Managing Knowledge Stock and Flow: Building Absorptive Capacity from an Ambidextrous Perspective Postprint

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Abstract

[Purpose/Significance] This study aims to bridge the theoretical gap between the organizational ambidexterity perspective, which posits that knowledge stock and knowledge flow should be balanced, and the knowledge-based view, which contends that these two elements are not always harmonious, thereby providing theoretical guidance for management practice.

[Method/Process] We construct the balancing and combinative dimensions of knowledge ambidexterity, and empirically examine the effects of knowledge ambidexterity on absorptive capacity as well as the moderating role of firm size.

[Results/Conclusion] Based on survey data from 215 enterprises, the findings indicate that: the combinative dimension of knowledge ambidexterity exerts a significant positive effect on absorptive capacity; the interaction between the balancing and combinative dimensions of knowledge ambidexterity has a significant positive effect on absorptive capacity; and firm size positively moderates the relationship between the combinative dimension of knowledge ambidexterity and absorptive capacity.

Full Text

Managing Knowledge Stocks and Flows: Building Absorptive Capacity from an Ambidexterity Perspective

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Abstract

[**Purpose/Significance**] This study aims to bridge the theoretical gap between the organizational ambidexterity perspective, which emphasizes maintaining balance between knowledge stocks and knowledge flows, and the knowledge-based view, which suggests that these two elements do not always coexist harmoniously, thereby providing theoretical guidance for management practice. [**Method/Process**] We construct balance and combined dimensions of knowledge ambidexterity and examine their effects on absorptive capacity, as well as the moderating role of firm size. [**Result/Conclusion**] Based on questionnaire data from 215 firms, the results indicate that the combined dimension of knowledge ambidexterity has a significant positive impact on absorptive capacity; the interactive effect between the balance and combined dimensions of knowledge ambidexterity significantly and positively influences absorptive capacity; and firm size positively moderates the relationship between the combined dimension of knowledge ambidexterity and absorptive capacity.

Keywords: knowledge stocks; knowledge flows; absorptive capacity; organizational ambidexterity; knowledge ambidexterity

Introduction

Organizational knowledge constitutes the foundational source of competitive advantage. The pressures of a rapidly changing technological and economic environment have intensified challenges to organizational survival and development. To overcome these obstacles, seize external opportunities, and maintain internal vitality, organizations must effectively absorb, integrate, and utilize knowledge in both static and dynamic states. Extant research from an organizational ambidexterity perspective has emphasized the importance of maintaining dynamic balance between exploiting existing knowledge and acquiring new knowledge [1-2]. I. Dierickx and K. Cool [3] conceptualized organizational knowledge as knowledge stocks (current organizational knowledge) and knowledge flows (acquisition of external new knowledge), and examined the dynamic balance between them. Meanwhile, numerous studies from the knowledge-based view have investigated the relationship between knowledge stocks, knowledge flows, and performance [4-5]. A. AL-Laham et al. [6] further discovered that while maintaining balance between knowledge stocks and flows, these elements exhibit positive interactive effects, though such interaction requires certain preconditions. In contrast, management practice reveals numerous instances of conflict and competition between knowledge stocks and flows, such as executives choosing between "external hiring" and "internal promotion," or the common business dilemma of "make versus buy." The academic community has yet to explain and theoretically explore such issues from the perspective of knowledge flows and stocks.

From a dynamic capabilities perspective, absorptive capacity is regarded as the ability to digest, absorb, and apply knowledge—a critical component of learning

capability that enables firms to rapidly renew themselves and maintain vitality. Absorptive capacity is undoubtedly essential for the success of outstanding enterprises [7]. However, absorptive capacity is strictly constrained and influenced by the attributes of knowledge itself. For instance, W. M. Cohen and D. A. Levinthal [8] examined the relationship between knowledge stocks and absorptive capacity, arguing that absorptive capacity is a function of prior knowledge stocks. Knowledge flows, defined as new knowledge input from outside the firm, can increase the depth and breadth of organizational knowledge [9]. When firms accumulate sufficient absorptive capacity for knowledge flows, they can maintain adequate knowledge reserves and capabilities to respond to external environmental changes [10]. Nevertheless, scholarly attention has rarely focused on how the competitive-cooperative relationship between knowledge stocks and flows influences absorptive capacity.

Current research on knowledge stocks, flows, and absorptive capacity suffers from several limitations [11]. First, existing studies have focused more on knowledge flows while neglecting knowledge stocks [12-13]. For example, research on knowledge flows has examined alliances and networks [14-16], employee mobility [6,17], and R&D investment [8], whereas studies on knowledge stocks remain insufficient. Second, current research often examines knowledge stocks and flows separately [5,18] or investigates their relationships without attending to competitive dynamics [19]. Third, existing research on knowledge stocks and/or flows has primarily focused on impacts on firm performance or competitive advantage [4-6], but limited attention has been paid to how these elements influence absorptive capacity. As H. W. Volberda et al. [11] noted, absorptive capacity research should examine its relationship with organizational knowledge stocks and flows.

This study introduces the organizational ambidexterity perspective to investigate knowledge ambidexterity and its impact on absorptive capacity, providing a new theoretical lens for understanding how firms manage the tension between utilizing knowledge stocks and developing knowledge flows.

