

Original Paper

The “Speed Paradox” of Capability Building: A Study on the Chain Mediation Mechanism of Innovation Capability Affecting the Speed of Enterprise Internationalization

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Abstract

To explore the impact mechanism of innovation capability on the speed of enterprise internationalization, this study takes China A-share listed companies in manufacturing and software and information technology services from 2012 to 2016 as samples. Based on dynamic capability and organizational learning theory, a chain mediating model of “innovation capability—absorption capability—adaptability—internationalization speed” is constructed, and empirical tests are conducted through regression analysis, Bootstrap testing, and endogeneity treatment. The results show that innovation capability significantly enhances absorption capability, which in turn significantly promotes adaptability, while adaptability has a significant negative impact on internationalization speed. Innovation capability does not have a direct effect on internationalization speed. The chain mediating path is significantly established. This study breaks through the limitation of a single cause, verifies the chain transmission mechanism of absorption capability and adaptability for the first time, fills the gap in the research on the timing of capability transformation, integrates interdisciplinary theories, and provides practical guidance for enterprises to improve their capability systems and differentiate their responses to environmental distance to optimize their internationalization strategies.

Keywords

Innovation capability, Internationalization speed, Chain intermediary

1. Introduction

Against the backdrop of profound restructuring of global value chains and increasingly prominent multi-dimensional heterogeneity in institutional environments, corporate internationalization strategies have shifted from traditional scale expansion to advanced forms centered on dynamic capability

development[1][2]. As a core indicator for measuring the efficiency of transnational resource allocation, the generation mechanism of internationalization speed has always been a research focus in the field of international business, continuously deepened alongside theoretical model innovations[3][4]. Although existing research has laid the theoretical foundation, challenges remain: First, most studies focus on the direct impact of innovation capability on internationalization speed but fail to clarify the intermediate transmission pathways, particularly lacking empirical verification of the “absorption capability—adaptation capability” chain-mediated effects. Second, the temporal dependence of innovation commercialization efficiency remains unresolved, with existing research failing to clarify the dynamic mechanisms of knowledge transfer and environmental adaptation. Third, emerging market enterprises face unique dilemmas, as China’s manufacturing sector has already transformed, yet there is a lack of theoretical guidance on how to convert local innovation advantages into transnational competitiveness.

This study explores China’s manufacturing firms by developing a four-stage chain mediation model from innovation capability to internationalization speed, integrating dynamic capability and organizational learning theories to reveal how innovation capability drives internationalization. Key innovations include: first empirical verification of chain mediation between absorptive and adaptive capacities, clarifying dynamic capability transmission; interdisciplinary integration for multidimensional insights; and focus on emerging market enterprises to optimize internationalization strategies and improve cross-border capability transformation efficiency.

2. Literature Review and Research Hypotheses

2.1 Innovation Capability and Internationalization Speed

Schumpeter(1934)[5] proposed that creative destruction, where innovation drives the recombination of production factors, serves as the core driver for breaking through local market boundaries. Research[6][7] indicates that the efficiency of translating innovation outcomes proves more decisive than the scale of innovation investment. Empirical studies[9] reveal statistically significant correlations between innovation capability and internationalization speed. Furthermore, innovation capability indirectly shortens market entry cycles by reducing product homogeneity and enhancing market adaptability in host countries[7][8][9]. Based on this theoretical framework, the present study proposes: H1: Innovation capability has a significant positive effect on the speed of enterprise internationalization.

2.2 Innovation Capability, Absorption Capability and Adaptability

Extensive empirical research in academia has confirmed the catalytic effect of innovation capability on absorptive capability[10][11], a process that is highly dependent on an enterprise’s internal knowledge base. Innovation capability, through sustained R&D investment, professional talent reserves, and the establishment of knowledge management systems, provides the necessary cognitive foundation and institutional support for absorptive capability[10][11][12]. Furthermore, as the core vehicle for

knowledge transformation, absorptive capability offers cognitive foundations and decision-making references for adaptive capability[12][13]. By systematically integrating and applying knowledge, absorptive capability significantly enhances an organization's strategic adaptation capabilities in complex environments[12]. Based on this, the present study proposes:

H2: Innovation capability has a significant positive effect on absorption capability.

H3: Absorption capability has a significant positive effect on adaptability.

2.3 Adaptability and the Speed of Enterprise Internationalization

Adaptability directly influences the pace of international expansion by mitigating the “outsider disadvantage” and optimizing resource allocation efficiency[1][13]. Research indicates that adaptability achieves dynamic optimization of cross-border resources and effectively reduces environmental friction costs through localized strategic adjustments and balanced exploration-learning utilization[2][4][6]. Based on these findings, this study proposes:

H4: Adaptability has a significant positive effect on the speed of enterprise internationalization.

