Relational Embeddedness, Absorptive Capacity and Supply Chain Flexibility: Evidence from China

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Abstract--**Competition is no longer company to company, but supply chain to supply chain and flexibility is viewed as a key dimension of supply chain performance in global competition recently. Companies must manage the entire supply chain and work together with supply chain node enterprises, have access to resources, knowledge, and information from the network, and improve supply chain flexibility. Relational embeddedness is often considered as crucial driver for the improvement of supply chain flexibility. However, quantitative studies demonstrating these links are scant and an increasing amount of evidence suggests that there is a need to develop a complete model of relational embeddedness on supply chain flexibility by examining the potential mediating effect of absorptive capacity. To meet this need, we define relational embeddedness and absorptive capacity, develop a valid and reliable instrument to measure these, build a framework that relates relational embeddedness, absorptive capacity and supply chain flexibility, and then test structural relationships within this framework using SPSS. Based on 136 responses from companies in the Yangtze River Delta, statistically significant and partially positive relationships were found among relational embeddedness, absorptive capacity and supply chain flexibility. Managerial implications of the empirical findings of this study are also discussed.**

I. INTRODUCTION

Supply chain flexibility has been promoted as a key enable to cope with high levels of uncertainty resulting from increased globalization, more demanding customers and other drivers [19][58], and is also a complex and multidimensional concept [51][56]. Recently, the literature on flexibility has tremendously increased. Supply chain flexibility can be achieved in the construction industry, and highlighted that supply chain flexibility is rationalized as comprising of two key concepts: vendor flexibility and sourcing flexibility [26]. Moreover, Supply chain flexibility represents those abilities of reducing supply chain lead time, providing product variety [39], improving firm performance [6] and IT integration enables a firm to tap its supply chain flexibility which in turn results in higher competitive business performance. Empirical evidence has also verified the positive impact of information sharing, trust and joint problem solving on supply chain flexibility. For example, information sharing creates opportunities for acquiring supply chain agility [33]; trust occurs in cognitive and affect-based forms and both forms can enhance coordination by lowering administrative costs, building relationships based on trust can improve supply chain responsiveness [45], joint problem solving often results in breaking down boundaries, and has been referred to as the driving force behind effective supply chain.

Although these findings are fruitful, little discussion about the relationship between relational embeddedness and supply chain flexibility, in the condition that trust, information sharing and joint problem solving have been theorized to be key features of the relational embeddedness. The concept of relational embeddedness was originally used in communication studies [57], describing the phenomenon of one-to-one resource distribution. Some research suggest that relational embeddedness can affect the design and implementation in supply chains and make it difficult for their competitors to imitate resulting from the causal ambiguity [14], lead to more easily exchanged tacit knowledge, and higher level of trust. Also prior research suggests joint dependence enhances the performance of procurement relationships, which is partially mediated by the level of joint action and the quality of information exchange [42]. Now the barriers in effective supply chain management are being overcome as a result of the transaction information [49]. In this research, we explore a complementary theoretical perspective: high level of relational embeddedness has a positive effect on supply chain flexibility. This idea is suggested in the embeddedness and supply chain management literature [18][23] [45] [48], but not being implicitly noted.

In addition to this, an increasing amount of evidence on relational embeddedness and knowledge absorption [57] indicates the need to advance the extant literature on the link between relational embeddedness and absorptive capacity. Absorptive capacity consists of acquisition, assimilation, transformation, and exploitation capabilities [46]. It is easier to achieve better effects in terms of mutual network learning, knowledge flow, and the close relationship brought by embeddedness which assists knowledge absorption[57]. However previous research only focused on the individual firm's internal capabilities ignoring the external sources (such as the supply chain) where information can be easier achieved. Previous studies presented little discussion on how absorptive capacity mediated the relationship between relational embeddedness and supply chain flexibility. In isolation from the embeddedness literature, absorptive capacity is recognized as important antecedent to supply chain flexibility. Thereby, we posit that absorptive capacity is likely to mediate the impact of relational embeddedness on supply chain flexibility. Therefore, this study investigates the relationships between relational embeddedness, absorptive capacity, supply chain flexibility, which requires further analysis.

