

Does the R&D manipulation of enterprises affect the readability of annual reports

Tao Yan

School of accountancy, Anhui University of Finance and Economics, Bengbu 233030, China;
acyt0108@163.com

Abstract

As an important tool for reducing information asymmetry between enterprises and investors, annual reports are gradually being used by management as a means of external impression management, and the R&D manipulation of enterprises affects the quality of information disclosed by management. This article selects Chinese A-share listed companies from 2015 to 2021 as research samples to empirically test the impact of corporate R&D manipulation on the readability of annual reports. Research has found a significant negative correlation between R&D manipulation and annual report readability. The economic consequences of R&D manipulation by enterprises on the impact mechanism of adjusting the readability of annual reports on analyst earnings forecasts; Heterogeneity analysis shows that real earnings management, digital transformation of enterprises, and media attention will moderate the impact mechanism of R&D manipulation on the readability of annual reports.

Keywords

Research and development manipulation, annual report readability, information asymmetry.

1. Introduction

Research and development are not only the main driving force for enterprise innovation and sustainable development, but also the key to socio-economic development. In the economic environment of high-quality development, grasping the research and development activities of enterprises becomes even more significant. However, the R&D activities of enterprises face an unavoidable problem: information asymmetry. Research and development activities, due to their higher professionalism, stronger concealment, and less clear accounting treatment, have led to serious information asymmetry.^[1] At the same time, investors should not ignore the accuracy of corporate disclosure information in this asymmetric environment. In a market environment where financial information is not completely transparent, obtaining authentic, reliable, and easily understandable information in the capital market is also an important goal of studying information readability.

Previous studies have shown that digital transformation of enterprises, academic experience of executives, and an increase in the proportion of international directors can all to some extent inhibit R&D manipulation in enterprises. However, due to the heterogeneity of enterprises and the uncertainty of the environment, enterprises inflate relevant R&D expenses in order to obtain policy benefits, and R&D manipulation still widely exists in listed companies in China, which also causes serious harm to the capital market and national resources. Enterprises mainly communicate their performance to investors through the disclosure of annual reports,^[2] which has made the accuracy of annual reports a focus of research. Recent studies have found that management's impression management behavior through annual reports is becoming increasingly significant. Given the motive of manipulating annual reports through management

to make the text obscure and difficult to understand, it is reasonable for companies to engage in opportunistic behavior of speculation when adverse events occur. In the existing research literature on the economic consequences of R&D manipulation, Li Fei et al. found that R&D manipulation has a moderating effect on the disclosure of key audit matters and the risk of stock price collapse, but there are few studies directly related to the quality of information disclosure caused by R&D manipulation. All company disclosures include information with different levels of understanding, but companies have considerable discretion to choose between highlighting information with high readability or information with low readability in their disclosures. The impact of management opportunistic behavior such as R&D manipulation on the readability of disclosed information has become the starting point of this study.

2. Literature review and research hypotheses

2.1. Review of Economic Consequences of Research and Development Manipulation

Research and development manipulation refers to the behavior of financial fraud and manipulating the quality of accounting information in the field of enterprise innovation research and development. Listed companies use this necessary means to adjust the proportion of research and development expenditures to achieve the goals that management wants to achieve. Zhang et al. (2022) found that executives may increase their R&D investment for equity incentive benefits.^[3] The motivation for enterprises to engage in R&D manipulation based on the uncertainty of the market environment has also been widely studied. Whether at the macro policy level, the heterogeneity level of enterprises, or the external supervision environment level, enterprises have sufficient motivation to engage in R&D manipulation behavior. In this field, scholars have studied the adverse consequences of R&D manipulation: empirical research shows that R&D manipulation increases the probability of a company's stock price collapse. However, some studies have also pointed out that R&D manipulation is not "useless". R&D manipulation to some extent alleviates the financing constraints of enterprises, auditors charge lower audit fees for enterprises with R&D manipulation. Existing research in the field indicates that R&D manipulation, as a double-edged sword, affects various elements of enterprises in different directions. In addition to the impact on the enterprise itself, from a macro perspective, the increase of companies engaged in research and development manipulation within the same region will correspondingly reduce local tax sources. In this environment, the difficulty for local governments to complete financial and tax plans will increase, which shifts the tax burden to the region itself and leads to higher actual income tax rates for other enterprises in the region.