Theoretical Development and Hypotheses

Absorptive Capacity

Absorptive capacity represents the ability to identify external knowledge, digest it, and convert it into commercial benefits [8]. W. M. Cohen and D. A. Levinthal [8] argued that firm-level absorptive capacity depends on individual absorptive capacity. As an integrated entity, a firm faces knowledge at three interfaces: within individuals, across external organizations, and flowing between the former two. Firms must facilitate efficient knowledge flow within and across organizational boundaries while enhancing their ability to integrate and utilize knowledge—namely, inward, outward, and hybrid absorptive capacity. Hybrid absorptive capacity can be considered a trade-off between the first two types, though subsequent research has not deeply examined this form [11].

From a process perspective, S. A. Zahra and G. George [7] conceptualized absorptive capacity as comprising two dimensions: potential absorptive capacity (PAC) and realized absorptive capacity (RAC), which consist of different knowledge management processes yet remain complementary. Since these two dimensions focus on distinct knowledge activities and processes, they are constituted by different organizational routines and procedures [20]. PAC includes knowledge acquisition and assimilation processes that help maintain firms' exploratory capabilities as a reserve for future capacity, while RAC encompasses knowledge transformation and exploitation that enables firms to realize current value. Consequently, firms must balance PAC and RAC [21,27], reducing the gap between them to maintain absorptive capacity efficiency at an appropriate level [7]. A. Y. Lewin et al. [20] further emphasized the importance of balancing internal knowledge creation processes with the identification, acquisition, and assimilation of external new knowledge (i.e., internal and external absorptive capacity). Balancing different dimensions of absorptive capacity represents a critical dynamic capability [20] that ensures sustained competitive advantage. To better explain the effects of PAC and RAC, J. J. P. Jansen et al. [21] suggested that future research should examine different types of balance between PAC and RAC.

Therefore, we argue that knowledge absorption requires attention not only to realized absorptive capacity but also to latent absorptive capacity embedded in different organizational activities and processes, as well as the ambidextrous balance between them, thereby enabling overall absorptive capacity to positively contribute to value creation. Grounded in organizational ambidexterity theory, this study achieves a holistic understanding of absorptive capacity by simultaneously executing PAC and RAC processes and achieving balance between them.

Knowledge Ambidexterity

The knowledge-based view posits that knowledge generation, accumulation, and application are sources of superior performance, with knowledge being the most important organizational resource. Organizational knowledge can be conceptualized as knowledge stocks and knowledge flows [3-4], representing two inherently contradictory static and dynamic characteristics. Knowledge stocks refer to the collection of knowledge at a given point in time that has been accumulated through selective flow paths and is controllable by the firm [22], including procedures, declarative organizational memory [23], and knowledge assets. Firms accumulate organizational knowledge through learning at individual, team, and organizational levels, reflecting the capacity and potential for knowledge production at a specific point in time [19,22]. Knowledge flows refer to the amount of knowledge stocks that flow into and are digested and developed by various departments during a certain period [4], or the amount of knowledge resources flowing out of the organization [23], reflecting the state of knowledge diffusion. In organizational learning processes, knowledge flows can be achieved through

feedforward and feedback learning at different organizational levels [24]. Thus, flows can be adjusted at any time, whereas stocks cannot, unless sufficient knowledge quantity and types are accumulated through continuous resource inflow patterns to achieve expected changes [3].

Evidently, the realization of knowledge stocks and flows depends on firms executing different organizational routines and processes. Since knowledge ultimately manifests in the application of individual-level knowledge, employees at different departments and levels accumulate or circulate organizational knowledge in accordance with organizational routines and processes. Therefore, firms must carefully manage resource accumulation and allocation to avoid mutual crowding-out between knowledge stocks and flows. For example, inter-firm knowledge exchange may generate knowledge spillovers that reinforce path dependence in knowledge accumulation, representing a crowding-out effect of knowledge flows on knowledge stocks. Simultaneously, knowledge stocks and flows are mutually reinforcing: the realization of knowledge stocks requires the superimposed effect of knowledge flows [3], while the flow rate of knowledge flows is constrained by the scale of knowledge stocks. Only when quantity and speed are appropriately matched can firms achieve spiral growth of new knowledge. Consequently, organizational knowledge exhibits ambidextrous characteristics and dimensions of stocks and flows, requiring firms to simultaneously manage both while maintaining relative balance without conflict and combining them to generate complementary effects that produce new knowledge. This study defines knowledge ambidexterity as firms' simultaneous commitment to maintaining relative balance between knowledge stocks and flows while promoting complementarity between them.

Balance Dimension of Knowledge Ambidexterity

The balance dimension of knowledge ambidexterity reflects the relative strength relationship between knowledge stocks and flows. Imbalance between knowledge stocks and flows is more likely to pose risks and threats to firms. As A. AL-Laham et al. noted, firms may suffer from capability traps resulting from existing human capital stocks [6]. The ambidextrous balance between knowledge stocks and flows can control such capability traps [1-2] while also facilitating the ambidextrous balance between PAC and RAC.

Although prior knowledge stock bases can facilitate identification of external opportunities [25], without sufficient inflow of new knowledge, the inertia and path dependence of existing knowledge accumulation paths will be strengthened, causing organizational knowledge structures to become rigid [26] and generating excessive knowledge redundancy [15]. This restricts motivation and capability for acquiring external new knowledge, which in turn further prevents firms from accurately identifying the value of external new knowledge. Moreover, increasing homogenization of knowledge accumulation creates risks of current knowledge obsolescence [2] and limits firms' ability to utilize combinable and reconfigurable knowledge elements. Further, rigid knowledge stock structures prevent match-

ing with external knowledge, while such rigidity constrains changes to current knowledge structures, thereby preventing effective digestion or transformation of externally acquired new knowledge [27] and hindering organizational learning and renewal processes.

