Internal Control, Technological Innovation and Corporate Performance: An Empirical Analysis from Listed Companies of China's Manufacturing Industry

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Abstract

Classic literature puts forward two different mechanisms of internal control acting on technological innovation, forming internal control promotion and internal control paradox respectively. Through the research of China's manufacturing industry, we find that although China's internal control can promote innovation input and performance, the force is weak. Future more, the problems include: companies with active technological innovation, the internal control has less power to improve the innovation performance. In most companies at the innovation average level, the strengthening of internal control has the tendency to restrain innovation investment.

In a company with negative technological innovation, internal control has not played a significant role in improving innovation input and innovation performance. With the China's economic transformation and upgrading, this study is of great significance to further improve the internal control construction, so as to promote the technological innovation of real economy and transformation to emerging manufacturing industry.

Keywords: Internal control, Innovation input, Innovation performance, Company performance.

Introduction

Technological innovation is of great significance to improving the production efficiency of manufacturing companies and promoting the optimization and upgrading of national industries. In recent years, with the strengthening of China's innovation strategy, the total R and D investment has shown a rapid growth trend.

According to the Statistical Communique on National Economic and Social Development in 2015, China's R and D expenditures in 2015 reached 142 billion yuan, accounting for about 2.10% of GDP.

However, it cannot be ignored that economic data analysis based on the Cobb-Douglas production function shows that although the overall investment in technology innovation in China has grown rapidly, the gap in innovation investment between companies has continued to widen.

At the same time, the output rate of innovation input continues to lag behind resource input and the role of innovation in driving company performance is still weak. Therefore, the investment in technology innovation and its performance, issues have received much attention in China's current economic transformation and upgrading period. Especially for the listed companies in the manufacturing industry, which is the main carrier of the “Made in China 2025”, the relevant influencing factors need to be discussed.

From the basic theory, the "production function" of neoclassical enterprise theory has long been challenged by the theory of new institutional enterprises based on contract incompleteness. As far as the "technical" elements are concerned, the agency problems and information asymmetry brought about by incomplete contracts will inevitably lead to moral hazard and adverse selection such as insufficient investment, financial fraud, capital chain breaks and project decision-making errors in R and D investment or technology transformation. Internal control, as a systematic mechanism to reduce agency costs and information asymmetry, is essentially to make up for the incompleteness of corporate contracts which in turn will have an important impact on technological innovation.

Many scholars have discussed the relationship between internal control and technological innovation. The relevant literature focuses on two aspects:

(1) The hypothesis of "internal control promotion theory": The hypothesis is that good internal control will clarify the responsibilities of various departments, positions and employees through organizational planning, division of labor, authorization and approval and independent responsibility system and will standardize and institutionalize the input of technological innovation. Therefore, the better internal control can bring about the higher capital investment efficiency and technological innovation output rate.

(2) Hypothesis of "internal control paradox": The hypothesis holds that institutionalized internal control necessarily leads to a degree of management rigidity and there will be conflicts between the management rigidity and the flexibility of operational operations required for technological innovation. In addition, strict internal controls are bound to increase the risk exposure of executives and reduce their hidden income, greatly reducing the willingness of executives to invest in risky projects such as technological innovation.
Moreover, internal controls can create a sense of restraint and oppression which will hamper employees' work enthusiasm and innovation. Therefore, although internal control helps to reduce the agency cost and information asymmetry in the process of technological innovation, it is likely to inhibit the company's overall innovation vitality and thus there is a certain negative effect on the value of the company as the basis of investors' interests.

In recent years, with the implementation and strengthening of China's internal control system, the relationship between internal control and technological innovation has begun to be explored. Although these studies discuss the positive effects of internal control on technological innovation, they rarely dissect the specific mechanisms by which internal control acts on technological innovation and the possible areas of action of "internal control paradox".

However, in the process of innovation and growth of Western companies, the negative effects of internal control have been repeatedly seen and widely concerned in practice. Jensen pointed out that during the period of 1980-1990, companies such as GE, IBM and AT and T which were famous for innovation, experienced a decline in performance and overcapacity. The important reason is that the rigid control system limits the continuous transformation and innovation of these companies. PwC’s survey of US companies’ technology innovations in 2004 and 2009 showed that many CEOs are trapped in conflicts between internal control and innovation. They proposed that in the actual operation of the company, the innovation process of a large number of new businesses and new products is often forced to be shelved or reduced due to the layers of approval and strict argumentation procedures in internal control; the institutionalized control system inhibits innovation.

The role is almost equivalent to financial constraints. Then, is the phenomenon of “internal control paradox” happening quietly in China? Especially in the current stage of economic development in China, on the one hand, the regulatory authorities need companies to strengthen internal control construction to promote the stable development of the capital market and the national economy.

On the other hand, the overall economic transformation and the “new normal” reform of the economy require the company to increase the intensity of technological innovation. At this time, relevant research needs to break through the theoretical framework of “internal control promotion theory”, carefully examine the possible areas of “internal control paradox” and propose suggested measures. This has important reference for further improving China's internal control construction, comprehensively promoting the company's technological innovation and accelerating China's transition to emerging manufacturing.

Based on the existing theories, this study proposes two mechanisms for internal control to influence the company's performance through influencing technological innovation and to use the data of listed companies in China's motherboard manufacturing industry in 2007-2013 for empirical testing. Based on the literature on internal control and technological innovation in China, this study examines the mediating and regulatory effects of internal control on technological innovation and corporate performance in detail. Through group analysis, we found a shortcoming of the internal control role of different manufacturing companies: 3 in companies with more active innovation activities, good internal control can stimulate the company to increase the level of technological innovation investment but cannot improve innovation performance.

Among the companies with horizontal centers, strengthening internal control and even the trend of restraining technological innovation investment, there are signs of “internal control paradox” at this time and in companies with negative technological innovation, internal control has not been able to invest in innovation and its performance.

