Exploratory Innovation, Exploitative Innovation and Firm Performance: Moderating Effect of Organizational Structure and Slack Resources

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Abstract--**As suggested by prior research, there are two types of innovation: Exploratory innovation and exploitative innovation. What is the relationship between the two approaches of innovation and firm performance? We argue that the effect of each approach of innovation on firm performance is contingent upon organizational structure, measured by centralization and formalization, and slack resources, consisted of absorbed slack resources and unabsorbed slack resources. Using data from 155 Chinese manufacturing firms, we show that centralization has a positive moderating effect on the relationship between exploitative innovation and firm performance; Formalization has a negative moderating effect on the relationship between exploratory innovation and firm performance; Unabsorbed slack resources have a negative moderating effect on the relationship between exploitative innovation and firm performance.**

I. INTRODUCTION

Nowadays, firms face increasingly complicated and dynamic business environments. To obtain sustainable competitive advantages, on one hand firms must fully utilize their own knowledge to consolidate the advantages of their products, and on the other hand continue to explore new knowledge to adapt to technological trends and new environments [14]. March [22] is the first to propose the application of exploration and exploitation in organizational learning. Through other scholars' development and application (e.g. [32]; [17]; [28]), exploration and exploitation has become an important topic in the field of organizational learning and innovation.

Numerous studies have examined the performance implication of exploration and exploitation. However, the results of these studies are not consistent. While some studies suggested the balance between exploration and exploitation is the key to enhancing firm performance (e.g. [2]; [3]), other studies argued that a high level of ambidexterity (both exploration and exploitation are strong) can greatly enhance firm performance (e.g. [17]). These mixed results reflect that some critical boundary conditions that may affect the relationship between exploration/exploitation and performance remain hidden. Some studies considered external environments as one of the boundary conditions of exploration and exploitation [18]. On the basis of these studies we try to examine some internal organizational factors that may moderate the relationship between exploration/exploitation and performance. Therefore, this study will examine these moderating effects and try to provide a better understanding of how organizations may successfully respond to organizational structure and resource conditions through pursuing exploratory and exploitative innovations.

Our study contributes to existing literature in two ways. One lies in that it involves the organizational structure as the boundary condition of performance implication of exploration and exploitation. Previous studies suggested that organizational structure affects the efficiency of a firm's exploration and exploitation [19]. In our study, we will further examine the moderating effect of centralization and formalization (two dimensions of organizational structure) on the relationship between approaches of innovation and performance. In addition, from the resource-based view, we argue that slack resources available for the focal firm will moderate the relationship between approaches of innovation and performance. Based on Sharfman et al. [29]and Tan and Peng [31], we divided slack resources into unabsorbed slack and absorbed slack, and test their different moderating effect on the relationship between approaches of innovation and performance.

This paper uses data from 155 Chinese firms to investigate the moderating effects of organizational structure and slack resources on the relationship between approaches of innovation and firm performance. The remaining of the paper is organized as follows: Section II synthesizes the theory and hypotheses; Section III explains the methodology; Section IV presents the results; Section V gives the discussion; and Section VI concludes the paper.

II. THEORY AND HYPOTHESES

A. Exploratory Innovation and Exploitative Innovation

Exploratory innovation is a radical innovative behavior, aiming at accommodating new customers and new markets[5] [12]. Firms conduct exploratory innovation to create new niche markets, design new products, develop new distribution channels, or provide services to new consumer groups. This type of innovation tries to escape and surpass the existing knowledge base, emphasize on gaining and creating new knowledge [5] [20] [23]. Therefore, the core of exploratory innovation is to seek change, represents a long-term direction, and focuses on the re-examination of current perceptions and policies.

On the contrary, exploitative innovation is a progressive and small-step innovative behavior, looking to fulfill the current demands of consumers[5] [12]. This type of innovation expands the existing knowledge and technologies, improves current designs of products, offers new products and services, and increases the efficiency of existing

distribution channels. Therefore, exploitative innovation is based on the current knowledge and technologies, and seeks to improve the existing technological capabilities, process, and structure [5] [20]. The core of exploitative innovation is to increase reliability and emphasize the refinement of current perceptions and policies in the short-term. Our study will reexamine the relationship between exploratory/exploitative innovation and firm performance in a new research context.

