

Research on the Correlation between Enterprise R&D Investment and Audit Charge

-- Moderating Effects based on Firm Size

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Abstract

In order to realize the high quality economic development and improve the scientific and technological innovation ability of enterprises, the research and development investment of listed enterprises in China has become increasingly concerned. Does R&D investment affect audit expenses? Based on the data of Chinese A-share listed companies from 2011 to 2020, this paper investigates how R&D investment affects audit fees. The results show that the higher the R&D investment, the higher the audit cost. Further research shows that firm size has a negative moderating effect on the impact of R&D investment on audit fees.

Keywords

R&D Investment; Audit Fees; Accounting Firm Size.

1. Introduction

In the first year of the 14th Five-Year Plan, the CPC Central Committee made it clear that scientific and technological innovation should be the strategic support to promote high-quality economic development. The 14th Five-Year Plan calls for innovation-driven development and new development advantages. In the implementation of the innovation-oriented development strategy at the same time, the innovation and R&D capabilities of enterprises are also getting more and more attention. As a micro-economic entity, the enterprise's "innovation and R&D" is closely related to "risk", which is mainly reflected in the high risk of R&D investment and the uncertainty of income and return. On the one hand, in order to encourage enterprises to innovate actively, the state has created many convenient conditions for enterprises' R&D activities, such as providing tax relief for high-tech enterprises and government subsidies for enterprises' R&D investment. On the other hand, many enterprises defraud the government by fictitious research and development projects with low feasibility or use the government's preferential policies to conduct earnings management within the enterprise and manipulate profits. These behaviors lead to high risks faced by CPA in the audit of R&D investment of enterprises. In order to identify and control these risks, CPA will increase audit procedures in the audit process, and these audit costs will eventually be reflected in audit fees.

Through literature review, it is found that there are extensive studies on the influencing factors of audit expenses and enterprise R&D investment, but the influencing factors are independent. In the cross-base field, there are few correlation studies on the impact of the two. Gan Wanrong (2020) empiratively found that enterprise R&D investment has a positive impact on audit expenses. In addition, the variable of enterprise debt size is added to the study to investigate its moderating effect on the relationship between R&D investment and audit expenses. The research of Reujou (2021) shows that R&D investment is positively correlated with audit expense, and agency cost plays a partial mediating role. Yin Zhenghao (2021) showed that there

is a significant positive relationship between R&D investment and audit expenses of listed companies in China through empirical research. The above scholars' research on the impact of R&D investment and audit expenses is based on the moderating effect of agency cost and liability scale, and they do not carry out analysis and research from the perspective of financial audit dimension and accounting firm size. Therefore, this paper explores the impact of enterprise R&D investment on audit expenses, in order to help realize the goal of high-quality economic development.

2. Hypothesis

This study holds that audit fees are the fees charged by accounting firms for providing enterprises with objective and fair evaluation of the information reflected in financial statements and providing audit opinions. Based on Simunic audit pricing model, audit fee consists of audit resource cost, risk premium and audit expected reward. On the one hand, audit risk will be affected by the size, governance and business complexity of the audited company. On the other hand, if an enterprise hires an accounting firm to conduct an audit, the reputation and scale of the accounting firm should be considered. The uncertainty of R&D investment activities of listed enterprises is high, and they need to invest longer time and more money, and the corresponding risk probability is also large. Innovation and R&D activities will promote enterprises to improve production efficiency, strengthen core competitiveness, and increase market share. However, as a high-risk research and development activity, once the research and development activities are not successful, the enterprise will face the loss of core competitiveness, reduce market competition share, capital chain breakage of great risks, so that the enterprise will fall into financial difficulties. Based on this, the auditor during the audit to the enterprise research and development business, is bound to increase audit procedures including more manpower material resources and gather more audit evidence, the audit personnel professional training, the implementation of specific audit procedures or enlarge the test scope of audit procedures, a more comprehensive understanding of the research and development of the risk. More audit resources will lead to higher audit costs. Secondly, enterprise management can adjust profit by manipulating the capitalization amount of R&D investment at the end of the reporting period. The larger the R&D investment, the more space the enterprise has for earnings management, which increases the audit risk and leads to the increase of audit investment by accounting firms, thereby increasing audit expenses. In addition, the state has issued a series of policies such as tax reduction and subsidy for high-tech enterprises to encourage enterprises to carry out innovation and R&D. It is not excluded that some enterprises will make up research and development business in order to obtain government innovation and R&D subsidies, which will also lead to increased audit risks. And then affect audit fees.