The possible contributions of this study include: First, through a detailed analysis of the impact of China's internal control on technological innovation activities and its relationship with the company's performance, it expands China's current research framework based on “internal control promotion theory”. In China, the negative effects of internal control on technological innovation are proposed for the first time, supplementing and refining relevant theories and literature. Second, through group testing, the phenomenon of “internal control paradox” was found in listed companies in China's manufacturing industry and its main forms of expression and areas of action were pointed out. This provides an important reference for China's regulatory authorities and related companies to improve internal control construction to promote technological innovation investment and improve innovation performance.

**Literature review, theoretical analysis and research hypothesis**

In a perfectly frictionless market, the marginal value of investment projects, including technological innovation investment projects is a key factor in corporate investment decisions. But in reality, on the one hand, the principal-agent relationship between shareholders and executives will lead executives to pay more attention to personal position security and maximize private utility. Therefore, executives will prefer projects with lower costs and lower risks which will bring the company the problem of insufficient investment in technological innovation. On the other hand, the internal opportunistic behavior under the condition of information asymmetry often makes the investment in technological innovation deviate from the goal of maximizing the interests of shareholders, which will be expressed as innovation performance.

As a control system jointly implemented by the company's board of directors, management and employees, internal control...
control plays an important role in reducing the agency cost and information asymmetry of the R and D investment operation level.13,23 As far back as the management field in the 1990s, the issue of control and innovation has attracted the attention and discussion of scholars. Simons25 argues that good internal control has the role of “encouraging innovative ideas”. Because, in a company of a certain size, innovation is often not a random process, but requires the guidance of the target and the structural support.

The introduction of a control system can promote a clear positioning of this goal and the structuring process.3,32 From the perspective of the components of internal control, the construction of organizational structure helps to balance the power of executives and reduce the behavior of executives to innovation investment for private profits; the clear development strategy helps to determine the innovation in meeting market and customer needs. The role of human resources policy can guarantee the promotion and welfare of the company's innovative talents and stimulate employees' innovation drive.

At the same time, through the establishment of a good system, budget and evaluation activities, the control activities can clearly convey the strategic positioning and risk tolerance boundaries of the employees at all levels of the company; the smooth information communication mechanism enables the innovation projects at all levels of the organization to be based on environmental changes which are fine-tuned in a timely manner to better meet the requirements of the organization and thus stimulate innovation at all levels within the organization.

In addition, China's "Guidelines for the Application of Internal Control Applications" specifically proposed the control of the company's R and D projects, R and D staffing, R and D process management and R and D results transformation. This comprehensive internal control system that covers the entire organization effectively monitors and controls agents at all levels, reducing moral hazard and improving innovation performance in technology innovation projects. These views suggest that the positive impact of internal control on innovation investment and innovation performance constitutes the main content of "internal control promotion theory".

However, internal control is, after all, based on institutional constraints and is embodied in number of specific policies and procedures that run through all levels of the company. This inevitably leads to conflicts between the normative nature of internal controls and the flexibility required for innovative activities.26 Dorf and Raitanen7 have long proposed the “internal control paradox” that internal control may inhibit innovation investment. They believe that innovation is often a process of continuous trial and error and full of uncertainty. If the company places too much emphasis on control, it is officially formulated. The control points, personnel assessment and evaluation criteria may cause the whole organization to be rigidly disciplined and unwilling to undertake risky innovation work.

Ultimately, organizational performance will be damaged by lack of innovation; Jensen15 analyzes 1980-1990. The decline of large US companies such as GE, IBM and AT and T pointed out that rigid internal controls constrained the ability of these companies to respond to changing market demands, which also led to concerns expressed by many scholars and CEOs at the time of the SOX Act. Because the strict internal controls required by the SOX Act may inhibit the company's ability to innovate, Ribstein26 points out from the perspective of employee behavior that strict internal control can make employees feel restrained and oppressed inhibiting employees' work passion and innovation.

Zhang pointed out from the perspective of executives that internal control has improved the wind of executives the risk exposure probability, but it reduces its hidden income which will obviously seriously weaken the incentives for executives to increase investment in innovation; PwC conducted a questionnaire survey on the economic consequences of the SOX acts to further prove that up to 59% of CEOs, the biggest risk of over-emphasizing internal control is to reduce the willingness of executives to take on the risk of innovative activities of the company and the results of Price Water House Coopers show once again that CEOs believe that strict control and approval inhibit innovation. The role is almost equivalent to the financial constraints of technological innovation projects.

In summary, on the issue of promoting or suppressing innovation, the "internal control promotion theory" and "internal control public opinion" have their own opinions. But in fact, internal control is a comprehensive control system that includes five elements: internal environment, risk assessment, control activities, information exchange and communication and internal supervision. The different strengths of the various control elements will lead to different effects of the internal control system on innovation.

It can be seen from the above theory that the strengthening of information communication and communication elements will promote new innovation projects through the communication of innovative ideas, or reduce the financial fraud of research and development projects by strengthening mutual supervision which will enhance the "internal control promotion theory".

However, if the control activities in internal control are too strong, the company will over-emphasize the success rate of technical innovation projects and their assessment requirements which will cause employees and senior managers to bear too many innovation risks. At this time, the phenomenon of “internal control paradox” will be even more prominent. In practice, the design of internal controls is influenced by the company's risk tolerance for innovation.3
When the company's innovation risk tolerance is high, control activities such as budget and performance appraisal will be weakened, information and communication will be strengthened and the role of "internal control promotion theory" may be more prominent; conversely, for those with low risk tolerance companies that place too much emphasis on the success rate or innovation performance of innovation inputs are likely to lead to the emergence of "inside control paradoxes" in which employees and executives are reluctant to take on innovation risks.

As the company's tolerance for innovation risks will be externally manifested as the activity of the company's innovation activities, it can be expected that in the active innovation companies, enhanced internal control will be more likely to promote the increase of innovation investment; while innovation activities are more conservative. In the company, enhanced internal controls will be more likely to generate the phenomenon of internal control paradox.

In addition, given that the average level of innovation investment in listed companies in China is still much lower than that of developed countries, the average investment risk of innovation will fall within the average risk tolerance boundary, so the overall role of "internal control promotion" may be even more significant. To this end, this study proposes the following assumptions based on the situation of China's overall manufacturing listed companies:

**H1**: Other conditions remain unchanged. In companies with more perfect internal control systems, the level of technological innovation investment is higher.