Conversely, when firms' knowledge flows (exploration of new knowledge) exceed utilization of existing knowledge stocks, firms allocate more resources to promoting new knowledge. In this situation, firms may face short-term profit losses from insufficiently utilizing existing knowledge stocks, potentially endangering their survival. When new knowledge is acquired externally, firms must fully leverage internal knowledge bases to help digest and transform this knowledge. However, insufficient internal knowledge stocks manifest as limitations in knowledge breadth and depth [28]. Shortcomings in knowledge breadth indicate a lack of diversified knowledge, creating disadvantages in identifying, digesting, or transforming knowledge. W. F. Boh et al. [29] noted that high levels of knowledge breadth and depth strongly promote innovation. P. J. Lane et al. [9] similarly found that firms with broader knowledge stocks implicitly demonstrate high-level absorptive capacity. Low levels of knowledge stock depth prevent firms from correctly understanding external knowledge, leading to failed knowledge digestion [30]. Moreover, exploring external new knowledge at the expense of short-term profits requires firms to bear search and experimentation costs [1]. Although searching for distant external knowledge brings diverse knowledge elements, it increases heterogeneity between existing knowledge bases and external knowledge [31], thereby raising the difficulty and cost of knowledge integration and absorption [10,32].

Hypothesis H1: The balance dimension of knowledge ambidexterity positively influences absorptive capacity.

Combined Dimension of Knowledge Ambidexterity

Knowledge stocks and flows are interdependent: flows originate from stocks, while flows can change stocks [13,19], demonstrating complementary effects between them. From this complementarity perspective [33], firms' activities in executing knowledge flows (or stocks) correspondingly increase the benefits derived from knowledge stock (or flow) activities. A. AL-Laham et al. [6] demonstrated positive interactive effects between knowledge stocks and flows in alliances.

Knowledge stocks constitute important conditions for realizing knowledge flows. Repeated utilization of existing knowledge deepens understanding of current knowledge and resources, enabling firms to create new knowledge or resource combinations through recombination and identify new opportunities across different domains [41]. Current knowledge bases are prerequisites for identifying, digesting, and utilizing external knowledge [13], especially when firms' prior knowledge bases exhibit moderate similarity with externally acquired knowledge, which facilitates embedding external new knowledge into organizational routines and processes through digestion or transformation [27]. Knowledge stocks com-

prising human and social capital reduce the depreciation rate of newly acquired knowledge assets [6] and better enable identification of recombination opportunities between existing and new knowledge elements. Rich and diversified knowledge stocks also provide more varied knowledge elements for combination and integration with external knowledge, enhancing the scope, efficiency, and flexibility of knowledge absorption [10,32], thereby rapidly converting external knowledge into organizational knowledge stocks. Additionally, high-level knowledge stocks accumulate operational experience for reusing existing knowledge, thereby improving knowledge utilization efficiency.

Knowledge flows enrich and renew existing knowledge stocks through timely inflow and outflow [18]. By continuously inputting new knowledge, firms maintain dynamic adjustment of knowledge structures, providing sustained and diversified knowledge inputs for capability development. When firms possess such dynamic knowledge bases, they can identify valuable knowledge during knowledge management processes and divest worthless knowledge [22], reducing excessive internal knowledge redundancy and maintaining appropriate levels of knowledge variety and quantity. Therefore, knowledge flows promote the development of high-level absorptive capacity by updating knowledge stocks and enabling firms to possess rich prior knowledge bases, thereby facilitating future knowledge utilization activities on a solid foundation. For example, firms' proactive selective knowledge disclosure [39-40] can induce external organizations to establish collaborative relationships, helping firms acquire external knowledge to achieve innovation. Platforms like InnoCentive create knowledge disclosure platforms that facilitate such collaborations.

The combined dimension of knowledge ambidexterity indicates that exploratory knowledge flow processes and exploitative knowledge stock processes need not be fundamentally competitive. In fact, knowledge stock utilization and new knowledge exploration may occur in complementary domains [34]. Recent research measuring knowledge flows through alliances [4-6] shows that establishing various forms of alliances with external organizations enables firms to acquire complementary knowledge, thereby increasing knowledge stocks and improving complementarity between existing knowledge bases and external organizations. Complementarity between knowledge flows and stocks can also be achieved across different domains (e.g., technology and markets) [37]. D. Lavie and L. Rosenkopf [38] found that during alliance formation, firms can balance new knowledge exploration and existing knowledge stock exploitation across structural, functional, and attribute domains over time, thereby positively influencing firm performance [37].

Hypothesis H2: The combined dimension of knowledge ambidexterity positively influences absorptive capacity.

Interactive Effect of Balance and Combined Dimensions

Since absorptive capacity is considered a function of prior knowledge bases [8], rich knowledge stocks often imply strong learning capabilities that help firms continuously absorb valuable external new knowledge and divest worthless old knowledge. Nevertheless, when firms cannot update their knowledge stocks in a timely manner, they are more likely to face rigid knowledge structures. Knowledge flows serve to enrich and renew existing knowledge stocks through inflow and outflow [18]. Thus, complementarity exists between knowledge stocks and flows (i.e., the combined dimension of knowledge ambidexterity). However, this complementarity is influenced by the degree of difference between knowledge stocks and flows, where greater difference indicates lower balance between them.

