

Descriptive Innovation and Managerial Opportunistic Equity Reduction: An Empirical Study of High-Tech Enterprises in Beijing

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Abstract: This study delves into the relationship between descriptive innovation and managerial opportunistic equity reduction in Beijing's high-tech enterprises through empirical research. The findings reveal a significant positive correlation between descriptive innovation and managerial opportunistic equity reduction. Due to the volatile nature of stock prices in high-tech enterprises, executives tend to opportunistically reduce their equity holdings following successful innovations. This discovery holds immense importance for internal governance and safeguarding shareholder interests in the high-tech sector. These insights provide valuable guidance for corporate management and regulatory decision-making, while also serving as a valuable reference for investors, scholars, and industry practitioners. Overall, this research contributes to the advancement of high-tech enterprises and promotes fairness in the market.

1. Introduction

The behavior and decisions of top-level executives play a pivotal role in the growth and prosperity of companies. Descriptive innovation signifies progressive improvements introduced by companies in products, services, or technologies. On the other hand, managerial opportunistic equity reduction refers to executives leveraging internal information and advantages to opportunistically reduce their company stock holdings and gain superior returns. With the rapid rise of China's high-tech enterprises, the relationship between descriptive innovation and managerial opportunistic equity reduction has gained significant attention.

This study endeavors to explore the connection between descriptive innovation and managerial opportunistic equity reduction within Beijing's high-tech enterprises and further examine its prevalence in this dynamic sector. Through empirical research, we conducted an extensive investigation utilizing comprehensive data and statistical analysis to understand the existence and impact of this correlation. The outcomes distinctly establish a noteworthy positive association between descriptive innovation and managerial opportunistic equity reduction. This finding carries essential practical implications for comprehending internal governance and safeguarding

shareholder interests within high-tech enterprises. By delving into this relationship, we aim to provide valuable insights and recommendations for the development and protection of shareholder interests in high-tech enterprises, offering robust decision-making support for corporate management and regulatory authorities. Additionally, our research advances understanding of internal behaviors and market operations for investors, scholars, and industry professionals.

This paper is structured as follows: firstly, we conduct a comprehensive review of pertinent literature, summarizing the current research status, viewpoints, and conclusions on descriptive innovation and managerial opportunistic equity reduction. Next, we detail our research methods and data sources to ensure scientific rigor and reliability. Subsequently, we present empirical results, undertaking in-depth analyses and interpretations. Finally, we conclude our research with insightful suggestions for future directions.

2. Literature Review

In general, internal trading refers to the practice of personnel within a company, particularly directors, supervisors, and executives, who hold significant authority, engaging in transactions of their own company's shares on the secondary market. While this behavior is not inherently improper, it can lead to opportunistic equity reduction, allowing insiders to gain excessive returns. In other words, opportunistic equity reduction represents a specific scenario within internal trading that clearly infringes upon the interests of unaware traders. Despite the Chinese Securities Regulatory Commission's issuance and implementation of a series of regulations to curb such practices, opportunistic equity reduction remains prevalent, prompting scholars to explore the motives and consequences behind this behavior.

According to the "income compensation" theory, opportunistic equity reduction is the result of insiders with relatively lower compensation attempting to compensate for their returns (Kallunki et al., 2018) ^[1]. On the other hand, the "information advantage" theory suggests that insiders profit from their informational edge and exhibit a stronger opportunistic tendency (Ali et al., 2017) ^[2]. As opportunistic equity reduction is primarily determined by insiders as the main actors, the driving factors can be categorized into two aspects: internal characteristics, mainly associated with management, and the company's overall environment. Concerning internal characteristics, research has increasingly focused on behavioral management and examined traits such as risk preferences, gender (Inci et al., 2017) ^[3], and their impact on internal transactions. At the environmental level, various company statuses and indicators can influence opportunistic equity reduction. For instance, the company's growth and stock price can affect insiders' confidence and risk preferences regarding the company's prospects, thereby influencing the likelihood of equity reduction (Lee, 2019)^[4]. Company size can also play a role (Davis, 2017) ^[5]. In relatively smaller companies, insiders' informational advantage is more likely to be utilized, making opportunistic equity reduction more prone to occur (Lakonishok et al., 2001) ^[6].

3. Research Hypothesis

Descriptive innovation refers to the practice of companies innovating their products, services, or technologies, often involving improvements, optimizations, or reconfigurations of existing offerings to meet market demands. When companies heavily engage in descriptive innovation, they can achieve market success and growth, leading to an increase in their stock prices.