**H1a**: Other conditions remain unchanged. In an innovative company, enhanced internal control can increase the level of technological innovation investment.

**H1b**: Other conditions remain unchanged. In innovative and conservative companies, enhanced internal control will reduce the level of technological innovation investment.

The ultimate goal of technological innovation is to increase company performance. According to the mainstream management literature, technological innovation is an important means for companies to effectively adapt to market, technology and competition. Increasing investment in innovation may have a positive contribution to the performance of the organization in the current or lag period. When the influence of internal control factors is added to the relationship between technological innovation and company performance, at least two possible mechanisms of action need to be considered: mediating effects and regulatory effects.

Intermediary effect refers to the level of internal control that affects the company's performance by affecting the company's technological innovation investment. The adjustment effect means that in the case of a certain investment in technological innovation, the implementation process of innovation activities will be monitored by good internal control and the efficiency of innovation performance, that is, the transformation of technological innovation investment into company performance can be improved.

If the above assumption H1 is established, internal control can increase company performance by stimulating innovation input. But even if the internal control paradox is dominant and the hypothesis H1 is difficult to establish, it is still possible to strengthen the internal control to improve the contribution of innovation to the company's performance. This adjustment effect can be explained by the contingency theory, that is, the influence of decision-making on performance is influenced by the structural arrangement.

As a series of policies and procedures implemented by the board of directors, the board of supervisors, the management level and all employees, internal control is a typical structured arrangement that is "embedded" into the company's operations. It is an important internal environmental factor for the successful transformation of innovation activities into company performance. By establishing strict monitoring interventions, budgeting systems and assessment mechanisms, internal control can effectively suppress the proliferation of unreasonable R and D projects in innovation activities, the confusion of research and development processes and the inefficient use of R and D funds, thereby improving innovation performance.

In addition, internal control is a comprehensive system composed of combinations of control elements. According to the above-mentioned "internal control promotion theory" hypothesis and the "internal control paradox" hypothesis, the various control elements have different forces in encouraging innovation input or improving innovation performance. In practice, the design of internal controls must take into account the company's risk tolerance for innovation. The heterogeneity of innovation risk tolerance will lead to differences in internal control when it focuses on promoting innovation investment or on improving innovation performance.

It can be expected that in companies with high risk tolerance for innovation and active innovation, internal control encourages the role of "new ideas" to be more prominent, mediating effects will be more significant and innovation risk tolerance is lower and manifested as in innovative and conservative companies, internal control will emphasize the transformation of technological innovation budget and performance appraisal and the adjustment effect will be more significant.

In summary, it is necessary to separately test the mediating effect and adjustment effect of internal control. Therefore, this study proposes the following assumptions:
H2: Other conditions remain unchanged and internal controls have a positive impact on company performance by stimulating innovation inputs.

H3: Other conditions remain unchanged. When the level of innovation input remains unchanged, the internal control system is more perfect and the contribution of innovation to the company's performance is greater.

Research design and sample selection

Model establishment: Based on the above theories and assumptions, internal control affects company performance by influencing technological innovation activities. On the one hand, this kind of influence needs to examine whether internal control affects the company's performance by affecting the level of technological innovation input. On the other hand, it is necessary to investigate whether the internal control can adjust or improve the efficiency of the transfer of technological innovation investment into the company's performance when the investment level of technological innovation is certain. Therefore, following two types of models are established in this study:

(1) Internal control affects innovation input and thus affects company performance. This requires the establishment of a mediation effect test model. Baron and Kenny proposed a classic mediation test procedure that included three successive regression models. According to Google Scholar's search results, the method is quite popular and has been used up to 59,000 times as of May 2016. This method seems to be challenged by some new methods in the near future, but Wen Zhonglin and Ye Baojuan pointed out through careful comparison: Baron and Kenny's stepwise regression test is still dominant in various methods of testing mediation effects. Based on this, this study establishes three empirical models to test the direct effect of internal control on company performance, the impact of internal control on innovation input level and the mediating effect of internal control on performance through innovation input level.

There has been literature on the impact of innovation on company performance, both in terms of current performance and in the use of lag periods. In view of the general belief that the technological innovation of the manufacturing industry is mainly product innovation, its impact on performance is relatively short, so the main body of this study uses Perf\textsubscript{ij}, At the same time, Perf\textsubscript{ij+1} will be used instead of the test in the robustness test. The mediation effect test contains the following model:

\[ \begin{align*}
    \text{Perf}_{ij} & = \delta + \beta_1 \text{IC}_{ij} + \mu \text{Controls} + \pi_{ij}, \\
    \text{Innov}_{ij} & = \alpha + \beta_2 \text{IC}_{ij} + \gamma \text{Controls} + \epsilon_{ij}, \\
    \text{Perf}_{ij} & = \delta + \beta_1 \text{IC}_{ij} + \theta_1 \text{Innov}_{ij} + \mu \text{Controls} + \text{Innov}_{ij},
\end{align*} \]

where \( \beta_1 \) represents the total effect of internal control \( \text{IC}_{ij} \) on the impact of company performance \( \text{Perf}_{ij} \); \( \beta_2 \) represents the influence of internal control \( \text{IC}_{ij} \) on innovation input level \( \text{Innov}_{ij} \). If the innovation input level \( \text{Innov}_{ij} \) remains unchanged, the internal control \( \text{IC}_{ij} \) represents the influence of innovation activity \( \text{Innov}_{ij} \) on company performance \( \text{Perf}_{ij} \). The mediating effect is significant, mainly to observe whether \( \beta_2 \) and \( \theta_1 \) are significant or whether the joint test value is significant. The total effect is \( \beta_1 = \beta_1 + \beta_2 \times \theta_1 \) and the ratio of mediating effect to total effect \( \beta_1 \times \theta_1 / \beta_1 \) or \( (\beta_1 - \beta_2) / \beta_1 \) can be used to measure the degree of mediating effect.

