

Does the Perception Level of Executives Affect the Innovation Capability of Firms?-An Empirical Study Based on Chinese Listed Companies

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Abstract— With the continuous advancement of economic globalization, acquiring key technologies and improving innovation capabilities have become the key breakthrough direction for listed enterprises in China and globally. An enterprise's innovation capability is an important guarantee for it to establish its core competitiveness, maintain its international competitive advantage and seize the international competitive position. Based on the statistical data of 2,626 listed companies in China from 2015 to 2019, this paper empirically examines the impact of the cognitive level of executives on the innovation capability of enterprises. The results show that the cognitive level of executives is significantly and positively correlated with corporate innovation capability, i.e. the increase in the cognitive level of executives helps to promote the implementation of corporate innovation strategies. This paper enriches the research on the relationship between executives and corporate innovation capability, and has important guiding significance for the formation of corporate executive teams.

Keywords— Business executives, Cognitive level, Innovation capacity.

I. INTRODUCTION

With the continuous improvement of the economic system, China's economy is gradually shifting from a single stage of high-speed growth to a stage of high-quality development. In 2012, the Chinese government has clearly proposed to implement the core strategy of innovation-driven development, making innovation an important guide for sustainable economic development. It is a powerful strategic support for building China's modern economic system". At a time when the country is driven by science and technology and innovation, enterprises, as one of the main actors in a country's economic development, are increasingly attracting the attention of academics from all over the world to study their innovation level and capability.

In addition, with the accelerating globalisation of international trade and the increasingly fierce competition in the international market, it is a necessary choice for enterprises in China and the world to have core competencies and improve their competitive advantages in the international market. According to the theory of enterprise resources, an enterprise's core competitive advantage is a collective term for its own tangible or intangible assets that are different from those of other enterprises and are difficult to be copied and irreplaceable. The ability to innovate is one of the indicators used to judge whether a company can establish core competencies and is the key to gaining a position in the international market. As the maker and implementer of strategic decisions, the executive management of a company is a central part of the company's management and decision making, discussing and implementing the company's development plans and strategic decisions to realise the company's production as well as social activities. The executive team of a company is also essentially the indispensable, inimitable and irreplaceable human capital of the company. Academic research on executive teams is still a

hot topic. According to Li Qian et al, people and the knowledge they draw on are increasingly becoming a key resource for the development of innovation in international enterprises, and human capital is the driving force behind the improvement of the innovative capacity of enterprises. And the cognitive ability of executives is an important component of human capital. In view of this, it is necessary to explore the question of whether the cognitive ability of executives contributes to the enhancement of corporate innovation capability, and then provide an effective reform path to promote the implementation of corporate innovation strategies.

II. RESEARCH DESIGN

A. Research theory and research hypothesis

The high echelon theory states that with the rapid development of the world economy, diverse consumer needs and rapid product changes, it is difficult to make accurate decisions with the wisdom of individual leaders alone in the face of such a complex and changing external environment. Hambrick and Mason also mention the limitations of individual leaders' decision-making and argue that management team members working with each other can effectively improve such limitations, thus shifting the perspective of scholars studying the factors influencing corporate decision-making from individual executives to executive teams. High-order echelon theory argues that when faced with a complex and changing business environment, the characteristics and knowledge and skills of individual leaders can hardly meet the needs of strategic decision-making, and team decision-making becomes particularly important, and the influence of the executive team on corporate strategic decision-making needs to be studied in terms of people as a whole. Thus the executive team, as the strategists and commanders of corporate reform and development, is a key presence in a company's decision on whether and how to implement an innovative strategy. The cognitive ability of

executives not only reflects their personal knowledge and skill level, but may also have a direct impact on the allocation of resources within the firm, which in turn affects the proportion of innovation invested in the firm. In addition, cognitive ability may also reflect personal values, preferences and personal traits to some extent. Zheng Jianzhuang and He Zhenyu's study points out that higher education is a specific source of innovation and entrepreneurship, and is a fundamental guarantee for economic development. Highly educated executives are more accepting of the uncertainty of the state of affairs, more tolerant of risk and more inclined to diversify their strategic choices in order to achieve personal fulfilment, and therefore dare to innovate in products and services, compared to highly educated executives with low management theories. They are also more visionary, able to develop a strategic path that is suitable for the long-term stability of the company in the light of market trends, and have a strong capacity for innovation. In addition, compared to executives with low cognitive ability, executives with higher education and higher cognitive ability are generally considered to have profound theoretical and practical knowledge, and are more likely to be recognised by their teams and subordinates in the management of the company, and are more likely to gain higher prestige, which in turn is conducive to the implementation of their own willingness to innovate and promote the implementation of the company's innovation strategy.

