

The Impact of R&D Information "Window Dressing" on the Long-term Value of Companies and the Role of Underwriters' Reputation: A Case Study of IPO Companies on the Chinese STAR Market

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Abstract

The registration-based IPO system on China's Science and Technology Innovation Board (STAR Market) places strong emphasis on firms' R&D capabilities, which may induce some issuers to engage in R&D "window dressing" to improve their apparent competitiveness. This study investigates how R&D window dressing affects the long-term value and post-IPO performance of STAR Market-listed firms from 2019 to 2021, and whether underwriter reputation moderates these effects. Based on information asymmetry, agency theory, and signaling theory, we empirically examine the economic consequences of opportunistic R&D disclosure practices in a high-tech IPO setting. The results show that R&D window dressing significantly undermines firms' long-term value and operating performance, although reputable underwriters can partly mitigate these adverse effects. Firms with severe R&D window dressing exhibit lower shareholder returns and weaker financial performance during the first two years after listing. Using the COVID-19 pandemic as an exogenous shock, we further show that firms with less R&D window dressing display stronger resilience to external market fluctuations, highlighting the importance of substantive rather than symbolic innovation. The findings underscore the need for more transparent R&D disclosure and stronger intermediary oversight under the registration-based framework, and provide meaningful implications for regulators, investors, and underwriters in emerging tech capital markets.

Keywords: *R&D information window dressing, long-term firm value, IPO pricing efficiency, underwriter reputation, STAR Market*

JEL Classification: O16, L25, D82

1 INTRODUCTION

Following the implementation of the registration-based IPO system, the IPO review committee was abolished. However, this does not imply a relaxation of regulatory oversight for IPO companies. On the contrary, the Chinese stock exchange continues to conduct reviews of the information disclosure and sustainable profitability of IPO companies after the registration-based system has been introduced. The registration-based system does not impose "rigid" financial criteria on companies aiming to issue new shares, which provides opportunities for companies currently in the investment stage with strong development potential to raise funds through the stock market. This, in turn, enhances the role of the capital market in serving the real economy.

Under the prior approval-based IPO system, there were rigid performance criteria that IPO candidates had to meet, creating incentives for companies to engage in earnings management in order to secure IPO qualifications. As a result, many studies have focused on earnings management in the context of IPOs, with companies manipulating financial performance and embellishing financial statements to increase their likelihood of passing the IPO approval

process (Aharony et al., 1993; Aharony et al., 2000; Dechow & Skinner, 2000; Zhang et al., 2024). However, in addition to the earnings management problem, there has also been the issue of research and development (R&D) "window dressing." China's STAR Market differs from NASDAQ and AIM in regulatory design. While NASDAQ uses tiered listing standards to screen firms, the Science and Technology Innovation Board (STAR Market) imposes strict R&D intensity thresholds ($\geq 15\%$) that may incentivize window dressing (Loughran, 1993). AIM's lifelong nominated adviser system also contrasts with the STAR Market's post-IPO withdrawal of underwriter supervision, which may shape intermediary incentives and post-listing monitoring differently. These institutional differences highlight how regulatory frameworks shape underwriter incentives and innovation outcomes, providing a global context for our study of R&D manipulation in China's tech-driven IPO market.

The economic consequences of R&D window dressing differ significantly from those of traditional earnings management. While both practices aim to enhance perceived firm value, their mechanisms and outcomes diverge. Earnings management typically involves manipulating accruals or real activities (e.g., cutting R&D expenses to boost short-term profits), which can be detected through financial statement analysis (Yan et al., 2022). In contrast, R&D window dressing focuses on inflating innovation metrics, such as R&D intensity or patent counts, which are less transparent and harder to verify. This opacity exacerbates information asymmetry, as investors struggle to distinguish genuine innovation from strategic embellishment (Ritala et al., 2023). Moreover, while earnings management often leads to short-term performance reversals, R&D window dressing undermines long-term value by diverting resources from core innovation activities (Ritala et al., 2023). This negative impact can, in turn, reduce the long-term value of these companies. The registration-based IPO system emphasizes information disclosure, requiring market entities to take responsibility for the accuracy and completeness of their disclosed information. Strengthening the supervision and improving the quality of information disclosure are crucial steps toward enhancing the STAR Market's risk-pricing function.

Zhang et al. (2024) and Reznakova and Stefankova (2022) found that the information disclosure system under the STAR Market must navigate a delicate balance between promoting efficient financing for listed companies and ensuring sufficient investor protection. Hu and Wang (2023) examined the reform of the information disclosure system under the STAR Market in both conceptual and practical terms. Their research concluded that the hallmark of the system under the registration-based regime is the balance between market orientation and investor protection. However, comparing China's experience with mature capital markets, Cheng and Huang (2024) identified four main gaps in China's STAR Market information disclosure system: first, the regulatory framework for information disclosure remains underdeveloped, with insufficient legislative progress in procedural constraints on regulatory powers and inadequate legal liability for information disclosure; second, the quality of disclosures is low, with overemphasis on macroeconomic and industry-wide risks and insufficient disclosure of company-specific risks; third, enforcement of violations of information disclosure regulations is weak, reducing its deterrent effect; fourth, the supporting legal framework for information disclosure, particularly in terms of investor protection, is incomplete, and the private remedy system is in need of improvement.

Qiu and Wang (2020) empirically studied the influence of ownership structure on company value in the STAR Market, using data from 21 companies. Their research demonstrated that the ownership ratio of the actual controller is positively correlated with company value, while the separation of ownership and control has an inverted U-shaped relationship with company value. Additionally, they found that longer control chains were negatively correlated with company

value. Further analysis revealed that when intellectual capital is introduced as a moderating variable, the technical expertise and innovative drive of the actual controller mitigate the negative effects of ownership structure on company value.

Due to the difficulty in determining the authenticity of "window dressed" R&D information, both regulatory authorities and investors may develop decision-making biases. The economic consequences of embellishing R&D information are manifold, and they have substantial implications for micro-level enterprise performance, regional innovation development, and even broader macroeconomic growth. This paper focuses on micro-level impacts, specifically investigating how R&D window dressing affects the long-term value of companies.

According to resource-based theory and competitive advantage theory, a higher level of R&D intensity signals a company's innovation capacity and growth potential, helping the company secure more resources and, in the long term, increasing its value. However, if this R&D intensity is artificially inflated, then companies that engage in R&D window dressing are likely to underperform compared to companies that do not. Furthermore, according to the acceleration trap theory, although excessive R&D investment may yield short-term gains through new product launches and rapid revenue growth, it can also drain resources from other critical business functions, leading to a long-term decline in performance. Recent studies suggest that, while strategic innovation disclosure may temporarily improve market perception, it can weaken long-term market performance and post-IPO operating quality when it is not supported by substantive innovation (Deng et al., 2024; John et al., 2025; Yuan et al., 2024). Similarly, firms engaging in symbolic patenting or opportunistic innovation disclosure are more likely to experience poorer post-IPO outcomes and weaker innovation sustainability (Chen et al., 2021; Ritala et al., 2023). In addition, government subsidies and disclosure-oriented regulatory pressures may induce symbolic rather than substantive innovation activities (Hou et al., 2021; Ritala et al., 2023).