(2) Internal control regulates innovation performance and thus affects company performance. In the implementation process of innovation activities, when the level of innovation input is kept constant, in order to examine whether internal control enhances the efficiency of innovation into company performance, it is generally to test the adjustment effect by adding interaction variables to the model.

\[ \text{Perf}_{ij} = \varphi_0 + \varphi_1 \text{IC}_{ij} + \varphi_2 \text{Innov}_{ij} + \varphi_3 \text{IC}_{ij} \times \text{Innov}_{ij} + \varphi \text{Controls} + \sigma_{ij}, \]

where \( \varphi_1 \) represents the internal control \( \text{IC}_{ij} \) transforms the innovation activity \( \text{Innov}_{ij} \) into performance efficiency. If \( \varphi_1 \) is significantly positive, it indicates that when the innovation input level \( \text{Innov}_{ij} \) remains unchanged, the enhancement of internal control helps to enhance the contribution of technological innovation to performance and the adjustment effect is significant otherwise, the adjustment effect is not significant.

Variable indicator selection

(1) Technological innovation: There are many ways in which the existing literature measures the company's technological innovation activities. Among them, R and D investment is the most widely accepted method, generally using R and D investment as a measure of sales revenue ratio. Another method is to use intangible assets as a percentage of total assets. The intangible assets in the annual report of listed companies in China include advanced technologies, patents and trademark rights that the company has already realized, representing the market-recognized technological innovation products of the company. Another method is to measure the R and D investment by the number of patent applications and approved patents.

Considering that the measurement requirements for intangible assets in China's accounting standards are expenditures or outsourcing expenses during the development phase, this is different from the company's spontaneous internal technological innovation activities discussed in this study. At the same time, in terms of measuring the amount of innovation investment, the number...
of patents comparing R and D inputs is more indirect. Therefore, among the three methods, this study tends to use R and D as a measure.

(2) **Company performance**: At present, scholars have three main methods for measuring company performance: first, market data commonly used in Western research literature such as Tobin's Q value; second, domestic scholars generally use accounting indicators to measure the operating performance of listed companies such as return on assets. ROA and net asset profit margin ROE; third, the use of synthetic indicators to measure company performance. Due to the volatility of China's stock market, the noise of market data method is too large. At the same time, the weighting method relied on the performance of synthetic index measurement companies is still controversial and considering the impact of innovation activities on the overall asset management return rate of the company, this study selects the classic ROA as the measurement index.

In addition, although the current management literature agrees that innovation is beneficial to the company's performance growth, this effect is manifested in the current year's performance or in the later stage of performance and there are still different views. Therefore, this study will use the company's performance as the dependent variable in the subject regression and test the performance lag in the first period of in the robustness test. This practice of lagging the dependent variable by one phase is also suitable as an endogenous test and compared to the two-stage or three-stage regression, the deviation caused by the tool variable can be avoided.

(3) **Internal control**: At present, the literature on internal control of Western research often uses the Internal Control Weaknesses (ICW) disclosed by the company as a measure. However, due to the fact that the disclosure of internal control defects of listed companies in China has accounted for less than 5% in recent years, empirical statistical analysis will produce big mistakes. For example, the "Analysis Report on the Implementation of the Internal Control Regulatory System of China's Listed Companies in 2012" disclosed by the Ministry of Finance shows that only 8 of the 2,244 listed companies in the year disclosed major defects in internal control. From the Dibo internal control database, only about 5% of companies disclose disclosure of general control defects each year. At the same time, the main concern of this study is not whether internal control is flawed, but the impact of the rigor of internal control on technological innovation and company performance.

Therefore, it is not appropriate to use internal control defect indicators, but it should be an indicator that can evaluate most of the internal control of listed companies without serious defects. At present, domestic scholars mostly use the internal control comprehensive score provided by Dibo database and its effectiveness is recognized. The evaluation index is formulated on the basis of reference to domestic and international internal control related evaluation standards and integrates internal environment, risk assessment, control activities, information and communication, supervision and inspection and whether the accounting firm issues evaluation reports, independent directors and board of supervisors. Whether to express opinions and other seven parts compared with the internal control major defect indicators, Dibo internal control scores are based on the principal component method and are comprehensive, so it is more in line with the requirements of this study design.

(4) **Control variables**: According to the existing literature on the company's performance and technological innovation as the explanatory variables, the commonly used control variables in the empirical model including: First, the asset size; large-scale companies often produce economies of scale or policy effects that affect company performance. Second, debt levels; classic corporate financial research finds that debt levels have a significant impact on company performance by affecting agency costs, investment decisions and control. Third, growth opportunities; growth opportunities affect the company's investable project selection and investment efficiency which in turn affect the performance of asset returns.

Fourth, executive incentives; executive compensation and equity incentives affect executives' work motivation and agency issues There is an important correlation with performance; the fifth is equity checks and balances; the concentration of ownership affects the agency problem and the important variables of internal control and its relationship with the company's operating performance has been widely concerned.

In summary, the variables in this study and their definition methods are shown in table 1.

**Data source and sample selection**: The data in this study comes from the Guotaian database (CSMAR) and the Dibo internal control database from which the financial data and internal control index of the listed companies in the Shanghai and Shenzhen stock markets have been selected. First of all, only the manufacturing companies are selected to eliminate the noise impact caused by the difference between the innovation mode and the business model between the industries and the innovation problem of the manufacturing industry is the focus of China's current economic transformation and upgrading of emerging manufacturing industries.

Secondly, only the listed companies in the main board manufacturing industry are selected because the construction and implementation requirements of the internal control of the listed companies are more standardized and mature and the internal control evaluation index is more reliable. Again, the starting year of the data is
2007 considering that China began to issue accounting standards in 2006, allowing the development of eligible R and D expenditures to be capitalized. At the same time, in the process of collecting R and D data of listed companies in the manufacturing industry, this study finds that the disclosure of technological innovation activities is worrying.

There are not many manufacturing companies with almost no R and D investment in the whole year and some companies have annual reports and t+1 or t+2 R and D input data in the 2 annual report, which is quite different and has not been specifically explained.

This study believes that the R and D investment of such samples is not reliable and is excluded. The final selection is for sample companies whose R and D data has not changed within at least three years of the annual report, so the sample selection year is as of 2013. In addition, this study excludes listed companies whose types of final controllers are foreign-owned enterprises other than state-owned or private-owned enterprises.