2.2. Review of Factors Influencing the Readability of Annual Reports

Financial reports typically contain both quantitative and qualitative information. In fact, most of the annual reports convey information through textual storytelling.^[4] Although textual narration may convey more valuable incremental information, it also leaves room for management manipulation due to its excessive subjectivity. According to the incomplete reflection hypothesis, managers have a motivation to manipulate their annual reports by hiding bad news to boost stock prices for their own benefit. Due to changes in the internal and external environment of a company, which can drive management to adopt opportunistic behavior, existing research mainly focuses on the impact of heterogeneity between different internal and external environments on the readability of annual reports. From the perspective of internal corporate environment, the readability of annual reports manipulated for earnings when the company's performance falls short of expectations is significantly reduced. In an environment of stricter accounting standards, more comprehensive market supervision, and greater information needs, the readability of corporate annual reports is higher, manifested in more complete disclosures, fewer template jargon, and greater comparability. Also "relational"

enterprises with more social dependence relationships are more likely to manipulate the readability of their annual reports by disclosing low-quality information due to their low dependence on other financing channels and their intention to reduce the exposure of dependence relationships, resulting in benefits that are known to the outside world.

2.3. The relationship between R&D manipulation and annual report readability

Firstly, according to the fraud triangle theory, when management engages in complex information disclosure due to R&D manipulation, there is a "motivation or pressure" for misreporting information: higher stock returns and lower capital costs to obtain more short-term benefits; when there is an "opportunity" to do so: high-intensity professionalism and concealment, unclear accounting treatment; when management has a "rationalization excuse" for misreporting: management's disclosure through the management analysis and discussion section in the annual report or other means reflects management's attitude and provides a way for management to rationalize their behavior, making fraud more likely to occur; Secondly, according to the agency theory, in an environment of information asymmetry and lack of regulation, the agency may even harm the interests of the principal in pursuit of its own interests, and the conflict of interests between the agency and the principal may lead to doubts about the accuracy of the information quality disclosed by the management. The management has the motivation to only disclose positive information and conceal negative information that may cause harm to the company, so there is an information asymmetry between the management and information users. The complexity of annual reports further reinforces the phenomenon of information asymmetry between management and information users. Management conducts earnings manipulation such as research and development manipulation to achieve performance effects, and then naturally manipulates the readability of annual reports to enhance the environment of information asymmetry and achieve the goal of deceiving people; The theory based on behavioral finance also explains that stakeholders may be misled by freely changing and opportunistic information disclosure, and decisions may also be influenced by environmental and behavioral uncertainties. According to Soros' principle, financial markets may not only distort real economic interests, but may even induce economic activities that are consistent with the intended signals. The relevant theories of behavioral finance explain that in an uncertain environment, individuals are not based on rationality but on bounded rationality, which leads to investors' decision-making errors. These also provide necessary conditions for companies to manipulate the readability of annual reports. Due to the fact that R&D manipulation behavior is essentially an untrue and fraudulent behavior, and fraudulent information transmission is more complex in language form and requires higher cognitive requirements, as liars tend to provide lengthy answers and strive to provide persuasive and credible statements, attempting to divert the listener's attention from any false or untrue information [5]. The increase in information complexity is a subconscious result of cognitive dissonance between potential actual performance and reported false performance. Therefore, based on the above analysis, this article proposes the following hypotheses:

H1: Under certain other conditions, the higher the degree of R&D manipulation of a company, the lower the readability of its annual report.

3. Empirical result analyses

3.1. Sample selection and data sources

This article selects A-share listed companies in China from 2015 to 2021 as the initial research sample. In subsequent studies, the following treatments were applied to the sample: (1) excluding financial industry samples; (2) Exclude abnormal enterprises such as ST; (3) Remove

samples with missing values; (4) Perform 1% truncation on the data. All data in this article are sourced from the CSMAR database, and Stata17.0 software was used for data processing and empirical analysis.

