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Board Interlock Tenure and Firm Internationalization

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ABSTRACT To overcome liabilities of foreignness and outsidership during internationalization, board interlock is an effective conduit of foreign knowledge inflows and organizational learning that firms require. We focus on the time dimension of such influence and hypothesize that the tenure of board interlocks with firms with experience in outward foreign direct investment (OFDI) in a country promotes the OFDI decision of the focal firm to that particular country. However, such an effect diminishes as the tenure of interlock ties increases. Moreover, as an alternative knowledge source, OFDI knowledge from the focal firm's neighboring region may weaken the baseline effect. Based on longitudinal data of listed firms in China, our empirical results support the hypotheses. This study enriches the literature on social network learning by identifying its temporal nature and the substitution between different knowledge sources. It also demonstrates the importance of rotating a firm's board members, so that knowledge acquisition and learning remain fresh.

KEYWORDS board interlock, organizational learning, outward foreign direct investment (OFDI), social network, tenure

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INTRODUCTION

When firms initiate internationalization activities, they face tremendous challenges from the complex environments of overseas markets. Their lack of awareness of the operating rules in new overseas markets causes salient liabilities of foreignness and outsidership in outward foreign direct investments (OFDIs) (Johanson & Vahlne, 1977, 2009). Such liabilities may be more pronounced for emerging market firms due to limited resources and international experience (Deng, 2012, 2013). Firms can directly obtain pertinent knowledge through organizational learning to overcome this challenge, which has been well documented in the

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literature on the internationalization process (Apaydin, Thornberry, & Sidani, 2020; Johanson & Vahlne, 1977; Zollo & Winter, 2002). Except for experiential learning, the extant literature has long studied learning from other firms through inter-firm ties and promoting internationalization, among which board interlock is a reliable and effective knowledge conduit.

Board interlock is formed by board members serving different firms simultaneously (Mizruchi, 1996). It promotes organizational learning processes and induces strategic similarities among diverse businesses (Gulati & Westphal, 1999). However, the influence of organizational learning via interlock ties is not fully accomplished immediately. The exploitation and exploration processes involved in the learning process require time to be realized (March, 1991). While studies have highlighted the knowledge transfer mechanism of board interlock, the literature on how board interlock influences internationalization is rather scant (Xia, Ma, Tong, & Li, 2018). To the best of our knowledge, no research so far has discussed the time dimension of such a relationship. A critical time dimension is board interlock tenure, that is, the time length of affiliation in a board interlock tie (Basuil & Datta, 2017). Subsequently, how the appointment tenure of the interlock directorates influences inter-firm foreign knowledge exploration and exploitation is an intriguing topic.

This study bridges the gap by exploring how the tenure of board interlock influences organizational learning from other firms and subsequently influences the internationalization of the focal firm. We argue that time may play a positive role by facilitating trust-building in the knowledge exploration through interlock ties. Moreover, the assimilation of knowledge related to OFDI obtained from interlocked firms, such as destination market evaluation, foreign client identification, cross-cultural management of human resources, and tacit knowledge of managing host market partners, takes considerable time to materialize into effective organizational learning. Considering the law of diminishing marginal utility, we further expect that such a positive role of time may depreciate along with the further increase of tenure. Moreover, firms can learn knowledge from others in their social and spatial networks, and studies have remained relatively silent about the interactions across different knowledge sources. To address this research gap, we also investigate how a learning process over the tenure may be mitigated by the geographical proximity with other firms with OFDI experience as another external source of knowledge.

This study makes two theoretical contributions to the internationalization literature. First, it contributes to the social network literature by emphasizing the dynamic role of time in organizational learning through board interlock during internationalization. It identifies the curvilinear learning effect of social networks on firm internationalization. Second, this study highlights the substitution among different knowledge sources, given that firms possess various channels to gain foreign knowledge (Forsgren, 2002; Johanson & Vahlne, 1977).

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THEORETICAL BACKGROUND

Value of Foreign Knowledge in Firm Internationalization

Conducting international business requires sufficient knowledge about the specific destination market to avoid liabilities of foreignness and outsidership. Firms face risk and uncertainty in the internationalization process (Liesch, Welch, & Buckley, 2011). The internationalization process model suggests that market knowledge is critical to overcoming foreign market uncertainty and that experiential learning is a crucial mechanism that deepens the internationalization process (Apaydin et al., 2020; Johanson & Vahlne, 1977). Such knowledge is particularly significant for OFDI, given that OFDI involves a high degree of strategic commitment and high operational risks in a foreign market (Johanson & Vahlne, 1977, 2009). As an advanced mode of foreign market entry, OFDI necessitates that investors have certain advantages and that firms have market intelligence to generate desirable returns (Wei, Zheng, Liu, & Lu, 2014). Owing to the distinct environment of different countries, the knowledge required for international expansion varies profoundly (Johanson & Vahlne, 1977). Such knowledge may cover the culture, economy, legislation, religion, and language perspective of each country (Cuervo-Cazurra, Maloney, & Manrakhan, 2007). It may also include information about specific foreign market opportunities and the preferences of customers in foreign markets (Lu & Beamish, 2001). Moreover, it can help firms identify potential partners and competitors in destination markets and shed light on how to search for and create new knowledge locally (Li, Zhang, & Lyles, 2015).

