



Parent-subsidiary Relationship, Risk-taking and Subsidiary Innovation Performance: Empirical Evidence from Chinese Listed Companies

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Abstract. As a distinctive communication and coordination mechanism of enterprise groups, the parent-subsidiary relationship has an impact on the innovation performance of subsidiaries. With the data of Chinese A-share listed subsidiaries from 2016 to 2020, we discuss the parent-subsidiary relationship from two dimensions: executive linkage and business linkage, testing respectively their influence mechanism on the innovation performance of subsidiaries, and examining the mediating role of subsidiaries' risk-taking ability. The empirical study indicates that the parent-subsidiary relationship positively affects the risk-taking ability of subsidiaries, and subsequently enhances the innovation performance of subsidiaries. The results provide management implications into developing technological innovation strategies for sustainable development.

Keywords: parent-subsidiary relationship; risk-taking; innovation performance.

1 Introduction

The parent-subsidiary mode is the basic organizational form of enterprise groups. Harmonious relationships between parents and subsidiaries help to leverage synergies within the group. For example, when carrying out innovative activities, subsidiaries can obtain internal resources and financial support from the parent company, thereby increasing their risk-taking ability and desiring to invest in innovative projects. By effectively redeploying project assets that perform poorly under existing management, the parent company secures an efficient allocation of internal resources and ensures the success of subsidiaries' innovation projects. Prior studies on enterprise group innovation have explored the relationship between the parent-subsidiary relationship and subsidiary innovation from different perspectives, including resource sharing[1-2], executive linkage[3], financial support and knowledge spillover[4-5]. However, the impact of the parent-subsidiary relationship on the innovation performance of subsidiaries has not

been fully explored and the mediating effect of risk-taking ability between the parent-subsidiary relationship and innovation performance has not attracted enough attention.

In this paper, we empirically study the effect of the parent-subsidiary relationship on subsidiary innovation performance and examine the mechanism of risk-taking ability between them.

2 Theoretical Analysis and Research Hypothesis

2.1 Parent-subsidiary Relationship and Subsidiary Innovation Performance

2.1.1 Parent-subsidiary Executive Linkage and Subsidiary Innovation Performance.

Executive linkage means parent company executives serve as subsidiary executives at the same time to form a vertical executive linkage between the parent and subsidiary companies, which symbolizing the status and influence of the subsidiary in the group's internal network. To a certain extent, executive linkage makes it easier for subsidiaries to obtain diversified innovation resources from the parent company, which facilitates the smooth progression of innovation projects. As a bridge between the parent company and its subsidiaries, associated executives enable the parent company to directly participate in the innovation process of the subsidiaries, reducing the opacity of information between the parent company and its subsidiaries, and helping the enterprise group form a long-term and stable synergistic relationship, which is helpful to improve the efficiency of innovation decision-making of subsidiaries[6]. Therefore, we propose the following hypothesis:

H1a: There is a positive correlation between parent-subsidiary executive linkage and subsidiary innovation performance.

2.1.2 Parent-subsidiary Business Linkage and Subsidiary Innovation Performance.

Business linkage refers to the extent of correlation between the main business operation scope of the subsidiary and the parent company, reflecting the horizontal connection relationship. The parent company will acquire more critical specific knowledge in the innovation process of subsidiaries by building organization and information systems through business linkage, so as to increase the participation in the innovation activities of subsidiaries and the attention to innovation projects of subsidiaries. Furthermore, subsidiaries with a high degree of business relatedness with parent company are often at the core of intra-group network relationships, and thus are more likely to match the resources needed for their development and increase enthusiasm for R&D investment.

H1b: There is a positive correlation between parent-subsidiary business linkage and subsidiary innovation performance.

2.2 The Mediating Role of Risk-taking

2.2.1 Executive Linkage, Risk-taking and Subsidiary Innovation Performance.

From the perspective of resource acquisition, it is easier for subsidiaries to establish a stable and lasting synergistic relationship with the parent company by associating executives. The parent-subsidiary executive linkage enhances the parent company's understanding of the current situation, development guidance and potential exploration of the subsidiary, helped subsidiaries obtain resource support from enterprise groups, which in turn facilitates the subsidiary's ability to overcome the adverse external environment and improved their risk-taking ability. According to social network theory, executive linkage enhances the trust level between parent and subsidiary companies and reduces the time and energy required to build trust, which advances the subsidiary's risk-taking ability and motivation to carry out innovation activities.