Because foreign-invested enterprises' R and D investment is affected by some special factors, their technology is likely to come directly from the introduction rather than through their own R and D innovation. On this basis, companies with major defects in internal control disclosure are further excluded, because this study mainly examines the impact of normal internal control construction on innovation investment and innovation performance.

Finally, in order to eliminate the influence of the extreme value, the sample was subjected to a 0.5% Winsor processing. According to the above method, this study obtained 1130 companies' annual data as the final research sample and used Stata13.0 for data processing.

**Empirical results and analysis**

**Descriptive statistics:** Table 2 is a descriptive statistical result of the variables. From the perspective of innovation variables, the R and D investment level of the average technological innovation of the sample is about 1.11%, which is close to the 1% statistical result of China's macro level\(^{10}\), indicating that the sample selection of this paper is representative. At the same time, compared with the average R and D investment level of 2% in developed countries, the R and D investment of listed companies in China's manufacturing industry is relatively low.

Moreover, from the 25%, 50% and 75% quantile of innovation investment, there is a big difference in innovation investment between different manufacturing companies. At this time, whether the strict internal control will inhibit R and D investment or reduce the output rate of R and D investment, the research significance is more prominent. From the perspective of internal control variables, the gap between the maximum and minimum values of the internal control evaluation index of the sample companies in the Dibo database is as high as 500 points. Moreover, after taking the natural logarithm of the internal control score, the internal control variable \(IC_{i,t}\) is obtained.

The median value of the variable is 6.5431 which is close to the mean value of 6.5365 and the standard deviation is small, which is 0.1161. The results show that the internal control scores of sample companies are evenly distributed. This aspect initially shows that the endogenous problems of internal control variables and innovation variables are small. On the other hand, compared with internal control defect index, the comprehensive score index of internal control of Debo can show different levels of internal control, which is more in line with the requirements of empirical test in this paper.

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<th>Variable type</th>
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<tr>
<td><strong>Explained variable</strong></td>
<td>(Perf_{i,t})</td>
<td>The company's current year's performance, measured by return on assets ROA, equals annual net profit / total assets.</td>
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<td>(Perf_{i,t+1})</td>
<td>The company's one-year performance is measured by the ROA of the next year's return on assets.</td>
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<td><strong>Test variable</strong></td>
<td>(Innov_{i,t})</td>
<td>Company innovation activities equal to annual R&amp;D investment/operating income.</td>
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<td></td>
<td>(IC_{i,t})</td>
<td>Internal control, equal to the natural logarithm of the internal control composite index in the Dibo database.</td>
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<td><strong>Control variable</strong></td>
<td>(Size_{i})</td>
<td>Company size, equal to the natural logarithm of total assets.</td>
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<td></td>
<td>(Lev_{i})</td>
<td>Asset-liability ratio, equal to total liabilities at the end of the year divided by total assets at the end of the period.</td>
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<td>(Growth_{i})</td>
<td>The growth rate of assets is equal to the growth rate of the company's main business income.</td>
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<td>(Ceoshare_{i})</td>
<td>The shareholding ratio of executives, taking the “proportion of executives shares” in the annual report.</td>
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<td>(Ceocom_{i})</td>
<td>Executive monetary compensation incentives, taking the natural logarithm of the “total amount of the top three executives with the highest amount” in the annual report.</td>
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<td></td>
<td>(Herfindahl_{i})</td>
<td>The balance of shareholders is equal to the concentration of Herfindahl held by the top five shareholders.</td>
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rates that Dibo's internal control activities and company performance. This is likely to mean that the “internal control promotion theory” will be more applicable from the perspective of manufacturing listed companies as a whole. This is also consistent with the main research conclusions of Fang Hongxing and Jin Yuna and Li Ping et al who initially explained the reliability of the data in this study. Among them, the correlation between internal control and company size is relatively high at 0.4448 which is consistent with the fact that larger companies in practice generally pay more attention to internal control construction; the correlation between internal control and company performance is 0.2785. This is consistent with the conclusion that internal controls in the existing literature contribute to the overall increase in performance.

This further demonstrates that Dibo's internal control database score is valid and can be used as a measure of the strength of internal control of the sample company. In general, the correlation coefficient values between the explanatory variables are all within an acceptable range. Therefore, it can be considered that there is no serious multicollinearity problem in multiple regression analysis. At the same time, both the mediation effect model and the adjustment effect model pass the VIF test. The VIF values of the whole sample are 1.33 and 1.40 respectively which are much less than 10, indicating that the collinearity problem does not significantly affect the estimation results of the model parameters.

Overall sample regression results and analysis: As mentioned above, according to the conventional methods of testing the mediating effect and regulating effect by Wen Zhonglin and Ye Baojuan, the regression of the model (1) to the model (4) is shown in table 4. The results are shown in table 4. Among them, the total effect coefficient of internal control on company performance in model (1) is 0.0873 which is significant at the level of 1%; the influence coefficient of internal control on innovation in model (2) is 0.0084 at 5% level. Significantly, the better internal control brings about the greater investment in technological innovation.

Combined with model (1) to model (3), the mediation effect of internal control on the company's performance by promoting technological innovation investment is 0.0084*0.3630=0.003 accounting for 3.5% of the total effect. Therefore, for mediating effects, the significance of the estimated coefficients supports hypothesis H1 and hypothesis H2. At the same time, the regression results of the adjustment effect model (4) show that when the level of technological innovation is certain, good internal control can help to improve the efficiency of innovation input into performance.

After incorporating the variables ICi, Innovi and ICi × Innovi, which reflect the effects of regulation, the model fit coefficient is improved, the adjustment effect is 0.0072 and is significant at the 1% level which supports the hypothesis H3. Therefore, from the regression results of the overall sample, the influence of internal control on technological innovation and company performance has both the mediation effect described by hypothesis H1 and hypothesis H2 and the regulation effect described by hypothesis H3. Therefore, the overall sample regression results support the "internal control promotion theory" to a certain extent.