Regardless of the primary source of knowledge through experiential learning (Johanson & Vahlne, 1977), firms can also indirectly obtain knowledge from other firms through inter-firm channels (Forsgren, 2002). They include board interlocks (Ang, Benischke, & Hooi, 2018; Connelly, Johnson, Tihanyi, & Ellstrand, 2011; Xia et al., 2018), foreign ownership linkages (Najafi-Tavani, Robson, Zaefarian, Andersson, & Yu, 2018), international joint ventures (Howell, 2018; Minbaeva, Park, Vertinsky, & Cho, 2018; Sun, Deng, & Wright, 2021), strategic alliances (Brass, Galaskiewicz, Greve, & Tsai, 2004; Gomes-Casseres, Hagedoorn, & Jaffe, 2006), and employee mobility (Corredoira & Rosenkopf, 2010). Among these channels, board interlock is a reliable and effective conduit to obtain external knowledge and could significantly influence firm strategy (Krause, Wu, Bruton, & Carter, 2019; Useem, 1986) because board members have access to core knowledge of the firm (Kroll, Walters, & Le, 2007) and also have a significant influence on firm strategic decisions (Ravasi & Zattoni, 2006). Additionally, Connelly et al. (2011) explored the competing effect of various types of board interlocks on the diffusion of knowledge and further international strategies. Ang et al. (2018) proposed that interlocking with multinational enterprises promotes firms' application of high control expansion modes in the internationalization process. Moreover, Xia et al. (2018) studied how network knowledge influences the global strategy of a firm by

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comparing board interlocking with joint venturing. However, studies have not yet identified the dynamic nature of the relationship between organizational learning through social network and internationalization of firms and have neglected the interactions between different knowledge sources.

Board Interlock and Organizational Learning

Board interlock is an efficient knowledge conduit and the interlock ties between dissimilar firms may cause managerial similarities (Gulati & Westphal, 1999). The knowledge embedded in social networks helps firms alleviate bounded rationality and make appropriate decisions (Borgatti & Foster, 2003). Board interlock as an effective connection in social networks can promote innovation inputs and outputs (Srinivasan, Wuyts, & Mallapragada, 2018), diversification strategy (Connelly et al., 2011), and corporate acquisition (Haunschild, 1993). Recent studies have highlighted the emergence of the influence of board interlocking on firms' international business, including cross-border Greenfield investments, mergers, and acquisitions (Ang et al., 2018; Connelly et al., 2011; Xia et al., 2018). However, most of them have not distinguished the knowledge difference among various foreign markets (e.g., Ang et al., 2018; Connelly et al., 2011). Moreover, it takes possible delays for the strategic influence of organizational learning as a process of obtaining knowledge when interacting with the external environment (Cyert & March, 1963) to fully realize itself (Deng, Jean, & Sinkovics, 2018; Simon, 1991; Zhang, Li, & Li, 2014). The significant role of time in this relationship remains under-examined in the literature.

Organizational learning has an integral role in knowledge transfers as an important consequence of board interlocking (Krause et al., 2019; Useem, 1986). Organizational learning involves exploring and exploiting knowledge (March, 1991). Explorative learning through interlock ties involves certain procedures, including trust-building among board members (Vanneste, Puranam, & Kretschmer, 2014), search and discovery of appropriate knowledge (March, 1991), and knowledge transfer (Gupta, Smith, & Shalley, 2006). Meanwhile, exploitative learning requires firms to assimilate the knowledge, which comprises the extension, reconfiguration, and optimal integration of explored knowledge with existing knowledge (Zollo & Winter, 2002). Exploitative and explorative learning processes jointly influence the strategies of firms (Stahl & Tung, 2015). The learning process only becomes complete when the explored knowledge is integrated into the firms' knowledge base, which makes organizational learning a time-consuming and progressive process (Deng et al., 2018; Simon, 1991; Winter, 2000). Organizational learning through board interlock in social networks also involves the process of knowledge exploration and exploitation. However, most international business studies have neglected the temporal nature of this process.

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HYPOTHESES DEVELOPMENT

Board Interlock Tenure and OFDI Decisions

The knowledge about a particular foreign market obtained through interlock ties over time could facilitate foreign market entry of the focal firm, and board interlock is a reliable and effective conduit of knowledge (Krause et al., 2019; Useem, 1986). In the experience of conducting foreign direct investment, firms could accumulate knowledge about international business. Such knowledge may be location-specific, including information about market opportunities (Zhou, Wu, & Luo, 2007) and the culture, religion, language, and legislation perspectives of the institutional environment (Cuervo-Cazurra et al., 2007; North, 1990). The knowledge could also be general and include technology-related information (Salman & Saives, 2005; Wadhwa & Kotha, 2006) and knowledge about how to manage inter-firm relationships (Mayer & Argyres, 2004; Salman & Saives, 2005; Wadhwa & Kotha, 2006) or complex environments (Cuervo-Cazurra, 2011). Such knowledge helps overcome the liability of foreignness in the internationalization process (Eriksson, Johanson, Majkgard, & Sharma, 1997; Johanson & Vahlne, 2009). The board members of a firm have access to insider knowledge, which is not readily accessible to outsiders (Haunschild, 1993), and firms lacking international experience can learn international knowledge through interlock ties. Given that directors serve as influential players in firms' strategic decisions (Judge & Talaulicar, 2017; Kroll, Walters, & Wright, 2008), knowledge transferred through interlock ties affects the focal firm's internationalization decisions. When firms are equipped with abundant knowledge about a specific foreign market, their motivation to enter it increases (Xia et al., 2018). Therefore, the board interlock with firms with OFDI projects could encourage the focal firm to conduct OFDI in the same country.

