



The effects of inward FDI communities on the research and development intensity of emerging market locally domiciled firms: Partial foreign ownership as a contingency

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ABSTRACT

This study examined how inward foreign direct investment (IFDI) concentration affects the research and development (R&D) strategies of locally domiciled firms operating in emerging markets. From a resource dependence perspective, we argued that any community-specific interdependencies between local and foreign firms stimulate the former to engage in R&D activities. The findings of our analyses of panel data of 161,632 manufacturing firms across 525 four-digit-coded industries operating in China support our predictions that the R&D intensity of local firms responds positively to the presence of IFDI in competitive and symbiotic communities. In addition, the positive effects of IFDI on the level of R&D intensity of locally domiciled firms in competitive and symbiotic communities are enhanced by the foreign ownership of such firms. We conclude this paper by drawing the implications of our findings for theory and practice.

1. Introduction

Over the past decades, inward foreign direct investments (IFDI) in emerging economies have substantially increased and have fundamentally influenced the operation and survival of the locally domiciled firms in such economies (Oecd, 2008; Xiao & Park, 2018). Most of the existing studies are based on the implicit assumption that multinational corporations (MNCs) possess competitive advantages in terms of their possession of advanced technologies, expertise, and key know-how, which will automatically flow to local emerging market firms (Hansen & Hansen, 2020; Piperopoulos, Wu, & Wang, 2018). However, this assumption is not necessarily correct because MNCs have little incentive to share such competitive advantages with local firms, which, on the other hand, are stimulated to make great efforts to imitate, learn and absorb their foreign counterparts' advanced technologies and management practices (cf. Feinberg & Majumdar, 2001; Saranga, Schotter, & Mudambi, 2019; UNCTAD, 2018; Zhang, Li, Li, & Zhou, 2010). This state of affairs makes it naive to assume that MNCs act in a friendly manner to improve the technological and competitive advantages of

local firms, which may then enter into direct competition with them in the future (Wu & Pangarkar, 2006; Xia, Ma, Lu, & Yiu, 2014). In any case, this stream of research has paid inadequate attention to how IFDI enables or inhibits local emerging market firms to develop their capabilities and get closer to the technological cutting edge, which thus remains an underexplored question.

We addressed this lacuna in the related literature and the impact of IFDI on emerging market firms by drawing upon insights from the resource dependence theory (RDT) (Pfeffer & Salancik, 1978), and extending such literature in three important ways. First, we provide a fine-tuned understanding of how local emerging market firms may respond to the influence of IFDI on local communities differently. Specifically, we draw on the insight of RDT with respect to the relevance of competitive (commensalism) and symbiotic (exchange) relationships between firms (Pfeffer, 1972) to argue that any IFDI made in a large market unavoidably results in the establishment of different types of communities that involve different types of exchanges, interactions, and interdependencies between local and foreign firms (Cui & Xu, 2019; Elia, Munjal, & Scalera, 2020). Second, we extend the insight of RDT by

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highlighting the pattern of interactions between local firms and MNCs embedded in local communities of emerging economies. Previous scholarly work on RDT suggests that IFDI in emerging markets can reduce the dependence on local government and trigger cooperation within the industry, competition, and capital markets (Gaffney, Kedia, & Clampit, 2013; Rodrigues & Dieleman, 2018). For example, Deng and Yang (2015) showed that firms facing external constraints in emerging markets can increase their power by acquiring alternative sources of resources. But inadequate attention was paid to the interactions between local firms and foreign firms (He, Khan, & Shenkar, 2018; Xia et al., 2014). This study addresses this lacuna by emphasizing the importance of regionalized or localized interactions between local firms and foreign firms in reducing transportation or distribution costs and arguing that such interactions affect the responses of local firms with respect to research and development (R&D) activities. Third, we extend the insight of RDT that highlights the relevance of external factors in predicting organizational behaviors and strategic choices (Deng & Yang, 2015; Hillman, Withers, & Collins, 2009; Kim, Wu, Schuler, & Hoskisson, 2020; Wry, Cobb, & Aldrich, 2013); in this respect, we posit that the foreign ownership of local firms will shape the effects of IFDI on the responses of local firms embedded in different types of communities. The RDT-centered hypotheses which are corroborated by rigorous empirical evidence could stimulate future scholars to expand the theoretical framework to other emerging economies.