B. The Moderating Effect of Organizational Structure on Innovation Method

Organizational structure often has two dimensions: centralization and formalization [9] [21] [25]. Centralization reflects how power is distributed and the degree to which policy decision is concentrated in the senior management level [1]. Formalization refers to the degree to which rules, procedures, instructions, and communications are formalized or written down in an organization [18] [19]. Both dimensions of organizational structure are expected to have impacts on innovation activities[18].

When the decision-making of an organization is centralized in the senior management level, its communication channels will become narrowed [9]. Centralization may reduce the quality and quantity of knowledge, and restrain the generation of new ideas to solve problems [30] [26]. Furthermore, employees' behaviors are more likely to be controlled in organizations with a high level of centralized decision-making. As a result, centralization lowers employees' incentives to generate new ideas to solve problems [3] [11]. However, exploratory innovation often requires innovative solutions to problems or combination of different knowledge domains, so it requires the focal firm to break away from common practices and organizational routines. Therefore, we argue that centralization inhibits the contribution of exploratory innovation to firm performance.

On the other hand, centralization is more likely to promote the process of exploitative innovation [30]. Exploitative innovations are limited in the scale and degree of innovation, so it does not require significant flexibility of organizational structure [16]. Therefore, the centralization of decision making and the relatively narrow communication channel are an advantage to achieving this type of small-scale improvements in a timely manner. In short, centralization can accelerate the process of exploitation innovation and enhance the relationship between exploitative innovation and firm performance.

Formalization stresses the abidance of existing rules and regulations [18] [19], so it might make employees incline to follow an established set of standard procedures, difficult for them to break away from routine practice and current organizational behaviors. However, the nature of exploratory innovation is radical change that tries to deviate away from existing knowledge base and create new strategic path [22] [17]. Obviously, formalization is likely to interfere the process of exploratory innovation and weaken the effect of exploratory innovation on firm performance.

On the contrary, organizations with a high degree of formalization are more likely to motivate employees to follow existing regulations and routines, and extract the best practice within the firm and diffuse it to subdivisions of the organization [18]. Thus, formalization is expected to improve the process of exploitative innovation, since exploitative innovation is a kind of progressive innovation, and tries to use existing knowledge to pursue given strategic objectives [17]. Therefore, in formalized organizations, exploitative innovation has a greater impact on firm performance.

Hence, we formulate the following hypotheses:

H1: Organizational structure has a moderating effect on the relationship between innovation direction and firm performance.

H1a: Centralization has a positive moderating effect on the relationship between exploitative innovation and firm performance.

H1b: Centralization has a negative moderating effect on the relationship between exploratory innovation and firm performance.

H1c: Formalization has a positive moderating effect on the relationship between exploitative innovation and firm performance.

H1d: Formalization has a negative moderating effect on the relationship between exploratory innovation and firm performance.

C. The Moderating Effect of Slack Resources on the Relationship between Approaches of Innovation and Firm Performance

Slack resources are excessive and disposable resources commonly existed in organizations [27]. Although slack resources are a "waste" without being used efficiently, they can serve as a cushion for a firm to adapt internal or external pressures, and help the firm modify its strategy to address external environments [7] [31]. Once slack resources are properly managed and utilized, they can nevertheless bring benefits to the firm.

Depending on whether slack resources are already deployed during the organizational process, they are divided into unabsorbed slack resources and absorbed slack resources[29]. Absorbed slack resources refer to those that are tied up with current operations and are difficult to redeploy, while unabsorbed slack resources are currently uncommitted, and are easier to redeploy. We propose that different slack resources have different moderating effects on the relationship between approaches of innovations and firm performance.

Unabsorbed slack resources are not focused on specific purpose, and can be redeployed to various organizational activities. Firms are more willing to reallocate this type of slack resources to those innovation efforts that can enhance their long-term competitiveness rather than using these resources for short term performance [31]. Exploratory innovation tries to create new knowledge and capabilities, and helps find new strategic opportunities in new product or

market domain [22]. Due to their high liquidity, unabsorbed slack resources are less restricted by organizational structure, and can be redeployed to other places to meet the demand of exploratory innovation. With sufficient unabsorbed slack resources, the focal firm can easily mobilize resources to discover strategic opportunities in new realm, and deploy resources to acquire the strategic opportunities to enhance firm performance. Therefore, unabsorbed slack resources can enhance the positive relationship between exploratory innovation and performance.