This study contributes to the advancement of theory in

different ways. To empirically test the effect of relational embeddedness on supply chain flexibility is the first contribution, using data from 136 companies in the Yangtze River Delta. Several studies focus on predicting relational embeddedness benefits for companies. However, few studies provide empirical evidence that acting on relational embeddedness is important in improving supply chain flexibility.

A second contribution is the analysis of the mediating effect of absorptive capacity in supply chain flexibility that can help to clarify the mechanisms by which relational embeddedness affects supply chain flexibility. The existing literature offers little insight regarding the mediating role of absorptive capacity in supply chain flexibility on the relational embeddedness performance and a better understanding of this effect can give guidance to managers when involving in leverage relational embeddedness to improve supply chain flexibility.

The rest of the research is structured as follows: the following sections will review the existing literature, explain the hypothesized research model, then the methodology, the results of construct validity assessment and hypotheses testing, the last followed by the conclusion.

II. THEORETICAL DEVELOPMEN

A. The Impact of Relational Embeddedness on Supply Chain Flexibility

Richard Thurnwald firstly introduced the relational embeddedness in 1932. Relational embeddedness is divided in three dimensions: trust, fine-grained information transfer, joint problem-solving arrangements [32]. Relational embeddedness is defined as an approach to external information and resources.

Researches on embeddedness are an exciting area as it enhances our understanding of how social structure affects economic life [13]. Researches have acknowledged the advantage of relational embeddedness on firm performance [5][13][15]. It has been found to enhance competitive capabilities [12], knowledge and innovation. As for the different circumstances of enterprise, how to select the partners is important and the relational embeddedness influences the decision of partner selection [32].

Literature suggests that helps improve supply chain flexibility in several ways. Over the last two decades, a great deal of research has occurred into defining various types of flexibilities. There is no general agreement on how to define flexibility. The literature relates supply chain flexibility through product flexibility, volume flexibility, new product introduction, widespread distribution, responsiveness to target market [37]. When explicating the nature of trust about embeddedness, making the distinction clearly between trust and risk is useful. Trust sometimes can be viewed as distinguishing characteristics of a personal relationship and never take advantage of me, the partnership always comes first. The primary relational requirement for supply chain flexibility is the development of greater levels of trust [45]. Trust is considered as an essential element of supply chain network, not only offer the economic benefits but also the belief-based trust. The trust relationship between supply chain members helps to improve the communication and the ability to copy with the dynamic market environment [23]. Once the trust is built, we can get supply chain coordination (SCC) through more effective information exchange and consistent forecasting [28], the partnership will grow better, which can offer the flexibility beyond the contract. Some studies also propose that the relationship between information sharing and supply chain flexibility [3][18][20][22][48]. Logistics, business flow, cash flow, information flow in supply chain is called the four main flows, in which information flow is most complex and valuable, scholars has yet recognized the importance when mentioning supply chain flexibility. In this study we define information sharing as "the degree to which each party discloses information that may facilitate the other party's activities" [24]. It is not enough to invest information technology alone, a firm can achieve firm performance when management terms highlight technology investment and choose to share the appropriate information [22]. Limiting information sharing results in negative effects on firm performance, and shared meaning is related to an approach to cycle-time reduction. Some researchers also conclude that information sharing is related to firm performance. Joint problem-solving enable firms to coordinate function and work out problem easier to a degree. In other words, it can be a problem, if you deal with the collaborators you don't have close relationship. We can view joint problem solving as mechanisms of voice, getting direct feedback quickly, which enhance the improvement of new product development performance [23][59]. Further, this relationship plays important role in improving supply chain flexibility. It is important for suppliers to learn from customers in order to enhance their performance from a supplier's perspective through knowledge transfer and integration process and learning cost reducing[25]. Joint problem-solving can promote cooperation to adapt to each other, and shorten NPD time. Thus, we formulate the following hypothesis:

H1: Relational Embeddedness has a positive relationship on supply chain flexibility.