These important theoretical extensions are associated with two key aspects that underpin the theoretical framework of this study. On the one hand, the presence of IFDI in a large country—which leads to concentrations of MNCs in certain regions and industries—naturally gives rise to distinctive types of communities. Among these, ‘*competitive communities*’ are formed when the local firms embedded in the same regions and sectors compete with MNCs. For example, competitive communities are formed when the local firms (e.g., Shenzhen BYD Auto Industry Company Limited) and MNCs (e.g., Tesla) compete within the same region of China (e.g., Eastern China) by selling electric vehicles (same industry – electric auto supply industry)². The ‘*symbiotic communities*’ are established when local firms and MNCs operating in the same regions enter into interdependent relationships (e.g., supplier–buyer ones). An example of symbiotic communities can be the interaction between local firms (e.g., Contemporary Amperex Technology Ltd, so-called |CATL”) and MNCs in the Fujian province of China (same region) belonging to different industries: while Tesla was launching new Model 3 and CATL provided Tesla with the new batteries (i.e., M3P batteries) that could provide the vehicle with at least 10% more range³. These two types of communities entail distinct interactions between local firms and MNCs that substantially affect the former’s responses to any control of critical resources exercised by MNCs; so far, this phenomenon has been neither theoretically explained nor empirically tested.

Moreover, to gain an even more nuanced understanding of the interdependence explanation, we further took into account the role played by the foreign ownership of local firms in the relationship between IFDI concentration and the R&D efforts made by local firms operating in different types of communities as mentioned above. We did so because ownership linkage is a form of the interdependence of exchange partners engage to deal with any common external uncertainties (Pfeffer & Salancik, 1978). To survive when under great external pressure in the same communities, MNCs need to work closely together with their partially owned local firms by sharing some of their own knowledge and technology (Haskel, Pereira, & Slaughter, 2007; Meyer &

Sinani, 2009). Local firms under partial foreign ownership, in turn, are also more likely to engage in R&D activities in order to absorb the knowledge coming from external sources. We tested the above predictions using panel data drawn from 161,632 manufacturing firms operating in China across 525 industries identified on the basis of the four-digit Chinese industrial codes—which are equivalent to the four-digit Standard Industrial Classification (SIC) codes used in the United States—over the 2005–2007 period.

This study thus makes three main contributions. First, we enrich the IFDI spillover literature by incorporating the concept of IFDI in local communities (Li, Yang, & Yue, 2007) to understand the different ways in which local firms respond to the influence of the different types of IFDI communities in which they are embedded. This approach not only complements the earlier studies that have focused on the influence of IFDI on the strategies followed by local firms at the country level (Perri & Peruffo, 2016; Rădulescu & Șerbănescu, 2012) but also extends the literature by explicitly articulating the strategies adopted by such firms in response to IFDI (cf. Wang & Kafouros, 2020). Meanwhile, this study significantly advances the literature on sub-national IFDI and firm strategies (Chan, Isobe, & Makino, 2008; Wu & Ang, 2019) by taking a community-based approach that simultaneously incorporates both region and industry as two independent yet mutually related aspects of this type of investment. In other words, we not only developed a much more fine-grained conceptualization of sub-national IFDI but further show how such conceptualization enables us to understand the distinct mechanisms underpinning the different potential responses to IFDI enacted by the local firms embedded in these distinct communities as they strive to improve their capabilities and move up along their value chains.