3.2. Sample selection and data sources

This article selected 12 control variables as shown in Table 1 and added dummy variables for industry and year.

Table 1 Variables

Variable type	Variable	Variable Symbol	Variable Definition
Explained Variable	Readability of annual reports	Readability	Logarithmic mean of N sentence generation probabilities
Explanatory variable	R&D manipulation	Rdin_abs	Absolute value of abnormal R&D investment
	Company size	Size	Natural logarithm of year-end total assets
	Financial leverage	Lev	Total assets/liabilities at the end of the period
	Corporate performance	Roa	Profit situation
	Fixed asset ratio	Fixed	Fixed assets/total assets of the enterprise
	Management compensation	Tmtpay	The natural logarithm of the total compensation of the top three management positions
	Control variable	Property rights nature	Soe
Ownership concentration		Top1	The proportion of the number of shares held by the largest shareholder to the total number of shares in the company
Is it audited by the four major auditors		Big4	The company has passed the four major audits and is rated as 1
Management age		Tmtage	Average age of management
Financial background of management		Finback	Does Dong Jiangaohave a financial background
	Financing constraints	Sa	SA index

	Management shareholding	Mshare	Management shareholding ratio
	Industry	Ind	Industry dummy variables
	Year	Year	Year dummy variables

3.3. Descriptive statistics

Table 2 below presents the descriptive statistical results of the main variables in this article. The maximum and minimum values of Readability, a measure of the readability of annual reports, are -11.216 and -25.896. The mean and standard deviation of R&D manipulation of Rdin_abs are both 0.006. In terms of controlling variables, there are significant differences in the size, asset returns, capital structure, and proportion of different types of assets among the A-share listed companies in the sample. The average shareholding ratio of the largest shareholder in the sample is around 33%, while 5.4% of the companies have undergone audits by the "Big Four". 67.7% of the directors, supervisors, and senior executives have financial backgrounds, and the average age of the management team in the sample is 49.48 years old.

Table 2 Descriptive statistical table

Variable	Sample	Mean	Standard deviation	Minimum	Median	Maximum
Readability	16873	-16.860	2.824	-25.336	-16.559	-11.236
Rdin_abs	16873	0.006	0.006	0.000	0.004	0.037
Size	16873	22.285	1.248	20.111	22.102	26.331
Lev	16873	0.409	0.191	0.064	0.402	0.870
Roa	16873	0.040	0.070	-0.273	0.040	0.226
Fixed	16873	0.200	0.141	0.004	0.173	0.643
Tmtpay	16873	14.681	0.657	13.203	14.637	16.642
Top1	16873	33.019	14.027	8.312	30.788	71.238
Soe	16873	0.286	0.452	0.000	0.000	1.000
Big4	16873	0.054	0.225	0.000	0.000	1.000
Tmtage	16873	49.485	3.147	41.760	49.540	56.890
Finback	16873	0.677	0.468	0.000	1.000	1.000
Sa	16873	-3.853	0.232	-4.445	-3.850	-3.186
Mshare	16873	15.471	19.571	0.000	3.850	67.500

3.4. Regression result analysis

The regression results based on R&D manipulation and annual report readability are presented in Table 3. In the table, it is found that the coefficient of enterprise R&D manipulation is significantly negative at the 1% level, regardless of whether control variables are included. This indicates a negative correlation between enterprise R&D manipulation and the readability of annual reports. The higher the level of enterprise R&D manipulation, the lower the readability of annual reports, supporting hypothesis H1. In the controlled variables, the coefficient of the property rights nature (Soe) of the enterprise is significantly positive, indicating that the readability level of the annual report of state-owned enterprises is high, which is in line with the reality that state-owned enterprises have high attention and management is not easy to manipulate; The financing constraint proxy index (Sa) of enterprises shows a negative correlation with the readability of annual reports, indicating that the higher the level of financing constraints of the company, the more likely it is to manipulate and reduce the readability of annual reports; The Tmtpay coefficients for management compensation are all negative, indicating that excessive levels of management compensation often result in low readability of annual reports.