However, the learning process through interlock ties that contribute to internationalization takes time to be accomplished (March, 1991). We suggest the time-consuming nature of the learning process by analyzing two approaches in organizational learning: knowledge exploration and exploitation (March, 1991). Before strategic influence from the board interlock comes true, firms first need to explore knowledge from other firms through interlock ties. Mutual trust is the foundation of knowledge sharing and assimilation (Holste & Fields, 2010; Johanson & Vahlne, 2009), whereas inter-personal and inter-organizational trust are not built overnight (Deng, Liesch, & Wang, 2021; Vanneste et al., 2014). Trust-building serves as the premise of knowledge exploration through interlock ties, and the degree of trust-building of board interlocks has an important influence on firm behavior (Tuschke, Sanders, & Hernandez, 2014; Vanneste et al., 2014). When the board interlock is appointed, limited trust level at the interlocked firm prevents the focal firm from exploring core knowledge in the firm's operations (Sonnenfeld, 2002). As the trust is built gradually, board interlock could increase access to more core knowledge of the interlocked firm. When the trust level of

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the board interlock at the focal firm is low, the potential knowledge exploration could also be limited because of low credibility of this knowledge. Such knowledge will become influential when the board interlock grows into a trustworthy source (Carpenter & Westphal, 2001). Thus, as the tenure of the board interlock increases, the degree of trust is low at the beginning but then increases, and the focal firm may explore more knowledge through interlock ties as tenure increases.

Furthermore, the knowledge explored through interlock ties also takes time to be exploited gradually (Simon, 1991; Zhang et al., 2014). After accessing such knowledge, time is required to realize its economic value to the firm (March, 1991). Such an exploitative learning process involves the decoding and effective assimilation of knowledge resources (Gupta et al., 2006; Ringberg & Reihlen, 2008; Simon, 1991). Some OFDI knowledge for specific countries obtained through board interlock requires scrutiny and interpretation before its potential value is fully assessed (Ringberg & Reihlen, 2008). For example, information about local culture and customs requires more effort to decode, while the decoding process of the information about explicit regulation is relatively easier. Besides, applicability of such externally obtained knowledge in the focal firm is subject to various limitations (Gupta et al., 2006; Simon, 1991; Zhang et al., 2014). For example, when the focal firm and interlocked firm conduct business in different industries, the product or industry-related knowledge may not be relevant, but the environmental knowledge, such as institutional information, could also be useful for the focal firm. Finally, the focal firm requires a new organizational design, routine, protocol, and team to assimilate the pertinent experience (Perkins, 2014). In summary, fully decoding and assimilating knowledge about OFDI in specific countries that are obtained through board interlocks is a progressive and time-consuming process. Therefore, trust-building in the exploration process and knowledge assimilation in the exploitation process require time. As the tenure of the board interlock increases, firms could iteratively explore and exploit more knowledge about OFDI projects conducted by the interlocked firm, which could enhance the OFDI propensity of the focal firm.

Moreover, we expect that the learning effect through board interlock is subject to the law of diminishing marginal utility. The OFDI propensity of the focal firm will increase at a declining rate because the marginal benefit from trust-building decreases when the tenure of the board interlock increases. When the tenure of the interlock tie is sufficiently high, the mutual trust required for knowledge transfer through this tie can be fully established (Westphal, 1999). Further time commitment exerts a lower marginal influence on trust-building and thus may not effectively contribute to the knowledge exploration. Moreover, as the focal firm becomes familiar with the interlocked firm, knowledge explored from the latter will become fully extracted (Hoang & Rothaermel, 2005). When a focal firm hosts interlocked directors during its early years, the knowledge from interlocked firms is relatively new and warrants learning (Deng et al., 2021). After several years of organizational learning, knowledge from

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interlocked firms adds limited fresh perspectives for the focal firm (Zhang et al., 2014). Furthermore, some knowledge could be idiosyncratic to interlocked firms and thus difficult to learn and imitate (Nelson & Winter, 1982). The knowledge that failed to be transferred in the early years of the established interlock tie may possess little value and have low compatibility with the focal firm. Thus, continuous increase of board interlock tenure will have a lower marginal effect on knowledge exploitation. Considering the decreasing marginal benefits from trust-building and the decaying knowledge value as the tenure increases, we hypothesize as follows:

> *Hypothesis 1 (H1): The tenure of board interlock with firms with OFDI experience in a country has a positive relationship with the OFDI propensity of the focal firm to the same country, and this positive relationship presents a declining trend as the tenure continues to increase.*

Moderator: Geographical Proximity as an Alternative Conduit of OFDI Knowledge

In addition to social networks, firms can also explore knowledge in spatial networks. Similar to social networks, spatial networks consist of direct and indirect relations among firms but are confined to a specific geographic area (Molina-Morales & Martinez-Fernandez, 2010). Exploring interactions of the learning process from these two different networks helps to enhance the understanding of the learning mechanism from different networks. Geographical proximity refers to the close physical distance between different economic actors (Boschma, 2005), and geographical proximity to firms with OFDI experience in a particular country that could provide the focal firm with OFDI knowledge. Knowledge could be transferred to nearby actors (Lee, 2009; Petruzzelli, 2008; Petruzzelli & Murgia, 2021) but will decay as distance grows (Knoben & Oerlemans, 2006). Subsequently, firms can take advantage of geographical proximity to acquire knowledge from other firms (Howells, 2002; Petruzzelli, 2008; Petruzzelli, Albino, & Carbonara, 2007).