Second, the existing RDT studies have focused on how firms respond to external interdependence by seeking inter-organizational solutions through actions such as interlocks, mergers and acquisitions, and joint ventures (Casciaro & Piskorski, 2005; Deng & Yang, 2015; Finkelstein, 1992; Pfeffer & Nowak, 1976; Pfeffer, 1972). However, external interdependence may also affect organizational strategies, such as those related to the internal distribution of power or organizational structure (Hillman et al., 2009; Pfeffer & Salancik, 1978; Wry et al., 2013). We extend this line of research by suggesting that the presence of IFDI in competitive and symbiotic communities stimulates the R&D intensity of local firms; this, in turn, encourages spillovers to local firms, which, in any case, need to absorb knowledge from spillovers for value creation (cf. Ge, Fu, Xie, Liu, & Mo, 2018; Kano, Tsang, & Yeung, 2020). In doing so, we add to the wider literature on RDT and on the ways IFDI impacts local firms. On the one hand, our study complements the scant research hitherto conducted on RDT with a focus on IFDI concentration in competitive and symbiotic communities; in doing so it provides a deeper understanding of its implications for the R&D intensity (i.e., strategy) of local emerging market firms. On the other hand, it provides the existing IFDI literature with further empirical evidence on the relevance of competitive and symbiotic IFDI communities for the R&D intensity of local firms.

Third, we focused on foreign ownership as a contingency factor for IFDI concentration in competitive and symbiotic communities—i.e., R&D intensity nexuses. RDT suggests that the establishment of interdependent relationships is a vital strategy for firms to overcome any external uncertainties (Pfeffer & Salancik, 1978). In this regard, we argued that the foreign ownership of local firms may unite them in local communities with the aim of exchanging the knowledge and advanced technologies they require to enhance their R&D activities and, in turn, benefit from any spillovers taking place as a consequence of the entry of MNCs. Therefore, in the presence of foreign ownership, the effects of IFDI on R&D intensity are enhanced in both competitive and symbiotic communities. This is an important contribution to both the RDT and IFDI literature; one that provides additional insights into the impact of foreign ownership on the R&D intensity of local firms. Overall, we provide a more fine-grained understanding of the key channels through

² <https://cleantechnica.com/2022/09/06/byd-sells-more-plugin-vehicles-than-tesla-but-tesla-makes-11-times-more-profit/#:~:text=Looking%20at%20revenue%2C%20Tesla%20took,terms%2C%20that's%20a%20massive%20difference.>

³ <https://www.teslarati.com/tesla-new-model-3-longer-range-china-report/>

which the entry of MNCs into emerging markets—which are becoming important destinations for IFDI—can be beneficial to local firms.

2. Theory development

2.1. The interdependencies between local and foreign firms

The RDT posits that organizations are dependent on their environmental actors for growth and survival and are thus inevitably influenced by such actors' actions and strategies. In response, organizations must take action to manage any critical environmental interdependencies (Finkelstein, 1992; Nienhüser, 2008; Pfeffer & Salancik, 1978), including their relationships with local governments and suppliers. In his seminal study, Pfeffer (1972) differentiated between 'symbiotic interdependence', which is defined as a resource exchange relationship between buyers and suppliers, and 'competitive interdependence', which refers to the relationship among firms in the same industry competing for the same resource. Building on Emerson (1962) power dependence approach, more recent studies have shown that the concept of interdependence is comprised of both mutual dependence and power imbalance, each with different implications for firm strategies (Casciaro & Piskorski, 2005; McWilliam, Kim, Mudambi, & Nielsen, 2020). This distinction represents an emerging stream of research in resource dependence studies (Cheng, Craighead, Crook, & Eckerdt, 2021; Karanović, Berends, & Engel, 2021; Rodrigues & Dieleman, 2018). In our study, we focused on the IFDI externality that may affect local firms' innovation strategies in relation to their absorption of external knowledge by entering into interdependent relationships with foreign firms, and on extending the RDT perspective to the unique context of the IFDI spillovers to emerging market firms.

The presence of IFDI in emerging markets unavoidably increases the interdependence between local and foreign firms, given that the former lack key know-how and thus have to rely on the latter to develop their capabilities (cf. Khan, Shenkar, & Lew, 2015; Kumaraswamy, Mudambi, Saranga, & Tripathy, 2012). In this context, symbiosis refers to those situations in which local and foreign firms coexist and benefit from business exchange relationships; conversely, competition refers to those situations in which the two groups of firms coexist in a market and compete for the same resources. The RDT view implies that any mutual dependence between local and foreign firms is also coupled—albeit complexly—with a power imbalance between them (Wu & Park, 2017).