On the contrary, because unabsorbed slack resources are characterized by low degree of asset specificity [24], they may diminish the efficiency of exploitative innovation. Exploitative innovation is a kind of progressive and incremental innovation, and is expected to make changes in a given direction [17] [22]. With too much unabsorbed slack resources, the efficiency of exploitative innovation will be weakened to a certain extend. Unabsorbed slack resources are not focused on specific usage [18]. The strength of this type of resources lies in that they can be easily redeployed to make firm pursue new strategic opportunities, but unabsorbed slack resources are physical or intangible investments that are not specialized and unique to a specific task [35], which may weaken the efficiency of firm's efforts in a particular strategic direction because of their lack for specificity. Therefore, we propose the negatively moderating effect of unabsorbed slack resources on the relationship between exploitative innovation and performance.

Absorbed slack resources are idling or unutilized on a specific purpose, such as some expertise and operation capabilities that can only be used in particular fields. Absorbed slack resources are widespread in firms, and can be easily obtained and mobilized. However, because absorbed slack resources have been embedded into an organization's structure for specific purposes, they are cohesive and hard to be distinguished and redistributed to other areas [31]. Furthermore, absorbed slack resources coexist with other resources and are inseparable, so their usage is also restricted by the structure of other resources. Even if they are redistributed, they can only be utilized within a specific range.

Because of the high degree of asset specificity [24], absorbed slack resources are likely to have a positive moderating effect on the relationship between exploitative innovation and firm performance. Exploitative innovation requires the focal firm to mobilize its existing resources to accomplish the established strategic goal. If deployed correctly, absorbed resources are expected to enhance process of exploitative innovation to a great extent. Therefore, we propose that absorbed slack resources are likely to have a positive moderating effect on the relationship between exploitative innovation and firm performance.

Although unutilized, absorbed slack resources are difficult to redeploy [18], thus we argue that absorbed slack resources are more likely to have a negative moderating effect on the relationship between exploratory innovation and firm performance. Exploratory innovation of firm tries to create new knowledge base and find new strategic opportunities in new fields. Therefore, exploratory innovation requires the focal firm to redeploy its resources to address the environmental changes. However, absorbed slack resources, although are ready for further usage, are already embedded into firm's existing operations, and hard to redeploy [18]. As a result, absorbed slack resources may inhibit the focal firm's capability of redeploying its resources to pursue new strategic opportunities. That is to say, absorbed slack resources are likely to have a negative moderating effect on the relationship between exploratory innovation and firm performance.

Hence, we formulate the following hypotheses:

H2: Slack resources have a moderating effect on the relationship between external matching and firm performance.

H2a: Unabsorbed slack resources have a negative moderating effect on the relationship between exploitative innovation and firm performance.

H2b: Unabsorbed slack resources have a positive moderating effect on the relationship between exploratory innovation and firm performance.

H2c: Absorbed slack resources have a positive moderating effect on the relationship between exploitative innovation and firm performance.

H2d: Absorbed slack resources have a negative moderating effect on the relationship between exploratory innovation and firm performance.

The theoretic model of the moderating effect of organizational structure and slack resources is shown in Figure 1.

III. METHODOLOGY

A. Sample

We use surveys to collect data for our empirical study. Over 300 questionnaires are sent out and 198 collected. Some invalid questionnaires are deleted. First, the questionnaires from firms in monopolistic industries such as utility industry, aircraft manufacturing, and tobacco manufacturing, are excluded because we need peer comparison to measure firm performance; Second, questionnaires with answers of consistent pattern or those that are not carefully answered are deleted from the sample; Third, questionnaires returned from non-enterprise institutions such as universities and hospitals are also deleted. In the end, there are 155 valid samples. Table 1 shows the information of sample firms.