When firms fail to maintain balance between knowledge stocks and flows, the promoting effect between them is significantly weakened, primarily due to potential mutual crowding-out effects [2] that create imbalance and diminish their combined effects. More specifically, when knowledge stock efforts are significantly lower than knowledge flow efforts, firms may be unable to utilize existing knowledge stocks to sufficiently digest external knowledge [7], thereby limiting the development of PAC. When knowledge stock efforts significantly exceed knowledge flow efforts, firms may be unable to acquire sufficient external new knowledge through knowledge flow activities, constraining future utilization of existing knowledge stocks and limiting the development of RAC. Consequently, ineffective balance between knowledge stocks and flows restricts their mutual utilization effects, reducing the mutual promotion between PAC and RAC. Conversely, when firms maintain balance between knowledge stocks and flows, existing knowledge can be more fully utilized to acquire and assimilate more new knowledge, enhancing PAC. Simultaneously, new knowledge can be more fully integrated into existing knowledge bases. We therefore infer that when firms maintain appropriate balance between knowledge flows and stocks, the combined effects of knowledge flows and stocks will be enhanced.

Hypothesis H3: The interactive effect between the balance and combined dimensions of knowledge ambidexterity positively influences absorptive capacity.

Moderating Effect of Firm Size

Firm size reflects how firms directly allocate resources and the degree of overall resource constraints [42]. Imbalance between knowledge stocks and flows may expose firms to risks of obsolescence or short-term profit loss [2]. Large firms generally possess more resources than small firms [43], while small firms face greater resource constraints and limited risk-bearing capacity. Large firms can utilize abundant internal resources as buffers. Therefore, small firms need to maintain balance between knowledge stocks and flows more than large firms do.

Increasing firm size expands resource stocks and enhances resource utilization. However, large firms may experience greater organizational inertia, creating stronger path dependence that stifles creativity and slows response to exter-

nal opportunities [44]. Small firms demonstrate greater flexibility in adjusting strategic objectives and actions, enabling rapid response to external opportunities. M. D. Santoro and A. K. Chakrabarti [45] argued that small firms are better at concentrating knowledge application in core technology areas through technology transfer and collaborative R&D. Excessive exploitation of knowledge stocks or exploration of knowledge flows is detrimental to all firms [1-2,46]. Small firms can adopt flexible approaches to achieve balance between knowledge flows and stocks, such as flexible organizational structure designs that enhance the efficiency, scope, and flexibility of knowledge integration [10,45].

Hypothesis H4a: Firm size negatively moderates the relationship between the balance dimension of knowledge ambidexterity and absorptive capacity; small firms are better able than large firms to promote absorptive capacity through the balance dimension of knowledge ambidexterity.

Large firms possess advantages in internal R&D [44] and are more likely to engage in R&D activities [47], thereby generating more innovation and knowledge flows that increase knowledge diversity and depth, implicitly indicating the development of latitudinal and longitudinal absorptive capacity [48-49]. Regarding partner selection, large firms' market position and technological capabilities make them more attractive to external organizations [50-51]. Y. Luo [52] found that Chinese firms prefer to form cooperative relationships with foreign firms possessing strong technological capabilities and market positions. Large firms can establish more connections with external organizations to acquire partners' knowledge and increase their own knowledge stocks. Therefore, based on their knowledge stocks, large firms can effectively digest and exploit externally acquired knowledge.

Large firms have more resources to support simultaneous high-level exploitation of existing knowledge stocks and exploration of new knowledge flows [53], whereas small firms cannot provide sufficient support for such simultaneous activities. Additionally, large firms typically have greater age and social status [42], accumulating experience in managing external cooperative relationships and attracting more partners, thereby promoting interaction between knowledge stocks and flows. J. B. Sørensen and T. E. Stuart [54] noted that as firms age, they can increase innovation based on accumulated experience. J. J. Reuer et al. [55] found that firms tend to acquire reputable firms to obtain external knowledge. Therefore, compared with small firms, large firms are better able to promote absorptive capacity through the interaction between knowledge stocks and flows.

Hypothesis H4b: Firm size positively moderates the relationship between the combined dimension of knowledge ambidexterity and absorptive capacity; large firms are better able than small firms to promote absorptive capacity through the combined dimension of knowledge ambidexterity.

In summary, our theoretical model is shown in Figure 1 [Figure 1: see original paper].

Figure 1 Theoretical Model

Balance Dimension (BD) |Knowledge Stocks - Knowledge Flows|
Combined Dimension (CD) (Knowledge Stocks * Knowledge Flows)
Balance Dimension * Combined Dimension
- Industry Background
- Industry Age
- Ownership

Methods

Sample and Data Collection

Questionnaires were distributed from September to December 2020 through two primary methods. First, we capitalized on training programs for middle-aged and young managerial staff commissioned by enterprises, conducting on-site questionnaire distribution and collection among participating trainees. A total of 120 questionnaires were distributed, with 120 returned. After eliminating 11 incomplete or incorrectly filled questionnaires (e.g., with multiple selections for a single item), 109 valid questionnaires remained, yielding a 90.8% valid response rate. Missing individual and firm-level information in incomplete questionnaires was subsequently supplemented via email or telephone.