B. Absorptive Capacity as Potential Mediator

Several authors emphasize that relational embeddedness can have significant implications for absorptive capacity, in particular, absorptive capacity can transfer the tacit knowledge and technology [34]. And absorptive capability is defined as an assembly of abilities that exploit external knowledge, evaluate and utilize outside knowledge, recognize the value of new information and apply it to commercial ends [16]. We suspect that relational embeddedness actual effects on supply chain flexibility may be indirect, or perhaps both direct and indirect. Trust in supply chain is considered to reduce the need for contractual safeguards [41], influences the validity of the information transfer [9][11] and represents the firm's willingness to share and communicate the information. Several empirical studies noted that trust level in outsourcing partners and the degree of communication is related to ab-

sorptive capacity. In supply chain, in order for the different partners to co-ordinate their activities, information sharing can't be ignored. Information sharing tends to be more detailed, intricate, and proprietary than in arm's relationship [12]. Through the process of interacting with others, firms can acquire new knowledge that increases their learning abilities. When understanding the firm's position on information sharing and experience learning between partners, firms may be more motivated to participate in learning, and apply the external knowledge. To a degree, joint problem-solving enhances the understanding between firms in the process of solving problem together, at the same time makes each other more close. In other words, getting feedback quickly because of joint problem solving makes the firms easier recognize the value of new, external information, assimilating it and apply it to commercial ends [17]. Token together the links between trust, information sharing, joint problem solving and absorptive capacity, and which suggested positive impact of relational embeddedness on absorptive capacity. Thus, we advance the following hypothesis:

H2: Relational embeddedness has a positive effect on absorptive capacity.

H2a: Relational embeddedness has a positive effect on potential absorptive capacity.

H2b: Relational embeddedness has a positive effect on realized absorptive capacity.

In recent years, researches have recognized the importance of absorptive capability in their analyses of complex organizational phenomena across many fields such as strategic management, technology management, international business and organization economics. Scholars highlighted the impact of absorptive capability on innovation ability [57], absorptive capability tends to develop cumulatively and can builds on related knowledge which contribute to innovation. Lack of absorptive capability resulted in a barrier when transferring internal knowledge within organization [50]. Absorptive capability requires learning capability and develops problem solving skills, the former is the capacity for imitation, latter is the capacity for innovation [29]. Absorptive capacity is also regarded as process which can influence the creation and sustenance of its competitive advantage [46].

In particular, some researches show that absorptive capability can improve supply chain flexibility. The ability to absorb external knowledge has become a main driver for competition [47]. Specially, in the supply chain network, to obtain and take advantage of the external resources, improve firm performance are the main purpose for firm interacting with other organizes, and the interactive process is essentially the process of absorptive capability, with the information exploiting, transferring and applying. As a consequence, absorptive capability reflects the firms' ability when coping with the dynamic environment, and decides the firms' ability to acquire the external knowledge. In turn, firms adapt this ability to improve their position in supply chain. The dimension of the absorptive capacity have been researched during the past decades, however, authors has held the different perspective on it. Authors divide it into different dimension in different studies, such as ability to value knowledge through past experience and investment, ability to assimilate, ability to apply [10][17][35], human capital [2][43][55], prior knowledge base, intensity of effort [52]. In this research we adapt two dimensions to measure absorptive capacity, potential absorptive capacity (PACAP) and realized absorptive capacity (RACAP) [46]. PACAP makes the firm acquire and assimilate external knowledge [40], RACAP is the capabilities of transformation and exploitation, to leverage the knowledge that has been absorbed. Thus, we formulate the following hypotheses:

H3: Absorptive capacity has a positive effect on supply chain flexibility.

H3a: Potential absorptive capacity has a positive effect on supply chain flexibility.

H3b: Realized absorptive capacity has a positive effect on supply chain flexibility.

Three hypotheses specifying several relationships among Relational embeddedness, absorptive capacity and supply chain flexibility are developed. The research model is shown in Fig. 1.