When neighbor firms have OFDI experiences in specific host countries, focal firms can learn neighboring OFDI knowledge through various channels. First, the focal firm can observe the best local practices of neighboring enterprises closely, and international knowledge is codified in the practices of firms and can be transferred through the observation of practices (Ringberg & Reihlen, 2008; Wang & Wu, 2016). Second, firms in the same region develop implicit and explicit connections through the local business community (e.g., business clubs), which provides managers with frequent contacts that promote organizational learning (Howells, 2002; Ramasamy, Goh, & Yeung, 2006). Third, employee mobility can also create knowledge transfers among firms (Corredoira & Rosenkopf, 2010), with turnover of managers with international experience in the prospective host

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countries also fostering knowledge flows across firms. All three channels help transfer OFDI-related knowledge from neighboring firms to focal firms.

When interlock tenure is short, OFDI knowledge from board interlocking and neighboring firms is more overlapping than complementary; when interlock tenure is long, OFDI knowledge from the two sources becomes more complementary than overlapping. Knowledge from different sources can be both complementary and overlapping (Han, Jo, & Kang, 2018). The knowledge obtained through board interlock is more informative, trustworthy, and reliable (Krause et al., 2019; Useem, 1986) than auxiliary knowledge acquired from neighbors. When firms have multiple overlapping knowledge sources, the benefits of using one of them will be weakened (Kim, Mukhopadhyay, & Kraut, 2016). When the tenure increases at the initial stage of board interlock, access to neighboring OFDI knowledge will weaken the uniqueness and value of knowledge from the board interlock, and thus the positive influence of board interlock on OFDI strategies is mitigated.

As the board interlock tenure further increases, knowledge obtained through interlocked directorates becomes less novel (Zhang et al., 2014). Therefore, focal firms will appreciate the value of knowledge acquired through spatial networks as an alternative external source. The knowledge obtained from neighboring firms may help focal firms better extract and assimilate tacit knowledge from interlocked directorates; thus, the complementary effect becomes nontrivial. Therefore, the declining trend in the relationship between board interlock and firm internationalization will be mitigated by the neighboring knowledge. Therefore, we hypothesize:

Hypothesis 2 (H2): Neighboring OFDI knowledge mitigates the effects of board interlock tenure on the focal firm's OFDI in that country in both rising and declining trends.

METHODS

Data

We used a sample of publicly listed firms in China to test our hypotheses for several reasons. First, publicly listed firms are intensely embedded into board networks, and their directors may hold positions on multiple corporate boards (Palmer, Barber, Zhou, & Soysal, 1995). Second, China is one of the largest sources of OFDI outflow globally and many firms have invested in OFDI projects (Deng, Yan, & Sun, 2020). According to the *World Investment Report* (UNCTAD, 2019: 7), China is the second-largest home country of OFDIs, reaching USD 133 billion in 2020. Third, although emerging market firms have recently become influential in the OFDI process, they encounter significant liabilities when entering foreign markets, which drives them to obtain OFDI knowledge from various channels, such as interlocked and neighboring firms.

Our sample includes listed firms from 2005 to 2014, and we collected data from two primary sources. First, we obtained board interlock information from

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the China Stock Market & Accounting Research Database (GTA Education Tech Ltd., 2019), which also reports information on firm performance, including balance sheets, income statements, and capital structures of firms, and detailed firm-level information, such as foundation year, location, and governance structure. Second, we collected data from the annual OFDI census of the Chinese Ministry of Commerce (Deng et al., 2020). To avoid sample selection bias, we included all observations of listed firms with any interlock ties regardless of OFDI experience. Our final dataset includes 21,387 observations of 2,697 listed firms from the Shanghai and Shenzhen Stock Exchanges located across all provinces of China.

Dependent Variable: *OFDI Dummy*

We adopted an OFDI dummy variable to measure the OFDI propensity of the focal firm. We assigned 1 to the observation if the firm carries out one or more OFDI projects in a specific year and at least one of the destinations of the projects is the same as the OFDI destination of interlocked firms over the past three years; otherwise, 0. When we tracked the OFDIs conducted by the focal and interlocked firms, we observed three possible scenarios. First, the firm had no OFDI that year. In this case, we assigned 0 to the observation. Second, the focal firm had one or more OFDI projects in that year, but the focal firm's interlocked firms had not invested in the destinations over the past three years. For example, a firm has OFDI projects in countries A and B, but its interlocked firms have OFDI projects in countries C and D. In this case, we still assigned 0 to the observations. Third, the focal firm had one or more OFDI projects in that year, and at least one of the destinations had been invested in by the focal firm's interlocked firms over the past three years. For example, a firm has OFDI projects in countries A and B, and its interlocked firms have OFDI projects in countries B and C. In this case, we assigned 1 to the observation.

Independent Variable: *Tenure of OFDI Ties*

Firms interlocked with peers with OFDI experience in specific countries can obtain the OFDI-related knowledge of those countries through board interlock ties. Consistent with the literature (Xia et al., 2018), we tracked the OFDI experience of interlocked firms over the past three years as a knowledge source. We regard the board interlock with firms with OFDI experience over the past three years as OFDI ties. This stock measure, rather than an annual flow measure, may help us overcome the potential endogeneity concern caused by reverse causality or omitted variables that simultaneously affect short-term investment motives and OFDI ties (Gulati & Westphal, 1999). We employed different time spans to measure the independent variable in our robustness tests which will be discussed shortly. Following the board tenure measurement in the literature (Basuil &

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Datta, 2017; Huang & Hilary, 2018), we measured the tenure of OFDI ties by summing up the tenure of each tie and dividing this by the number of interlocked firms with OFDI experience. For instance, company A is interlocked with companies B and C, both of which have OFDI experience over the past three years. This A–B interlock has existed for two years, whereas the A–C interlock has existed for five years. In this example, the average tenure of the OFDI tie is $(2 + 5)/2 = 3.5$ years.

