

Research on the relationship between Executive motivation and R&D innovation

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Keywords: Executive incentive, R&D innovation, Direct relationship view, Dynamic contingency view, System integration view.

Abstract: With the development of innovation economics theory system and the evolution of corporate governance theory, the relationship between executive incentive and R&D innovation has gradually attracted the attention of scholars. This paper summarizes the research context of the relationship between executive motivation and research innovation from the perspectives of direct relevance, dynamic contingency and system integration, and reviews the literature based on these three perspectives. Finally, on the basis of deeply analyzing the shortcomings of existing research, the future research is prospected.

1. Introduction

It has become an important topic in corporate governance research how to motivate senior executives as main insiders to be innovation-oriented and allocate important resources to innovation, and whether they can promote R&D innovation has also become an important dimension to measure the incentive effect of senior executives. In this context, scholars gradually turn their research focus to the relationship between executive motivation and research innovation. The existing studies are mainly based on the Direct relationship view, the Dynamic contingency view and the System integration view. Studies based on the Direct relationship view mainly investigate the direct relationship between a single executive incentive contract and R&D innovation. The research based on the Dynamic contingency view pays more attention to the influence of different situational factors on the relationship between executive motivation and R&D innovation. Based on the System integration view, the research deeply analyzes the R&D innovation effect of different executive incentive contracts, including explicit contracts such as cash compensation, stock options, restricted stock and implicit contracts such as control incentive and promotion incentive.

2. Research on the relationship between executive motivation and R&D innovation from different perspectives

2.1 Research based on the perspective of Direct relationship view

The direct relationship view is the most common research perspective to study the relationship between executive motivation and R&D innovation. Based on principal-agent theory and management power theory, the direct relationship view mainly investigates the direct relationship between incentive contract of single executive and R&D innovation. According to the hypotheses and conclusions it is based on, this kind of research can be subdivided into linear view and nonlinear view. The linear view holds that there is a linear relationship between executive motivation and R&D innovation. The nonlinear view considers that the relationship between executive motivation and R&D innovation is nonlinear.

2.1.1 Research on linear view

Cho (1992) used the data of 184 American manufacturing companies in 1986 to take the ratio of R&D expenditure to sales revenue as the operational variable of technological innovation input, and the ratio of the market value of executive stock holdings to their annual total compensation and the

ratio of the market value of executive stock holdings to their annual cash compensation as the operational variable of equity incentive. After regression analysis, it is found that there is a positive correlation between equity incentive and R&D innovation. Equity incentives, he explains, not only align the interests of executives with those of shareholders, but also give them the voting power to guarantee their continued employment at the company [1]. Holthausen et al. (1995) measured R&D innovation by the proportion of the number of patents in sales revenue, and carried out an empirical test by using simultaneous equation model. The results show that the higher the proportion of long-term incentive such as stock options in executive incentive, the higher the output of technological innovation [2].

2.1.2 Research on nonlinear view

Lazonick (2007) established a model and found that incomplete contracts almost filled the entire innovation process. Moderate executive incentives could promote enterprises to increase R&D innovation investment. But beyond a certain level, executives' power increases dramatically, potentially leading to severe insider control and increased risk of R&D innovation failure. As a result, they spend less on R&D innovation [3]. Xu Ning and Xu Xiangyi (2012) used the data of Chinese high-tech listed companies from 2007 to 2010 and took "in-service consumption" as the operational variable of executive control incentive to conduct factor analysis on "R&D investment intensity", "R&D personnel intensity", "total number of patent applications" and "invention application quantity -- intangible asset ratio". They obtained the factors of R&D innovation input ability, output ability and transformation ability, and took them as dependent variables for regression analysis. The results showed that there was an inverted U-shaped relationship between the incentive of executive control and the input ability, output ability and transformation ability of R&D innovation. That is, when the incentive of control power increases to a certain extent, the R&D innovation capability of enterprises tends to decrease [4].

2.2 Research based on the perspective of Dynamic contingency view

Different from those based on the direct relationship view, those based on the dynamic contingency view fully consider the influence of dynamic situational factors when examining the relationship between executive motivation and R&D innovation. Specifically, related researches based on dynamic contingency view mainly focus on the way that executive incentive affects R&D investment in different environments. Relevant studies have mainly investigated the impact of governance mode, government subsidy, enterprise culture and other situational factors on the relationship between executive motivation and R&D innovation.

2.2.1 Research on governance patterns as situational factor

Niu Jianbo et al. (2019) divided the corporate governance model into supervisory governance and trust governance by referring to psychological research results. By considering the impact of salary gap on the psychology and behavior of high-paid recipients, the number of patent applications and the number of patents granted were used to measure the innovation level of enterprises. The relationship between different governance modes and R&D innovation is examined. The results show that trust-based governance positively moderates the relationship between the executive compensation gap and the number of patents granted, and improves the innovation efficiency of firms [5]. Cheng Xinsheng et al. (2019) empirically tested the logical chain of authoritative professional directors' influence on innovation activity through executive incentive based on the data of China's A-share listed companies from 2007 to 2015, and found that authoritative professional directors' influence on the structure and level of executive incentive enhanced the enterprise's innovation activity. And different types of authoritative professional directors can play a positive role [6].