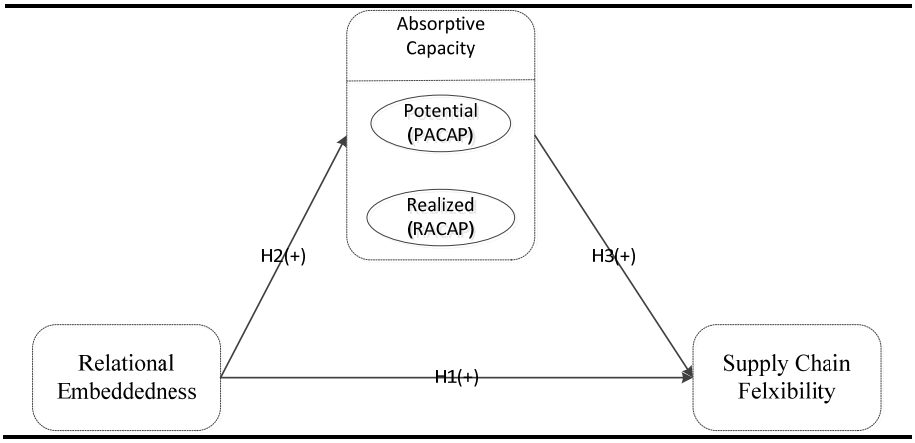

Fig.1.The research model

III. RESEARCH METHODOLOGY

A. Sampling

We focused on typical manufacturing firms at different type and position in supply chain in Yangtze River Delta. The participants in the study were directly responsible for supply chain management. In order to well address research questions, an empirical study employing perceptual measures of the study's key variables was chosen. In this research, data were collected during the 2011-2013 timeframe by a team of researchers working in Zhejiang GongShang University.

We called up every firm we intended to survey to verify names and to confirm that it was a manufacturing firm in supply chain. Then 260 firms were selected in total (see table 1) and questionnaires were sent out. The research questionnaire was mailed to the participant referred above through e-mail. The letter clearly stated the purpose of this research and participant was instructed to complete the survey for the firm.

Telephone calls were made to obtain definitive responses from respondents and asked them to provide their titles and contact addresses for the purpose of receiving the research results. This information can also be used to contact respondents to complete missing values and to confirm illegible responses. Of the 260 questionnaires, 136 were returned, which represented a response rate of 52.3%.

B. Measurement

A five-point Likert scale (1 = totally disagree, 5 = totally agree) was used to measure the constructs. The detail items are shown in appendix table.

Dependent Variable: supply chain flexibility

Vickery et al [54] have defined supply chain flexibility as an amalgamation of product flexibility, volume flexibility, new product flexibility, distribution flexibility and responsiveness flexibility. We used five items adapted from Vickery et al [54] scale, which covers supply chain flexibility broadly.

Independent Variable: relational embeddedness

Relational embeddedness construct is composed of three dimensions: trust, information sharing, and joint problem solving [13]. And the measure has frequently been used by related studies in the field [1] [32] [24]. In this study, relational embeddedness was measured with three items capturing the use of trust, information sharing and joint solving. These items are based on the measurement instrument developed by McEvily and Marcus [32].

Intermediate Variable: absorptive capacity

To examine potential and realized absorptive capacity, we sought to measure the dimensions that have been defined [61]. Items were measured on a five-point disagree/agree scale and were partially based on Jansen et al [23]. We use four items to measure potential and realized absorptive capacity.

Control Variable

Respondents were asked basic questions about firm size, age, ownership, R&D expenditures, type of industry and cooperation time. This information, shown in Table 1, above, was used to control for firm attributes.

TABLE 1.RESPONDING FIRM CHARACTERISTIC

Characteristic	Category	Number	%
Firm age	0~5	25	18.4%
	6~10	47	34.6%
	11~15	25	18.4%
	15 or greater	39	28.7%
Firm size	0~50	16	11.8%
	50~100	21	15.4%
	101~500	52	38.2%
	501~1000	25	18.4%
	1000 or greater	22	16.2%
Type of industry	Software and electronic	38	27.9%
	Biological pharmaceutical、 materials	45	33.1%
	Machinery chemical and textile industry	42	30.8%
	else	11	8.1%
cooperation time	0~1	8	5.9%
	1~2	5	3.7%
	3~5	53	39.0%
	6~10	46	33.8%
	11 or greater	24	17.6%

C. Reliability and Validity

The assessment of these measurement properties is discussed for relational embeddedness (RE), supply chain flexibility (SCF) and absorptive capacity (AC). The relational embeddedness construct was initially represented by three dimensions comprising 11 items: trust (T) (4 items), information sharing (I) (4 items), joint problem solving (J) (3 items). And absorptive capacity construct consisted of two dimensions, 8 items: potential absorptive capacity (P) (4 items), realized absorptive capacity (R) (4 items) (see Appendix for measurement details).