However, this internal control promotion role is still weak and cannot show that the internal control index has a small coefficient value for performance through technological innovation with only a mediating effect of 3.5%. This low ratio shows that the strength of internal control to promote technological innovation in listed companies of China still needs to be strengthened. A further reason is likely to be that in some of the sample groups, the effects of internal control are particularly weak or even counterproductive. To this end, it is necessary to conduct further group analysis of the sample.

Further text: According to the above theoretical analysis, in companies with different levels of technological...
innovation, because of the different risk tolerance of technology innovation, there will be differences in the focus and role of internal control on technological innovation. At the same time, in order to investigate whether the endogenous problem between the internal control and the innovation may affect the robustness of the results, the study further tests the samples according to the quantile value of the variable Innov

Among them, companies with a maximum Innov

value of 25% are High Innov Group; Companies with a minimum Innov

value of 25% are Low Innov Group; The remaining Innov

is at the middle level for the Middle Innov group.

The results of the regression analysis are shown in table 5. Due to space limitations, table 5 only reports the coefficient values of the main test variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>IC</th>
<th>Innov</th>
<th>IC × Innov</th>
<th>Size</th>
<th>Lev</th>
<th>Growth</th>
<th>Ceoshare</th>
<th>Ceocom</th>
<th>Herfindahl</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC</td>
<td>1.000</td>
<td>Innov</td>
<td>0.0785</td>
<td>1.000</td>
<td>IC × Innov</td>
<td>0.2785</td>
<td>0.2316</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>0.4448</td>
<td>0.0448</td>
<td>0.0054</td>
<td>1.000</td>
<td>Lev</td>
<td>-0.0082</td>
<td>-0.1431</td>
<td>-0.3356</td>
<td>0.3565</td>
</tr>
<tr>
<td>Growth</td>
<td>-0.0725</td>
<td>-0.1268</td>
<td>-0.1620</td>
<td>0.0312</td>
<td>0.1404</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceoshare</td>
<td>-0.0107</td>
<td>0.1340</td>
<td>0.1110</td>
<td>-0.0699</td>
<td>-0.1475</td>
<td>-0.0155</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceocom</td>
<td>0.3649</td>
<td>0.2434</td>
<td>0.2731</td>
<td>0.4183</td>
<td>0.0176</td>
<td>-0.0312</td>
<td>0.0312</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Herfindahl</td>
<td>0.1669</td>
<td>0.0526</td>
<td>0.0684</td>
<td>0.3560</td>
<td>0.0791</td>
<td>-0.0320</td>
<td>-0.1379</td>
<td>0.0725</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Table 3
Correlation analysis between variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>IC</th>
<th>Innov</th>
<th>IC × Innov</th>
<th>Size</th>
<th>Lev</th>
<th>Growth</th>
<th>Ceoshare</th>
<th>Ceocom</th>
<th>Herfindahl</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC</td>
<td>1.000</td>
<td>Innov</td>
<td>0.0785</td>
<td>1.000</td>
<td>IC × Innov</td>
<td>0.2785</td>
<td>0.2316</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>0.4448</td>
<td>0.0448</td>
<td>0.0054</td>
<td>1.000</td>
<td>Lev</td>
<td>-0.0082</td>
<td>-0.1431</td>
<td>-0.3356</td>
<td>0.3565</td>
</tr>
<tr>
<td>Growth</td>
<td>-0.0725</td>
<td>-0.1268</td>
<td>-0.1620</td>
<td>0.0312</td>
<td>0.1404</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceoshare</td>
<td>-0.0107</td>
<td>0.1340</td>
<td>0.1110</td>
<td>-0.0699</td>
<td>-0.1475</td>
<td>-0.0155</td>
<td>1.000</td>
<td></td>
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</tr>
<tr>
<td>Ceocom</td>
<td>0.3649</td>
<td>0.2434</td>
<td>0.2731</td>
<td>0.4183</td>
<td>0.0176</td>
<td>-0.0312</td>
<td>0.0312</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Herfindahl</td>
<td>0.1669</td>
<td>0.0526</td>
<td>0.0684</td>
<td>0.3560</td>
<td>0.0791</td>
<td>-0.0320</td>
<td>-0.1379</td>
<td>0.0725</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Table 4
Full sample model regression results

Note: *, **, *** are significant at the 0.10, 0.05 and 0.01 levels, respectively (two-tailed).
First, the influence of internal control on technological innovation in the High Innov group is mainly represented by mediating effects in which the correlation coefficients of model (2) and model (3) are significant at the levels of 5% and 1% respectively (P values are 0.016 and 0.010 respectively) and the ratio of the calculated intermediaries to the total effect increased from 3.5% of the above-mentioned overall sample to about 6.2%. However, the internal control of the group does not contribute much to the efficiency of the innovation input into performance. It is expressed as IC\textsubscript{i,t} × Innov\textsubscript{i,t} and the coefficient P is 0.518.

This shows that in the most innovative companies, internal control mainly promotes the increase of innovation investment through mediation effect to improve the company's performance but fails to adjust the effect of design through internal control to improve the efficiency of innovation activities into performance. Secondly, in the Middle Innov group, internal control is mainly to play the regulatory effect, but the mediation effect becomes insignificant. And the “internal control paradox” appeared in the group of sample companies, which showed that the influence coefficient of IC\textsubscript{i,t} in the model (2) on Innov\textsubscript{i,t} is negative, even if the value of coefficient P is not significant, but this tendency cannot be ignored. Again, in the Low Innov group, neither the mediation effect nor the regulation effect is significant.

Although the correlation coefficient of the model (2) in this group is significant, the Innov\textsubscript{i,t} coefficient of the model (3) is not significant (P=0.760) and the Sobel value is calculated to be 1.205 according to coefficient test procedure of the mediation effect model. There is no mediating effect. This shows that in the negative-innovative companies, the correlation between internal control and technological innovation is very weak.

**Robustness test:** In the above-mentioned subject regression, the group test is used to control the self-selection endogeneity problem between internal control and innovation due to the missing variables. In this study, the robustness test results further test the robustness of the results through two methods:

1. Tested from the perspective of sample selection and the stricter Bootstrap method is applied to the mediation effect test. The Bootstrap method is a method of repeating sampling from a sample, such as taking the original sample as a population and repeating the sampling to obtain a Bootstrap sample similar to the original sample, thereby performing deviation correction to obtain high test force.\textsuperscript{35} The results of 1000 runs of Bootstrap in this study are shown in Table 6. Due to space limitations, only the regression results of the main test variables are reported in Table 6 and it is found to be similar to the overall regression results above.