As company insiders, high-level executives hold stocks in the company. When a company successfully implements descriptive innovation and its stock price rises, the value of the stocks held by executives also increases accordingly. At this point, executives face an opportunity to gain higher returns by strategically reducing their stock holdings. They may believe that the stock price

has reached its peak or is likely to decline, leading them to opportunistically reduce their holdings to maximize their profits. This behavior can result in insiders gaining excess returns and potentially harming the interests of other ordinary investors, as these investors might not be aware of the executives' assessments of stock prices and their reduction plans.

This situation is more prevalent in high-tech enterprises. In the field of technological innovation, stock prices of high-tech companies often experience significant fluctuations. High-tech enterprises are usually operating in high-risk and highly uncertain environments, where stock prices are strongly influenced by technological advancements, market competition, policy changes, and other factors. When a high-tech company achieves a significant innovation breakthrough or gains market recognition, its stock price may rise rapidly, providing executives with an opportunity to strategically reduce their holdings and gain substantial profits. Furthermore, high-tech enterprises often heavily rely on the innovation capabilities and expertise of their founding teams during the early stages, creating a strong correlation between the interests of executives and the company. Once the company achieves innovation success, executives, being insiders, typically hold a relatively large number of stocks, making them more inclined to engage in opportunistic equity reduction.

In summary, a higher frequency of descriptive innovation in high-tech enterprises may lead to an increase in stock prices, motivating executives to engage in opportunistic reductions of their stock holdings. As a result, this relationship is more common in such enterprises. Based on this, we propose the following hypothesis:

Hypothesis 1: There is a significant positive correlation between descriptive innovation in high-tech enterprises and managerial opportunistic equity reduction.

4. Research Design

4.1 Sample Selection

This study selects technology-oriented publicly listed companies in Beijing from the years 2001 to 2022 as the initial sample. To ensure the validity of our empirical results, we follow specific screening steps for the sample data: we eliminate samples with missing data, remove companies labeled as "ST" or "PT". Data on executive stock reductions is obtained from the CNRDS database, while other financial and governance data of the companies are sourced from CSMAR. Additionally, textual data is collected from the WinGo Financial Text Data Platform.

4.2 Model Specification

$$IT = \alpha \times innovation_index + \beta \times Controls + Controls + \mu \quad (1)$$

In our model, "IT" represents opportunistic executive stock reductions and serves as the dependent variable. On the other hand, "innovation_index" stands for descriptive innovation, which is the core explanatory variable. We also include a set of control variables represented by "CONTROLS" and use "YEAR" as the annual dummy variable.

4.3 Variable Definitions

Opportunistic Executive Stock Reduction (IT): This indicator consists of two sub-variables - the amount of stock reduction due to opportunism (SELL) and the frequency of stock reduction due to opportunism (SellTimes). Previous research has shown that excess returns from stock reductions serve as an important quantitative representation and indirect evidence of executives engaging in opportunistic stock reductions based on information advantages. In essence, when executives use

their information advantages for opportunistic stock reductions, the individual stocks should exhibit significantly lower cumulative abnormal returns compared to those before the reductions. Thus, we employ the event study method to calculate the cumulative abnormal return for 30 days before and after each reduction. If the cumulative abnormal return for the 30 days before the reduction is higher than that for the 30 days after, the reduction is classified as opportunistic; otherwise, it is considered routine.

Descriptive Innovation (Innovation_index): Descriptive innovation information disclosure refers to textual information related to innovation that companies disclose beyond quantitative information about real innovation activities. Here, innovation primarily refers to narrow technological innovation, including descriptive information about inputs and outputs related to technological advancements. To construct the descriptive innovation index, we utilize a novel and large-sample word analysis method based on dictionaries. Unlike traditional dictionary methods, we employ the "seed word set Word2Vec similarity word expansion" method. We begin by collecting the seed word set for descriptive innovation through relevant literature. Then, we use the Word2Vec neural network similarity word algorithm to expand the vocabulary based on the seed word set, determining key words related to descriptive innovation. Finally, we calculate the ratio of the sum of the word frequency of descriptive innovation keywords in the annual report to the total word count of the annual report, which serves as the descriptive innovation index. The information on word frequency of innovation keywords and the total word count of the annual reports are sourced from the WinGo Financial Text Data Platform's financial report word frequency database. The variable definition is listed in Table 1.