Reliability analysis was performed for each of the three dimensions of RE and the two dimensions of (AC). The construct were evaluated for internal consistency. Cronbach's Alpha (α) was sued to examine the reliability (see Appendix). Alpha of the factors was above 0.70, which indicates a very good statistical result. All item-to-total correlations exceeded the 0.35 criterion. Overall, these results provide strong evidence of acceptable reliability for the measurement items.

The 11 items RE and 8 items AC were submitted to a construct-level analysis. The factors emerged from the factor analysis and all factor loadings were above 0.60 and no cross-loading was observed. We can see the construct-level factor analysis results in Appendix.

The SCF construct was conceptualized as having one dimension comprising five items. One single factor emerged and all factors were above 0.60 when performing exploratory factor analysis in order to check the unidimesionality, indicating very good unidimensionality and convergent validity (see Appendix). An alpha score of 0.738 for the five items of supply chain flexibility represents good scale reliability.

A confirmatory factor was conducted to check the validity of factor structures using AMOS 17.0 software. Multiple fit indices including CFI, $\chi 2$/df, TIL, RMSEA were used to validate the factor analysis model fit [4]. As the $\chi 2$/df rations all below 3, CFI and TIL are all above 0.9, RMSEA below 0.08, referring to a good model fit [7]. The standardized regression weights for the final measurement model are given in Table A6 (see Appendix).

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D. Result of regression modeling and hypotheses testing

Table 2 shows the means, standard deviations, and correlations of relational embeddedness, absorptive capacity, and supply chain flexibility. The standard deviations reflect the variability in the measures of the constructs. As expected, relational embeddedness is positively associated with potential absorptive capacity $(r = 0.76, p < 0.01)$, realized absorptive capacity$(r = 0.65, p < 0.01)$, and with supply chain flexibility$(r = 0.80, p < 0.01)$, while potential, realized absorptive capacity and supply chain flexibility are positively correlated $(r = 0.78, p < 0.01)$, $(r = 0.75, p < 0.01)$.

In this study, we use hierarchical regression modelling to test our hypotheses. Specifically, we adopt the mediated casual steps approach and exam the following effects hierarchically: direct effects first, and then the mediating effects. And table 3 presents these results of our analyses.

As shown in the table 3, relational embeddedness is positively related to supply chain flexibility $(\beta = 0.81, p < 0.001,$ Model 4), supporting Hypothesis 1. In addition, Hypotheses 2 and 3 predict the positive effects of relational embeddedness on absorptive capacity, and the relationship between absorptive capacity and supply chain flexibility, respectively. In testing the mediating role of absorptive capacity, we find that relational embeddedness is significantly related to the mediator of absorptive capacity$(\beta = 0.79, p < 0.001,$ Model 2), and the positive relationship between absorptive capacity and supply chain flexibility$(\beta = 0.85, p < 0.001,$ Model 5). After entering absorptive capacity (potential and realized) in the regression, the main effect of relational embeddedness on supply chain flexibility is still significant$(\beta =$ cant$(\beta = 0.36, p < 0.001,$ Model 7), thereby partial mediation is indicated. As expected, both the effects of potential absorptive capacity and realized absorptive capacity on supply chain flexibility are significant$(\beta = 0.30$ and $0.32, p <$ $0.001,$ Model 7), supporting H3a, H3b. Taken together, these results allow us to conclude that there are supports for our Hypotheses