2. Solving the endogeneity problem brought about by the simultaneity by delaying the performance of the dependent variable t period into the regression model. This test also responds to the impact of some technological innovations on

<table>
<thead>
<tr>
<th>Group</th>
<th>Regression Variable</th>
<th>Model(1)</th>
<th>Mediation effect</th>
<th>Model(2)</th>
<th>Model(3)</th>
<th>Model(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Innov group (N=284)</td>
<td>IC\textsubscript{i,t}</td>
<td>0.1956***</td>
<td>0.019388</td>
<td>0.1835***</td>
<td>0.0227***</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Innov\textsubscript{i,t}</td>
<td>0.6263***</td>
<td>0.010</td>
<td>0.0060*</td>
<td>0.069</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IC\textsubscript{i,t} × Innov\textsubscript{i,t}</td>
<td></td>
<td></td>
<td></td>
<td>0.0026</td>
<td>0.518</td>
</tr>
<tr>
<td></td>
<td>Adj – R\textsuperscript{2}</td>
<td>0.3237</td>
<td>0.1085</td>
<td>0.3384</td>
<td>0.3369</td>
<td></td>
</tr>
<tr>
<td>Middle Innov group (N=561)</td>
<td>IC\textsubscript{i,t}</td>
<td>0.0771***</td>
<td>-0.003</td>
<td>0.842</td>
<td>0.0771***</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Innov\textsubscript{i,t}</td>
<td>0.1078</td>
<td>0.801</td>
<td>-0.001292</td>
<td>0.799</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IC\textsubscript{i,t} × Innov\textsubscript{i,t}</td>
<td></td>
<td></td>
<td></td>
<td>0.0092*</td>
<td>0.092</td>
</tr>
<tr>
<td></td>
<td>Adj – R\textsuperscript{2}</td>
<td>0.1697</td>
<td>0.0616</td>
<td>0.1683</td>
<td>0.1710</td>
<td></td>
</tr>
<tr>
<td>Low Innov group (N=285)</td>
<td>IC\textsubscript{i,t}</td>
<td>0.0442*</td>
<td>0.0006*</td>
<td>0.069</td>
<td>0.0434*</td>
<td>0.065</td>
</tr>
<tr>
<td></td>
<td>Innov\textsubscript{i,t}</td>
<td>1.2210</td>
<td>0.760</td>
<td>0.0149</td>
<td>0.769</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IC\textsubscript{i,t} × Innov\textsubscript{i,t}</td>
<td></td>
<td></td>
<td></td>
<td>-0.0026</td>
<td>0.965</td>
</tr>
<tr>
<td></td>
<td>Adj – R\textsuperscript{2}</td>
<td>0.2904</td>
<td>0.0971</td>
<td>0.2881</td>
<td>0.2855</td>
<td></td>
</tr>
</tbody>
</table>

Note: *, **, *** are indicated on 0.10, 0.05, and 0.01 respectively (two-tailed); subject to space limitation, only the regression results of the main test variables are listed.
the performance of the literature. The overall sample regression results of the performance lag phase I are shown in table 7 and the results of the subject regression are still similar. The results of the group test and the lag of the performance of the first phase are shown in table 8. The mediating effects and regulatory effects of the internal control of each group are consistent with the performance of the above-mentioned subject test.

Table 6
Bootstrap (1000) Robustness Test Regression Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mediation effect</th>
<th>Regulation effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model(1)</td>
<td>Model(2)</td>
</tr>
<tr>
<td>Explained variable</td>
<td>Perf&lt;sub&gt;i&lt;/sub&gt;</td>
<td>Innov&lt;sub&gt;i&lt;/sub&gt;</td>
</tr>
<tr>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>coefficient</td>
<td>P-value</td>
</tr>
<tr>
<td>Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.0873***</td>
<td>0.000</td>
</tr>
<tr>
<td>IC&lt;sub&gt;i&lt;/sub&gt; × Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.3630***</td>
<td>0.002</td>
</tr>
<tr>
<td>Adj – R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.2304</td>
<td>0.1181</td>
</tr>
<tr>
<td>N</td>
<td>1130</td>
<td>1130</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significant (two-tailed) at 0.10, 0.05, and 0.01, respectively; subject to space limit, only regression results of major test variables are listed

Table 7
Robustness test results of the latter period of dependent variable overall sample

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mediation effect</th>
<th>Regulation effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model(1)</td>
<td>Model(2)</td>
</tr>
<tr>
<td>Explained variable</td>
<td>Perf&lt;sub&gt;i&lt;/sub&gt;</td>
<td>Innov&lt;sub&gt;i&lt;/sub&gt;</td>
</tr>
<tr>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>coefficient</td>
<td>P-value</td>
</tr>
<tr>
<td>Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.0511***</td>
<td>0.004</td>
</tr>
<tr>
<td>IC&lt;sub&gt;i&lt;/sub&gt; × Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.2698</td>
<td>0.045</td>
</tr>
<tr>
<td>Adj – R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.2475</td>
<td>0.1184</td>
</tr>
<tr>
<td>N</td>
<td>862</td>
<td>862</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significant (two-tailed) at 0.10, 0.05, and 0.01, respectively; subject to space limit, only regression results of major test variables are listed

Table 8
Robustness test results of the latter period of the dependent variable (group sample)