This research uses data from companies listed on the STAR Market between 2019 and 2021 to explore the impact of R&D window dressing on company value. The theoretical framework draws upon information asymmetry, agency theory, signaling theory, resource-based theory, institutional theory, the acceleration trap, and the opportunistic behavior hypothesis. This study also considers China's unique science and technology policy context and the distinct institutional features of the STAR Market. It provides a micro-level analysis of the impact of R&D window dressing on long-term company value and examines the moderating role of underwriter reputation. The findings offer insights for securities regulators seeking to improve China's IPO system and enhance the information disclosure and intermediary institution systems in the STAR Market under the registration-based regime.

2 THEORETICAL BACKGROUNDS

2.1 The R&D window dressing and long-term firm value

What are the economic consequences of window dressing R&D information by listed companies? As analyzed previously, IPO pricing tends to be less efficient when companies window dress their R&D information. Therefore, what impact does this window dressing have on the long-term value and future performance of companies? On the one hand, a higher level of R&D intensity may signal increased scientific innovation capabilities for the company, which could, in turn, elevate its long-term value. However, on the other hand, if this higher R&D intensity results from window dressing, the related R&D expenses may not be truly allocated to the R&D process or may be funneled into non-substantial innovation, making it

difficult to achieve genuine, high-quality innovation outputs. Therefore, the potential consequences of this practice on a company's long-term value require further exploration.

The impact of R&D window dressing on long-term firm value can be understood from two theoretical perspectives. From the perspective of innovation investment, higher R&D intensity can signal stronger innovation capability and growth potential. According to resource-based theory and competitive advantage theory, heterogeneous resources such as patents are difficult to imitate and can generate above-average returns. A larger patent portfolio may therefore signal stronger innovation capacity and growth prospects to external stakeholders, helping firms attract resources and investor attention (Zhang et al., 2016; Basana et al., 2024; ur Rehman et al., 2023). As a result, firms with higher R&D intensity may receive more favorable valuation in capital markets. This view is also broadly consistent with empirical studies showing that innovation investment can improve returns and competitiveness under certain conditions (Lewandowska et al., 2021; Lv & Xiong, 2023; Vrabcova et al., 2022).

Second, from the window dressing perspective, such behavior can have negative effects. The acceleration trap theory posits that, while excessive R&D investment may allow a company to launch new products and experience a short-term surge in operating income, it risks depleting future consumer purchasing power and diverting resources from other operational activities, ultimately causing long-term declines in sales revenue (Yang & Wang, 2021). Additionally, Miao et al. (2021) found that the relationship between patent output and core business income is "inverted U-shaped," indicating that excessively high patent output diminishes corporate performance. Further, earnings management practices related to R&D expenditures may lead companies away from their normal business activities (Schipper, 1989) and, as a result, harm their long-term value (Yan et al., 2022). Moreover, patents rushed through the application process during "window dressing" tend to be of lower quality, especially non-invention patents with short protection periods and low production value. These patents fail to provide long-term growth prospects for the company (Ritala et al., 2023; Mao et al., 2018). McLeod et al. (2022), using a dataset of Chinese GEM companies between 2009 and 2018, found that the behavior of patent raiding, often seen in GEM-listed companies, reduces patent quality and negatively affects long-term business performance after listing. They also noted that the rapid accumulation of patent applications led investors to overestimate the true value of the company, harming shareholder interests and reducing long-term returns. According to agency theory, managers face dual agency risks: short-termism in R&D investment decisions (Fama & Jensen, 1983) and misaligned incentives to manipulate R&D disclosures to attract investors (Jensen & Meckling, 1976).

According to signaling theory, R&D window dressing sends distorted signals to investors, eroding trust and increasing the cost of capital (Spence, 1973). By artificially inflating R&D metrics (e.g., sudden surges in R&D expenditures or patent filings), firms aim to reduce information asymmetry and signal high growth potential. However, such signals often lack credibility due to their opportunistic nature. When post-IPO performance fails to align with pre-IPO disclosures, investors penalize these firms by discounting their long-term value (Jensen & Meckling, 1976). This misalignment between signaled and actual innovation capacity explains the observed decline in shareholder returns and financial performance. Meanwhile, resource-based theory suggests that artificially inflated R&D expenditures divert resources from core innovation activities, ultimately harming long-term competitiveness (Barney, 1991). From an institutional theory perspective, China's registration-based IPO reform has created regulatory isomorphism pressure (DiMaggio & Powell, 1983), compelling firms to align their R&D disclosures with institutional expectations. This, combined with agency conflicts (Jensen & Meckling, 1976), drives managers to engage in window dressing to secure listing approval and

maximize IPO proceeds. Specifically, management may manipulate R&D information before the IPO to meet regulatory requirements and investor expectations, but such behavior often comes at the cost of strategic myopia. Therefore, the effect of R&D information window dressing on the long-term value of IPO companies depends on the degree and direction of the window dressing. If the window dressing successfully enhances the company's innovation capabilities and technological advancement, it will have a positive impact on the company's long-term value. Conversely, if the window dressing fails to create substantial improvements in innovation and technology, it will likely have a negative impact on long-term value. According to the opportunistic behavior hypothesis, window dressing in R&D is frequently a short-term earnings management tactic aimed at increasing the IPO approval rate and enhancing the IPO issue price. This practice often involves allocating R&D funds to non-substantial innovation activities. Once the IPO is successful, companies may subsequently reduce R&D expenditures or cut the R&D investments that were originally planned for future years. R&D projects that were scheduled for later years are often advanced to the year of the IPO or the year before, which ultimately undermines the sustainability and long-term impact of R&D and innovation activities, and consequently damages the long-term value of the company.

Based on our prior research showing that R&D information manipulation reduces IPO pricing efficiency in the STAR Market (Zuo & Zhang, 2023), this study extends the analysis to firms' post-IPO outcomes. Specifically, we examine whether strategic R&D window dressing—manifested in abrupt increases in R&D intensity, inflated R&D staffing, and clustered patent applications before listing—has persistent effects on long-term firm value.

Hypothesis 1: R&D window dressing by IPO companies leads to a decline in the long-term value of the company after the IPO (decline in the long-term return to shareholders)

2.2 Underwriter reputation, R&D window dressing and long-term firm value

The impact of R&D information window dressing on the long-term value of IPO companies depends largely on the extent and direction of this practice. Reputable underwriters possess the ability to transform R&D information window dressing into substantive innovation activities by scrutinizing the sustainability and continuity of R&D and innovation activities. Through this process, they can limit the negative effects of window dressing and thus enhance the long-term value of the company.

First, highly reputable underwriters can more effectively restrain opportunistic R&D window dressing. According to principal-agent theory and the opportunistic behavior hypothesis, STAR Market IPO firms may have incentives to inflate R&D indicators in order to increase the probability of approval and obtain a higher offer price. This may take the form of sudden increases in R&D expenditure, short-term expansion of R&D personnel, or concentrated patent filings immediately before the IPO. Such changes often reflect strategic short-term behavior rather than sustained innovation. Reputable underwriters possess substantial reputational capital accumulated over time and therefore have stronger incentives to avoid litigation risk and reputational damage. They are more likely to conduct rigorous due diligence through document review, executive interviews, and on-site verification (Boulton, 2023), while also imposing tighter constraints on managerial opportunism. In this way, reputable underwriters may reduce the negative consequences of R&D window dressing and improve firms' long-term value. They act as both information intermediaries, by reducing information asymmetry through credible certification, and governance enforcers, by strengthening compliance with disclosure standards (Baker & Wurgler, 2006). Their commitment, including mandatory follow-on investment under STAR Market rules, further aligns their incentives with long-term innovation outcomes. In particular, reputable underwriters may mitigate R&D window dressing through three channels:

pre-IPO verification of R&D authenticity, stricter enforcement of disclosure standards, and certification effects that reduce investor skepticism.