2.2.2 Research on corporate culture as situational factor

Cheng Bo et al. (2020) found that previous studies mostly investigated how macro and micro environmental factors affect corporate innovation activities, and ignored the influence of culture on

corporate innovation behavior. Therefore, by studying the impact of trust culture on corporate innovation and the interactive impact of trust culture and salary gap on corporate innovation, he proves that trust culture has a significant role in promoting corporate innovation. He found that widening the gap between the top management team and the internal compensation of employees has a positive incentive effect on the innovation level of the company, and thus enhances the positive correlation between the trust culture and the innovation of the company [7]. Peng Sijia (2021) uses the data of A-share listed companies in The Beijing-Tianjin-Hebei region from 2016 to 2018 as research samples. She constructs a theoretical model of innovation culture, executive incentive and R&D investment, and empirically tests the relationship among innovation culture, executive incentive and R&D investment, as well as the mediating role of executive incentive in the path of innovation culture influencing R&D investment. The results show that: (1) innovative culture can significantly drive enterprises to carry out R&D innovation. (2) Both short-term compensation incentive and long-term equity incentive can promote corporate executives to increase innovation investment. (3) Both short-term executive compensation incentive and long-term equity incentive have mediating effects on R&D investment [8].

2.2.3 Research on government subsidy as situational factor

Zhao Xiaoyang and Xu Chaoyang (2019) used the data of A-share listed companies from 2014 to 2016 to study the relationship between government subsidies and enterprise R&D investment. They investigated the moderating effect of executive compensation on government subsidies and R&D spending, and analyzed the changes among government subsidies, executive compensation and R&D spending under different ownership. The results show that government subsidy can promote R&D investment of enterprises. Executive compensation can adjust the relationship between government subsidies and R&D investment, and has a positive moderating effect on executive compensation in private enterprises, while has a negative moderating effect on executive compensation in state-owned enterprises [9]. Wang Xu et al. (2019) focused on the integrated impact of government subsidies and executive incentives on enterprises' green innovation from the dual aspects of fiscal and tax policies and corporate governance. Taking the manufacturing industries listed in Shanghai and Shenzhen stock markets from 2010 to 2017 as samples, they prove that the complementary relationship between compensation incentive and reputation incentive promotes the innovation compensation effect of incentive mix. In addition, fiscal and tax subsidies can achieve the optimal driving effect on green innovation under the condition of moderate compensation incentive intensity [10].

2.3 Research based on the perspective of System integration view

From the perspective of system integration, this paper explores the difference of technological innovation effect of different executive incentive contracts and their relationship, and then investigates the R&D innovation synergy effect of executive incentive contract combination. As far as the research topic of this paper is concerned, it is necessary to investigate the interaction between different executive incentives and their combined effect on the company's technological innovation. In the practice of corporate governance, executive incentives are usually completed by signing contracts. Therefore, the impact of executive incentives on the company's technological innovation is the result of synergistic effects of various incentive contracts (Dale-Olsen, 2012) [11].

In corporate governance practice, executive incentive usually adopts the following three different forms: the first is cash compensation, such as salary, bonus, etc.; the second is equity or stock options; the third is non-monetary incentives, such as power, reputation, public image, etc. Filatotchev and Allcock (2010) divided executive incentives into cash compensation incentives (such as basic salary and bonus), long-term incentives (such as stock options and restricted stock) and special allowances (such as pension and in-service consumption) [12].

Harley et al. (2002) used simultaneous equation model to test the endogenous relationship between executive incentive and technological innovation input. The results show that stock option has a significant positive effect on technological innovation input, while restricted stock has a negative effect. In addition, even for stock options, the incentive effect is different with different vesting periods [13].

Lin et al. (2011) used the survey data of 1088 private manufacturing enterprises in 18 Cities in China from 2000 to 2002 released by the World Bank. They examine the impact of executive incentives on firms' technological innovation activities. The results show that executive incentive has a significant effect on innovation input (represented by R&D expenditure) and technological innovation output (represented by new product sales). However, different incentive methods have different effects, and the compensation incentive scheme taking sales revenue as the main performance appraisal index is more conducive to technological innovation than the scheme taking profit as the main appraisal index [14].

3. Conclusion and Prospect

This paper summarizes the existing research on the relationship between executive motivation and R&D innovation into three perspectives: direct correlation view, dynamic contingency view and system integration view. On this basis, it systematically reviews the existing research on the relationship between executive motivation and R&D innovation. Follow-up research can start from the following issues:

Firstly, explore the internal correlation mechanism between executive incentive and R&D innovation. Specifically, based on the integration of direct correlation view, dynamic contingency view and system integration view, the subsequent research should deeply study how to configure or integrate different incentive means, and further study how different situational factors will affect the effect of R&D innovation. That is to say, it first studies how to rationally allocate different incentive means for senior executives, and then deeply investigates the mechanism, situational factors and realization approaches of incentive systems with different configurations to promote R&D innovation.

Secondly, the mechanism of executive incentive affecting R&D innovation input, R&D innovation output and even the whole process of R&D innovation is deeply analyzed, so as to longitudinally expand the relationship between executive incentive and R&D innovation. Existing researches mainly focus on the relationship between executive motivation and R&D innovation input or output. In fact, the whole process of R&D innovation from input to output and then from output to transformation may be affected by senior executives' decisions or behaviors. Executive incentives are likely to have an impact on the whole process of R&D innovation. Therefore, the subsequent research should carry out theoretical interpretation and empirical test on the influence degree, mode of action and evolutionary mechanism of executive incentive on R&D innovation process.

Thirdly, situational factors such as characteristics of senior management team or personal characteristics of senior management can regulate the direct relationship between senior management motivation and R&D innovation, which should be regarded as the focus of subsequent research. In addition to the company, industry and market factors, the characteristics of senior management team and personal characteristics of senior management (such as age, educational background, professional background, etc.) are also important factors influencing the effect of senior management incentive on R&D innovation. Under the influence of different executive teams and individual characteristics, various executive incentive contracts will have different effects. Therefore, subsequent studies should further explore how to develop differentiated executive incentive contracts based on different characteristics of executive teams or individuals, so as to improve the R&D innovation effect of executive incentives.

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