TABLE 2. MEANS, STANDARD DEVIATIONS, AND CORRELATIONS

Variables	Mean	SD	1	2	3	4	5	6	7	8
1.Firm age	12.551	9.773	1.00							
2.Firm size	3.120	1.211	0.57**	1.00						
3.Type of industry	2.190	0.939	−0.01	0.06	1.00					
4.Cooperate time	3.540	1.018	0.52**	0.58**	−0.09	1.00				
5.Relational embeddedness	4.685	0.769	0.21*	0.07	−0.03	0.11	1.00			
6.Potential absorptive capacity	4.855	0.800	0.07	−0.03	−0.07	0.05	0.76**	1.00		
7.Realized absorptive capacity	4.816	0.780	0.06	−0.04	−0.08	0.05	0.65**	0.64**	1.00	
8.Supply chain flexibility	5.043	0.675	0.12	0.01	0.02	0.04	0.80**	0.78**	0.75**	1.00

Notes: $N = 136$. ** $p < 0.01$, * $p < 0.05$.

TABLE 3. RESULTS OF HIERARCHICAL REGRESSION ANALYSES

	Absorptive capacity		Supply chain flexibility				
	M1	M2	M3	M4	M5	M6	M7
Control variables							
Firm age	0.11	-0.07	0.16	-0.03	0.07	0.01	0.01
Firm size	-0.14	-0.07	-0.09	-0.01	0.04	0.03	0.03
Type of industry	-0.06	-0.05	0.03	0.04	0.08	0.07	0.07
Cooperate time	0.07	0.04	0.01	-0.02	-0.05	-0.05	-0.05
Independent variable							
Relational embeddedness		0.79（***）		0.81(***)		0.36（***）	0.36（***）
Mediator							
Absorptive capacity					0.85（***）	0.57（***）	
Potential absorptive capacity							0.30（***）
Realized absorptive capacity							0.32（***）
R^2	0.02	0.62	0.02	0.65	0.72	0.77	0.77
F值	0.75（0.56）	42.62（***）	0.61（0.658）	47.36(***)	67.21（***）	71.48（***）	60.84（***）
ΔR^2	0.02	0.60	0.02	0.63	0.60	0.12	0.12
ΔF	0.75	205.45（***）	0.61	230.12(***)	327.56（***）	68.72（***）	34.15（***）

IV. DISCUSSION AND CONCLUSION

The findings from this research broaden and deepen our understanding of how to acquire supply chain flexibility and verify new ideas beyond existing literature. Relational embeddedness is becoming an inevitable strategic choice in supply chain management in a fast-paced, highly uncertain, and competitive environment. Relational embeddedness is one part of an overall plan to create organization competence that lead to supply chain flexibility. Supply chain flexibility increases strategic flexibility for firms when facing dynamic market environment and can enhance the ability of firm reducing the cycle time of product and satisfying the variety needs. In addition to engaging in their own trial-and-error experimentation to improve supply chain flexibility, firms can achieve it through relational embeddedness. Building upon the existing literature, we posited that relational embeddedness can engender absorptive capacity that in turn can determine improvements in supply chain flexibility. The results have several important theoretical and practical implications.

The findings of this study support our hypotheses about the linking relational embeddedness to supply chain flexibility. First, we find that relational embeddedness is positively associated with supply chain flexibility, which supports H1. It implies that firms hoping to reap the benefits from supply chain flexibility must take every effort to get closer relationship to partners, obtain trust and information, and get direct feedback quickly. Information sharing can significantly influence the performance of the supply chain, achieve greater improvements in supply chain performance when retailers face identical demand with trends and/or with medium capacity tightness. The magnitude of cost savings can help companies weigh the cost of sharing information against the benefits of sharing information with supplier. Meanwhile , buyer appears concerned about trust and transaction specific investment, when trust is high, relatively high degree of joint effort responses are likely undertaken to protect the specific assets, the joint efforts can minimize the systemic transaction costs related to high transaction specific investment. Parties learned from one anther that can enhance organization flexibility [36]. Some scholars inferred that partners connected with relational embeddedness were more likely to share tacit information, develop mutual understanding and long term relationship. [27] stated clearly that relational embeddedness can be defined as "the degree to which the firm's alliance relationships are facilitated using flexibility". In this research, we demonstrate it and highlight the use of relational embeddedness for facilitating supply chain flexibility.