On the other hand, reputable underwriters also help signal the substantive nature of technological innovations undertaken by IPO companies listed on the STAR Market. According to information asymmetry theory, the complexity and inherent uncertainty of corporate innovation activities increase the degree of information asymmetry between firms and investors. Highly reputable underwriters, functioning as third-party certifiers, play a critical role in reducing information asymmetry between internal and external investors (Baker & Wurgler, 2006; Le et al., 2024; Vychytilova et al., 2020). Therefore, under the disciplinary influence of reputable underwriters, whether R&D window dressing reflects long-term substantive innovation or short-term strategic innovation, external investors are more likely to perceive these activities through a more credible information environment. This perception attracts investors, reduces financing costs for the company, and ultimately enhances the company's long-term value. Signaling theory further explains the moderating role of underwriter reputation. Reputable underwriters act as credible third-party certifiers, validating the authenticity of R&D disclosures and strengthening market confidence in disclosed innovation capacity (Baker & Wurgler, 2006; Hu et al., 2021). Their rigorous due diligence transforms superficial R&D signals into more credible commitments to innovation. Underwriter follow-on investment further aligns the interests of underwriters and investors, incentivizing underwriters to conduct rigorous due diligence and suppress opportunistic R&D window dressing. This mechanism enhances IPO pricing efficiency and provides an exogenous channel to address endogeneity concerns (Baker & Wurgler, 2006; Hu et al., 2021).

Hypothesis 2: Highly reputable underwriters can dampen the negative impact of R&D window dressing on the long-term value of IPO firms.

2.3 Additional Moderating Factors

Beyond underwriter reputation, other contextual factors may influence the economic consequences of R&D window dressing. First, corporate governance structures, particularly the proportion of independent directors, can enhance oversight and reduce opportunistic behavior (Jensen & Meckling, 1976). Second, government subsidies may either incentivize genuine innovation or exacerbate R&D window dressing, depending on the design and enforcement of subsidy policies (Hou et al., 2021). Third, the regional innovation environment, including R&D density and access to innovation resources, may shape firms' innovation behaviors (Porter, 1990). Behavioral finance theories explain how investor expectations interact with R&D disclosures. For example, investor overreaction to R&D metrics creates pricing inefficiencies, which underwriters may mitigate through certification and disclosure discipline. These factors are incorporated into our extended theoretical framework and empirical analysis.

3 RESEARCH OBJECTIVE, METHODOLOGY AND DATA

3.1 Research Objective, Methodology

This paper examines whether R&D window dressing reduces the long-term value of IPO firms. We expect firms with more serious R&D window dressing to exhibit lower long-term returns than firms without such behavior, or with less severe window dressing. Following Xu and Chen (2009) and McLeod et al. (2022), model (1) is specified as follows:

$$BHAR6/BHAR12 = \alpha + \beta manipulate_i + \gamma controls + industry + year + \varepsilon_{it} \quad (1)$$

The dependent variables, BHAR6 and BHAR12, measure the portion of stock returns exceeding the market return over 6 and 12 months after listing, respectively. Manipulate is a dummy variable indicating severe R&D window dressing. Firms are first identified as engaging in R&D window dressing based on changes in R&D intensity between the IPO year and the previous year. We then calculate the annual average level of window dressing among STAR Market-listed firms and classify firms with above-average window dressing intensity in the same year as having severe R&D window dressing (manipulate = 1); all others are coded as 0. Controls include two groups of variables. The first group captures firm operations, including firm size, total liabilities, operating costs, operating profit, leverage, ownership structure, and balance. Except for lev and balance, these variables are expressed in natural logarithms. The second group captures issuance characteristics, including IPO size (IPOsize), underwriting fee rate (underwfee), and first-day turnover rate (trodf1). Industry and year denote industry and year dummy variables, respectively, and ε is the random disturbance term.

To further test Hypothesis 2, model (2) adds underwriter reputation (reputation) and its interaction with R&D window dressing (manipulate \times reputation) to model (1).

$$\frac{BHAR6}{BHAR12} = \alpha + \beta_1 manipulate_i + \beta_2 manipulate_i \times reputation_i + \gamma controls + industry + year + \varepsilon_{it} \quad (2)$$

3.2 Data

3.2.1 Definitions and measures of key variables

Drawing on the framework established in Zuo and Zhang (2023), the severity of R&D window dressing is determined based on the following four criteria: (1) abnormal R&D intensity: R&D intensity (R&D expenditure/revenue) in the IPO year increases $>1\sigma$ above the industry mean and declines below the mean within two years post-IPO; (2) sudden R&D personnel adjustment: the R&D personnel ratio increases $>10\%$ pre-IPO (vs. the two-year average) and declines $\geq 5\%$ within two years post-IPO; (3) abnormal patent quality/timing: patent applications increase $>50\%$ pre-IPO (vs. the two-year average) with non-invention patents $>70\%$ (industry average: 50%-60%); and (4) abnormal R&D capitalization: the R&D capitalization rate (capitalized R&D/total R&D) in the IPO year exceeds the industry 75th percentile. Firms meeting at least two of the above four criteria are classified as having severe R&D window dressing (manipulate = 1); all other firms are coded as 0. The explanatory variables used to characterize R&D-related disclosure are measured as follows. First, R&D expenditure intensity (RD) is equal to the ratio of the company's R&D expenditure to its operating revenue in the current year (Xin et al., 2021). Second, the proportion of R&D personnel (Reratio) is measured as the ratio of R&D personnel to the total number of employees. Third, patent intensity (patent1) is measured as the number of patent applications divided by operating revenue. Fourth, the proportion of non-invention patents (patent2) is measured as 1 minus the number of invention patent applications divided by the total number of patent applications.

Based on this framework, the variables used to capture the effects of R&D window dressing on long-term firm value and the moderating role of underwriters are constructed as follows. The control variables are selected on the basis of theoretical relevance and prior empirical evidence. Firm size (Size) captures differences in resource availability, as larger firms may have greater capacity for R&D investment (Zhang et al., 2016). Leverage (Lev) is included because financing pressure may constrain R&D spending and affect innovation outcomes. Operating costs (Cost) capture financial pressure that may induce R&D manipulation (Yan et al., 2022). Profitability (ROA/ROE) reflects firms' financial health and may influence both R&D decisions

and long-term performance (Lewandowska et al., 2021). Equity structure (Balance) is controlled for because ownership concentration may affect managerial incentives (Qiu & Wang, 2020). IPO size (IPOsize) and underwriting fee rate (Underwfee) reflect market confidence and underwriter effort, respectively (Baker & Wurgler, 2006; Xu & Chen, 2009). Finally, the first-day turnover rate (Trodf1) is included to capture speculative trading behavior (Loughran, 1993).

Tab. 1 - Definitions and Measures of key variables.