While potentially finding themselves at a disadvantage in terms of their liability of foreignness (Zaheer, 1995) and their weak connections with the host government, MNCs can also find themselves in a favorable position due to the firm-specific ownership advantages associated with their possession of intangible assets—such as brand name, innovation capability, superior technologies, key know-how, and new product development capabilities—that they can mobilize on a global scale (Wu & Pangarkar, 2006). The advantages afforded to MNCs by these assets enable them to expand and compete abroad and to coordinate multidirectional flows of knowledge through their subsidiaries' networks (cf. Dunning, 1993; Lee, Jiménez, & Bhandari, 2020). MNCs may thus rely on such established advantages to compensate for the inherent weakness caused by their foreignness and effectively compete with local firms.

On the other hand, local emerging market firms are usually in an advantageous position in terms of their familiarity with local business practices, well-established social networks, and policy support from the local government. However, such firms can also be at a disadvantage due to their weak and underdeveloped capabilities and to the ability of MNCs to enhance their own host country market position by bringing in their distinctive technological resources (Buckley & Casson, 1998; Dunning, 1993; Kogut & Zander, 1993).

Foreign and local firms may thus be driven to engage in actions aimed at redressing the resulting power imbalance. One such action involves firms enhancing their absorptive capacity—which reflects their ability to learn by identifying, assimilating, transforming, and exploiting

knowledge for value creation (Cohen & Levinthal, 1990; Zahra & George, 2002)—by, for instance, investing in R&D. We thus argue that the presence of MNCs in a given host-country community may stimulate local firms to increase their R&D investment in an attempt to absorb external knowledge and exploit it for value creation (Khan, Lew, & Marinova, 2019).

2.2. Local and foreign Firms' dynamics in emerging markets

Earlier studies have emphasized the importance for MNCs to absorb and accumulate local market, regulatory, and business practice knowledge to enhance their competitiveness in host countries (cf. Contractor, Nuruzzaman, Dangol, & Raghunath, 2021; Jha, Dhanaraj, & Krishnan, 2018; Pattnaik, Singh, & Gaur, 2021; Zeng, Khan, & De Silva, 2019). As a complement to this body of research, we focused on the innovation strategies followed by local firms based in an emerging market (China), as shaped by the IFDI externality in a given sub-national region. From a long-term perspective, emerging market firms may increasingly engage in R&D activities to take advantage of any spillover resulting from IFDI through the mechanism of interdependence and subsequently, enhance their market positions. This process is closely associated with the economic influence of the generation of IFDI linkages with local firms and the resulting spillover to them (Guimón, Chaminade, Maggi, & Salazar-Elena, 2018; Hu, 2021; Li, Quan, Stoian, & Azar, 2018). This phenomenon has been widely observed in emerging markets, with local firms increasing their R&D investment to absorb any available external knowledge and enhance their competitiveness (Matusik, Heeley, & Amorós, 2019; UNCTAD, 2018).

Scholars have used stage models to explain this phenomenon (Kumar, Singh, Purkayastha, Popli, & Gaur, 2020; Zhou, Xu, Xu, & Barnes, 2020). Specifically, at the early stage, MNCs find themselves in more technologically advantageous positions, far ahead of local firms. However, IFDI spillover starts to take place, enabling local firms to enhance their operations (cf. Meyer & Sinani, 2009). During the intermediate stage, despite still lacking the resources needed to challenge the market power of MNCs, local firms begin to enhance their capabilities to assimilate external innovation and knowledge through direct and indirect channels. During the late stage, local firms are predicted to have gained the capabilities necessary to compete with MNCs, in terms of innovation, both domestically and globally (Li & Fleury, 2020; Ricard, Shimizu, & Vieu, 2021; Rong, Wu, Shi, & Guo, 2015; Stevens & Newenham-Kahindi, 2017).