Based on this, this paper proposes the following hypothesis: an increase in the level of awareness of executives will drive companies to develop innovation strategies and enhance their innovation capabilities.

B. Data sources and processing

A sample of 9,249 statistics of 2,626 Chinese listed companies for the period from 2015 to 2019 was selected for the study. The data were mainly sourced from the CSMAR database, and some data were manually collated and aggregated. To ensure the reasonableness of the study results, companies with ST and *ST in the sample period were excluded, and continuous variables were tail-limited at 1%.

C. Model construction and description of variables

To ensure the accuracy and reasonableness of the data results, and to reduce the interference of time trends and the impact of industry changes on cognitive ability and firm innovation levels, a fixed effects model is used in this paper. The specific model is as follows.

$$R\&D_{it} = \sigma_0 + \sigma_1 Edu_{it} + \sigma_2 Life_{it} + \sigma_3 Size_{it} + \sigma_4 Lasr_{it} + \sigma_5 Roa_{it} + \sigma_6 Enum_{it} + \sum ind + \sum year + \epsilon_{it}$$

In the above formula, the dependent variable R&D is the innovation capability of the enterprise, expressed as the ratio of R&D investment to business revenue; the core explanatory variable Edu is the cognitive ability of the executives, expressed as the average education level of the executives; the measurement of the education level of the executive team in this paper will be divided into five categories according to the level of education: junior college and below = 1, college = 2,

bachelor = 3, master = 4, The final average was taken as a measure of the executive's cognitive ability. The main control variables are firm age Life (expressed as date of data - date of establishment, or less than one year), firm size Size (expressed as the logarithm of the firm's total assets), firm profitability Roa (expressed as net operating margin), top shareholder shareholding Lasr (measured as the ratio of the maximum number of shares held by a single shareholder to the total number of shares) and Executive Size Enum (expressed as the total number of people in the executive team). In addition $\sum year$ refers to year fixed effects; $\sum ind$ refers to industry fixed effects and $\epsilon_{i,t}$ is a random disturbance term.

III. RESEARCH RESULTS

A. Descriptive statistics

Table 1 focuses on the minimum, maximum, mean and standard deviation of the variables studied. In terms of the innovation capacity of the enterprises, there is a clear difference in the innovation capacity of the enterprises. The minimum value is zero, indicating that some enterprises may have a poor sense of innovation and do not make relevant investments in corporate R&D. Some scholars, in their research on the development of enterprises in developed countries, have concluded that only at a level greater than 5% can an enterprise invest in R&D to have a competitive advantage in the international market (2% can only maintain the basic survival of the enterprise). The average value of the 2,626 listed companies in the sample of this paper is less than 5%, which indicates that the innovation ability of China's listed companies still needs to be improved and they have a long way to go to occupy the international market position. In terms of cognitive level, the maximum value is 4.48, which indicates that there exist some enterprises requiring higher education level for executives, generally at master's degree level and above.

TABLE 1. Descriptive statistical analysis.

| Name | Observed | Min | Max | Mean | Standard |
|------|----------|---------|--------|-------|----------|
| R&D | 9249 | 0.00 | 151.61 | 4.96 | 5.68 |
| Edu | 9249 | 1.88 | 4.48 | 3.29 | 0.37 |
| Life | 9249 | 4.00 | 51.00 | 17.28 | 5.33 |
| Size | 9249 | 7.66 | 12.38 | 9.53 | 0.57 |
| Lasr | 9249 | 3.00 | 89.09 | 33.50 | 14.24 |
| Roa | 9249 | -190.88 | 37.89 | 3.65 | 9.05 |
| Enum | 9249 | 8.00 | 51.00 | 18.67 | 4.93 |

However, there are also some companies where the average education level of executives is less than a college degree (the mean value is 1.88), with serious differences in comparison. As executives are the makers and implementers of corporate strategic decisions, their personal traits largely influence the implementation of corporate strategies. Therefore, it is necessary to discuss the cognitive level of executives in conjunction with corporate innovation capabilities and explore the possible reasons for the large gap in corporate innovation capabilities. In addition, there is a difference of nearly 30 times in the shareholding of the first largest shareholder, and the level of shareholding of the first largest shareholder directly affects the voice and implementation of executives.