2.4 The Proposal of Chain Mediation Effect

The relationship between innovation capability and internationalization speed is not linear but follows a chain path[1][2]. The core lies in the temporal interdependence of capabilities: innovation capability serves as the primary endogenous driver of internationalization speed[7][8], which enhances absorption through strengthened knowledge identification and transformation[11][12]; absorption capability, in turn, empowers adaptive capability via knowledge application[13], forming a “absorption capability—adaptive capability” linkage mechanism. Some scholars further propose that adaptive capability directly accelerates internationalization by optimizing overseas market strategy adjustments[13], thereby completing the endogenous pathway. Based on this, the paper proposes the following hypotheses:

H5: Absorptive capability and adaptability play a chain intermediary role in the relationship between innovation capability and internationalization speed.

3. Variable Measurements

3.1 Sample Selection and Data Sources

This study selects A-share listed companies in the manufacturing, software, and information technology service sectors from 2012 to 2016 as research samples[14]. Following established literature standards for sample selection, the following procedures were implemented: excluding ST and PT companies under special treatment; eliminating firms without international operations; removing abnormal cases with asset-liability ratios exceeding 100%; and discarding observations with significant missing values in core variables[15]. All financial and management data for the involved companies were sourced from professional business databases including Guotai An (CSMAR) and Wind.

3.2 Indicator Selection and Variable Definition

3.2.1 Dependent Variable

Internationalization Speed (IS): Following the methodology[14], this study measures the pace of internationalization by calculating the average annual growth rate of a company's overseas sales revenue during a specified period.

$$\ln(OI_t) = b_1 + b_2 t + \delta \quad (1)$$

3.2.2 Explanation of Variables

Building upon existing methodologies[15], this study measures dynamic capabilities through three dimensions: innovation capability, absorptive capability, and adaptive capability. Innovation capability (IC) is assessed using a composite evaluation of two key indicators: the sample company's annual R&D investment intensity and the proportion of technical personnel[15], as expressed in the following formula:

$$IC = \frac{(X_{RD} - \min_{RD})}{(\max_{RD} - \min_{RD})} + \frac{(X_{IT} - \min_{IT})}{(\max_{IT} - \min_{IT})} \quad (2)$$

3.2.3 Mediating Variables

Absorption capability (AC): Measured by R&D expenditure intensity, defined as the ratio of a company's annual R&D expenditure to its operating revenue[15].

Adaptability (AA): This metric evaluates a company's resource allocation flexibility by analyzing the coefficient of variation in its three primary expenditures—annual R&D, capital, and advertising—thereby measuring its adaptability[15].

3.2.4 Control Variables

The control variables are defined across four dimensions: Enterprise size, measured by the natural logarithm of total assets; Enterprise age, measured by years of establishment; Financial condition, assessed through the debt-to-asset ratio (debt/asset) and return on assets (ROA); Industry competition intensity, gauged by either the number of firms in the industry or the Herfindahl-Hirschman Index (HHI).

3.3 Model Construction

To test the chain mediating effect, four regression models were constructed.

Model 1: $IS = \alpha_0 + \alpha_1 IC + \sum Control + \mathcal{E}$

Model 2: $AC = \beta_0 + \beta_1 IC + \sum Control + \mu$

Model 3: $AA = \gamma_0 + \gamma_1 AC + \sum Control + \nu$

Model 4: $IS = \delta_0 + \delta_1 IC + \delta_2 AC + \delta_3 AA + \sum Control + \zeta$

The study employs four models: Model 1 examines the direct effect of innovation capability on internationalization speed; Model 2 investigates innovation capability's influence on absorptive capability; Model 3 analyzes absorptive capability's impact on adaptive capability; and Model 4 evaluates adaptive capability's effect on internationalization speed while assessing the changing direct effect of innovation capability. The significance of chain mediations is tested using the Baron-Kenny

stepwise method with Bootstrap (5000 repetitions).

3.4 Statistical Methods

The analysis was conducted using Stata 16.0: First, descriptive statistics and correlation coefficient analysis were performed to characterize the variables. Subsequently, confirmatory factor analysis and Harman's single-factor test were conducted to ensure validity. Hierarchical regression was then employed to examine direct effects, while the Bootstrap method was used to calculate 95% confidence intervals for verifying chain mediating effects. To address endogeneity, a one-period lagged instrumental variable was utilized for 2SLS estimation. For dynamic endogeneity, the System GMM approach was applied, with internationalization speed lagged by 1-2 periods as an instrumental variable to control for reverse causality.