Second, we leveraged personal networks for distribution. Since respondents were acquaintances, this approach helped ensure careful completion and achieved higher response rates. Questionnaires were distributed among employed classmates and friends, and through snowball sampling via their interpersonal networks. Through these two methods, 300 questionnaires were distributed, with 118 returned. After eliminating 12 invalid questionnaires, 106 valid questionnaires were obtained, representing a 35.3% valid response rate.

In total, 420 questionnaires were distributed, with 238 returned. After removing 23 invalid questionnaires, the final sample comprised 215 valid questionnaires, yielding an overall valid response rate of 51.2%. The sample structure is shown in Table 1 .

Table 1 Sample Structure Description

Category	Count	Percentage (%)
Manufacturing		
Finance, Insurance & Real Estate		
Mining		
Services		
Other		
Firm Size (Employees)		
1-100		
101-300		
301-1,000		

Category	Count	Percentage (%)
1,001-1,999		
2,000+		
Firm Age (Years)		
1-3		
4-5		
6-10		
11-20		
21+		
Respondent Position		
Junior Manager		
Middle Manager		
Senior Manager		
Respondent Tenure (Years)		
1-3		
4-5		
6-10		
11-20		
21+		

Measures

Dependent Variable Existing research has identified absorptive capacity as comprising potential absorptive capacity (PAC) and realized absorptive capacity (RAC) [7]. The organizational routines and process foundations of these two types of absorptive capacity differ [20], and both require continuous resource investment. Following J. G. March' s [1] logic, the two types of absorptive capacity require ambidextrous balance. A. Y. Lewin et al. [20] also noted that firms need to balance internal knowledge creation with processes for identifying, assimilating, and utilizing external knowledge. Building on S. A. Zahra and G. George [7] and G. Todorova and B. Durisin [27], we measure absorptive capacity through the interaction effect between PAC and RAC to capture the dynamic process more comprehensively.

Specifically, following C. Camisón and B. Forés [56], J. J. P. Jansen et al. [21], and S. A. Zahra and G. George [7], PAC was measured through acquisition (4 items) and assimilation (3 items), with Cronbach' s alpha values of 0.847 and 0.924, respectively. First-order confirmatory factor analysis yielded ^{2}/df = 1.343 (p = 0.201 > 0.05), RMSEA = 0.040, TLI = 0.993, NFI = 0.987, indicating good model fit. All factor loadings ranged from 0.659 to 0.915 (greater than 0.5), with composite reliabilities of 0.849 and 0.924, and average variance extracted (AVE) values of 0.586 and 0.801.

RAC was measured through transformation (4 items) and exploitation (4 items), with Cronbach' s alpha values of 0.892 and 0.872, respectively. Confirmatory factor analysis results showed ^{2}/df = 1.413 (p = 0.137 > 0.05), RMSEA =

0.044, TLI = 0.990, NFI = 0.983, indicating good model fit. Factor loadings ranged from 0.699 to 0.880, with composite reliabilities of 0.881 and 0.866, and AVE values of 0.649 and 0.619. These results demonstrate that the measures for PAC and RAC satisfy reliability and validity requirements.

Independent Variables (1) Knowledge Stocks. Knowledge stocks reflect the quantity and type of knowledge currently possessed by the firm. Following N. Bontis' s [57] classification of organizational intellectual capital and D. L. Deeds and D. M. Decarolis' s [4] operationalization, we measured knowledge stocks based on the extent to which firms possess market capital, intellectual property capital, human capital, and organizational capital. Using a 5-point Likert scale, respondents rated their firms' knowledge stocks (1 = lowest, 5 = highest). Cronbach's alpha was 0.883. Confirmatory factor analysis showed ^{2}/df = 1.923 (p = 0.165 > 0.05), RMSEA = 0.066, RMR = 0.013, GFI = 0.996, CFI = 0.998, TLI = 0.988, NFI = 0.996, indicating good model fit. Factor loadings ranged from 0.805 to 0.848, with composite reliability of 0.895 and AVE of 0.680, satisfying reliability and validity requirements.

(2) Knowledge Flows. Knowledge flows reflect the inflow and outflow of organizational knowledge [58-60]. Following D. L. Deeds and D. M. Decarolis [4] and Z. Erden et al. [5], we measured knowledge flows through the richness of firms' geographic environment (e.g., presence of industry clusters), alliances, R&D investment, and market activity investment. Cronbach' s alpha was 0.812. Confirmatory factor analysis yielded ^{2}/df = 3.118 (p = 0.044), RMSEA = 0.099, RMR = 0.034, GFI = 0.985, CFI = 0.985, TLI = 0.955, NFI = 0.978, indicating good model fit. Factor loadings ranged from 0.635 to 0.779, with composite reliability of 0.817 and AVE of 0.529, satisfying reliability and validity requirements.

(3) Knowledge Ambidexterity. Current operationalizations of organizational ambidexterity include multiple approaches [61]. More comprehensively capturing different dimensions of organizational ambidexterity and their interrelationships contributes to a deeper, multi-level understanding of the concept and provides richer theoretical insights for managing ambidexterity.