Moderating Variable: *Neighboring OFDI Knowledge*

Subnational variance exists extensively in many countries (Chan, Makino, & Isobe, 2010; Deng et al., 2020; Hutzschenreuter, Matt, & Kleindienst, 2020). Different provinces in China have experienced different levels of firm internationalization. For instance, the OFDI intensities in southeastern provinces are generally higher than those in central and western provinces. We first obtained data on the number of OFDI projects in the province of corporate headquarters over the past three years. Then, to measure the overlap between the OFDI knowledge from neighbors and that from interlocked firms, we calculated the number of province-level OFDIs whose destinations are the same as the country in which the interlocked firms have invested over the past three years. To scale down the measure, we divided this number by 1,000 and obtained the *neighboring OFDI knowledge* in the models.

Control Variables

We incorporated several firm and region-level control variables into our models. First, we included the dependent variable (*OFDI dummy*) in the previous year to control the potential serial correlation and reverse causality. At the firm level, we adopted a logarithm of the total asset of the firm to measure *firm size* (Kumar & Aggarwal, 2005). Return on assets (*ROA*), apart from reflecting the financial capability of a firm, also influences its international investment decisions (Tan & Vertinsky, 1996). *Firm age* was included to reflect the degree of organizational rigidity and experiential resource accumulation of the firm (Dowell & Killaly, 2009). We also included *financial leverage*, measured by total liabilities divided by total assets, and *operating leverage*, measured by operating profit divided by gross profit, to reflect the risk tolerance of the firm (Gamba & Triantis, 2013). We measured *state ownership*, which fosters relationships between firms and the government, using the share of state-owned equity in non-current capital stock (Sun et al., 2021).

Following the literature (Lu, Liu, Wright, & Filatotchev, 2014), we measured the *OFDI experience* of the focal firm using the number of its OFDI projects over the past three years. We also controlled for other sources of external international knowledge, including *foreign ownership* and *international joint ventures*. *Foreign ownership* may link Chinese firms to foreign markets through ownership shares in non-

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current capital stock (Zou & Adams, 2008). We measured the international knowledge that firms may obtain from international joint ventures using the number of international joint ventures the focal firm invested in. These data were collected from the National Bureau of Statistics of China (Zhou & Li, 2008).

At the regional level, we calculated *regional competition* using the number of listed firms operating in the same business category in the province (Haveman, 1993). We incorporated industry dummy variables into our models to control the influence of industry-specific factors and year dummy variables to control the periodic disturbance. We lagged all independent, moderating, and control variables in the models by one year to accommodate the time delay between the antecedents and consequences of the OFDI decision.

RESULTS

Descriptive Statistics

Table 1 reports the descriptive statistics and correlation coefficients of the variables. All correlation coefficients between variables are lower than 0.40. We further calculated the variance inflation factors (VIFs) of all moderating, control, and independent variables. The maximum VIF is 1.27, and the average VIF is 1.10, both of which are far below the threshold when assessing the presence of multicollinearity. The average *tenure of OFDI ties* in Table 1 is 0.554, which is relatively low, given that 71.9% of the observations in our sample have no interlock ties with firms with OFDI experience over the past three years. If we exclude these 71.9% of our observations, then the average tenure of the OFDI ties of firms with at least one valid OFDI interlock tie is 2.56.

Baseline Results

Given that the dependent variable is a dummy variable, we used a panel data logit model (*xtlogit* in Stata 15.0) to run our analyses (Agresti & Kateri, 2011), and Table 2 reports the empirical results. Following the literature (Ma, Zhang, Zhong, & Zhou, 2020; Shi, Sadowski, Li, & Nomaler, 2020), we report both the coefficients and odds ratio to illustrate the effect size of explaining variables on the dependent variable. We set firm serial number as the identifier variable and year as the time variable and, therefore, used a firm-year combination as our unit of analysis. As our baseline model, Model 1 includes all control and moderating variables. Meanwhile, we include the *tenure of OFDI ties* in Model 2. As illustrated in the table, the tenure of OFDI ties has a statistically positive relationship with the OFDI decision of the firm at the 1% level. The odds ratio reveals that for each one-year increase in board interlock tenure with firms with OFDI experience, the probability ratio of the firm OFDI increases by 24.0% when the board interlock tenure with firms with OFDI experience increases by a year.