Although this three-stage modelization predicts the general trend in the technological development of emerging market firms and the dynamic relationships between local and foreign firms, it fails to provide a systematic explanation of the impact of IFDI on any sub-national differences in local firm strategies. Although, currently, emerging market firms are largely at the intermediate stage described in the above-mentioned model, it has been observed that, within large emerging markets such as that China, the strategic efforts made by local firms often vary across industries and regions. To complement this stream of thought, we developed and advanced a community-based resource dependence perspective that shows that the R&D intensity of local firms can be determined by any imbalance in the distribution of IFDI in large emerging countries. Specifically, our study was focused on the community effects accruing to local and foreign firms geographically located close to each other, as discussed in the next section.

2.3. A Community-Based resource dependence approach

Most RDT studies have taken an industry-based approach (Pfeffer, 1972) to identify the interdependent relationships established between two groups of firms (Ashraf, Ahmadsimab, & Pinkse, 2017; Cui & Xu, 2019; Prasad, Zakaria, & Altay, 2018). In its conceptualization of interdependence, this approach does not take geography or location into account. However, location does play a role in organizational decision-

making (Oh, Shapiro, Ho, & Shin, 2020; Zamir & Saeed, 2020), with firms being able to exploit any specific advantages associated with a particular location. For example, any new software firm establishing itself in Silicon Valley would benefit from a locational advantage by observing the best practices of the firms and related and supporting industries already based there. To extend the theory, scholars have called for more research to focus on geography (Clough, Fang, Vissa, & Wu, 2019; Meyer, Li, & Schotter, 2020; Wang & Kafourous, 2020). Building upon this call, we adopted a community-based approach (Li et al., 2007) by using industry and geographical location as two dimensions suited to produce a more fine-grained understanding of the influence of IFDI externalities on local firm R&D strategies. In a large emerging market such as China, MNCs tend to choose certain industries across different regional clusters, thus forming various communities that are distinct in regard to FDI either in their own eyes (Adarkwah & Malonaes, 2020) or in those of their local counterparts (Wu, Pangarkar, & Wu, 2016; Xia et al., 2014).

Whereas prior studies have considered the presence of IFDI in different industries (Hertenstein, Sutherland, & Anderson, 2017; Li, Liu, & Bustinza, 2019), less scholarly attention has been devoted to its regional⁴ distribution (Cui, Fan, Li, & Choi, 2020). Indeed, specific host country regions may offer agglomeration benefits and attract critical masses of foreign investors (Stallkamp, Pinkham, Schotter, & Buchel, 2018) because of the presence of specific production factors, including human, physical, and financial resources, as well as the infrastructure quality provided by communication, transportation, healthcare, and education systems (Fainshmidt, Smith, & Judge, 2016; Iammarino, 2018). Well-developed regions provide MNCs with locational advantage and enable local firms to acquire resources critical for their strategic activities.

Scholars have indicated that regional differences prevail not only in developed countries (Hutzschenreuter, Matt, & Kleindienst, 2020; Villaverde & Maza, 2015), but also in emerging ones (Fan, Wang, & Zhu, 2011; Zhang, Li, Uddin, & Guo, 2020). More importantly, regional differences are quite prominent in large countries (e.g., the US and China), which are divided into administrative areas as large as small countries (Hutzschenreuter et al., 2020). However, scholarly work suggests that regions also differ in small countries, such as Malaysia and Vietnam, because of marked developmental disparities (Bravo-Ureta, Higgins, & Arslan, 2020; Vu, Tan, Nguyen, & Nguyen, 2018). This makes it vital to investigate the mechanism of legitimacy spillovers to local firms to understand the effect of community-level IFDI on the market entry strategies followed by MNCs.