Second, this study reveals that absorptive capacity mediates the linkage of relational embeddedness on supply chain flexibility. To the best of our knowledge, no study has examined the underlying mechanisms linking relational embeddedness and supply chain flexibility. Few studies analyze the mechanisms by which relational embeddedness affects supply chain flexibility, and how can firms improve supply chain flexibility by developing relational embeddedness. Our findings contribute to filling this gap by indicating that relational embeddedness has both direct and indirect effects on supply chain flexibility, and that the indirect effects operate through the absorptive capacity. On the one hand, this means that a firm can improve flexibility through relational embeddedness strategy in itself. On the other hand, in line with the literature [9][12][16][17][58], we can suppose that relational embeddedness, by making colleting, storing and transferring knowledge easier, engenders and facilitates absorptive capacity, which in turn can lead to supply chain flexibility. In this study, the finding that relational embeddedness indirectly partial affects supply chain flexibility through absorptive capacity suggests that relational embeddedness leads firms to collect, store and transfer information, and will makes firms more easier to learn from one anther which can enhance supply chain flexibility.

Finally, it is not hard to find that absorptive capacity has a significant relationship with supply chain flexibility, as we stated above. The two aspects of absorptive capacity (potential and realized absorptive capacity) appear to have a significant influence on flexibility. Of the relationships, realized absorptive capacity has a stronger relationship with supply chain flexibility than potential absorptive capacity. [9] has inferred that potential capacity comprises the capacities of knowledge acquisition and assimilation, meanwhile, realized capacity centers on knowledge transformation and exploitation. Both the components of absorptive capacity fulfill a necessary but insufficient condition to improve supply chain flexibility. In this study, we find that firms need pay more attention on realized capacity, implying that the ability of transform and exploit knowledge means more than the ability of acquire and assimilate knowledge for firms. We can suppose that just the capacity of knowledge acquisition is not enough, how to transfer and exploit the knowledge is more valuable. The result may prove useful to managers in understanding and dealing with flexibility in supply chain management.

The theoretical framework in this study lends to excellent support for our hypotheses, which is fundamentally different from the traditional mindset. This new model emphasizes the transfer knowledge over assimilate knowledge, flexibility over cost, trust over contract. Given today's highly uncertain and globally competitive market, firms should abandon the old mindset and embrace relational embeddedness when managing supply chain. The result of this study demonstrates an innovative and practical approach to improve supply chain flexibility by clearly laying out the roadmap of what needs to be done to achieve the expected benefits.

V. LIMITATION AND FUTURE RESEARCH

As pointed out above, these results have both theoretical and managerial implications. However, it is also important to recognize the limitations of this study.

Our research setting, the industrial characteristics of the

selected 136 companies is the first limitation. All the companies are distributed in the Yangtze River Delta and could limit the generalizability of our findings. Moreover, a further limitation of this research is that supply chain flexibility is a research area with a huge body of literature. It is hardly to include all the variables in one study. According to the study demanding, we select only some variables. Furthermore, supply chain flexibility is considered as the organization's ability to meet an increasing variety of customer expectations; therefore, putting forward the customer involvement is essential when noting supply chain flexibility. Finally, some other factors in relation to absorptive capacity re not considered in this study, which means that other variables, factors, and constructs omitted by this study could be developed in future research.

Future research may incorporate several issues. First, we can explore the balance between potential and realized absorptive capacity. It can be investigated that what kind of absorptive capacity will influence the supply chain flexibility more strongly? [23]. Furthermore, relational embeddedness leads to what kind of absorptive capacity? Second, we can consider the environment dynamism as the moderate variable between relational embeddedness and absorptive capacity. In high environment dynamism, we may expect more potential absorptive capacity while in low

environment dynamism, we may expect more realized absorptive capacity absorptive capacity. Furthermore, the technology dynamism and market dynamism may provide different moderate consequences. Examining various consequences and moderating effects would enhance understanding of how certain level of rational embeddedness may contribute to absorptive capacity and supply chain flexibility.