- **Balance Dimension (BD)** represents the relative magnitude between knowledge flows and stocks. Following Q. Cao et al. [53] and Z. L. He [62], we operationalized BD using the absolute difference between knowledge stocks and flows, which ranged from 0 to 2.5. For interpretability, we used the absolute difference between this value and 5 to represent BD, where larger absolute differences indicate greater BD.
- **Combined Dimension (CD)** reflects the combined magnitude of knowledge stocks and flows. Since knowledge stocks and flows are complementary, we operationalized CD as the product of knowledge stocks and flows. This approach has been widely adopted in ambidexterity research [61]. Prior to analysis, we standardized knowledge stocks and flows to avoid

multicollinearity.

(4) Moderating Variable. Firm size is an important organizational-level factor affecting organizational ambidexterity [42,53]. Following prior operationalizations, we measured firm size by number of employees, categorizing firms into five groups: 1-100, 101-300, 301-1,000, 1,001-1,999, and 2,000+ employees, coded 1-5 respectively. Following prior research [63], we replaced categorical values with midpoints (e.g., 50 for the 1-100 category). We standardized firm size before constructing interaction terms.

(5) Control Variables. We controlled for firm-level factors influencing absorptive capacity. First, we controlled for industry background, as prior research indicates that industry environment affects knowledge flows [64]. We categorized firms into five industries: manufacturing, finance/insurance/real estate, mining, services, and other, with "other" as the reference group, creating four industry dummy variables. Firm age also affects organizational innovation [54]. We measured firm age by years since establishment, categorizing into five groups: 1-3, 4-5, 6-10, 11-19, and 20+ years, coded 1-5. Following prior research [63], we replaced categorical values with midpoints (e.g., 2 for 1-3 years) and applied a logarithmic transformation. We also controlled for ownership type, as institutional context matters [65]. In China' s imperfect institutional environment, state-owned enterprises are more likely to receive government support. We created ownership dummy variables with state-owned enterprises as the reference group (0 = state-owned, 1 = non-state-owned).

Table 2 summarizes the reliability and validity tests for all variables.

Table 2 Reliability and Validity Tests

Variable	Cronbach' s α	^{2}/df	RMSEA	CFI	TLI	NFI	Composite Reliability	AVE
Knowledge Stocks	0.883	1.923	0.066	0.998	0.988	0.996	0.895	0.680
Knowledge Flows	0.812	3.118	0.099	0.985	0.955	0.978	0.817	0.529
Potential AC	0.847/0.924	1.343	0.040	-	0.993	0.987	0.849/0.924	0.586/0.801
Realized AC	0.892/0.872	1.413	0.044	-	0.990	0.983	0.881/0.866	0.649/0.619

Results

Descriptive Statistics and Correlations

Means, standard deviations, and inter-variable correlations are presented in Table 3 . The results show that both the balance dimension (BD) and combined

dimension (CD) of knowledge ambidexterity are significantly positively correlated with absorptive capacity (r = 0.138, p < 0.05; r = 0.533, p < 0.01), consistent with our predictions. Additionally, no strong correlations exist between independent and control variables (maximum r = -0.481, p < 0.01), reducing multicollinearity concerns.

Table 3 Descriptive Statistics and Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Ownership	1											
2. Manufacturing	-0.080	1										
3. Finance/Insurance	0.328**	0.354**	1									
4. Mining	-0.337**	-0.400**	-0.235**	1								
5. Services	0.019	-0.354**	-0.208**	-0.235**	1							
6. Firm Size	-0.227**	0.396**	0.229**	-0.302**	0.155*	1						
7. Firm Age	-0.450**	0.263**	0.242**	0.471**	-0.340**	-0.311**	1					
8. Knowledge Stocks	-0.340**	-0.229**	0.017	0.167*	0.078	0.095	0.757**	1				
9. Knowledge Flows	-0.235**	-0.304**	0.140*	0.097	0.058	0.312**	0.294**	0.138*	1			
10. BD	0.019	0.139*	0.069	0.174*	-0.481**	-0.451**	0.262**	0.138*	0.533**	1		
11. CD	0.139*	0.069	0.174*	0.481**	-0.451**	0.262**	0.138*	0.533**	0.138*	1		
12. Absorptive Capacity	0.139*	0.069	0.174*	0.481**	-0.451**	0.262**	0.138*	0.533**	0.138*	0.533**	1	

Note: **p < 0.01; *p < 0.05; BD and CD refer to balance and combined dimensions of knowledge ambidexterity.

Common Method Bias Test

Since all questionnaire items were completed by single respondents, common method bias may exist. Following P. M. Podsakoff et al. [66], we conducted Harman' s single-factor test. Model 1 assigned all items to a single common latent factor, while Model 2 performed first-order confirmatory factor analysis on all measured latent variables. If Model 2 shows significant improvement over Model 1, common method bias is not significant.

As shown in Table 4 , Model 1 exhibited poor fit: ^{2}/df > 3, RMSEA > 0.10, and GFI, IFI, TLI, CFI all below 0.8. Model 2 demonstrated satisfactory fit: ^{2}/df between 1-3, RMSEA near 0.08, GFI > 0.8, and IFI, TLI, CFI > 0.9. Model 2 represents substantial improvement over Model 1, meeting structural equation modeling requirements and indicating that common method bias does not seriously affect our conclusions.