In this study, we expanded the concept of the IFDI community from the local firms' perspective. Specifically, we defined IFDI communities as either *symbiotic* or *competitive* based on the local firms' geographic locations and industry sectors. We defined an IFDI community as *symbiotic* when its constituent local firms and MNCs were based in the same administrative region (e.g., a province) but operated in different industries. The L2C (learning to collaborate) project is an example of a symbiotic community where local entrepreneurs/firms operating in different industries often become customers or suppliers to the MNCs (Rand, 2015; Surdu, Mellahi, Glaister, & Nardella, 2018). We identified a *competitive* IFDI community as one in which local firms and MNCs were located in the same region and belonged to the same industry. This form of community is often observed in the case of Hershey, the US chocolate giant, that aimed to triple its operations in Brazil through IFDI in cocoa production and related products (Pekic, 2015). Research suggests that MNCs may play a critical role in innovation throughout their geographic locations (Cha, Wu, & Kotabe, 2021; Malik, Sharma, Pereira, & Temouri,

2021). To examine the effects of community-wide interdependence on the R&D of local firms, we argued that it will be triggered by IFDI in both symbiotic and competitive communities.

Moreover, according to the study conducted by Baum and Mezas (1992) on localized competition, the relative importance of intra-region IFDI on the strategic efforts of local firms may vary in both symbiotic and competitive communities. We argued that geographically localized communities are highly influential in providing access to the knowledge and information conducive to R&D intensity. Our central argument was that interdependence may serve as a central mechanism suited to explain why the effect of IFDI externalities on the R&D of local firms is essentially community-specific. We developed the hypotheses presented below to advance this theoretical framework (as shown in Fig. 1). We started by examining the community IFDI effect and then investigated the moderating effect exerted by local firms' foreign ownership on the relationship between community-wide IFDI levels and the R&D intensity of local firms.

3. Hypotheses

3.1. Symbiotic IFDI communities and R&D intensity of local firms

In symbiotic IFDI communities (Martin, Swaminathan, & Mitchell, 1998), MNCs and their vertical partners (i.e., local suppliers or buyers) located in the same region are mutually dependent (Dindial, Clegg, & Voss, 2020; McWilliam et al., 2020). Due to the reduced transportation or distribution costs stemming from the physical closeness of symbiotic communities, high IFDI concentrations within such communities indicate the presence of extensive direct or indirect resource exchanges between local firms and MNCs across different value chains throughout a region, thus reflecting typical symbiotic relationships (Dindial et al., 2020; He et al., 2018). This is in line with the RDT perspective, which argues that regional concentrations increase resource exchanges between emerging market-based and foreign firms, thereby enhancing mutual dependence (Pfeffer & Salancik, 1978). Symbiotic IFDI communities enable the transfer of knowledge between foreign and local firms through the demonstration, training in, and implementation of advanced technologies and managerial techniques (Lee & Gereffi, 2021). However, as the MNCs and local firms in such communities belong to different industries, they need to frequently negotiate the price, quality, and delivery time of each input (Pham & Petersen, 2021). By doing so, local firms can absorb the external knowledge they need to increase their R&D intensity. Therefore, we expect that an increased concentration of IFDI in a symbiotic community will lead to higher R&D intensity of local firms based in emerging markets.

First, MNCs often bring their differentiated high-quality products or services to emerging markets, thus spurring large numbers of local suppliers or buyers to compete for foreign resources. In symbiotic IFDI communities, powerful MNCs are likely to impose (quality, price, or delivery) demands on local firms in order to obtain favorable conditions (Goerzen, Iskander, & Hofstetter, 2021). RDT postulates that to compensate for this increasing pressure, local firms restructure their dependence by reducing any uncertainties or seeking stable access to resources (Huo, Flynn, & Zhao, 2017). Thus, in symbiotic communities, local firms are required to enhance their innovative capabilities in relation to technological development in response to the demands made by MNCs. Previous evidence shows that inter-industry spillovers may take place even between foreign and local firms that are not directly linked (Pangarkar & Wu, 2012). In this situation, the economic exchanges between foreign and local firms are the primary channel for the technological spillovers that support the latter's R&D intensity (Kano et al., 2020).

Second, the presence of foreign MNCs in emerging markets provides local firms with access to advanced tacit knowledge through greater interconnectedness (Pfeffer & Salancik, 1978; Pfeffer, 1972). However, to absorb such knowledge, local firms need to possess their own

⁴ Following previous studies (e.g., Cui & Xu, 2020; Sun & Grimes, 2017), we conceptualized 'region' based on the geographic delineations of MNCs and local firms located either in the same or different 'provinces'. For example, Inner Mongolia—a Chinese province—was conceptualized as a region in our study.