Source: CSMAR Database and WIND Database

| Variable type | variable name | variable symbol | Variable Calculation Formulas |
|-----------------------|--|-------------------|---|
| Dependent variables | 6-month holding rate of return | <i>BHAR6</i> | Excess of stock return over market rate of return for six months of holding company stock |
| | 12-month holding yield | <i>BHAR12</i> | Excess of stock return over market rate of return for 12 months of holding company stock |
| | return on total assets | <i>ROA</i> | Net profit to total assets |
| | return on net assets | <i>ROE</i> | Ratio of net profit to net assets |
| Explanatory variables | Severity of window dressing intensity of R&D information | <i>manipulate</i> | R&D information window dressing is more serious take the value of 1, otherwise 0 |
| | Underwriter reputation | <i>reputation</i> | The higher the reputation of the underwriter, the higher the value of 1, otherwise 0. |
| Control variables | Enterprise size | <i>size</i> | Natural logarithm of total assets |
| | total liability | <i>liability</i> | Natural logarithm of total liabilities |
| | business costs | <i>cost</i> | Natural logarithm of operating costs |
| | business profit | <i>profit</i> | Natural logarithm of operating profit |
| | gearing | <i>lev</i> | Total liabilities/total assets |
| | shareholding structure | <i>balance</i> | Shareholding ratio of the largest shareholder |
| | issue size | <i>IPOsize</i> | Natural logarithm of the total amount of funds raised at the time of the IPO |
| | underwriting rate | <i>underwfee</i> | Natural logarithm of underwriters' sponsored offering expenses |
| | Turnover rate on the first day of IPO | <i>trodfl</i> | Turnover rate on the first day of IPO |

3.2.2 Sample selection and data sources

This study uses firms listed on the STAR Market from 2019 to 2021 as the research sample. The sample is screened according to the following criteria: (1) financial firms are excluded; (2) firms designated as ST, *ST, or PT are excluded; and (3) observations with missing or abnormal data are removed. After screening, 463 observations remain. The data are obtained from the CSMAR and WIND databases, and all continuous variables are winsorized at the 1% level at both tails to reduce the influence of outliers.

3.2.3 Descriptive statistics

Table 2 presents the descriptive statistics of the main variables. It is evident that the average return of companies 6 and 12 months after listing is not high, with some negative values observed. In particular, the 12-month return is lower than the 6-month return, indicating that

long-term returns are generally unsatisfactory. Regarding ROA and ROE, the performance of listed companies remains relatively strong, with values of 6% and 9%, respectively. The proportion of firms exhibiting significant R&D window dressing (manipulate = 1) is notably high, accounting for approximately 33% of the sample. Additionally, the percentage of IPO firms using the top ten underwriters (considered reputable) is as high as 67%, reflecting a high concentration of top-tier underwriters in this market segment. The descriptive statistics of the other variables are detailed in Table 2 and will not be reiterated here.

Tab. 2 - Descriptive Statistics of the Main Variables.

Source: CSMAR Database and WIND Database

| Variable type | variable symbol | observed value | average value | (statistics) standard deviation | minimum value | maximum values |
|-----------------------|-------------------|----------------|---------------|---------------------------------|---------------|----------------|
| Dependent variables | <i>BHAR6</i> | 463 | 1.29 | 1.24 | -0.18 | 6.92 |
| | <i>BHAR12</i> | 463 | 1.23 | 1.18 | -0.26 | 7.52 |
| | <i>ROA</i> | 463 | 0.06 | 0.02 | -0.06 | 0.39 |
| | <i>ROE</i> | 463 | 0.09 | 0.03 | -0.09 | 0.68 |
| Explanatory variables | <i>manipulate</i> | 463 | 0.33 | 0.05 | 0 | 1 |
| | <i>reputation</i> | 463 | 0.67 | 0.06 | 0 | 1 |
| control variables | <i>size</i> | 463 | 20.75 | 0.91 | 19.28 | 25.10 |
| | <i>liability</i> | 463 | 19.20 | 0.80 | 17.89 | 24.36 |
| | <i>cost</i> | 463 | 17.66 | 0.33 | 16.45 | 21.39 |
| | <i>profit</i> | 463 | 18.92 | 0.60 | 16.37 | 22.61 |
| | <i>lev</i> | 463 | 0.36 | 0.17 | 0.04 | 0.86 |
| | <i>balance</i> | 463 | 0.31 | 0.12 | 0.09 | 0.72 |
| | <i>IPOsize</i> | 463 | 20.64 | 0.67 | 19.47 | 23.08 |
| | <i>underwfee</i> | 463 | 17.96 | 0.50 | 16.93 | 19.58 |
| | <i>trodfl</i> | 463 | 0.74 | 0.059 | 0.57 | 0.99 |

4 RESULTS AND DISCUSSION

4.1 Basic regression results

The regression results from models (1) and (2) are reported in Table 3. The coefficients on the R&D window dressing variable, *manipulate*, are significantly negative in all four columns, with significance levels of 1% or 5%, indicating that R&D window dressing reduces the long-term returns of listed firms. The coefficients on the interaction term *manipulate* × *reputation* in columns (3) and (4) are significantly positive, suggesting that IPO firms sponsored by reputable underwriters have higher long-term value, measured by post-listing holding returns. These results support Hypotheses 1 and 2.

The coefficient of *manipulate* (-0.008, $p < 0.01$) indicates that firms with severe R&D window dressing suffer an economically meaningful decline in long-term shareholder returns. To contextualize, this effect is economically meaningful, suggesting that R&D manipulation introduces substantial risk to investors. Furthermore, the interaction

term *manipulate* × *reputation* (0.005, $p < 0.01$) implies that underwriter reputation mitigates over 60% of this loss, underscoring the value of reputational capital in aligning innovation incentives.

Tab. 3 - Impact of R&D Window Dressing on Long-term Firm Value.

Source: CSMAR Database and WIND Database

| | (1) | (2) | (3) | (4) |
|---------------------------------------|----------------------|---------------------|----------------------|----------------------|
| | <i>BHAR6</i> | <i>BHAR12</i> | <i>BHAR6</i> | <i>BHAR12</i> |
| <i>manipulate</i> | -0.008*** (0.003) | -0.005** (0.003) | -0.010*** (0.005) | -0.008*** (0.002) |
| <i>manipulate</i> × <i>reputation</i> | | | 0.004*** (0.001) | 0.005*** (0.001) |
| control variable | Yes | Yes | Yes | Yes |
| industry fixed effect | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |
| sample size | 463 | 463 | 463 | 463 |
| R ² | 0.207 | 0.218 | 0.209 | 0.220 |

Note: Robust standard errors clustered to the industry level are in parentheses, "yes" indicates that the variable of interest is controlled for, and *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.

4.2 Robustness tests

4.2.1 How R&D window dressing affects firm performance

As a robustness check, we replace long-term value with post-IPO operating performance. Prior research has debated whether R&D intensity improves firm performance. International evidence generally supports the view that technological innovation inputs and patent outputs can enhance firm performance, while domestic studies report more mixed findings. For example, Ali et al. (2022) found that R&D investment by Chinese listed manufacturing firms can significantly improve current operating performance, although the effect of capitalized R&D shows some lag. Zhang (2019), using a sample of U.S. listed firms from 1962 to 2012, constructed a technology innovation capital index and showed that innovation improves firms' current and future operating performance.

Of course, there are also opposing views. Lewandowska et al. (2021), based on their research on the Growth Enterprise Market (GEM), found that technological innovation investment can only improve the net profit of GEM companies to a certain extent and does not significantly enhance their operating performance or cash flow. Therefore, the mechanism through which technological innovation investment improves a company's capital market performance by enhancing internal performance will fail. In summary, there is a certain degree of disagreement in the existing literature regarding whether R&D intensity effectively improves the operating performance of technology companies.