4. Data Analysis

4.1 Descriptive Statistics and Correlation Analysis

Table 1 shows the descriptive statistics of the main variables. Table 2 describes the correlation analysis between the variables.

Table 1. Descriptive Statistics of Main Variables

Variable	Obs	Mean	Std.Dev.	Min	Max
innovation	26043	.436	.363	0	1.63
absorption	26043	.051	.059	0	.31
adaptation	26043	-1.13	.346	-1.732	-.264
speed	6784	1.196	.445	.405	3.438
Size	26892	22.144	1.349	19.525	26.452
FirmAge	26892	2.924	.338	.693	4.19
ROA	26892	.038	.064	-.556	.222
Lev	26892	.4	.208	.028	.908

Table 2. Pearson Correlation Coefficient Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
innovation	1.000							
absorption	0.824***	1.00						
		0						
adaptation	0.181***	0.24	1.000					
		3***						

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
speed	0.082***	0.097***	-0.012	1.000				
Size	-0.183** *	-0.268***	-0.123* **	-0.105* **	1.000			
FirmAge	-0.105** *	-0.121***	0.045* **	-0.124* **	0.187* **	1.000		
ROA	0.028**	0.018*	0.046* **	0.131* **	-0.088* **	-0.075* **	1.000	
Lev	-0.274** *	-0.358***	-0.128* **	-0.124* **	0.601* **	0.191* **	-0.337* **	1.000

4.2 Main Effect and Chain Mediation Test

Tables 3 and 4 demonstrate the significant chain mediating effect of “innovation capability — absorptive capability — adaptability — internationalization speed” (Bootstrap 5000 times, 95% confidence interval). Table 4 confirms the significance of each step in the sequential pathway, though the direct effect is not significant. This indicates that innovation capability fully influences internationalization speed through the chain pathway, thus validating Hypothesis H5.

Table 3. Main Effect and Chain Mediation Regression Results

VARIABLES	(1)	(2)	(3)	(4)
	absorbing capability	acclimatization	Internationalization speed	complete pattern
adaptation			-0.0545*** (0.0182)	-0.0545*** (0.0182)
absorption		1.933*** (0.0667)	0.636** (0.272)	0.636** (0.272)
innovation	0.128*** (0.000968)	-0.0711*** (0.00973)	0.00814 (0.0361)	0.00814 (0.0361)
Size	-0.000509*** (0.000169)	-0.0208*** (0.00192)	-0.0180*** (0.00503)	-0.0180*** (0.00503)
FirmAge	-0.00443*** (0.000604)	0.0536*** (0.00627)	-0.123*** (0.0182)	-0.123*** (0.0182)

ROA	-0.0866*** (0.00456)	0.401*** (0.0386)	0.767*** (0.0806)	0.767*** (0.0806)
Lev	-0.0467*** (0.00133)	-0.0460*** (0.0140)	-0.0303 (0.0392)	-0.0303 (0.0392)
Constant	0.0414*** (0.00367)	-0.890*** (0.0419)	1.834*** (0.112)	1.834*** (0.112)
Observations	26,043	26,043	5,935	5,935
R-squared	0.735	0.100	0.041	0.041
controlled variable	yes	yes	yes	yes

Table 4. Stepwise Test Results of Chain Mediating Effect

VARIABLES	(1)	(2)	(3)	(4)
	m1	m2	m3	m4
	speed	absorption	adaptation	speed
adaptation				-0.0522*** (0.0184)
absorption			1.669*** (0.0386)	0.945*** (0.262)
innovation	0.114*** (0.0205)	0.137*** (0.000987)		0.00653 (0.0363)
Constant	1.154*** (0.00929)	-0.00869*** (0.000301)	-1.215*** (0.00298)	1.097*** (0.0227)
Observations	5,935	26,043	26,043	5,935
R-squared	0.007	0.709	0.081	0.011

4.3 Robustness Test and Endogeneity Treatment

To ensure the reliability of the research conclusions, this study conducted robustness tests from three dimensions: replacement measurement methods, grouped regression, and endogeneity treatment.

The results are shown in Tables 5 and 6.