B. Measurement

To ensure the reliability and validity of our study, we choose the commonly used scales to measure constructs in the conceptual model (see Table 1). Since all our measures were originally constructed in English, we created Chinese versions for all measures following the commonly used translation–back translation procedure [8].

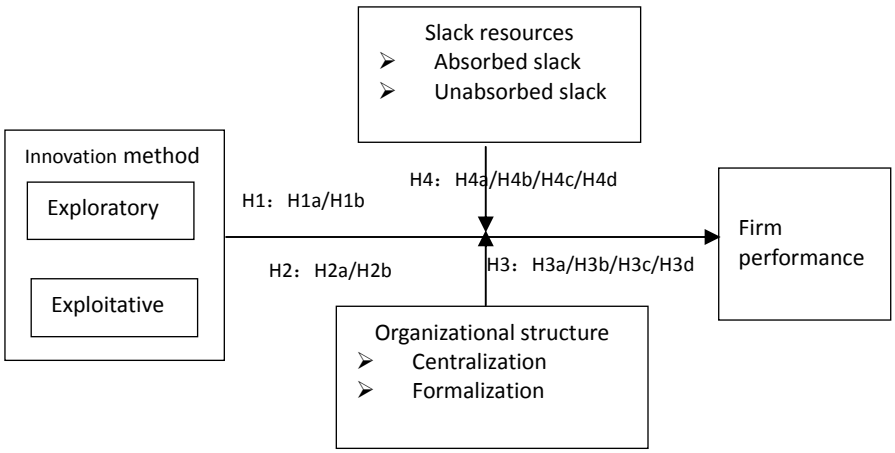

Figure 1: The Conceptual Model

TABLE1 INFORMATION OF SAMPLE FIRMS

Firm ownership			**Industry**		
Type	Number	Percentage (%)	Industry	Number	Percentage
State-owned	43	27.49	Manufacturing industry	73	46.78
Private	78	50.29	Service industry	48	30.99
Foreign-owned	15	9.36	Others	34	22.22
Sino-foreign equity joint venture	15	9.36	High-tech industry	86	55.48
Others	5	3.51	Traditional industry	69	44.52
Firm Scale			**Firm age**		
Number of people	Number	Percentage	Firm age	Number	Percentage
Less than 100	34	22.22	Less than two years	6	3.90
100-500	28	18.13	2 to 5 years	17	11.04
500-1000	17	11.11	6 to 10 years	25	16.23
1001-5000	35	22.81	11 to 15 years	31	20.13
More than 5000	40	25.73	More than 15 years	75	48.70

TABLE 2 THE MEASUREMENT OF VARIABLES

Variable	Number	Item
Firm Performance Use five-point scale to rate relative firm performance compared with main competitors: 1=very low, 5= very high.	A1	Market Share
	A2	Sales revenue
	A3	Profitability
	A4	Growth of total assets
	A5	Growth of revenue
	A6	Employee morale
	A7	Overall competitive advantages
Exploitative Innovation Use five-point scale to rate firm's exploitative innovation: 1=Strongly disagree, 5=Strongly agree.	B1	Frequently improve existing technologies and skills to adapt to current needs.
	B2	Try to increase the suitability of existing technologies and skills in multiple related businesses.
	B3	Frequently utilize existing technologies and skills to increase the number and features of products and services.
	B4	Frequently summarize accumulated experience to apply to current practice.
Exploratory Innovation Use five-point scale to rate firm's exploitative innovation: 1=Strongly disagree, 5=Strongly agree	C1	Frequently try to use immature and somewhat risky new technologies and skills.
	C2	Frequently try to develop new and unrelated subdivided markets.
	C3	Frequently try to use operational strategies and tactics that have not been used by peers within the same industry.
Centralization Use five-point scale to rate centralization of organizational structure: 1=Strongly disagree, 5=Strongly agree	D1	Employees have to report small things to their supervisors.
	D2	Even within one's responsibility, an employee has to acquire permission before taking action.
	D3	When encountering a special circumstance, an employee cannot determine on his/her own how to handle the event.
Formalization Use five-point scale to rate formalization of organizational structure: 1=Strongly disagree, 5=Strongly agree	E1	The firm has standard procedures for most routine practices, and these standards are written.
	E2	There is a complete and refined set of rules and systems.
	E3	It is required that everyone in the firm complies with the rules and codes.
Unabsorbed Slack Resources Use five-point scale to rate firm's unabsorbed slack resources: 1=Strongly disagree, 5=Strongly agree	F1	There are sufficient internal financial resources for use.
	F2	Retained earnings are sufficient to support market expansion.
	F3	There are abundant potential external connections to use.
	F4	At times of need, the firm can obtain loans or support from banks and other financial institutions.
Absorbed Slack Resources Use five-point scale to rate firm's absorbed slack resources: 1=Strongly disagree, 5=Strongly agree	G1	Existing technologies and equipment are sophisticated and modern, but not fully used.
	G2	Human capital and expertise are relatively abundant and have potentials.
	G3	Current production is below designed operating capacity.