Consistent with the preceding analysis, the key issue is whether R&D window dressing merely inflates innovation indicators or reflects substantive innovation. We expect higher levels of window dressing to be associated with poorer post-IPO operating performance. Specifically, we hypothesize that R&D window dressing by IPO firms leads to a decline in post-IPO operating performance. Model (3) is specified as follows:

$$performance_{it} = \alpha + \sum_{k=0}^2 \beta_k \times d_{ik} + \gamma controls + industry + year + \varepsilon_{it} \quad (3)$$

Tab. 4 - Impact of R&D Window Dressing on Firm Performance.

Source: CSMAR Database and WIND Database

| | (1) ROA | (2) ROE | (3) ROA | (4) ROE |
|-----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>d</i> ₀ | 0.017 (0.026) | 0.050*** (0.008) | 0.018*** (0.005) | 0.009* (0.006) |
| <i>d</i> ₁ | -0.007*** (0.003) | -0.013*** (0.004) | -0.006** (0.003) | -0.005*** (0.001) |
| <i>d</i> ₂ | -0.012*** (0.003) | -0.016*** (0.004) | -0.010*** (0.003) | -0.014*** (0.003) |
| control variable | No | No | Yes | Yes |

Note: Robust standard errors clustered to the industry level are in parentheses. "Yes" indicates that the relevant variables are controlled for. *, **, and *** represent significance levels at 10%, 5%, and 1%, respectively. *d*₀, *d*₁, and *d*₂ are dummy variables that equal 1 for firms with severe R&D window dressing (manipulate = 1) in the listing year, the first post-listing year, and the second post-listing year, respectively, and 0 otherwise.

*Performance denotes post-listing operating performance and is measured by return on assets (ROA) and return on equity (ROE). The indicator *d*_{*i*} corresponds to firm-year observations for firms with severe R&D window dressing during years 0-2 after listing. Specifically, *d*₀, *d*₁, and *d*₂ are three dummy variables that equal 1 in the listing year, the first post-listing year, and the second post-listing year, respectively, for firms with severe R&D window dressing, and 0 otherwise. As shown in Table 4, firms with severe R&D window dressing exhibit significantly lower performance in the first and second years after listing than other firms.*

4.2.2 Subsample analysis for industries such as the digital economy and healthcare

In studies on the STAR Market, special attention should be paid to the performance of industries with strong sci-tech innovation attributes. Comparing the industrial structures of China and the U.S. stock markets: U.S. S&P 500 Index: information technology, healthcare, financials, and communication services are the top four sectors by market capitalization weight, accounting for ~59% of total market value. Information technology dominates with a weight of 21.12% (end of Q1 2019). After the COVID-19 pandemic triggered multiple circuit breakers in Q1 2020, this sector's weight rose to 27.16% as the market recovered. In China's Shanghai Composite Index, financials, industrials, materials, and consumer staples accounted for 60-65% of total market value, with financials alone comprising 32%. The information technology sector's weight increased from 5.98% (end of March 2019) to 8.93% (July 22, 2020), rising from the 7th to 4th most weighted sector. Including STAR Market listings, this sector's weight increases to ~10%, significantly optimizing China's capital market structure. On the STAR Market, information technology accounts for 40% of listed companies, addressing long-standing weaknesses in China's capital market support for core tech industries. This positions China to compete in the global new industrial revolution by strengthening capital allocation to strategic sectors. We found that R&D window dressing in high-tech industries (e.g., semiconductors, AI) has a more pronounced negative impact on long-term value compared to traditional industries

(e.g., machinery, materials). This is attributed to the higher investor expectations for genuine innovation in high-tech sectors.

Tab. 5- Sector Distribution on the STAR Market

| Industry | The number of enterprises | Industry | The number of enterprises |
|--|---------------------------|--|---------------------------|
| Machinery and Equipment Manufacturing Industry | 1 | Manufacture of Railway, Ship, Aerospace and Other Transportation Equipment | 3 |
| Non-metallic Mineral Products Industry | 4 | General Equipment Manufacturing Industry | 1 |
| Waste Resources Comprehensive Utilization Industry | 1 | Rubber and Plastics Products Industry | 2 |
| Internet and Related Services | 1 | Research and Experimental Development | 2 |
| Manufacture of Chemical Raw Materials and Chemical Products | 4 | Pharmaceutical Manufacturing Industry | 14 |
| Manufacture of Computers, Communication Equipment and Other Electronic Equipment | 24 | Instrument Manufacturing Industry | 1 |
| Metal Products Industry | 1 | Non - ferrous Metal Smelting and Rolling Processing Industry | 1 |
| Software and Information Technology Services Industry | 19 | Professional Technical Service Industry | 1 |
| Ecological Protection and Environmental Governance Industry | 2 | Special Equipment Manufacturing Industry | 22 |
| Food Manufacturing Industry | 1 | Total | 105 |

Data source: Zhang Zongxin, "Science and Technology Innovation Board and the Registration System: A Study on the Reform Performance of China's Capital Market," China Financial Publishing House, January 2021.

This paper further conducts subsample tests for digital economy-related industries (including Internet and related services, manufacturing of computers, communication equipment and other electronic equipment, and software and information technology services), the pharmaceutical manufacturing industry, and other industries. The results are reported in Table 6. R&D window dressing is observed across all three groups before and after the IPO. However, digital economy firms appear to experience steeper post-IPO performance declines, possibly because of shorter technology life cycles and faster market correction when innovation expectations are not met.

This paper continues to use the variables established in our prior research in Zuo and Zhang (2023) to test the sub-sample test, R&D is R&D intensity, Reratio is proportion of R&D personnel, patent 1 is patent intensity, patent 2 is proportion of non-invention patents.

Tab. 6 - Results of the Subsample Tests.

| | (1) | (2) | (3) | (4) |
|---|----------------------|----------------------|----------------------|---------------------|
| | <i>R&D</i> | <i>Reratio</i> | <i>patent1</i> | <i>patent2</i> |
| Industries related to the digital economy | -0.933*** (0.107) | -2.542*** (0.460) | -0.280*** (0.077) | 0.129*** (0.030) |
| Pharmaceutical Manufacturing Industry | -1.284*** (0.253) | -1.019*** (0.255) | -0.100*** (0.042) | 0.094*** (0.023) |
| Other industries | -1.406*** (0.278) | -1.822*** (0.438) | -0.093*** (0.020) | 0.062** (0.030) |
| control variable | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |

Note: Robust standard errors in parentheses. Control variables: size, liability, cost, profit, lev, balance, IPOsize, underfee, trodfl. Year fixed effects included. *, **, *** represent 10%, 5%, 1% significance levels.

4.2.3 The Role of Underwriter Follow-On Investment

As a significant reform measure in the registration-based IPO system, the underwriter follow-on investment mechanism helps mitigate information asymmetry in the issuance of new shares and reinforces the responsibilities of underwriters in the IPO process. Because this mechanism requires underwriters to bear direct post-listing valuation risk, it may strengthen their incentives to price offerings prudently and to verify issuer disclosures more carefully. The economic consequences of implementing the underwriter follow-on investment system therefore warrant further examination.

The fundamental rationale for underwriter follow-on investment is to strengthen underwriting incentives under the registration-based IPO system. Once underwriters commit capital to the issuer, they no longer act solely as gatekeepers; they also become residual claimants with direct exposure to post-IPO outcomes. This incentive alignment can improve due diligence, reinforce disclosure discipline, and reduce information asymmetry between issuers and investors (Baker & Wurgler, 2006; Diamond, 1989; Boulton, 2023). In particular, because follow-on investors bear lock-up constraints and medium-term valuation risk, they have stronger incentives to scrutinize the authenticity and sustainability of the issuer's R&D activities and to curb opportunistic earnings or disclosure management.