H2a: Risk-taking plays a mediating role in the relationship between parent-subsidiary executive linkage and subsidiary innovation performance.

2.2.2 Business linkage, Risk-taking and Subsidiary Innovation Performance.

The parent-subsidiary business linkage is more reflected in the relevance between their business scopes. The subsidiary can timely obtain changing market information through the superior social network of the parent company[7], and avoid risks by quickly adjusting wrong business decisions. The relevant business scope will bring high-frequency business cooperation between parent and subsidiary companies, and provide a way for subsidiaries to improve their risk-taking ability through resource integration and service exchange. In addition, parent companies and subsidiaries with a high degree of business linkage place more emphasis on risk sharing through various formal or informal communication mechanisms, thereby increasing the subsidiary's risk-taking ability.

H2b: Risk-taking plays a mediating role in the relationship between parent-subsidiary business linkage and subsidiary innovation performance.

3 Research Design

3.1 Data and Sample

This paper uses Chinese A-share listed subsidiaries as research samples, and selects the annual data from 2016 to 2020. We obtain relevant initial data through the China Stock Market Accounting Research (CSMAR), Wind Database, and the annual reports of Chinese listed companies. Referring to the research of Cai et al.(2019), this paper takes at least two listed subsidiaries as the definition standard of enterprise group, and selects the listed subsidiaries controlled by group companies as the analysis samples. To avoid the influence of outliers on the data results, some continuous variables are winsorized at the 1% and 99% levels.

3.2 Variables

3.2.1 Dependent Variable.

Subsidiary innovation performance(INNO). This paper uses the natural logarithm of one plus the number of invention patent applications to measure innovation performance of subsidiaries.

3.2.2 Independent Variable.

Parent-subsidiary executive linkage (EA). This paper uses the ratio of the number of executives in both the parent company and subsidiaries to the total number of executives of subsidiaries to measure the parent-subsidiary executive linkage.

Parent-subsidiary business linkages (BU). This paper compares the industry codes of listed subsidiaries and parent companies. It is a dummy variable that equals 1 if the business scope of listed subsidiaries is related to the parent company, and 0 otherwise.

3.2.3 Mediator Variable.

Risk-taking ability(Risk). The volatility of the industry-adjusted return on total assets (ROA) of enterprises over the past three years is used to measure the risk-taking ability of Chinese enterprises. To eliminate the impact of industry heterogeneity, this paper first uses the industry average to adjust the total asset returns of enterprises, then calculates the standard deviation of ROA after the industry adjusted to measure the profit volatility.

3.2.4 Control Variables.

In reference to existing studies, other factors that may affect subsidiary innovation performance as control variables in this paper are selected, including the following variables.(1)Firm size(Size).(2)Asset-liability ratio(Leverage).(3)Operating cash flow(Operate).(4)Operating income growth rate (Growth).(5)Equity balance (Top25). (6)Board size(Board).(7)Number of executives(Executive). (8)CEO duality (Dual).In addition, this paper also controls the time effect and industry effect.

4 Research Models

In this paper, models 1 and 2 are constructed to test the effects of executive affiliation and business affiliation on the innovation performance of subsidiaries, and then models 3 and 4 are constructed to verify the mediating role played by risk-taking ability in the above relationships.

$$INNO_{i,t} = \alpha_0 + \alpha_1 EA_{i,t} + \alpha_2 X_{i,t} + \sum Industry + \sum Year + \varepsilon_{i,t} \quad (1)$$

$$INNO_{i,t} = \alpha_0 + \alpha_1 BU_{i,t} + \alpha_2 X_{i,t} + \sum Industry + \sum Year + \varepsilon_{i,t} \quad (2)$$

$$INNO_{i,t} = \alpha_0 + \alpha_1 EA_{i,t} + \alpha_2 RISK_{i,t} + \alpha_3 X_{i,t} + \sum Industry + \sum Year + \varepsilon_{i,t} \quad (3)$$

$$INNO_{i,t} = \alpha_0 + \alpha_1 BU_{i,t} + \alpha_2 RISK_{i,t} + \alpha_3 X_{i,t} + \sum Industry + \sum Year + \varepsilon_{i,t} \quad (4)$$

5 Empirical Results and Analyses

5.1 Regression Results and Analyses

5.1.1 Parent-subsidiary Relationship and Subsidiary Innovation Performance.

As shown in the first and second columns of Table 1, parent-subsidiary executive linkage(EA) is significantly positive($\alpha=7.162, p<0.01$), which is consistent with hypothesis 1. Parent-subsidiary business linkage(BU) is significantly positive($\alpha=0.426, p<0.01$), which supports hypothesis 2.