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Table 1. Descriptive statistics and correlation coefficients

Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1. OFDI dummy	1.000												
2. Firm size	0.096	1.000											
3. ROA	0.025	0.117	1.000										
4. Age	0.020	0.083	−0.015	1.000									
5. Financial leverage	−0.002	−0.064	−0.045	0.015	1.000								
6. Operating leverage	−0.004	0.003	−0.016	0.013	0.000	1.000							
7. State ownership	−0.032	0.154	−0.061	−0.235	0.007	−0.002	1.000						
8. OFDI experience	0.077	0.128	0.020	0.020	−0.002	0.000	−0.038	1.000					
9. Foreign ownership	0.004	−0.015	0.038	0.012	−0.003	−0.005	−0.105	0.006	1.000				
10. International joint ventures	0.066	0.218	0.028	0.123	−0.002	0.002	−0.001	0.071	0.088	1.000			
11. Regional competition	0.080	0.016	0.064	0.139	−0.008	0.003	−0.155	0.104	0.035	0.012	1.000		
12. Neighboring OFDI knowledge	0.101	0.078	0.052	0.100	−0.005	−0.002	−0.119	0.225	0.017	0.066	0.284	1.000	
13. Tenure of OFDI ties	0.105	0.198	0.051	0.125	−0.004	0.003	−0.096	0.197	0.005	0.081	0.084	0.353	1.000
Mean	0.010	21.636	0.034	14.257	0.614	4.499	0.345	0.021	0.027	0.285	6.428	0.052	0.554
Std. dev.	0.102	1.424	0.060	5.360	7.813	48.227	0.433	0.177	0.125	1.136	8.804	0.207	1.238

Notes: $N = 12{,}977$. Correlation coefficient$| \geq 0.02$, significant at $p < 0.01$.

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Table 2. Logit regression of panel data

	(1)		(2)		(3)		(4)	
Model #	*Coefficient*	*Odds ratio*	*Coefficient*	*Odds ratio*	*Coefficient*	*Odds ratio*	*Coefficient*	*Odds ratio*
Industrial dummies	Included		Included		Included		Included	
Year dummies	Included		Included		Included		Included	
DV_{t-1}	−1.272	0.280	−1.220	0.295	−1.191	0.304	−1.341	0.262
	(0.018)		(0.021)		(0.025)		(0.012)	
Firm size	0.671	1.957	0.625	1.867	0.596	1.814	0.600	1.823
	(0.000)		(0.000)		(0.000)		(0.000)	
ROA	1.135	3.112	1.273	3.571	1.067	2.907	1.099	3.000
	(0.550)		(0.506)		(0.574)		(0.562)	
Age	−0.031	0.969	−0.033	0.967	−0.028	0.972	−0.027	0.974
	(0.066)		(0.054)		(0.090)		(0.107)	
Financial leverage	−0.820	0.440	−0.960	0.383	−0.816	0.442	−0.796	0.451
	(0.118)		(0.071)		(0.122)		(0.130)	
Operating leverage	−0.007	0.993	−0.007	0.993	−0.007	0.993	−0.007	0.993
	(0.185)		(0.165)		(0.190)		(0.186)	
State ownership	−0.189	0.828	−0.141	0.868	−0.196	0.822	−0.219	0.803
	(0.427)		(0.552)		(0.407)		(0.355)	
OFDI experience	0.115	1.122	0.026	1.026	−0.002	0.998	0.023	1.023
	(0.628)		(0.918)		(0.993)		(0.924)	
Foreign ownership	−0.048	0.954	−0.038	0.963	−0.039	0.962	−0.059	0.942
	(0.934)		(0.947)		(0.946)		(0.916)	
Number of international joint ventures	0.072	1.075	0.070	1.072	0.065	1.067	0.064	1.067
	(0.054)		(0.064)		(0.081)		(0.079)	
Regional competition	0.025	1.025	0.028	1.029	0.031	1.032	0.031	1.032
	(0.003)		(0.001)		(0.000)		(0.000)	
Neighboring OFDI knowledge	0.551	1.736	0.299	1.349	0.000	1.000	1.534	4.638
	(0.008)		(0.166)		(1.000)		(0.003)	

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Table 2. Continued

	(1)		(2)		(3)		(4)	
Model #	*Coefficient*	*Odds ratio*	*Coefficient*	*Odds ratio*	*Coefficient*	*Odds ratio*	*Coefficient*	*Odds ratio*
H1: Tenure of OFDI ties			0.215	1.240	0.786	2.194	0.910	2.485
			(0.000)		(0.000)		(0.000)	
H1: Tenure of OFDI ties^2					−0.109	0.897	−0.130	0.878
					(0.000)		(0.000)	
H2: Tenure of OFDI ties × Neighboring OFDI knowledge							−1.163	0.312
							(0.001)	
H2: Tenure of OFDI ties^2 × Neighboring OFDI knowledge							0.152	1.164
							(0.000)	

Notes: $N = 12{,}977$. *F*-value or log-likelihood χ^2 is significant at $p < 0.01$ in each model. *p*-values in parentheses.

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In Model 3, we added the squared term of *tenure of OFDI ties*. In this model, the *tenure of OFDI ties* has a consistently positive effect on firms' OFDI at the 1% level, whereas the squared term exerts a negative effect at the 1% level. However, the turning point of the curvilinear relationship is at 3.62 years, which is even at the right-hand side of the 95th percentile of the observations. Therefore, instead of an inverted U-shape relationship, the *tenure of OFDI ties* positively affects the OFDI decision in all value ranges of the independent variable. In other words, the positive marginal effect of H1 demonstrates a diminishing trend, but it will never become negative. Following the literature (Zelner, 2009; Zhang et al., 2014), we plotted this relationship in Figure 1 to facilitate interpretation. The sign in the vertical axis is negative because the positive effect has been treated with a logarithm transformation. The *tenure of OFDI ties* in Figure 1 has an overall positive effect on the OFDI decision of the firm, whereas the slope of this positive relationship diminishes as the tenure continues to increase. Therefore, Hypothesis 1 is supported.