Based on this, this paper puts forward the following hypotheses:

H1: The R&D investment of enterprises will increase audit expenses, that is, there is a positive correlation between the two.

Generally speaking, larger firms have more competent and experienced CPAs, so in the audit process, CPAs from larger firms can more easily identify the material misstatement risk of the audited company, so as to reduce the risk of audit failure. Relatively speaking, smaller accounting firms tend to be less skilled in professional knowledge and will carry out more audit procedures, which will lead to the rise of audit costs, that is, the increase of audit fees. This paper proposes hypothesis two.

H2: The larger the firm size, the more R&D investment will reduce the audit fee.

3. Research Design

3.1. Sample Selection and Data Sources

The empirical data in this paper are from CSMAR database. In addition, all variables were tailed to avoid extreme values affecting the conclusion. Finally, 25714 sample observations of Chinese A-share listed companies from 2011 to 2020 except ST company, *ST company and other companies with abnormal trading status are obtained.

3.2. Variable Selection and Definition

According to the proposed hypothesis, the natural logarithm of domestic audit fees paid by sample enterprises each year (LnAfee) is taken as the explained variable, and the total amount of R&D investment of sample enterprises each year is taken as the natural logarithm (LnRD) as the explanatory variable. The overall selection and definition of variables are shown in Table 1:

Table 1. Variable definitions

Variable nature	The variable name	Variable symbol	Variable definitions
Explained variable	Log of audit fees	LnAfee	The natural logarithm of domestic audit expenses in that year is taken
Explanatory variables	Logarithm of R&D investment	LnRD	The total amount of R&D investment in that year is taken as the natural logarithm
Control variables	asset-liability ratio	Lev	Total ending liabilities/total assets
	Quick ratio	Quick	Quick assets/current liabilities
	Return on assets	Roa	Net profit/average total assets
	The company size	Size	Natural log of ending total assets
	Accounting firm size	Big4	If audited by the Big Four accounting firms, the value is 1; otherwise, the value is 0
	Property rights	Soe	If the company is state-owned, the value is 1; otherwise, the value is 0
	The annual variable	year	The value is 1 when the sample belongs to an industry, and 0 otherwise
	Industry variable	Industry	The value is 1 when the sample belongs to a certain year, and 0 otherwise

3.3. Model Setting

On the basis of Simunic's classic audit expense influencing factor model, in order to verify the hypothesis: the influence of enterprise R&D investment on audit expense, this paper constructs the following model for testing:

$$LnAfee = \alpha_0 + \alpha_1 LnRD + \alpha_2 Lev + \alpha_3 Quick + \alpha_4 Roa + \alpha_5 Size + \alpha_6 Big4 + \alpha_7 Soe + \sum industry + \sum year + \varepsilon$$

4. Empirical Analysis

4.1. Descriptive Statistics

Table 2. Descriptive statistics

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
LnAfee	25,714	13.63	0.670	9.210	18.14
LnRD	25,714	17.72	1.551	7.409	24.10
Roa	25,714	0.0383	0.102	-3.164	7.446
size	25,714	22.09	1.270	17.81	28.64
Quick	25,714	2.538	20.06	-4.416	3,078
Lev	25,714	0.406	0.209	-0.0872	3.661
big4	25,714	0.0489	0.216	0	1
soe	25,714	0.333	0.471	0	1

Table 2 shows the descriptive statistical results of the main variables in this paper. The results show that: The average value of LnAfee is 13.63, and the standard deviation is 0.67, indicating that there are certain differences in audit fees among different enterprises. The maximum value of LnAfee is 18.14, and the minimum value is 9.21. In other words, the highest audit fee of A-share listed companies is 75,526,900 yuan, and the minimum audit fee is 9996.60 yuan. That's a big difference. The mean value of Big4 is 0.0489, indicating that the Big Four accounting firms undertake 4.89% of the audit business of listed companies. The average value of Soe is 0.333, indicating that 33.3% of the listed companies are state-owned. At the same time, the mean value of Lev is 0.406, indicating that the asset-liability ratio of sample enterprises has generally maintained a balanced state in the past 10 years.