Table 1 Variable Definition

	Variable	Description
Dependent Variable	SELL	Amount of Opportunistic Executive Stock Reductions
	SellTimes	Frequency of Opportunistic Executive Stock Reductions
Explanatory Variable	Innovation_index	Proportion of the sum of descriptive innovation keywords' frequency in the annual report to the total word count of the annual report
Controls Variables	Size	Natural logarithm of total assets
	Lev	Debt-to-Asset Ratio
	ROA	Net Profit-to-Asset Ratio
	Growth	Revenue Growth Rate
	Loss	Whether the company is in a loss position
	Indep	Ratio of Independent Directors to the total number of Directors
	Dual	Whether the Chairman and CEO positions are combined
	Balance1	Ownership Concentration
	BM	Book-to-Market Ratio
	ListAge	Difference between the current year and the year of the company's listing
	Mshare	Management Ownership Percentage
	Opinion	Audit Opinion

5. Empirical Analysis

5.1 Descriptive Statistics

Table 2 provides the descriptive statistics of the main variables. According to the data, during the sample period, the median values for both the number and amount of opportunistic executive stock reductions are 0. This suggests that a significant portion of technology-oriented companies in Beijing did not engage in opportunistic executive stock reductions, indicating a generally robust development of Beijing's capital market. However, it's worth noting that the maximum value for

opportunistic reduction amount (SELL) is 30.57, with a minimum of 0, a mean of 5.00, and a standard deviation of 7.5. As for opportunistic reduction frequency (SellTimes), the maximum value is 3.85, with a minimum of 0, a mean of 0.53, and a standard deviation of 0.89. This indicates substantial variations in opportunistic executive stock reduction behavior among technology-oriented companies in Beijing, suggesting that such actions might be more concentrated in certain types of listed companies. Turning to descriptive innovation, the mean and median are both 0.01, indicating no significant difference. This implies that technology-oriented companies in Beijing tend to adopt a "responsive steering" disclosure strategy. However, the maximum and minimum values for descriptive innovation are 0.03 and 0.01, respectively, with a standard deviation of 0.01, indicating little variation in the degree of descriptive innovation among different companies. The descriptive statistics of other control variables are generally consistent with previous literature.

Table 2 Variable Descriptive Statistics

	mean	sd	min	P50	max
SELL	5.00	7.50	0.00	0.00	30.57
SellTimes	0.53	0.89	0.00	0.00	3.95
Innovation_index	0.01	0.01	0.00	0.01	0.03
Size	21.78	0.99	18.65	21.73	24.36
Lev	0.36	0.20	0.04	0.33	1.30
ROA	0.02	0.11	-0.44	0.04	0.23
Growth	0.12	0.39	-0.65	0.09	3.59
Loss	0.21	0.41	0.00	0.00	1.00
BM	0.60	0.44	0.05	0.49	2.43
ListAge	1.87	0.90	0.00	1.95	3.50
Mshare	0.19	0.19	0.00	0.114	0.79
Opinion	0.94	0.24	0.00	1.00	1.00

5.2 Empirical Results

To test hypothesis H1, which posits that companies with a higher level of descriptive innovation are more likely to experience opportunistic executive stock reductions, we conducted regressions using Model (1), and the results are presented in Table 3. In Table 3, column (1) represents the dependent variable, which is the amount of opportunistic executive stock reductions (SELL), while column (2) represents the dependent variable, which is the frequency of opportunistic executive stock reductions (SellTimes). In both columns, the explanatory variable is descriptive innovation (Innovation_index).

Analyzing the regression results in Table 3, the regression coefficient for descriptive innovation (Innovation_index) is significantly positive at the 5% significance level. This indicates that companies disclosing more descriptive innovation information are indeed more likely to experience opportunistic executive stock reductions, and such reductions are more frequent and involve larger amounts. Thus, hypothesis H1 is supported by the empirical findings.