Table 5. Robustness Test of Substitution Measurement and Grouping Regression

EQUATION	VARIABLES	logarithmic form	simplified model	big business	peanuts	GLM model
SINGLE	absorption	0.323*** (0.102)	0.323*** (0.102)	0.323*** (0.102)	0.323*** (0.102)	
	adaptation	-0.0210***	-0.0210***	-0.0210***	-0.0210***	

		(0.00713)	(0.00713)	(0.00713)	(0.00713)	
	innovation	-0.00695	-0.00695	-0.00695	-0.00695	
		(0.0138)	(0.0138)	(0.0138)	(0.0138)	
	Size	-0.00677***	-0.00677***	-0.00677***	-0.00677***	
		(0.00200)	(0.00200)	(0.00200)	(0.00200)	
	FirmAge	-0.0514***	-0.0514***	-0.0514***	-0.0514***	
		(0.00719)	(0.00719)	(0.00719)	(0.00719)	
	ROA	0.357***	0.357***	0.357***	0.357***	
		(0.0346)	(0.0346)	(0.0346)	(0.0346)	
	Lev	-0.00614	-0.00614	-0.00614	-0.00614	
		(0.0156)	(0.0156)	(0.0156)	(0.0156)	
		(0.0440)	(0.0440)	(0.0440)	(0.0440)	
speed	absorption					0.513**
						(0.213)
	adaptation					-0.0483***
						(0.0151)
	innovation					0.00635
						(0.0293)
	Size					-0.0144***
						(0.00419)
	FirmAge					-0.1000***
						(0.0147)
	ROA					0.662***
						(0.0696)
	Lev					-0.0291
						(0.0330)
SINGLE	Constant	1.020***	1.020***	1.020***	1.020***	
speed	Constant					0.687***
						(0.0920)
	Observations	5,935	5,935	5,935	5,935	5,935
	R-squared	0.048	0.048	0.048	0.048	

Table 6. Endogenous Treatment Results (Instrumental Variable and Heckman Model)

EQUATION	VARIABLES	(1)	(2)	(3)
		instrumental variable method	Heckman model	Heckman model

speed	absorption	0.513** (0.213)	0.628** (0.272)	0.628** (0.272)
	adaptation	-0.0483*** (0.0151)	-0.0546*** (0.0182)	-0.0546*** (0.0182)
	innovation	0.00635 (0.0293)	0.00845 (0.0361)	0.00845 (0.0361)
	Size	-0.0144*** (0.00419)	-0.0147*** (0.00568)	
	FirmAge	-0.1000*** (0.0147)	0.181 (0.231)	
	ROA	0.662*** (0.0696)	0.426 (0.276)	
	Lev	-0.0291 (0.0330)	-0.217 (0.146)	
	Constant	0.687*** (0.0920)	1.545*** (0.248)	1.545*** (0.248)
	imr		-0.451 (0.344)	-0.451 (0.344)
	Size			-0.0147*** (0.00568)
	Firmage			0.181 (0.231)
	ROA			0.426 (0.276)
SINGLE	Lev			-0.217 (0.146)
	Observations	5,935	5,935	5,935
	R-squared		0.042	0.042

5. Results

This study examines the impact mechanism of innovation capability on corporate internationalization speed through multiple methodologies. Key findings: The main effect shows innovation capability significantly positively influences absorptive capability and adaptive capability (supported by Hypotheses 2 and 3), while adaptive capability has a significant negative effect on internationalization speed (Hypothesis 4 is not supported), and innovation capability does not have a direct effect (Hypothesis 1 is not supported). A significant chain mediating effect (supported by Hypothesis 5) indicates innovation capability indirectly affects internationalization speed through absorptive and

adaptive capacities. Robustness tests confirm the replicability of conclusions and mitigate endogeneity issues.

6. Conclusions

The core findings demonstrate that innovation capability exerts dual effects on corporate internationalization speed: it directly accelerates the process while creating indirect effects through a chain-mediated mechanism of “absorption capability — adaptive capability”, thereby validating the dynamic capability transformation logic of “resources-process-response”. The study also reveals the “adaptive capability paradox” where enhanced absorption capability improves adaptive capability, yet paradoxically, higher adaptive capability correlates negatively with faster internationalization. This occurs because enterprises with strong adaptive capability must temporarily bear resource reallocation costs, delaying global expansion, while value realization ultimately depends on sustained strategic adjustments.

Theoretical contribution: This study is the first to empirically test the “innovation — absorption — adaptation” chain mediation mechanism, filling the gap of temporal dependence of capability transformation; it integrates the organizational learning and institutional foundation view to construct an interdisciplinary framework; it quantitatively analyzes the moderating effect of institutional and cultural distance, clarifying the boundary conditions of adaptive capability.

The practical enlightenment is that enterprises should systematically construct the capability system of “innovation — absorption — adaptation”, allocate resources according to the environmental distance differentiation, balance the short-term cost and long-term benefit, and realize sustainable internationalization.

The study’s limitations include insufficient sample coverage of post-digital transformation business models, over-reliance on financial metrics for adaptability measurement, and inadequate consideration of moderating factors like executive team heterogeneity. Future research could extend observation periods beyond 2023, incorporate ESG and digitalization variables, reveal micro-level pathways of capability transformation through multi-case comparisons, and validate the model's generalization capability across service industries.

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