The above phenomenon indicates that the sample enterprises have a high overall risk from 2011 to 2020, and auditors from external audit institutions need to implement more audit procedures, consume more audit resources, and thus cause the increase of audit expenses.

4.2. Correlation Analysis

Table 3. Correlation analysis

	LnAfee	LnRD	Roa	size	Quick	Lev	big4
LnAfee	1						
LnRD	0.440***	1					
Roa	-0.045***	0.054***	1				
size	0.739***	0.514***	-0.011*	1			
Quick	-0.057***	-0.027***	0.022***	-0.059***	1		
Lev	0.368***	0.146***	-0.203***	0.508***	-0.115***	1	
big4	0.369***	0.196***	0.021***	0.307***	-0.012**	0.103***	1
soe	0.166***	0.073***	-0.056***	0.381***	-0.038***	0.327***	0.134***

eg: ***p<0.01, **p<0.05, *p<0.1

As shown in Table 3, according to the data results of Pearson correlation analysis, the correlation coefficient between R&D investment (LnRD) and audit fee (LnAfee) is 0.44, and R&D investment and audit fee are positively correlated at the 1% significance level. This indicates that with the increase of R&D investment of the auditee, accounting firms will correspondingly

charge more audit fees. The results can be used to preliminarily confirm that there is an obvious linear correlation between R&D investment and audit fees, which is consistent with hypothesis H1. In addition, firm size is positively correlated with audit fees at 1% significance level, which can be used to preliminarily prove hypothesis 2. This is consistent with the research conclusion of Choi (2008). Compared with non-Big Four international accounting firms, the Big Four international accounting firms bear greater legal responsibilities, and certified public accountants have greater motivation to increase workload to obtain higher audit quality, thus requiring higher audit fees as rewards. Other control variables such as asset-liability ratio, return on total assets, quick ratio, enterprise scale and property right are significantly linearly correlated with the explained variables, so further regression analysis can be carried out.

4.3. Results of Multiple Regression Analysis

Table 4. Results of multiple regression analysis

VARIABLES	(1) LnAfee
LnRD	0.025*** (10.36)
Roa	-0.298** (-2.16)
size	0.370*** (91.19)
Quick	-0.000** (-2.21)
Lev	0.065** (2.50)
big4	0.494*** (26.79)
soe	-0.192*** (-29.44)
Constant	5.040*** (66.43)
Observations	25,714
R-squared	0.590

Table 4 shows the regression analysis results of enterprise R&D investment and audit expense. According to the results, the T value of enterprise research and development investment (LnRD) is 10.36, and the regression coefficient is 0.025. The coefficient of LnRD is significantly positively correlated with LnAfee at the level of 1%, which indicates that when the time effect, industry effect and other factors are controlled, the more R&D investment of enterprises, the higher audit expenses will be generated. Hypothesis one is tested.

Table 5. Regression analysis results of the Big Four firms and non-Big Four firms

VARIABLES	(1)	(2)
	The big four LnAfee	Not the big four LnAfee
LnRD	-0.001 (-0.08)	0.026*** (12.26)
Roa	-0.554* (-1.84)	-0.283*** (-10.57)
size	0.526*** (32.56)	0.355*** (113.53)
Quick	0.018* (1.72)	-0.000*** (-3.69)
Lev	0.222* (1.74)	0.079*** (5.08)
soe	-0.169*** (-4.28)	-0.194*** (-30.72)
Constant	2.207*** (7.69)	5.365*** (94.26)
Observations	1,254	24,133
R-squared	0.667	0.512
F test	0	0
r2_a	0.666	0.512
F	417.1	4218

Table 5 shows the regression results of enterprise R&D investment on audit expenses under different accounting firm sizes. It is found that the LnRD coefficient is -0.001 when audited by the Big Four accounting firms, and the result is not significant. However, under the audit of smaller accounting firms, LnRD coefficient is 0.026, and presents a significant positive correlation at the level of 1%. Through the difference test of LnRD coefficients between Big 4 accounting firms and non-Big 4 accounting firms, the results show that these regression coefficients can be compared. Based on this, it can be concluded that firm size will have a negative moderating effect on the relationship between R&D investment and audit expenses.

