structure, it is not necessary to employ large-scale CPA firms and the audit fee should not be too high. There are some differences between the results of this study and the previous literature; following are the explanations one by one according to the order of explanatory variables in the model.

4.1 The Size of CPA Firms

previous literatures tend to employ "BIG4" CPA firms, and the earnings quality will be better, but the empirical results of this study are just opposite to those of previous literatures. The empirical results of fs/QCA also shows that employing "BIG10" CPA firms is conducive to earnings quality. This shows that the general quality of China's CPA industry has improved significantly, and even small-scale CPA firms can help to improve the earnings quality.

4.2 Audit Fees

Although audit fees have no significant effect on earnings quality in the OLS method, in the fs/QCA method, each solution has different effects according to the combination of factors. As mentioned in the previous literature, CPA firms may attract customers at low prices, but audit quality is also relatively low. This is likely to reduce the earnings quality [7]. From the empirical results of each group of fs/QCA, we can see that group A is a small-scale enterprise with governance concept, which is in the stage of development. High audit fees help CPA firms to provide services that are more professional and establish a correct accounting concept and good management foundation for enterprises, while group B is a large-scale enterprise, most of them have already found complete system and good accounting concept, so it does not need to pay high audit fees.

4.3 CPA Rotation

Based on national laws and regulations, CPA rotation is an obligation. The supervision institutions are very strict in monitoring the listed companies; therefore, companies with good earnings quality must also follow the law.

4.3.1 Based on the above findings, this study puts forward the following suggestions

The empirical results show that large-scale CPA firms have no obvious impact to the improvement of earnings quality, which represents the overall

improvement of the quality of Chinese CPA firms. The scale of CPA firms has no obvious difference in the earnings quality of financial statements certification, which is a positive performance for the development of the accounting industry. Therefore, it is suggested that we should continue to strengthen the industry norms of CPA firms, and establish the standards for the collection of audit fee. If there are obviously excessive fees, we should pay attention to the services provided by CPA firms, to avoid providing improper suggestions for earnings manipulation. In addition, investors should pay more attention to the performance of corporate governance, Together with the financial statement information; it is included in the reference index of investment decision.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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