At the same time, follow-on investment may also create countervailing concerns. On the one hand, a capital commitment by the underwriter can serve a certification function and help screen higher-quality issuers. On the other hand, it may create potential conflicts of interest if underwriters become overly invested in defending the valuation of the firms they sponsor. In the STAR Market setting, however, the lock-up period and the underwriter's reputational constraints make ongoing monitoring particularly important. From a principal-agent

perspective, once securities firms become shareholders, they have stronger incentives to supervise management and protect their own medium- and long-term investment interests, thereby reducing firm uncertainty and improving post-IPO value (Diamond, 1989; Boulton, 2023).

To examine the impact of follow-on investment on IPO pricing efficiency, model (4) is specified below. *Underpricing1* denotes the level of IPO underpricing, and *underpricing2* denotes market-adjusted IPO underpricing:

$$\begin{aligned}
 \text{Underpricing}_{it} &= \alpha + \beta_1 \text{followratio}_i + \beta_2 \text{manipulate}_i \\
 &\times \text{followratio}_i + \beta_2 \text{reputation}_i \times \text{followratio}_i + \text{ycontrols} \\
 &+ \text{industry} + \text{year} + \epsilon_{it}
 \end{aligned} \tag{4}$$

The empirical results are presented in table 7. The study reveals that a higher proportion of underwriter follow-on investment is associated with lower offering prices, higher underpricing, and lower IPO pricing efficiency. This effect is even more pronounced for companies with severe R&D information window dressing. These findings suggest that underwriter follow-on investment may not be an optimal policy design for IPO pricing under the registration-based system. However, the last two columns of table 7 indicate that for underwriters with higher reputations, a higher follow-on investment ratio reduces IPO underpricing and improves IPO pricing efficiency. This insight suggests that granting greater participation rights and flexibility to higher-reputation underwriters in the IPO process can enhance IPO pricing efficiency.

Tab. 7 - The Impact of Underwriter Follow-on Investment on IPO Pricing Efficiency

Source: CSMAR Database and WIND Database

| | (1) | (2) | (3) | (4) |
|--|----------------------|----------------------|----------------------|----------------------|
| | <i>underpricing1</i> | <i>underpricing2</i> | <i>underpricing1</i> | <i>underpricing2</i> |
| <i>followratio</i> | 0.003** (0.002) | 0.006*** (0.001) | 0.001 (0.002) | 0.003** (0.002) |
| <i>manipulate</i> × <i>followratio</i> | 0.004*** (0.001) | 0.003*** (0.001) | 0.003*** (0.001) | 0.002** (0.001) |
| <i>reputation</i> × <i>followratio</i> | | | -0.005** (0.003) | -0.006*** (0.002) |
| control variable | Yes | Yes | Yes | Yes |
| industry fixed effect | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |
| sample size | 463 | 462 | 463 | 462 |

| | | | | |
|----------------|-------|-------|-------|-------|
| R ² | 0.281 | 0.285 | 0.287 | 0.288 |
|----------------|-------|-------|-------|-------|

Note: Robust standard errors clustered at the industry level are reported in parentheses. "Yes" indicates that the relevant variables are controlled for. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. One observation is missing for underpricing₂ due to unavailable market return data

5 FURTHER DISCUSSIONS

5.1 Does the Science and Technology Board Have a Strategic Perspective?

Does the STAR Market genuinely support the listing of high-level science and technology enterprises in line with national strategy? This paper addresses this question from the perspective of underwriters' long-term strategic role. The strategic positioning of the STAR Market is explicit in its institutional design. According to the Rules for Examination and Review of Stock Issuance and Listing on the Science and Technology Innovation Board of the Shanghai Stock Exchange (SSE [2019] No. 18), issuers applying for listing should align with the Board's strategic positioning by focusing on global technological frontiers, key economic sectors, and national strategic priorities.

The pilot registration system of the STAR Market has allowed the national science and technology-driven strategy to find a market anchor. First, it emphasizes scientific and technological innovation indicators. On March 20, 2020, the China Securities Regulatory Commission (CSRC) issued the Guidelines for Evaluation of Science and Innovation Attributes (for Trial Implementation). This guideline provides a specific evaluation system to measure the R&D inputs and outputs and technological content of listed enterprises. The introduction of these quantitative and detailed evaluation standards for science and innovation attributes has far-reaching effects, clarifying the entry thresholds for companies intending to list on the STAR Market in the future.

Second, the focus is on key areas of technological innovation. On March 3, 2019, the Shanghai Stock Exchange issued the Recommended Guidelines for Listing Enterprises on the Shanghai Stock Exchange's Science and Technology Innovation Board. Among other directives, it requires sponsors to focus on recommending enterprises from six major fields, including new-generation information technology, high-end equipment, new materials, new energy, energy-saving and environmental protection, and biomedicine.

Third, underwriters have played an essential role in fostering a strategic perspective for science and innovation companies. On one hand, they focus on long-term development, emphasizing future business value and innovation capacity. On the other hand, they consider national strategic priorities, which leads to greater investment in innovation. Underwriters, as critical strategic investors in listed companies, provide both strategic guidance and supervision. Strategic investors, generally legal entities that meet national legal and regulatory requirements, typically maintain cooperative relationships or intentions with IPO firms. These investors enter into strategic investment placement agreements and usually have close business ties with the IPO companies, or operate within the same supply chain or industrial chain as the IPO firm. Their long-term investment aims are to promote industrial structure upgrades, enhance core competitiveness and innovation capabilities, and expand market share for both themselves and the IPO company.

Strategic investors do not only contribute to the future development of the issuer, but also play a key role in demonstrating confidence to potential investors, increasing their willingness to subscribe, and improving the success rate of new share issuances. Strategic investors, however,

are subject to restrictions. For instance, they are prohibited from participating in both the online and offline offerings of publicly traded shares. Strategic investors, excluding subsidiaries of the sponsoring organization, are required to commit to holding their shares for at least 12 months, starting from the IPO listing date. Moreover, reputable underwriters exhibit a stronger long-term strategic perspective, evident in their efforts to assist follow-on funding facilitation for the parent company to secure capital for long-term gains. While underwriters may not always adopt a long-term perspective, their approach tends to be more strategic than that of smaller investors or retail investors. Additionally, their reputation curtails any tendency towards opportunistic behavior. This reflects the original goal behind the creation of the STAR Market—balancing long-term innovation with reputation, as innovation requires a long-term view and so does reputation. Similar research suggests that stakeholder engagement can enhance innovation. Wu et al. (2023) found that stock options granted to employees positively impact innovation output, as innovation involves risk-taking, and employee stock options correlate their wealth with stock return volatility, encouraging greater risk-taking in the innovation process.

While events like the 2008 financial crisis or the 2015 Chinese stock market crash offer valuable insights, their prolonged buildup and sector-specific impacts introduce endogeneity concerns. For instance, the 2008 crisis was preceded by years of credit expansion and housing market speculation, making it difficult to disentangle firm-specific behaviors from systemic risks. In contrast, COVID-19's abrupt and universal disruption allows for clearer identification of firm-level resilience mechanisms.

5.1.1 Justification for COVID-19 as an Exogenous Shock

The COVID-19 pandemic was selected as an exogenous shock due to its unanticipated nature, global scope, and homogeneous impact across industries. Unlike policy-driven or sector-specific shocks, the pandemic's sudden onset in early 2020 provides a quasi-experimental setting to examine how firms' pre-IPO R&D strategies influenced their resilience to systemic market disruptions. This approach aligns with recent studies employing COVID-19-related shocks to isolate firm-level causal effects in financial markets (e.g., Hassan et al., 2023).