<table>
<thead>
<tr>
<th>Group</th>
<th>Regression Variable</th>
<th>Mediation effect</th>
<th>Regulation effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Explained variable</td>
<td>Model(1)</td>
<td>Model(2)</td>
</tr>
<tr>
<td>High Innov group</td>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>coefficient</td>
<td>P-value</td>
</tr>
<tr>
<td>(N=176)</td>
<td>Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.2348***</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>IC&lt;sub&gt;i&lt;/sub&gt; × Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.6017**</td>
<td>0.039</td>
</tr>
<tr>
<td></td>
<td>Adj – R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.3909</td>
<td>0.0901</td>
</tr>
<tr>
<td>Middle Innov group</td>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>0.0771***</td>
<td>0.000</td>
</tr>
<tr>
<td>(N=561)</td>
<td>Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.1078</td>
<td>0.801</td>
</tr>
<tr>
<td></td>
<td>IC&lt;sub&gt;i&lt;/sub&gt; × Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.0092*</td>
<td>0.092</td>
</tr>
<tr>
<td></td>
<td>Adj – R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.1697</td>
<td>0.0616</td>
</tr>
<tr>
<td>Low Innov group</td>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>0.0442*</td>
<td>0.058</td>
</tr>
<tr>
<td>(N=285)</td>
<td>Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>1.2210</td>
<td>0.760</td>
</tr>
<tr>
<td></td>
<td>IC&lt;sub&gt;i&lt;/sub&gt; × Innov&lt;sub&gt;i&lt;/sub&gt;</td>
<td>-0.0026</td>
<td>0.965</td>
</tr>
<tr>
<td></td>
<td>Adj – R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.2904</td>
<td>0.0971</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significant (two-tailed) at 0.10, 0.05, and 0.01, respectively; subject to space limit, only regression results of major test variables are listed
It should be noted that due to the controversy over the selection of relevant instrumental variables, instrumental variables or Heckman tests should not be used here. Since this study has already selected all manufacturing listed companies to obtain samples after necessary elimination, it is not appropriate to use paired sample testing. In addition, considering the different property rights of China's listed companies, this study tests the models (1) ~ (4) in state-owned enterprises and private enterprises respectively. However, it is found that there is no significant difference in the above mechanism between state-owned enterprises and private enterprises.

Finally, in order to test whether the five elements of internal control have different effects on the above results, this study replaces the internal control comprehensive score with the internal environment, risk assessment, control procedures, information communication and internal supervision five elements in the Dibo database. The regression shows that the internal environment and information communication have certain role in promoting technological innovation investment in the mediation effect and risk assessment, control activities and internal supervision have a negative effect on technological innovation investment. This is consistent with the theoretical analysis of "internal control promotion theory" and "internal control paradox".

In terms of regulation effect, the regulation effect of control activity was the most significant at 0.4944 (P=0.049). This is consistent with the view that internal control in the aforementioned theoretical analysis is to improve innovation performance by monitoring the progress of innovation activities.

**Conclusion and Discussion**

Since the beginning of the 21st century, after major global financial scandals such as Enron and World.Com have been exposed, internal control is considered to be an important mechanism for protecting the interests of investors and has become an important topic of discussion in the academic community.

However, up to now, domestic and foreign empirical studies on internal control mainly focus on the correlation analysis of internal control and information disclosure, market response and internal and external governance mechanism of the company and lack sufficient evidence to explore how internal control affects the internal performance of the company in detail.27

Based on the relationship between internal control and corporate innovation, this study reviews and sorts out two related theoretical hypotheses, namely "internal control paradox" and "internal control promotion theory" and USES the data of China's listed manufacturing companies to test the explanatory power of the two hypotheses in China. By analyzing the ways and problems of internal control influencing technological innovation in China, this study is of great significance to the improvement of internal control in practice.

(1) Although the average innovation activity of listed companies in China's manufacturing industry is developing rapidly, the overall innovation development time is still short and the average innovation investment level is still lower than that of mature innovative manufacturing companies in Western countries.

From the overall study of China's manufacturing companies, the current strengthening of internal control construction can promote innovation activities. On the one hand, strong internal controls can spur higher levels of innovation investment. This is because the strengthening of internal control helps to clearly communicate the strategic positioning and risk tolerance boundary of the organization to employees of the company, so as to build a good internal environment for organizational innovation activities and stimulate innovation at all levels of the organization.

At the same time, good internal control can enhance the efficiency of innovation activities into corporate performance. This mainly comes from internal control. Through the supervision of the innovation project process, it is helpful to reduce blind or inefficient research and development projects, so as to enhance the efficiency of innovation activities into corporate performance.

(2) Although the sample is applicable to the "internal control promotion theory" as a whole, both of the above accelerators need to be strengthened. The promotion effect of internal control on innovation input is only evident in the sample group with active technological innovation. The moderating effect of internal control on innovation performance is only evident in the sample group of technical innovation level. In the sample group of negative innovation, internal control failed to improve innovation input and innovation performance.

At the same time, in different groups of companies with different risk tolerance of innovation, the promotion effect of internal control has its own disadvantages: in companies with relatively active innovation, internal control makes no significant contribution to improving innovation and transforming it into corporate performance. In companies with a high degree of innovation activity, strict internal rules and regulations even lead to the trend of restraining innovation investment as described in the "internal control paradox". In companies with negative innovation activities, internal control has largely failed to improve technological innovation activities.

These short plate phenomena of internal control effect explain the reason why the correlation mediating effect and adjustment effect are weak in the whole sample. In the "new normal" period of the economy, these are important issues that listed companies in the manufacturing industry need to
pay attention to internal control construction and improvement. On one hand, Chinese manufacturing companies still need to improve internal control to promote technological innovation. On the other hand, in the improvement of internal control, attention should be paid to the possible negative effects of rigid control points, budget and performance appraisal system on innovation activities so as to prevent the paradox of internal control.

(3) In practice, the company's internal control system design is not once and for all. Internal control is a systematic mechanism composed of five elements: internal environment, risk assessment, control activities, information communication and internal supervision. Based on the analysis of the specific mechanism and approaches of internal control on innovation activities, different types of manufacturing companies should pay attention to different key areas when improving internal control. For companies with active innovation, the current focus of internal control improvement is to strengthen the construction of control activities related to innovation projects, so as to enhance the efficiency of innovation transformation into corporate performance.

For companies with a high degree of innovation activity, the current focus of internal control improvement is to strengthen the construction of internal environment and information communication elements and to change the situation of over-reliance on budget and performance assessment to restrain innovation activities. For companies with negative innovation, internal control needs to be strengthened comprehensively to promote their innovation activities, of course, from a long-term perspective.

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References


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