4.4. Robustness Test

In this paper, the reliability of the conclusion is verified again by changing the measurement method of R&D investment and changing the sample size. In order to change the measurement method of explanatory variables, this paper selects the percentage of the number of R&D personnel to the total number of employees of the enterprise as an alternative index of R&D investment of the enterprise, and conducts regression tests on all hypotheses, and the regression results do not produce significant changes. For the test of reduced sample size, China's A-share listed companies from 2015 to 2019 were selected as the research samples, and all hypotheses were re-tested by regression, and the results remained unchanged.

5. Conclusions and Suggestions

5.1. Analysis Conclusion

This paper selects Chinese A-share listed companies from 2011 to 2020 as samples to study the relationship between enterprise R&D investment and audit expenses. The research findings are

as follows: First, the greater the enterprise R&D investment, the greater the audit expenses of the enterprise. In other words, there is A positive correlation between the two. Second, the larger the firm size, the more R&D investment will reduce the audit fee. That is, firm size will have a negative moderating effect on the relationship between R&D investment and audit expenses. On the one hand, R&D investment itself is characterized by high risk, long investment cycle and high uncertainty of return on investment, so the possibility of forming intangible assets is uncertain when enterprises carry out R&D activities. On the other hand, the state will encourage enterprises' R&D activities by giving them innovation subsidies. Enterprise may rely on government subsidies in order to maintain the normal operation of capital chain, but certain conditions are needed to obtain the government subsidies, subsidies for threshold will refuse to part of the enterprise for r&d subsidy, so it is possible that these companies in order to obtain the government subsidies for the surplus manipulation, r&d project management, etc., makes the enterprise's capital chain formed in the long run a vicious circle.

5.2. Policy Recommendations

5.2.1. Enterprise Level

For emerging enterprises, innovation is an important step to achieve enterprise development and growth, which requires certain R&D investment. However, on the basis of understanding the risks of R&D investment, appropriate arrangements should be made for the implementation of enterprise innovation and R&D activities. Due to its greater income uncertainty and high risk, emerging enterprises are still in the early stage of growth, so it is necessary to fully consider their own risk resistance ability and act within their capabilities. Improve the standardization of the r&d expenditure accounting treatment and cautious, strengthen the management of enterprise internal control system, the financial revenues and expenditures, and standardize enterprise r&d activities, thereby reducing managers use r&d spending and even the possibility of financial fraud by earnings management, real into enterprise to bring the positive effect of r&d capital and reduce the potential risk enterprise, Avoid internal earnings management, profit manipulation.

5.2.2. Accounting Firm Level

In general, the larger the size of the enterprise, the greater the corresponding innovation and R&D investment and capacity. CPA will usually spend more time and energy to determine the capital investment and capitalization amount of R&D activities, which increases the audit cost. The uncertainty of R&D investment and the large amount of investment increase the risk of audit failure, and also have an impact on audit costs. In view of the particularity of research and development projects, accounting firms should try to select experienced CPAs for auditing work, and those with stronger professional competence for auditing. Based on this, certified public accountants should improve their professional knowledge and competence, improve their audit ability and rich audit experience through continuing education, training and other activities, so as to reduce the risk of audit failure, and improve their ability to audit R&D investment, so as to seek better career development.

5.2.3. At the Level of Regulatory Authorities

For the regulatory authorities, on the one hand, should strengthen the supervision of listed companies' R&D investment and R&D expenditure capitalization, use market supervision to control listed companies, make it difficult to carry out financial manipulation, and then maintain the sustainable and healthy development of the capital market. On the other hand, we should pay more attention to the enterprises with increased audit expenses in the current period. According to the research conclusion of this paper, the increase of enterprise R&D investment will affect the increase of audit expenses. Therefore, the increase in audit fees charged by accounting firms is likely to be caused by the increase in audit risks caused by

enterprises' current R&D investment and other high-risk investment projects. If the audit risk is too high, there may be collusion between CPA and management or the purchase of audit opinions, and the CSRC should strengthen the supervision.

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