We then added the interaction term of *neighboring OFDI knowledge* with the *tenure of OFDI ties* and its squared terms into Model 4, both of which are significant at the 1% level. The odds ratios for these terms are 0.312 and 1.164, respectively. These results suggest that the influence of the *board interlock tenure* and its squared term on the probability ratio of the firm OFDI decreases and increases, respectively. Therefore, Hypothesis 2 is supported. To facilitate interpretation, we plotted the interaction effect in Figure 2. Compared with the curve with a low value of *neighboring OFDI knowledge*, that with a high value of *neighboring OFDI knowledge* becomes flatter.

Robustness Tests

To examine the robustness of our findings, we ran several sets of tests. For the brevity of the article, we outlined the regression results of robustness tests without providing the corresponding tables. First, we redefined board interlock with firms that have conducted OFDI over the past five, ten, or all historical years, instead of over the past three years, as an OFDI tie. Consistent with this measurement, we also re-measured the moderator using the number of OFDI projects in the province over the past five, ten, or all historical years when the destinations were the same as the countries that the interlocked firms have invested in over the same period. The results are consistent with those in Table 2, firmly supporting both hypotheses.

Second, we incorporated another time dimension into our measurement of the independent variable. Board members with a longer tenure in the focal firm have more power over its strategic decisions (Golden & Zajac, 2001). We multiplied the *tenure of OFDI ties* by the serving tenure of board members, took the sum of the product term for each individual tie, and divided it by the number of interlocked firms with OFDI experience. The empirical results consistently support all hypotheses.

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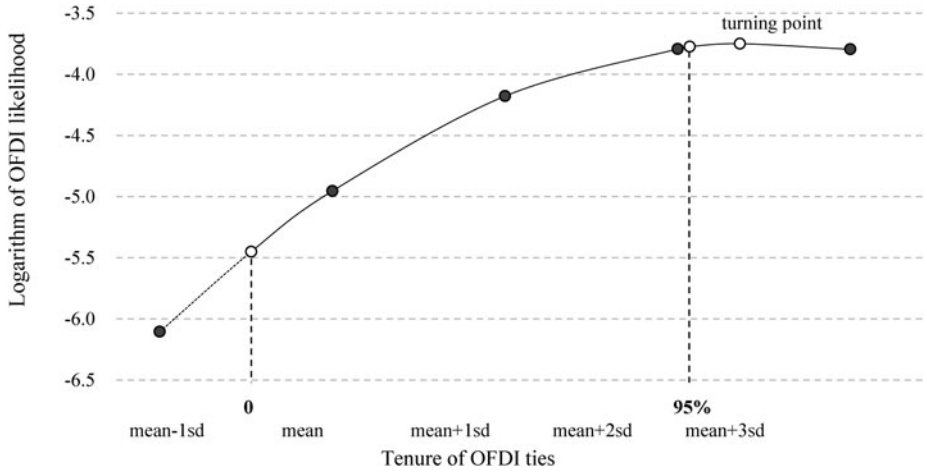

Figure 1. Tenure of OFDI ties and predicted OFDI likelihood (in logarithm)

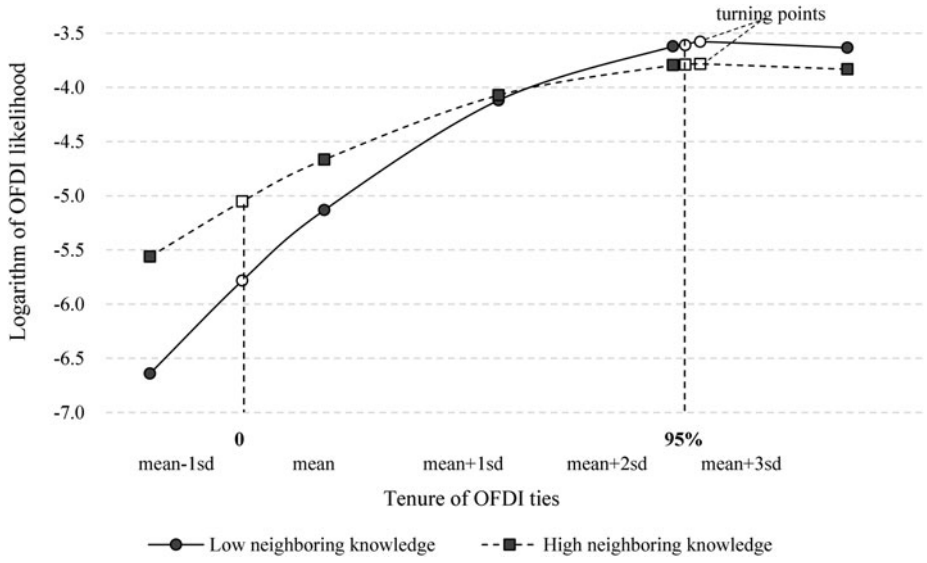

Figure 2. Moderating effects

Third, we adopted an instrumental variable approach to address the potential endogeneity. In line with the extant literature (Patro, Zhang, & Zhao, 2018), we used the industrial average value of the *tenure of OFDI ties* as the instrumental variable. The industry- and firm-level director tenures are likely to be highly correlated, but the industrial director tenure could be less related to the corporate OFDI decisions. Thus, it is an appropriate instrumental variable. Since the main models in this study are nonlinear models for the panel data, we adopted an instrumental variable probit model (*ivprobit* in Stata) and clustered it around the firm identifier. To obtain algorithm convergence in these *ivprobit* models, we

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omitted industrial and year dummies. The Wald χ^2 tests confirm the endogeneity of the tenure of OFDI ties. The results are consistent with those in Table 2, further supporting all hypotheses.