Table 4 Common Method Bias Test Results

Model	^{2}/df	RMSEA	GFI	IFI	TLI	CFI
Model 1 (Single Factor)	>3	>0.10	<0.8	<0.8	<0.8	<0.8
Model 2 (Multi-Factor)	1-3	~0.08	>0.8	>0.9	>0.9	>0.9

Hierarchical Regression Analysis

We employed hierarchical linear regression to test hypotheses. All VIF values were below 10, and Durbin-Watson statistics were near 2, indicating normally distributed and independent residuals. Table 5 reports regression results.

Table 5 Hierarchical Regression Results

Variable	Model 1	Model 2	Model 3(a)	Model 3(b)	Model 3(c)	Model 4	Model 5
Control Variables							
Ownership	(0.501)	(0.330)	(0.353)	(0.361)	(0.360)	(0.200)	(0.319)
Manufacturing	2.525***	0.684*	0.604†	0.978**	(0.341)	(0.191)	(0.297)
Finance/Insurance	(0.555)	(0.307)	(0.334)	(0.347)	(0.336)	(0.189)	(0.293)
Mining	(0.330)	-0.334**	-0.255*	-0.273*	-0.340**	0.504**	(0.182)
Services	(0.584)	0.582*	0.903**	0.693*	1.082***	(0.172)	(0.267)
Firm Size	(0.877)	0.587*	0.912**	0.703*	1.090***	(0.174)	(0.269)
Firm Age	(0.904)	0.590*	0.923**	0.619†	0.996***	(0.169)	(0.281)

Variable	Model 1	Model 2	Model 3(a)	Model 3(b)	Model 3(c)	Model 4	Model 5
Main Effects							
Knowledge Stocks		-0.334**			-0.094		-0.212†
Knowledge Flows		-0.255*			0.430***		0.371***
BD			0.504**		0.094	0.143**	-0.094
CD				0.430***	0.430***	0.209***	0.164***
Interactions							
BD × CD						0.143**	0.209***
BD × Firm Size							-0.055
CD × Firm Size							0.164***
Adjusted R^2	0.070	0.164	0.178	0.284	0.284	0.302	0.344
ΔR^2		0.094**	0.014†	0.120***	0.120***	0.018**	0.042***
F-value	5.290***	5.701***	11.734***	10.552***	10.613***	9.355***	18.183***

Note: ***p < 0.001;*** *p < 0.01;* p < 0.05; †p < 0.1; unstandardized coefficients reported with standard errors in parentheses; BD and CD refer to balance and combined dimensions of knowledge ambidexterity.

Model 1 includes only firm- and industry-level control variables. Model 2 adds knowledge stocks and knowledge flows. Interestingly, knowledge stocks negatively affect absorptive capacity (β = -0.334, p < 0.01), as do knowledge flows (β = -0.255, p < 0.05), implicitly suggesting that knowledge stocks and flows cannot individually exert positive effects on absorptive capacity and require simultaneous ambidextrous balance.

To test the effects of knowledge ambidexterity dimensions on absorptive capacity, following Z. L. He et al. [62], we separately assessed the effects of BD and CD. Model 3(a) includes only BD, while Model 3(b) includes only CD. In Model 3(a), BD significantly affects absorptive capacity (β = 0.504, p < 0.01). In Model 3(b), CD significantly affects absorptive capacity (β = 0.430, p < 0.001). In Model 3(c), which includes both BD and CD, BD shows a non-significant positive effect (β = 0.094, p > 0.1), while CD maintains a significant positive effect (β = 0.430, p < 0.001). Based on the most conservative Model 3(c), Hypothesis H1 is not supported, while Hypothesis H2 is supported.

Model 4 adds the BD × CD interaction term to Model 3(c). The results show that the interactive effect between knowledge ambidexterity dimensions significantly and positively influences absorptive capacity ($\beta = 0.143$, $p < 0.01$), supporting Hypothesis H3. Figures 2 [Figure 2: see original paper] and 3 [Figure 3: see original paper] illustrate the moderating effects.

Model 5 includes all variables plus the moderating effects. CD remains significant ($\beta = 0.371$, $p < 0.001$), while BD becomes non-significantly negative ($\beta =$ -0.094, $p > 0.1$). The BD × CD interaction remains significant ($\beta = 0.209$, $p <$ 0.001). Regarding moderating effects, firm size negatively but non-significantly moderates the BD-absorptive capacity relationship ($\beta =$ -0.055, $p > 0.1$), while significantly and positively moderating the CD-absorptive capacity relationship ($\beta = 0.164$, $p < 0.001$), supporting Hypothesis H4b. Large firms are better able than small firms to leverage the combined dimension of knowledge ambidexterity to promote absorptive capacity, as shown in Figure 4 [Figure 4: see original paper].

Figure 2 Interactive Effect of Balance and Combined Dimensions (Low CD)

Figure 3 Interactive Effect of Balance and Combined Dimensions (High CD)

Figure 4 Moderating Effect of Firm Size

To address potential reverse causality from cross-sectional data, we followed R. Landis and W. P. Dunlap [67] by treating absorptive capacity as the independent variable and knowledge ambidexterity as the dependent variable to test reverse interaction effects. Results showed that the interaction between absorptive capacity and firm size did not significantly affect BD ($\beta =$ -0.022, $p > 0.1$), alleviating reverse causality concerns.