Firm performance. This research uses the five-point Likert scale to measure firm performance. According to Wang, Tsui, Zhang and Ma [34], Tsui, Wang and Xin [33], we use 7 items (see Table 2) to measure firm performance, and these items are always used to measure firm performance in research in Chinese context. In order to ensure the validity of the measurement scale, we conducted a confirmatory factor analysis (CFA) with AMOS 4.0 to test the structure of the measure (see Table 3). The fit indices for CFA fell within a good range ($\chi 2$ (8) = 162.474, $p < .01$; CFI = .821; TLI = .731; RMSEA = .262). Cronbach's alpha was .916 for firm performance.

Exploitative innovation and explorative innovation. Exploitative innovation is to improve and enhance competitive advantages in firms' existing products or markets, while explorative innovation tries to help firms discover new competitive advantages in new products or markets [17]. According to He & Wong [16] and Jansen et al. [18], we use 4 items to measure exploitative innovation and 3items to measure explorative innovation (see Table 2). In order to ensure the validity of the measurement scale, we conducted a CFA with AMOS 4.0 to test the structure of the measure (see Table 4). The fit indices for CFA fell within a good range ($\chi 2$ (8) = 22.111, $p < .01$; CFI = .982; TLI = .970; RMSEA = .067). Cronbach's alpha was .873 for exploitative innovation and .785 for explorative innovation.

Organizational structure. We use formalization and centralization to describe the organizational structure in this study. Formalization refers to the degree to which organizations use formal rules and procedures to regulate employee's behaviors, and Centralization reflects how power is distributed and the degree policy decision is concentrated in the senior management level[18] [19]. According to Ferrell and Skinner [13] and Caruana, Morris, and Vella [10], we use 3 items to measure formalization and 3 items to measure centralization (see Table 2). In order to ensure the validity of the measurement scale, we conducted a CFA with AMOS 4.0 to test the structure of the measure (see Table 5). The fit indices for CFA fell within a good range ($\chi 2$ (8) = 20.119, $p < .01$; CFI = .970; TLI = .943; RMSEA = .099). Cronbach's alpha was .794 for formalization and .875 for centralization.

TABLE 3 CFA OF FIRM PERFORMANCE

Factor	Item	Standardized regression weights	regression weights	C.R.	P
Firm performance	A1	0.661	1.000		
	A2	0.754	1.053	8.318	***
	A3	0.820	1.118	8.924	***
	A4	0.867	1.147	9.326	***
	A5	0.869	1.111	9.343	***
	A6	0.677	0.912	7.582	***
	A7	0.831	1.038	9.018	***
x^2	162.474	CFI		0.821	
df	14	Tueker-Lewis（TLI）		0.731	
x^2/df	11.6	RMSEA		0.262	

TABLE 4 CFA OF EXPLOITATIVE INNOVATION AND EXPLORATORY INNOVATION

Factor	Item	Standardized regression weights	regression weights	C.R.	P
Exploitative innovation	B1	0.754	1.000		
	B2	0.828	1.070	10.191	*
	B3	0.858	1.095	10.521	*
	B4	0.748	1.000	9.168	*
Explorative innovation	C1	0.726	1.049		*
	C2	0.710	1.059	7.502	*
	C3	0.785	0.942	7.923	*
x^2	22.111	CFI		0.982	
df	13	Tueker-Lewis（TLI）		0.970	
x^2/df	1.7	RMSEA		0.067	