Table 3 Empirical Results

	(1)	(2)
Variables	SELL	SellTimes
Innovation_index	44.330**	4.703**
	(2.46)	(2.16)
Size	0.406*	0.037
	(1.69)	(1.26)
Lev	-0.442	-0.029
	(-0.41)	(-0.24)
ROA	-4.488*	-0.286
	(-1.69)	(-0.87)
Growth	-0.168	-0.005
	(-0.64)	(-0.16)
Loss	-0.555	-0.016
	(-0.89)	(-0.21)
BM	-1.455**	-0.157**
	(-2.51)	(-2.31)
ListAge	0.730***	0.069**
	(2.95)	(2.48)
Mshare	6.395***	0.651***
	(6.24)	(5.43)
Opinion	1.755***	0.211***
	(2.69)	(2.85)
Constant	-7.344	-0.646
	(-1.55)	(-1.14)
Year	Control	Control
Observations	12,416	12,416
R-squared	0.070	0.063

Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

5.3 Robustness Test

To ensure the proper conduct of share reduction activities by directors, supervisors, and senior executives of listed companies and to promote the long-term stability and healthy growth of the securities market, the China Securities Regulatory Commission (CSRC) has recently issued several "new regulations on share reduction." Notably, on May 27, 2017, the CSRC released the "Provisions on Share Reduction by Shareholders, Directors, and Senior Executives of Listed Companies" (referred to as the "new regulations"), which imposed stricter requirements on share reduction activities undertaken by senior executives in listed companies, touting it as the most stringent regulation to date. The degree of external oversight can potentially impact the stability of our study's findings. In situations where external oversight is more lenient, opportunistic share reductions by directors and senior executives may increase. Hence, the occurrence of opportunistic share reductions might be influenced more by the leniency of the external regulatory environment rather than the company's strategic decisions.

To address this concern, we conducted an adjustment to the sample period by excluding data from periods characterized by relatively lenient regulatory environments (samples before 2018). Subsequently, we re-ran the regression analysis using Model (1), and the results are presented in Table 4. From Table 4, it is evident that regardless of whether the dependent variable is the amount of opportunistic executive share reductions (SELLA) or the frequency of opportunistic executive

share reductions (SELLT), the regression coefficient for descriptive innovation (innovation_index) remains significantly positive at the 5% significance level, with no changes in our conclusions.

Table 4 Robustness Test

	(1)	(2)
Variables	SELL	SellTimes
Innovation_index	23.644	2.989
	(1.32)	(1.37)
Size	0.006	-0.000
	(0.02)	(-0.00)
Lev	1.738	0.203
	(1.22)	(1.25)
ROA	-3.284	-0.182
	(-1.07)	(-0.50)
Growth	-0.550	-0.038
	(-1.24)	(-0.70)
Loss	-0.256	0.017
	(-0.31)	(0.17)
BM	-0.808	-0.073
	(-1.08)	(-0.84)
ListAge	0.916***	0.087***
	(3.22)	(2.69)
Mshare	8.622***	1.006***
	(6.58)	(6.18)
Opinion	1.777**	0.196*
	(1.98)	(1.87)
Constant	-1.355	-0.194
	(-0.22)	(-0.26)
Year	Control	Control
Observations	5,619	5,619
R-squared	0.079	0.079

Robust t-statistics in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

6. Conclusion

The primary objective of this study was to investigate the relationship between descriptive innovation and opportunistic executive stock reductions. Through empirical research, we discovered a significant positive correlation between the two variables within technology-oriented companies in Beijing. In the dynamic realm of technological innovation, stock prices often exhibit pronounced fluctuations. Successful descriptive innovation leads to increased stock values held by executives, prompting them to engage in opportunistic stock reductions. This phenomenon holds substantial implications for internal governance and the protection of shareholder interests in technology-oriented enterprises.

Our findings underscore the negative impact of opportunistic executive stock reductions on investors, potentially compromising the interests of ordinary shareholders. Therefore, regulatory authorities should take measures to strengthen supervision over such practices, safeguard investor rights, and uphold market fairness and stability. Furthermore, our study highlights the significant role played by internal governance and executive incentive mechanisms in shaping the relationship between descriptive innovation and opportunistic executive stock reductions. Enhancing internal governance and refining incentive structures can help mitigate the occurrence of opportunistic stock reductions and improve long-term company value.

For both investors and corporate decision-makers, our research offers valuable insights. Investors should remain vigilant regarding opportunistic executive stock reductions while carefully considering a company's descriptive innovation strategy to make more informed evaluations of investment risks and returns. In conclusion, the notable correlation between descriptive innovation and opportunistic executive stock reductions in technology-oriented companies provides valuable insights for corporate management, regulatory decision-making, and investor behavior. Further in-depth exploration of the drivers and consequences of this relationship will contribute to the establishment of a healthier, more stable, and sustainable market environment in the future.

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