To examine the role of strategic orientation, this paper applies a breakpoint analysis to assess stock price stability during the COVID-19 pandemic. We compare the stock price movements of firms with lower levels of R&D window dressing across several post-outbreak windows. In the early stage of the pandemic in 2020, both A-share and global stock markets faced substantial downward pressure. Using January 2020 as the breakpoint, we examine one-month, two-month, three-month, and four-month windows. As shown in Table 8, firms with lower levels of R&D window dressing experienced more stable share prices and were less affected by short-term external shocks, suggesting that substantive innovation is associated with stronger resilience under adverse market conditions.

Tab. 8 - Results of the Breakpoint Analysis during the COVID-19 Pandemic.

Source: CSMAR Database and WIND Database

| | (1) | (2) | (3) | (4) |
|--|-----|-----|-----|-----|
|--|-----|-----|-----|-----|

| | One-month window | Two-month window | Three-month window | Four-month window |
|---|---------------------|---------------------|--------------------|---------------------|
| Share price movements of firms with less severe R&D window dressing | 2.081*** (0.322) | 1.672*** (0.538) | 1.190** (0.506) | 2.035*** (0.430) |

Note: The COVID-19 pandemic is used as an exogenous shock because of its sudden and broad impact. The breakpoint is set at January 2020. Robust standard errors are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

5.1.2 Do firms with weaker profitability have stronger incentives to engage in R&D window dressing?

Existing literature has found that firms with weaker financial conditions are more likely to capitalize their R&D expenditures prior to their initial public offerings (Xin et al., 2021). Zhou et al. (2019) discovered that, in order to meet the performance requirements set by securities regulators for listed companies, firms on the Growth Enterprise Market (GEM) may reduce their R&D investments before going public. Therefore, this paper continues to use the Models established in Zuo and Zhang (2023) to test whether STAR Market IPO firms with weaker profitability are more inclined to window dressing their R&D information. Additionally, model (5) is constructed as follows:

$$\text{innovation}_{it} = \alpha_0 + \alpha_1 \text{IPO}_{it} + \alpha_2 \text{IPO}_{it} \times \text{unprofit}_i + \gamma \text{controls} + \text{company} + \text{year} + \epsilon_{it} \quad (5)$$

Here, unprofit is a dummy variable equal to 1 if a firm's profitability at listing is below the sample mean, and 0 otherwise. In model (5), the coefficient of IPO captures the change in R&D intensity around the IPO for firms with stronger profitability. A significantly negative coefficient suggests these firms engage in window dressing R&D. The coefficient of IPO×unprofit reflects whether firms with weaker profitability exhibit greater changes in R&D intensity around the IPO compared to stronger firms. A significantly negative coefficient indicates weaker firms are more prone to window dressing.

Table 9 presents the results. Columns (1)-(4) report the corresponding models from Zuo and Zhang (2023) for the subsample of firms with weaker profitability. The larger absolute coefficients on IPO and IPO-1 indicate that weaker firms experience a sharper rise in R&D intensity before listing and a steeper decline after listing. Columns (5)-(6) report the results of model (5). The significantly negative coefficient on IPO × unprofit confirms that firms with weaker profitability are more likely to engage in R&D window dressing.

Tab. 9 - Window Dressing of R&D by Firms with Weaker Profitability

Source: CSMAR Database and WIND Database

| (1) | (2) | (3) | (4) | (5) | (6) |
|-----|-----|-----|-----|-----|-----|
|-----|-----|-----|-----|-----|-----|

| | R&D Expenditure to Revenue Ratio <i>R&D</i> | R&D Expenditure to Revenue Ratio <i>R&D</i> | The proportion of R&D personnel <i>Reratio</i> | The proportion of R&D personnel <i>Reratio</i> | R&D Expenditure to Revenue Ratio <i>R&D</i> | The proportion of R&D personnel <i>Reratio</i> |
|------------------------------|---|---|--|--|---|--|
| <i>IPO</i> | -0.680*** (0.059) | | -1.233*** (0.082) | | 0.023 (0.040) | -0.395*** (0.057) |
| <i>IPO-1</i> | | 0.677*** (0.039) | | 1.374*** (0.145) | | |
| <i>IPO</i> × <i>unprofit</i> | | | | | -1.700*** (0.156) | -1.152*** (0.130) |
| control variable | Yes | Yes | Yes | Yes | Yes | Yes |
| industry fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| sample size | 1045 | 1045 | 641 | 641 | 2099 | 1284 |
| R ² | 0.162 | 0.140 | 0.155 | 0.126 | 0.154 | 0.208 |

Note: Robust standard errors clustered at the industry level are reported in parentheses. "Yes" indicates that the relevant variables are controlled for. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively.

5.2 Is the long-term value of unprofitable firms low?

One important feature of the STAR Market registration system is that it strengthens disclosure-based review while permitting the listing of firms that are not yet profitable, provided they meet the relevant STAR Market requirements. This raises an important question: how should the market evaluate unprofitable issuers? In recent years, especially after the full implementation of the registration system in 2023, some investors have argued that the listing of unprofitable firms may have weakened market confidence. But should unprofitable firms necessarily be regarded as low-quality firms? This section examines that question in greater depth.

In reality, companies listed on the STAR Market possess two primary characteristics. First, the entry requirements have been lowered, allowing companies that have not achieved profitability before going public to have an IPO. In this paper, these will be referred to as "pre-listing unprofitable companies." Historically, other boards imposed strict accounting constraints, but the SSE STAR Market has relaxed these requirements, specifically by not mandating pre-listing profitability. This shift aims to enable the market to identify enterprises with greater long-term potential, placing higher demands on IPO pricing efficiency. Second, companies listed on the SSE STAR Market typically exhibit strong innovation attributes. The SSE STAR Market is generally characterized by high R&D investment enterprises, referred to in this paper as "strong

innovation enterprises." Theoretically, R&D investment and innovation are inherently uncertain, high-risk endeavors. A significant distinction between the SSE STAR Market and other sectors is that the research on companies listed on the STAR Market cannot be separated from their core feature of "innovation capability."

On the one hand, access conditions are lowered, and unprofitable enterprises before listing can also conduct IPOs. The STAR Market has introduced a series of institutional innovations. The introduction of China's Science and Technology Innovation Board was recent, and the existing empirical research on its institutional design focuses both on system design and on its operational effects. Dong et al. (2021) analyze the STAR Market from the perspective of institutional supply, arguing that it serves as a form of institutional innovation. From the perspective of the relationship between the government and the market, Chen (2023) and Feng and Zhao (2024) discuss the core mechanism and implementation path of the convergence between the STAR Market and the registration system from the perspectives of registration and review, information disclosure, the return of intermediaries to the position of due diligence, and the delisting system. Zhang and Li (2020) are problem-oriented and find that there are risks related to market pricing, information disclosure, and the trading system in the specific operation of the STAR Market. Wu and Zheng (2020) use comparative analysis to examine the development of science and technology innovation boards in the United States, Japan, and South Korea, and propose that China should steadily implement the registration system, provide stratified and differentiated services, introduce a multiple market-maker system, strengthen legal safeguards, tighten information-disclosure regulation, and formulate a strict delisting system.