TABLE 5 CFA OF CENTRALIZATION AND FORMALIZATION

Factor	Item	Standardized regression weights	regression weights	C.R.	P
Centralization	D1	0.841	1.000		
	D2	0.705	0.789	7.509	**
	D3	0.707	0.845	7.516	**
Formalization	E1	0.826	1.000		
	E2	0.906	1.032	11.909	**
	E3	0.788	0.898	10.838	**
x^2	20.119	CFI		0.970	
df	8	Tueker-Lewis（TLI）		0.943	
x^2/df	2.51	RMSEA		0.099	

TABLE 6 CFA OF SLACK RESOURCES

Factor	Item	Standardized regression weights	regression weights	C.R.	P
Unabsorbed slack resources	F1	0.754	1.000		
	F2	0.828	1.070	10.191	*
	F3	0.858	1.095	10.521	*
	F4	0.748	1.000	9.168	*
Absorbed slack resources	G1	0.726	1.049		*
	G2	0.710	1.059	7.502	*
	G3	0.785	0.942	7.923	*
x^2	33.649	CFI		0.949	
df	13	Tueker-Lewis（TLI）		0.918	
x^2/df	2.59	RMSEA		0.102	

Slack resources. Slack resources can be divided into unabsorbed and absorbed slack resources. Absorbed slack resources refer to those that are tied up with current operations and are difficult to redeploy, while unabsorbed slack resources are currently uncommitted, and are easier to redeploy elsewhere. According to Tan and Peng [31], we use 4 items to measure unabsorbed slack resources and 3 items to measure absorbed slack resources (see Table 2). In order to ensure the validity of the measurement scale, we conducted a CFA with AMOS 4.0 to test the structure of the measure (see Table 6). The fit indices for CFA fell within a good range ($\chi 2$ (8) = 33.649, p < .01; CFI = .949; TLI = .918; RMSEA = .102). Cronbach's alpha was .836 for unabsorbed slack resource and .712 for absorbed slack resource.

Control Variables

To rule out the extraneous effects, we controlled scale, firm age, and industry type. In our study, we include a number of control variables: number of employees (for firm size), year of establishment, type of industry (1 for manufacturing, 0 for service and other), and high-tech to describe whether a firm is identified as a high-tech company by the government (1 for yes, 0 for no). Number of employees is used for the proxy of firm scale. Firm age was obtained based on the years of the firm's establishment.

C. Reliability and Validity

We tested the reliability of variables, and statistical results show that the values of Cronbach's α of all variables are greater than 0.7, representing a good reliability. All Item-Total Correlations are above 0.35 (not reported here), indicating that the overall measure of variables in the study has a high level of reliability.

We conducted confirmatory factor analysis to fit 27 scale items into 7 factors (results shown in Tables 3-6). The fitness indices of results are within good range, with standardized factor loadings between 0.661 and 0.906, p-value <0.01, showing good convergent validity.

IV. RESULTS

Table 7 provides descriptive statistics and a correlation matrix for the variables used in this study. As shown in Table 6, the correlations among independent variables are low. In order to examine potential collinearity among the variables, we calculated variance inflation factors (VIFs) associated with each of the predictors in our model. The maximum value of VIFs ranged from1.920 to 2.17 (see Table 7), suggesting no problem of collinearity.

We relied on OLS regression to test our hypotheses. As shown in Table 8, model 1 only includes control variables, model 2 and model 3 gradually include exploitative innovation and exploratory innovation. Models 4 to 7 are to test the moderating effects of centralization, formalization, unabsorbed slack resources, and absorbed slack resources respectively.