Table 3 Regression Results Analysis Table

Variable	Readability	Readability
Rdin_abs	-30.270*** (3.472)	-13.071*** (3.344)
Size		-0.390*** (0.025)
Lev		0.390*** (0.140)
Roa		3.862*** (0.328)
Fixed		1.870*** (0.177)
Tmtpay		-0.228*** (0.038)
Top1		0.017*** (0.002)
Soe		0.555*** (0.056)
Big4		-0.316*** (0.096)
Tmtage		0.057*** (0.007)
Finback		-0.318*** (0.043)
Sa		-0.524*** (0.094)
Mshare		-0.005*** (0.001)
Constant	-16.693*** (0.029)	-10.848*** (0.755)
Control Year	YES	YES
Control Ind	YES	YES
Sample	16,873	16,873
R2	0.004	0.172

Note: ***, **, and * respectively indicate significance at the 1%, 5%, and 10% levels, with standard errors in parentheses, the same applies below.

3.5. Endogeneity processing

To further alleviate the potential endogeneity issues in the model, given the competitive pressure between the same region and industry, corresponding R&D manipulation may be influenced by each other, but it will not affect the readability of individual enterprise annual reports. Therefore, this article selects the average R&D manipulation value (Mrdin) of the same industry and province as the instrumental variable, and uses a two-stage least squares method to test the robustness of the main regression. As shown in Table 4, the F-value of 1096.61 in the first stage of the two-stage regression passed the test, and the coefficient of R&D manipulation in the second stage of the regression was significantly negative, supporting the hypothesis of this paper.

Table 4 Endogeneity processing

	First Stage	Second Stage
Variable	Rdin_abs	Readability
Mrdin	0.947*** (32.984)	
Rdin_abs		-44.993*** (-3.310)
Constant	0.012*** (6.977)	-10.330*** (-13.170)
Control variable	YES	YES
Control industry/year	YES	YES
Sample	16,873	16,873
R2	0.155	0.168

3.6. Economic consequences test

The impact of R&D manipulation by enterprises on the readability of annual reports has been identified in the previous text. The influence of information disclosure transparency on analyst opinions. However, the decrease in annual report readability caused by R&D manipulation not only reduces the transparency of disclosure, but also may affect the accuracy of analyst earnings forecasts due to complex statements and difficult to understand annual reports. This article use the R&D manipulated dummy variable (Rdin-dum) used in robustness testing for group regression. The regression results are shown in Table 5, which indicates that when companies engage in R&D manipulation, the coefficient of annual report readability is no longer significant. The bootstrap method's inter group difference test of 1000 samples passed, indicating that R&D manipulation moderates the impact of annual report readability on the quality of analyst earnings forecasts. The decrease in information transparency is a key factor leading to a decrease in the quality of analyst earnings forecasts, and the R&D manipulation of enterprises directly results in a decrease in information transparency affecting the quality of analyst earnings forecasts. This mechanism has a stronger impact on the quality of analyst earnings forecasts than the decrease in the readability of annual reports, leading to differences between groups.

Table 5 Endogeneity processing

	Rdin-dum=1	Rdin-dum=0
Variable	Ferror	Ferror
Readability	-0.011 (-0.60)	-0.110*** (-5.34)
Size	-0.205** (-2.56)	-0.330*** (-4.74)
Lev	0.766* (1.76)	0.053 (0.11)
Roa	-4.494*** (-6.80)	-18.696*** (-11.96)
Fixed	1.341** (2.38)	0.522 (1.07)
Tmtpay	-0.188* (-1.76)	-0.114 (-1.18)
Top1	0.020 (1.53)	0.003 (0.23)
Soe	-0.362** (-2.11)	0.237 (1.47)