Compared to other domestic boards and in comparison, to NASDAQ, one of the defining features of the STAR Market is its lower IPO entry threshold, allowing the market to determine the IPO price to a greater extent. Drawing from NASDAQ's practical experience in the United States and China's early-stage reforms of the Science and Innovation Board (SIB), it is clear that, unlike other A-share boards (especially those that have not adopted the registration system), one of the key features of China's SIB is the relaxation of approval restrictions and the lowering of access conditions for IPOs. This shift allows the market to play a more decisive role in IPO pricing. The relaxation of access conditions is manifested in various ways, with one prominent example being the reduction in corporate profitability requirements. The STAR Market has become a favored platform for unprofitable companies to go public, particularly hard-tech firms. Moreover, in practice, the unprofitability of companies is closely correlated with IPO pricing, as evidenced by all six unprofitable firms listed on the STAR Market in the first four months of 2022 experiencing post-listing market declines. This calls for a deeper theoretical and empirical analysis of the relationship between a company's unprofitability and IPO pricing efficiency. From an international perspective, NASDAQ was initially established to lower the entry threshold for companies through a computerized electronic trading system, providing a crucial financing channel for emerging startups. While the New York Stock Exchange also does not require profitability, its higher thresholds for market capitalization and revenue significantly limit its capacity to attract emerging industries, making it less accessible compared to NASDAQ (Loughran, 1993).

For many retail investors, profitability remains the most intuitive indicator of firm quality, while R&D-related indicators are often viewed with greater skepticism. This cognitive bias may stem from two factors: limited investor understanding of innovation-related disclosure and the reduced credibility of R&D indicators when window dressing is prevalent. When an unprofitable firm passes the listing review, some investors may doubt whether its R&D capability is truly strong enough to justify approval. In this sense, R&D window dressing

weakens the signaling value of innovation-related disclosure and may erode investor confidence in both firms and the review process.

To examine this issue, we test whether unprofitable firms ($unprofit2 = 1$) are significantly more likely than other firms to experience a first-day offer-price break, that is, a closing price below the IPO offer price on the first trading day. We therefore define a dummy variable, *break*, which equals 1 when the closing price on the listing day is below the offer price and 0 otherwise. Model (6) is estimated using a logit specification:

$$break_{it} = \alpha + \beta unprofit2_i + \gamma controls + industry + year + \epsilon_{it} \quad (6)$$

The regression results are reported in Table 10. Unprofitable firms before listing are significantly more likely to experience a first-day offer-price break, whereas R&D window dressing is not significantly associated with this outcome. This suggests that investors still rely more heavily on profitability signals than on R&D indicators when evaluating newly listed firms. After the implementation of the registration-based system and the relaxation of profitability requirements, R&D indicators have not yet fully replaced profitability as a credible benchmark for many investors, which may complicate IPO pricing. In addition, whether a stock falls below the offer price on the first trading day may be affected by broader market conditions, thematic speculation, and other non-fundamental factors rather than solely by firm-specific fundamentals.

Because some investors may treat unprofitable firms as low-quality firms without adequately considering their innovation capacity, policymakers need to respond carefully. On the one hand, regulators should curb R&D window dressing and strengthen the signaling value of successful listing review based on substantive innovation. On the other hand, during the transition phase of the registration-based system, the review of unprofitable firms should more effectively combine profitability indicators, R&D indicators, and long-term growth potential so that temporary losses are distinguished from weak fundamentals.

Tab. 10 - Whether Unprofitable Firms are More Likely to Fall below the Offer Price on the First Trading Day.

Source: CSMAR Database and WIND Database

| | (1) break | (2) break | (3) break |
|-----------------------|---------------------|---------------------|---------------------|
| unprofit2 | 0.726*** (0.081) | 0.565*** (0.049) | 0.562*** (0.049) |
| manipulate | | | 0.065 (0.098) |
| control variable | No | Yes | Yes |
| industry fixed effect | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes |
| sample size | 463 | 463 | 463 |
| R2 | 0.092 | 0.475 | 0.476 |

Note: Robust standard errors clustered to the industry level are in parentheses, "yes" indicates that the variable of interest is controlled for, and *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.

6 CONCLUSIONS

This paper examines the economic consequences of R&D window dressing by listed firms. Building on prior evidence that R&D window dressing reduces IPO pricing efficiency, we extend the analysis to long-term value and post-IPO operating performance through an empirical investigation.

Using STAR Market-listed firms from 2019 to 2021, and drawing on information asymmetry theory, principal-agent theory, acceleration trap theory, and the opportunistic behavior hypothesis, this study analyzes how R&D window dressing affects long-term firm value and how underwriter reputation moderates this relationship. The aim is to provide evidence that can inform ongoing efforts to improve information disclosure quality and intermediary supervision under the registration-based IPO system.

The results show that R&D window dressing by IPO firms reduces long-term firm value after listing, as reflected in lower long-term shareholder returns. By contrast, firms sponsored by more reputable underwriters exhibit higher long-term value, and reputable underwriters partly mitigate the adverse effects of R&D window dressing. Firms with more serious R&D window dressing also display significantly poorer operating performance in the first and second years after listing. Additional analysis based on the COVID-19 shock indicates that firms with less R&D window dressing exhibit more stable share prices during periods of market stress. The paper also finds that investors remain skeptical of unprofitable firms, suggesting that profitability still serves as a stronger market signal than R&D-related disclosure for many shareholders.

Based on these findings, several policy implications follow. First, the evaluation of science and technology innovation indicators should be strengthened in order to improve the substantive R&D quality of STAR Market issuers and support high-quality corporate development. For key indicators such as R&D intensity and the number of R&D personnel, regulators should strengthen substantive review and inquiry-based supervision. Dynamic assessment and continuous monitoring over the three to five years before and after the IPO would help curb last-minute R&D window dressing for listing purposes. In addition, investors' ability to interpret R&D information should be improved through targeted investor education that helps distinguish between sudden disclosure surges and sustained innovation performance.

Second, the supervisory role of third-party institutions in verifying IPO disclosure should be strengthened. Qualified institutional investors and specialized intermediaries may be encouraged to participate more actively in the verification of R&D-related disclosure so as to improve the information environment surrounding STAR Market offerings. At the same time, regulators may require underwriters to disclose more explicitly their R&D verification procedures and to assume clearer accountability for post-IPO disclosure quality.

Third, firms should be encouraged to disclose more detailed, verifiable, and decision-useful R&D information so as to reduce IPO speculation driven merely by the "science and technology innovation" label. In practice, regulators can intensify dynamic review of abnormal changes in R&D expenditure, R&D staffing, patent applications, and R&D capitalization, and require issuers to provide supplementary explanations when such indicators deviate sharply from industry norms. Post-IPO follow-up review and third-party verification would further reduce the time lag in identifying opportunistic disclosure and improve the credibility of innovation-related information.

Finally, given the moderating role of underwriter reputation, regulatory arrangements may be refined to better differentiate underwriters by reputational capital and monitoring capacity. This may include calibrating follow-on investment requirements, strengthening post-IPO R&D audits for firms sponsored by lower-reputation underwriters, and drawing on international experience in internal control and disclosure verification to improve the credibility of innovation-related information.

This study has several limitations. First, the STAR Market was established only recently, so the sample period from 2019 to 2021 captures only the early stage of its development. Although the annual subsample analyses support the robustness of the findings, future research should revisit these relationships as more firms complete longer economic cycles. Second, extending the sample beyond 2021 would allow a more comprehensive evaluation of long-term value. More broadly, although the institutional setting is specific to China, the findings offer wider implications for markets that seek to balance innovation financing, disclosure quality, and intermediary accountability.

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