TABLE 7 MEANS, STANDARD DEVIATIONS, AND CORRELATIONS

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
Firm Performance	3.508	.843										
Scale	2.987	1.546	.346***									
Age	3.877	1.250	.330***	.628***								
High_tech	.561	.498	.097	.271**	.070							
Manufacturing industry	.458	.500	-.001	.310***	.174*	.108						
Exploitative innovation	3.776	.869	.490***	.201*	.212**	.188*	.006					
Exploratory innovation	3.088	.984	.423**	.176*	.127	.159*	-.034	.530**				
Centralization	2.746	1.089	.073	.040	.041	-.043	.076	-.020	-.073			
Formalization	3.871	.958	.314***	.429***	.385***	.080	.147	.358***	.231**	.260***		
Unabsorbed resources	3.455	.869	.465***	.334***	246**	.127	.104	.413***	.300***	.015	.381***	
Absorbed resources	3.351	.773	.326***	.174*	.148	.160*	.153	.313***	.370***	.050	.338***	.435***

N=143; +P < 0.10; *p < 0.05; **P< 0.01; ***P < 0.001

TABLE 8 RESULTS OF REGRESSIONS

	Model1	Model 2	Model 3	Model 4	Model 5	Model 6	Model7
Constant	2.663***	1.376***	1.228***	1.234***	1.237***	1.741***	1.449***
Control variables							
Scale	.257*	.124*	.205*	.197*	.176+	.139	.204*
Age	.187+	.116	.124	.120	.125	.127	.114
High_tech	.026	-.044	-.053	-.042	-.041	-.035	-.068
Manufacturing_industry	-.116	-.089	-.075	-.071	-.064	-.085	-.096
Independent variables							
Exploitative innovation		.429***	.324***	3.824***	.299***	.226**	.310***
Exploratory innovation			.205**	2.831***	.249**	.188*	.166*
Centralization				.092			
Formalization					.042		
Unabsorbed slack resource						.242***	
Absorbed slack resources							.137+
Exploitative*Centralization				.113+			
Exploratory*Centralization				-.031			
Exploitative*Formalization					.109		
Exploratory*Formalization					-.181*		
Exploitative*Unabsorbed						-.149+	
Exploratory* Unabsorbed						.109	
Exploitative*Absorbed							.028
Exploratory* Absorbed							-.048
Model Statistics							
R^2	.153	.323	.352	.369	.370	.410	.369
Adjusted R^2	.131	.300	.326	.330	.331	.374	.330
F	6.799***	14.186***	13.409***	9.423***	9.466***	11.208***	9.441***
Max. value of VIF	1.920	1.926	1.942	2.031	2.078	2.054	2.171

The results of model 3 show that there is a significantly positive relationship between exploitative innovation and firm performance (β=0.324, P<0.01) and a significant positive relationship between exploratory innovation and firm performance (β=0.205, P<0.01). This finding is consistent with prior research.

Model 4 shows that the interaction term between exploitative innovation and centralization has a significant and positive effect on firm performance (β=0.113, P<0.10), so hypothesis H1a is supported. The interaction term between exploitative innovation and centralization has no significant effect on firm performance (β= -0.031, P>0.1). Hypothesis H1b is not supported, but the direction of its moderating effect is consistent with what we expected. Model 5 shows that the interaction term between exploitative innovation and formalization has no significant effect on firm performance (β= 0.109, P>0.1)，so hypothesis H1c is not supported, but the direction of its moderating effect is consistent with what we expected. The interaction term between exploratory innovation and formalization has a significant and negative effect on firm performance (β= -0.181, P<0.05)， so hypothesis H1d is supported. Therefore, hypothesis H1 is partially supported.

Model 6 shows that the interaction term between exploitative innovation and unabsorbed slack resources has a significant and negative effect on firm performance (β= -0.149, P<0.05), so hypothesis H2a is supported. The interaction term between exploratory innovation and unabsorbed slack resources has no significant effect on firm performance (β= 0.109, P>0.1)，so hypothesis H2b is not supported. In model 7, the interaction term between exploitative innovation and absorbed slack resources has no significant effect on firm performance (β= 0.028, P>0.1)，so hypothesis H2c is not supported. The interaction term between exploratory innovation and absorbed slack resources has no significant effect on firm performance, (β= -0.48, P>0.1)， so H2d is not supported. Although the above hypotheses do not have statistical significance, the directions of their moderating effects are consistent with our expectation. Therefore, hypothesis H2 is partially supported.