Big4	0.163 (0.60)	0.172 (0.90)
Tmtage	-0.019 (-0.88)	-0.080*** (-3.76)
Finback	0.019 (0.16)	0.019 (0.16)
Sa	-0.181 (-0.68)	0.432* (1.82)
Mshare	-0.027*** (-5.42)	-0.012*** (-2.61)
Pb	-0.021** (-2.16)	-0.051*** (-4.96)
Herfindahl10	-0.016 (-0.01)	0.333 (0.21)
Intangible	-1.113 (-1.00)	-1.979 (-1.60)
Inst	-0.025*** (-6.38)	-0.022*** (-5.55)
Control industry/year	YES	YES
Sample	6,123	8,113
R2	0.054	0.118
P-value of inter group coefficient difference test		0.000***

3.7. Heterogeneity analysis

The performance growth illusion caused by a company's real earnings management behavior will appear more real and persistent, and is more likely to demonstrate the company's excellent performance and future development. This article refers to the real earnings management measurement model of Roychowdhury (2006) [6] to introduce the real earnings management variable (REM), and also introduces the dummy variable of whether the company's real earnings management in the current year is greater than the median of the same industry and year's real earnings management. The higher group is assigned a value of 1, while the lower group is assigned a value of 0. The results of the group regression are shown in Table 6. The bootstrap method's 1000 inter group coefficient sampling difference test results are significant at the 1% level. The test results indicate that in enterprises with low-level earnings management, the impact of R&D manipulation on the readability of annual reports is no longer significant, and the correlation coefficients of enterprises with different levels of earnings management have statistical differences. The results demonstrate that R&D manipulation is a part of true earnings management, and when a company engages in high levels of true earnings management behavior, R&D manipulation has a significant impact on the readability of annual reports. When there is less real earnings management, R&D manipulation has a weak impact on the readability of annual reports.

The higher the degree of digital transformation in enterprises, the higher the readability of annual reports disclosed by management in order to reduce potential financial risks and meet the needs of external stakeholders. Meanwhile, digital transformation can also improve the information asymmetry environment of enterprises, enhance the mechanism of mutual supervision among different enterprises, and thereby reduce the possibility of R&D manipulation by enterprises. The digital transformation of enterprises promotes high-quality annual report disclosure while suppressing opportunistic phenomena of R&D manipulation. Therefore, this article believes that the degree of digital transformation of enterprises has a

certain substitution effect. Simultaneously generate dummy variables indicating whether the degree of digital transformation of the enterprise in the current year is greater than the median degree of digital transformation in the same industry and year. The higher group is denoted as 1, while the lower group is denoted as 0. The results of the grouped regression are shown in Table 6. The test results indicate that when the degree of digital transformation of enterprises is high, the impact coefficient of R&D manipulation on the readability of annual reports is no longer significant, and the difference in correlation coefficients between enterprises with different degrees of digital transformation is significant at the 10% statistical level. The test results demonstrate the existence of the substitution effect of enterprise digital transformation, that is, when the degree of enterprise digital transformation is high, the influence of R&D manipulation behavior of the enterprise is no longer important, and digital transformation will further suppress the R&D manipulation behavior of the enterprise.

Media attention, as an exogenous factor affecting corporate governance mechanisms, further influences the patterns of opportunistic behavior adopted by enterprises. Therefore, R&D manipulation and annual report readability manipulation, as manifestations of opportunistic behavior, are also moderated by media attention. This article introduces the proxy variable of media attention, the number of media report titles mentioned (newstitlenum), and generates the median of the same industry and year. If the media attention of the enterprise in the same year is greater than the median of the same industry in the same year, the dummy variable (Mnsnum) is assigned a value of 1, otherwise it is assigned a value of 0. The results of group regression are shown in Table 6. The results indicate that when media attention is high, the impact of R&D manipulation on the readability of annual reports significantly decreases. The bootstrap method passed the inter group difference test, and there was a significant difference between groups. This suggests that under strong external attention and supervision, management will also weaken the manipulation of annual report readability, thereby weakening the mechanism by which R&D manipulation affects annual report readability.