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APPENDIX

TABLE A1.MEASUREMENT ITEMS FOR RELATIONAL EMBEDDEDNESS, ABSORPTIVE CAPACITY AND SUPPLY CHAIN FLEXIBILITY

Code names	Question items
	Trust
T1	Our main [customer/supplier] negotiates fairly with us
T2	Our main [customer/supplier] keeps its word
T3	Our main [customer/supplier] does not mislead us
T4	This [customer/supplier] may not use opportunities that arise to profit at your expense
	Information sharing
I1	Exchange of the information in this relationship takes place frequently and not only according to a prespecified agreement.
I2	Our main [customer/supplier] warns us of events that may create problems for us
I3	Our main [customer/supplier] shares proprietary and sensitive information with us
I4	Our main [customer/supplier] shares its plans for the future with us
	Joint problem solving
J1	We work with our main [customer/supplier] to help solve each other's problems
J2	Our main [customer/supplier] works with us to overcome difficulties
J3	We are jointly responsible with our main [customer/supplier] for getting things done
	Potential absorptive capacity
P1	We collect industry information through informal means (e.g. lunch with industry friends, talks with trade partners)
P2	Our unit periodically organizes special meetings with customers or third parties to acquire new knowledge
P3	New opportunities to serve our clients are quickly understood
P4	We are fast to recognize shifts in our market (e.g. competition, regulation, demography)
	Realized absorptive capacity
R1	Employees records and store newly acquired knowledge for future reference
R2	Our units periodically meet to discuss consequences of market trends and new product development
R3	It is clearly known how activities within our should be performed
R4	We constantly consider how to better exploit knowledge
	Supply chain flexibility
S1	The ability to handle difficult, nonstandard orders; to meet special customer specifications; and to produce products characterized by numerous features, options, sizes or colors.
S2	The ability to rapidly adjust capacity so as to accelerate or decelerate production in response to changes in customer demand
S3	The ability to rapidly introduce large numbers of product improvements/variations or completely new products
S4	The ability to effectively provide widespread and/or intensive distribution coverage
S5	The ability to respond to the needs and wants of the firm's target market(s)

TABLE A2.RELIABILITY ANALYSIS RESULTS

Items	Item-to-Total Correlation	Alpha If Deleted	Alpha Score
		Trust	
T1	0.62	0.76	
T2	0.62	0.75	0.80
T3	0.67	0.73	
T4	0.57	0.78	
		Information sharing	
I1	0.79	0.74	
I2	0.68	0.79	0.84
I3	0.65	0.80	
I4	0.57	0.84	
		Joint problem solving	
J1	0.65	0.68	
J2	0.62	0.72	0.78
J3	0.60	0.73	
		Potential absorptive capacity	
P1	0.53	0.76	
P2	0.62	0.72	0.79
P3	0.60	0.73	
P4	0.62	0.72	
		Realized absorptive capacity	
R1	0.37	0.74	
R2	0.57	0.63	0.73
R3	0.58	0.63	
R4	0.55	0.64	

TABLE A3.RELATIONAL EMBEDDEDNESS —— CONSTRUCT –LEVEL FACTOR ANALYSIS RESULTS

Kaiser-Meyer-Olkin(KMO) Measure of Sampling adequacy=0.90			
Questionnaire Items	F1: T	F2: I	F3:J
T1	0.64		
T2	0.71		
T3	0.77		
T4	0.72		
I1		0.76	
I2		0.69	
I3		0.60	
I4		0.72	
J1			0.70
J2			0.73
J3			0.78

TABLE A4.ABSORPTIVE CAPACITY —— CONSTRUCT –LEVEL FACTOR ANALYSIS RESULTS

Kaiser-Meyer-Olkin(KMO) Measure of Sampling adequacy=0.87		
Questionnaire Items	F1:P	F2:R
P1	0.65	
P2	0.80	
P3	0.77	
P4	0.73	
R1		0.64
R2		0.71
R3		0.74
R4		0.67

TABLE A5.UNIDIMENSIONALITY ASSESSMENT OF SUPPLY CHAIN FLEXIBILITY

Item	Factor Loading	Alpha Score
S1	0.71	
S2	0.65	
S3	0.67	0.74
S4	0.70	
S5	0.77	