DISCUSSION

Theoretical Contributions

This study offers two contributions to the internationalization literature. First, it emphasizes the time dimension and curvilinear nature of organizational learning in the social network, which has been neglected in the social network and internationalization literature. Firms can learn foreign market knowledge from social networks to overcome the liabilities of foreignness and outsidership in the process of internationalization (Deng, 2013; Johanson & Vahlne, 1977, 2009). As an effective knowledge conduit, board interlock may provide firms with important enabling knowledge (Krause et al., 2019; Useem, 1986). Based on our analysis of the time-consuming yet curvilinear nature of the learning process, our findings suggest that organizational learning through interlock ties promotes the internationalization of firms when interlock tenure increases, but such a relationship exerts a diminishing marginal effect as the tenure increases continually. Studies on the influence of social networks on firm internationalization tend to be static (e.g., Ang et al., 2018; Xia et al., 2018) and ignore the temporal nature of such effect. However, the exploitation and exploration of knowledge take time to be gradually accomplished. Through the analysis of the learning curve and diminishing marginal learning effect through the board interlock, we underscore that time is a critical boundary condition of the learning process in social networks as well as a crucial dimension in internationalization process studies (Zhang, Li, Li, & Zhou, 2010).

Second, this research extends the internationalization process literature by revealing the interactions among different sources of foreign knowledge. Firms obtain knowledge from diverse sources to reduce information asymmetry (Boeh, 2011). Social and spatial networks are both informative sources of knowledge. Our study confirms the presence of substitutions between different types of knowledge sources that have been relatively ignored in the internationalization literature. The simultaneous existence of multiple knowledge sources weakens their independent roles in firm internationalization. Businesses need to choose among diverse knowledge sources when they expend resources to seek knowledge. This study, therefore, provides a framework of multi-channel foreign knowledge and extends our understanding of the association between knowledge acquisition and firm internationalization.

Limitations and Future Research Directions

First, potential knowledge complementarity may be considered when nuanced board information is available. Various knowledge sources have both overlapped

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components and different values, and in this study, we mainly discussed the trade-off between different knowledge sources. However, potential complementarity deserves further exploration. More detailed data on each external directors' OFDI experience could allow researchers to pin down their exact contributions and the potential complementary effects between board interlock and alternative sources of OFDI knowledge.

Second, apart from board interlock, other sources of external knowledge in social networks, such as foreign ownership linkages, joint ventures, and strategic alliances, also serve as knowledge conduits. In our study, we controlled for the influence of foreign ownership and international joint ventures, apart from neighboring knowledge sources as a moderator. When data on other inter-firm ties are accessible, future studies could explore if and how other ties in social networks play the role of knowledge conduits and affect the corporate internationalization process over time. Moreover, firms could also learn from neighbor firms of their subsidiaries. The knowledge transfer from neighbors to subsidiaries and then to the headquarters is quite an interesting topic that deserves comprehensive research in the future.

Third, each board member may have a different level of influence on the strategic decisions of firms. However, the empirical studies based on archive data analyses cannot capture these differences. In the robustness test of this study, we added tenure of the board member in the focal firm to the measurement of the IV, which is an attempt to capture the different influences on the strategic decisions by board members. Future studies can further analyze these differences through case studies, which could incorporate detailed information about the role of board members in the focal firm.

Managerial Relevance

This study has rich managerial implications for firms that intend to conduct OFDI. To overcome the liability of information asymmetry, firms could search for foreign knowledge directly or indirectly. According to our results, instead of treating board members as a knowledge repository, firms should optimize them as a conduit to acquire new knowledge externally, thus assisting firms in making effective strategic decisions. Moreover, the firm owner should consider the tenure of the interlock tie because the marginal effect of organizational learning decreases along with increasing interlock tenure. This finding highlights the value of retaining the acquired recent and fresh knowledge by regularly rotating board members who hold external positions and 'exotically' valuable knowledge. The moderating results in this study also demonstrate that scanning the external market for useful OFDI knowledge is an effective method that may reduce overdependence on the knowledge learned through board interlocks. Geographic agglomeration is a possible substitutive knowledge source for firms. However, it is worth noting that the overlapping between multiple knowledge sources may weaken the possible

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benefits of each. In other words, less is more for multi-channel knowledge sources. Therefore, managers should deploy their limited resources wisely to obtain knowledge from certain sources and avoid knowledge redundancy.

CONCLUSION

This study enhances our understanding of the temporal role of organizational learning through social networks and its influence on firm strategies by examining how board interlock of firms influences their internationalization decisions over time and how multiple knowledge sources interactively affect these decisions. Through empirical tests, we find that board interlocks with firms with OFDI experience can provide OFDI-related knowledge that helps them overcome the liabilities of foreignness and outsidership and apply effective internationalization strategies. Such influence changes over time because of the temporal and dynamic nature of organizational learning. The organizational learning effect unfolds as the tenure of the interlock tie increases, while its marginal effect demonstrates a diminishing trend. This study identifies an important alternative knowledge source – spatial network – and verifies its interactions with organizational learning through interlock ties.

NOTES

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DATA AVAILABILITY STATEMENT

We may not publish the data due to third-party property rights. GTA Education Tech Ltd. possesses the copyright of China Stock Market & Accounting Research Database containing the board interlock information. The Ministry of Commerce in China possesses the copyright of the information on the OFDI projects of the sample firms.

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