Table 6 Heterogeneity analysis

	High real earnings management	Low real earnings management	High degree digital transformation	Low degree digital transformation	High media attention	Low media attention
Variables	Readability	Readability	Readability	Readability	Readability	Readability
RDIN_abs	-11.994*** (6.051)	-1.146 (3.983)	-2.303 (3.948)	-8.644* (5.073)	-5.235 (3.719)	-14.308*** (5.136)
Control variable	YES	YES	YES	YES	YES	YES
Control Industry/Year/ Firm	YES	YES	YES	YES	YES	YES
Sample	7144	7024	7,543	7,663	7,502	7,843
R2	0.716	0.777	0.770	0.767	0.740	0.754
P-value of inter group coefficient difference test	0.005***		0.076*		0.012**	

4. Conclusion

This article empirically studies the impact of R&D manipulation on the readability of annual reports of A-share listed companies from 2015 to 2021. The conclusions drawn are as follows: R&D manipulation has a significant negative effect on the readability of annual reports. Based on the above conclusions, this article proposes the following policy recommendations: at the enterprise level, it is necessary to strengthen the supervision of executives' decision-making on R&D activities, including attribution, capitalization, and reasons for expense selection of R&D

expenses. Improve the relevant mechanisms for executive assessment. Enterprises can choose to incorporate R&D achievements and innovation efficiency into the executive assessment and evaluation system, while preventing opportunistic behaviors such as R&D manipulation by executives. Annual reports and other disclosure information should be disclosed in a diversified manner to enhance readability and visualization in order to gain more attention and investment, rather than engaging in illegal and unethical behavior such as manipulation. Avoiding opportunistic manipulation of disclosed information, increasing the frequency and quality of information exchange with investors, and boosting the confidence of investors and the market; At the level of government regulation, although the existence of R&D manipulation makes it difficult to distinguish the authenticity of R&D activities, the government cannot implement a one size fits all policy on the R&D activities of enterprises. But the government can strengthen the effective identification of research and development activities, encourage and support genuine research and development activities, and strengthen supervision, review, and punishment of false research and development activities. Secondly, further improve the relevant content of the accounting standards for research and development expenses, and strengthen the audit supervision of registered accountants on the capitalization of research and development expenses and expenses. The supervision and audit of highly covert real earnings management activities such as research and development manipulation are particularly important. Finally, pay attention to growth oriented enterprises. Start up companies in the growth stage provide the majority of employment opportunities. Based on encouraging R&D activities of enterprises without manipulating R&D expenditures, the government can also provide corresponding funding for these enterprises' R&D activities and improve their internal governance mechanisms. At the investor level, investors should carefully examine and prioritize improving their decision-making efficiency when obtaining accounting information. Comprehensively understand the disclosure information of enterprises and collect more decision-making materials with reference value. At the regulatory level of the securities market, market supervision departments should also increase the scrutiny and supervision of mandatory disclosure of information such as annual reports disclosed by enterprises, strengthen the supervision of the quality of information disclosure related to research and development innovation disclosed by enterprises, and reduce the occurrence of harmful investment market behaviors such as manipulating financial statements, forging transaction items, and manipulating non-existent transactions by enterprises.

References

- [1] L.A. Franzen, K.J. Rodgers, T.T. Simin. Measuring distress risk: The effect of R&D intensity, *The journal of finance*, vol.62(2007)No.6,p.2931-2967.
- [2] R.D. Hines. The usefulness of annual reports: the anomaly between the efficient markets hypothesis and shareholder surveys, *Accounting and business research*, vol.12(1982)No.48,p. 296-309.
- [3] W. Zhang , P. Hu,J.J. Wang,et al. Equity incentive plans and R&D investment manipulation: evidence from China, *Accounting & finance*, VOL.62(2022)No.3,p.4157-4183.
- [4] K. Lo ,F. Ramos, R.Rogo. Earnings management and annual report readability, *Journal of accounting and economics*, vol.63(2017)No.1,p.1-25.
- [5] J.T. Hancock,L. E.Curry, S.Goorha, et al.On lying and being lied to:A linguistic analysis of deception in computer-mediated communication, *Discourse processes*, vol.45(2007)No.1,p.1-23.
- [6] S. Roychowdhury.Earnings Management through Real Activities Manipulation, *Journal of accounting and economics*, vol.42(2006)No.3,p.335-370.