Table 1. Regression results analysis

Variable	INNO		RISK		INNO	
	(1)	(2)	(3)	(4)	(5)	(6)
EA	7.162*** (33.59)		0.006*** (12.27)		7.078*** (32.61)	
BU		0.426*** (2.82)		0.004*** (15.66)		0.167 (1.08)
RISK					15.297** (2.05)	59.323*** (6.99)
Size	0.223*** (5.02)	-0.147*** (-3.01)	-0.001*** (-7.12)	-0.001*** (-8.99)	0.233*** (5.22)	-0.099** (-2.02)
Leverage	-1.803*** (-7.20)	-1.427*** (-3.52)	-0.083*** (-158.00)	-0.075*** (-100.95)	-0.526 (-0.78)	3.047*** (4.03)
Operate	-0.021 (-0.07)	-0.872*** (-2.65)	-0.004*** (-5.79)	-0.004*** (-6.57)	0.034 (0.12)	-0.635* (-1.93)
Growth	-0.040* (-1.81)	-0.076*** (-3.04)	-0.000 (-1.58)	-0.000** (-2.04)	-0.039* (-1.76)	-0.070*** (-2.83)
Top25	0.200*** (2.78)	0.323*** (3.98)	0.001*** (3.49)	0.001*** (3.79)	0.192*** (2.66)	0.290*** (3.58)
Board	-0.144*** (-4.35)	-0.167*** (-4.47)	-0.000 (-0.53)	-0.000 (-1.12)	-0.143*** (-4.34)	-0.162*** (-4.37)
Executive	0.080*** (5.21)	0.092*** (5.34)	-0.000 (-1.08)	-0.000 (-0.45)	0.080*** (5.25)	0.093*** (5.42)
Dual	-0.234** (-2.36)	-0.419*** (-3.74)	0.000* (1.88)	0.000 (1.32)	-0.241** (-2.42)	-0.436*** (-3.91)
Industry	control	control	control	control	control	control
Year	control	control	control	control	control	control
Constant	-5.930*** (-5.38)	5.615*** (4.60)	0.104*** (44.94)	0.104*** (46.27)	-7.527*** (-5.58)	-0.566 (-0.38)
N	4,059	4,059	4,059	4,059	4,059	4,059
r2 a	0.378	0.206	0.901	0.903	0.379	0.215

5.1.2 The Mediating Role of Risk-taking.

According to the test criteria for mediating effects proposed by Wen et al., we apply a three-step approach to test hypotheses 2a and 2b. The first step is to test the effect of the independent variables on the dependent variables. The results of this test have been shown above. In the second step, it is shown that, the impact coefficients of the influence of EA and BU on RISK are significantly positive. In the third step, the substitution of mediating variables is tested. As shown in Table 1, after adding the mediator variable, the coefficient of RISK and EA is greater than 0 and significant, while the regression coefficient of BU becomes insignificant, which indicates that RISK partially substitutes for the promotion of EA on INNO, and completely substitutes for the effect of BU, hypotheses 2a and 2b are supported respectively.

6 Conclusion

First, the higher the degree of executive linkage and business linkage, the more important the strategic advantage of subsidiaries in the group's internal network, and the higher degree of trust of the parent company in subsidiaries. So, enterprise groups should pay attention to the establishment and maintenance of the parent-subsidiary relationship, which will promote the ability of subsidiaries to absorb and accumulate innovation resources. Second, parent-subsidiary executive linkage and business linkage can strengthen inter-organizational network resource relationships, improve the tolerance and motivation of subsidiaries to cope with innovation risks. Subsidiaries are more willing to explore potential new investment opportunities, which will improve their innovation efficiency. Therefore, enterprise groups should improve risk management mechanisms, so subsidiaries can take more initiative to seize market opportunities and obtain core strengths through upgrading of new technologies.

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