V. DISCUSSIONS

Using empirical data of 155 Chinese firms, we examined the moderating effects of organizational structure and slack resources on the relationship between approaches of innovation and firm performance. We confirm the result of prior research in that both exploratory innovation and exploitative innovation have positive effects on firm performance by using a sample from emerging economies. The results of this study show that organizational structure has a moderating effect on the relationship between approaches of innovation and firm performance. Specifically, centralization has a positive moderating effect on the relationship between exploitative innovation and firm performance, but it does not have a significant moderating effect on the relationship between exploratory innovation and firm performance. Formalization has a negative moderating effect on the relationship between exploratory innovation and firm performance, and it does not have a significant

moderating effect on the relationship between exploitative innovation and firm performance. Unabsorbed slack resources have a negative moderating effect on the relationship between exploitative innovation and firm performance, but they do not have a significant effect on the relationship between exploratory innovation and firm performance. Absorbed slack resources do not show any significant moderating effects on the relationship between either type of innovation and firm performance.

In our study, we try to examine moderating effects of centralization and formalization on the relationship between approaches innovation and firm performance by using the data from emerging economies. Jasen et al. [18] suggested that organizational structure is the important antecedent of firms' exploitative and exploratory innovation. Using data of firms from developed economies, they found that centralization inhibits exploratory innovation and formalization promotes exploitative innovation. Based on prior studies, this study examines the moderating effects of centralization and formalization and provides a clearer understanding of how organizations may successfully respond to organizational structure conditions through pursuing internal exploratory and exploitative innovations. It suggests that both types of innovation generate diverse performance outcomes under different organizational structure.

The results are consistent with our expectations in that centralization has a positive moderating effect on the relationship between exploitative innovation and firm performance. The main reason is that exploitative innovation requires minor changes in the current organizational operations, and centralization is helpful in making timely decisions toward this type of incremental innovations, so centralization accelerates the speed of exploitative innovation. On the other hand, formalization has a negative moderating effect on the relationship between exploratory innovation and firm performance. The rationale is that exploratory innovation requires breaking routine practices and move away from current organizational structure, and formalization emphasizes on the compliance with established rules and procedures, so employees in formalized organizations are more likely to follow an ossified set of reactions to surrounding changes, which inhibits the process of exploratory innovation. Formalization does not have any significant impact on the relationship between exploitative innovation and firm performance, nor does centralization have on the relationship between exploratory innovation and firm performance.

There are limited researches that use slack resources as a moderating variable between exploitation/exploration and performance. On the basis of resource-based view [6], our study enriches the existing empirical literature through the examination of the moderating effects of slack resources, and shows that both types of innovation lead to different performance outcomes under different resource portfolio. Our study suggests that unabsorbed slack resources have a negative moderating effect on the relationship between exploitative innovation and firm performance. The rationale is that the more unabsorbed slack resources, the less effective exploitative innovation is, because unabsorbed slack resources inhibit the firm from utilizing existing innovation opportunities to improve firm performance. However, we are unable to confirm the moderating effect of unabsorbed slack resources on the relationship between exploratory innovation and firm performance or the moderating effect of absorbed slack resources on the relationship between exploitative innovation and firm performance. Nevertheless, our study still provides good insights on the issue of "the match between exploitation/exploration and slack resources", which enriches the existing literature.

A limitation of this paper is that we used a cross-sectional research design, but innovation activities and the improvement of firm performance are a long-term process, so maybe a longitudinal study is better to study the mechanism of the effects of variables. Additionally, future studies can use different measures of firm performance (i.e., separately measuring long-term and short-term performances, efficiency, and effectiveness), so that the effects of exploratory and exploitative innovations as well as other boundary conditions can be better distinguished.

VI. CONCLUSION

This paper tested the moderating effects of organizational structure and slack resources on the relationship between approaches of innovation and firm performance. We confirmed that both exploitative innovation and exploratory innovation have significant and positive effects on firm performance. In addition, the results suggest that centralized organizational structure has a positive moderating effect on the relationship between exploitative innovation and firm performance, formalized organizational structure has a negative moderating effect on the relationship between exploratory innovation and firm performance, and unabsorbed slack resources have a negative moderating effect on the relationship between exploitative innovation and firm performance.

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