The concentration of shareholding directly determines the direction of overall corporate decision-making and therefore needs to be controlled.

IV. ANALYSIS OF RESULTS

The first five columns in Table 2 mainly list the results of the regressions that substituted the control variables in turn. It can be seen that the age, size, profitability and shareholding of the largest shareholder are all significantly and negatively related to the innovation capability of the firm, i.e., the increase in age, size, profitability and concentration of shareholding will cause a decrease in the firm's willingness to innovate and hinder the implementation of the firm's innovation strategy. The effect of age and size may be explained by the fact that as firms mature and reach a certain size, they can use their own social resources and scale to easily gain revenue without the risk of innovation failure. At the same time, companies with high profitability may choose to avoid risky innovations in favour of the existing substantial

returns on the balance of benefits. And the shareholding of the first largest shareholder reflects the concentration of equity in the company's management. If a company's equity concentration is too high, this indicates that the first largest shareholder has strong voting and veto power, and also bears greater responsibility and risk, and therefore may feel constrained in making strategic decisions and be too conservative and refuse to innovate. Column 6 is a regression with the inclusion of all control variables and the independent variable executive's cognitive level substituted into the model. The results show that executive's cognitive level is highly positively correlated with a company's ability to innovate, i.e. the higher the average level of education in the executive team, the stronger the company's willingness to innovate and the greater the proportion of R&D investment in total revenue. In summary, the research hypothesis of this paper is supported.

TABLE 2. Analysis of the results of the relationship between executives' perception level and firms' innovation capability

| Name | (1) | (2) | (3) | (4) | (5) | (6) |
|------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|
| Edu | | | | | | 1.939*** (18.22) |
| Life | | | | | -0.062*** (-7.37) | -0.057*** (-6.89) |
| Size | | | | -1.168*** (-14.27) | -1.010*** (-13.29) | -1.381*** (-16.24) |
| Lasr | | | -0.014*** (-4.93) | -0.011*** (-3.84) | -0.012*** (4.33) | -0.011*** (-3.87) |
| Roa | | -0.023** (-2.40) | -0.019* (-1.92) | -0.024*** (-2.48) | -0.026*** (-2.67) | -0.025*** (-2.59) |
| Enum | -0.031*** (-3.55) | -0.034*** (-3.92) | 0.035*** (-4.01) | 0.014 (1.52) | 0.018* (1.93) | 0.006 (0.61) |
| Cons | 5.457*** (16.53) | 5.634*** (16.78) | 8.082*** (17.39) | 15.799*** (20.33) | 16.064*** (20.81) | 12.168*** (15.84) |
| R2 | 0.321 | 0.322 | 0.323 | 0.336 | 0.341 | 0.362 |
| Year | Control | Control | Control | Control | Control | Control |
| Ind | Control | Control | Control | Control | Control | Control |
| N | 9249 | 9249 | 9249 | 9249 | 9249 | 9249 |

Note: ***, **, * indicate significant at the 0.01, 0.05, 0.1 levels respectively.

V. CONCLUSION

This paper empirically analyses the impact of the cognitive ability of the executive team on the implementation of corporate innovation strategies, starting from the personal attributes of the team members. The results show that as the cognitive ability of the executive team increases, firms are more willing to implement innovation strategies and increase their R&D investment to gain long-term international competitive advantage and secure their competitive position in the market. Therefore, it is important for companies to improve the staffing of their executive team and increase the overall cognitive ability of the executive team. For the executives themselves, they should recognise the importance of their intellectual capital and use their free time to improve their education and knowledge base, thereby improving their innovation capabilities and overall quality. In addition, the cognitive ability of different regions may have different effects on innovation due to external factors such as local

customs and gender, which is subject to further research and discussion by subsequent scholars in order to propose more targeted practical guidance.

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