Discussion and Implications

This study employs organizational knowledge stocks and flows to represent two dimensions of organizational knowledge and examines how ambidexterity between them influences absorptive capacity. Specifically, we conceptualize knowledge ambidexterity as comprising balance and combined dimensions. Following J. G. March' s [1] logic, firms must balance exploiting knowledge stocks and exploring knowledge flows, with knowledge ambidexterity representing this balance. Based on complementarity principles, knowledge stocks and flows are also complementary and synergistic, allowing firms to combine them [68]. Knowledge stocks and flows represent static and dynamic manifestations of knowledge activities that require resource investment and are closely linked to absorptive capacity [11-12], making their ambidextrous management crucial for firms.

Following prior research [53,62], we operationalized knowledge ambidexterity using balance and combined dimensions. We argued that the balance dimension promotes PAC-RAC balance by avoiding overinvestment in either knowledge stocks or flows (H1). However, results show that the balance dimension does not significantly affect absorptive capacity. We also argued that the combined

dimension creates synergy between knowledge stocks and flows by executing one to enhance the other, thereby positively influencing absorptive capacity (H2). Our results support this argument, indicating complementarity rather than substitutability. Furthermore, we proposed a positive interactive effect between balance and combined dimensions (H3), suggesting that maintaining balance between knowledge stocks and flows promotes their interaction, while their complementarity prevents overinvestment in either. Results support H3, demonstrating that knowledge ambidexterity better explains firm outcomes by examining the interaction between knowledge dimensions and other factors. We examined firm size as an organizational contingency (H4a and H4b), finding that large firms benefit more from the combined dimension, while small firms benefit more from the balance dimension. However, only the moderating effect of firm size on the combined dimension was supported.

Theoretical Contributions

This study makes three primary contributions. First, it enriches the knowledge-based view literature by examining organizational knowledge' s static and dynamic features from an ambidexterity perspective [3-4,19] and empirically testing the effects of knowledge stock and flow dimensions. While prior literature has examined relationships between knowledge stocks, flows, their interaction, and firm performance [4-6], it has focused more on combined effects [6] and lacked evidence on knowledge-capability relationships. Our study investigates the combined and balance effects of knowledge ambidexterity on absorptive capacity, finding that the combined dimension positively influences absorptive capacity, though the balance dimension does not. These findings advance understanding of the relationship between organizational knowledge and capabilities.

Second, this study enhances understanding of absorptive capacity. While research has indicated that absorptive capacity requires balancing internal and external routines [8,20] and maintaining PAC-RAC balance [7,21], insufficient attention has been paid to this issue [21]. We examine how knowledge ambidexterity dimensions affect PAC-RAC balance, finding that the combined dimension promotes interaction between PAC and RAC. Though the balance dimension' s effect is non-significant, the synergy between balance and combined dimensions is supported. These results advance understanding of absorptive capacity ambidexterity and respond to Volberda et al.' s [11] call for research on how absorptive capacity relates to the changing nature of knowledge.

Third, this study contributes to organizational ambidexterity research in two ways. (1) Organizational ambidexterity reflects the ability to buffer and resolve conflicting objectives [69] and is a multi-dimensional concept. While most research focuses on single dimensions [61], studies of other dimensions and their interactions remain limited [53,62]. We find that firms can combine synergistic effects of knowledge stocks and flows and the synergy between balance and combined effects to promote absorptive capacity, enriching understanding of organizational ambidexterity' s connotation and outcomes. (2) Prior research

shows that organizational ambidexterity' s effects depend on contextual factors [42,53,70]. We advance understanding of contingency effects by demonstrating that knowledge ambidexterity' s impact on absorptive capacity depends on organizational-level factors (firm size). Large firms can better leverage the combined effect of knowledge stocks and flows to influence absorptive capacity, enhancing understanding of the conditions under which organizational ambidexterity operates.

Practical Implications

Our findings offer several managerial implications. First, the interactive effect between knowledge stocks and flows promotes PAC-RAC balance. Firms should actively explore new knowledge inflows while exploiting existing stocks, updating current knowledge stocks while promoting external knowledge acquisition, and simultaneously utilize knowledge stocks and explore knowledge flows to maintain balance. Second, results show that the effect of knowledge ambidexterity on absorptive capacity depends on organizational factors. Large firms should fully leverage interactive effects between knowledge stocks and flows, while resource-constrained small firms should reasonably balance exploitation and exploration to avoid overinvestment in either. Finally, the ambidextrous logic studied here can help managers develop paradoxical thinking [71-72]. Extending this logic to strategic management, organizational learning, organizational design, and innovation management, managers should simultaneously attend to conflicting and opposing aspects in these domains to effectively manage organizational paradoxes and resulting conflicts [73].

Limitations and Future Research

This study has several limitations that suggest directions for future research. First, our cross-sectional data cannot effectively capture the longitudinal development of knowledge stocks, flows, and absorptive capacity. Future research should employ longitudinal process studies to collect data on how these constructs evolve over time. Second, our operationalization of absorptive capacity ambidexterity only examined the interaction between PAC and RAC. Future research could develop more nuanced operationalizations of absorptive capacity ambidexterity, following advances in organizational ambidexterity measurement [61]. Finally, we only examined firm size as a moderator. Future research should investigate other organizational-level contingencies (e.g., firm age [54]), contextual factors [70], and network-level factors.

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Author Contributions

Liu Fanghong: Responsible for paper structure, data collection, analysis, and initial draft.
Wang Jiangang: Developed research ideas and revised the final manuscript.

Note: Figure translations are in progress. See original paper for figures.