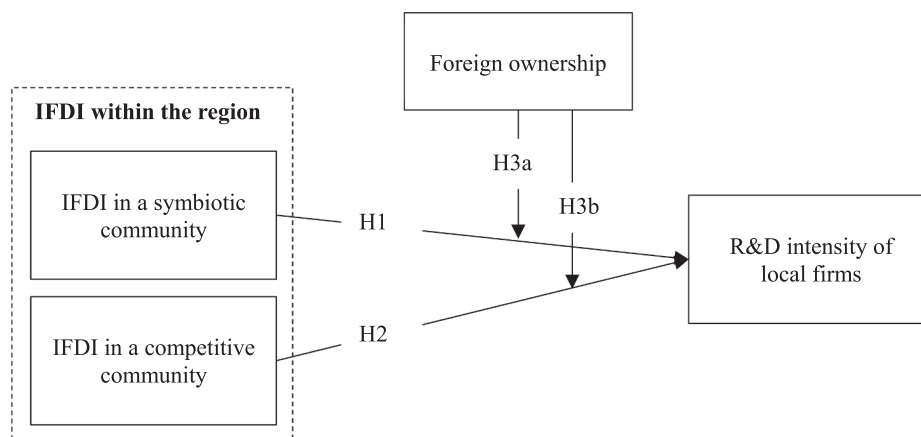


Fig. 1. Theoretical framework of the study.

technical competencies and make their own investments. In emerging markets, a certain level of local firm R&D activity is necessary, or even crucial, for such firms to benefit from any IFDI spillovers (Ge et al., 2018; Kano et al., 2020). Internal R&D enables local firms to absorb the knowledge and technological information available from foreign MNCs, which, in turn, enhances their productivity and absorptive capacity (Jiang, Jiao, Lin, & Xia, 2021). R&D investments can help local firms to compete among themselves and with the MNCs in emerging markets by effectively enabling them to absorb the knowledge available in symbiotic communities (Wu, Lao, Wan, & Li, 2019) thereby enhancing their market position (Zhang, Li, Hitt, & Cui, 2007). Therefore, we expected that, in the presence of IFDI in symbiotic communities, local firms would be likely to exhibit higher levels of R&D investments. Thus, the preceding discussion led us to suggest the following.

Hypothesis 1. *Higher levels of IFDI in symbiotic communities result in higher levels of R&D intensity of the domiciled local firms.*

3.2. Competitive IFDI Communities: Regionalized competition

In competitive IFDI communities, local and foreign firms overlap along the two dimensions of region and industry; they do because they tend to strive for the custom of the same buyers within the same region, and thus intensify regionalized competition (Wu et al., 2016), which in turn, increases ‘outcome uncertainty’ (Pfeffer & Salancik, 1978). For example, given that, in emerging economies, the size of markets is limited, and growth rates are relatively stable (Li, Xue, Truong, & Xiong, 2018), any increase in the sales made by MNCs will erode those of local firms in the same market. IFDI concentration in such communities directly increases the struggle between local and foreign firms to maximize their respective market shares and influences organizational mortality (Wu et al., 2016). Specifically, foreign MNCs have a power advantage due to their control of advanced resources, including technology and new management systems (Deng, Ma, & Zhu, 2022; Wu & Ang, 2019); as such, they use their local competitors to their own advantage, hindering their growth while increasing their own market dominance (Gaur, Ma, & Ding, 2018; Nuruzzaman, Singh, & Pattnaik, 2019). By the same token, foreign MNCs are affected by their liability of foreignness (Wan, Williamson, & Pandit, 2020), whereby they face uncertainty in doing business in emerging markets due to their lack of local knowledge and legitimacy.

RDT suggests that the MNCs and local firms in competitive communities can control any critical external resources while reducing any power imbalance through greater interdependence (Pfeffer & Salancik, 1978). Such firms are mutually dependent, with MNCs seeking to gain legitimacy by exploiting the relational assets of local firms, which, in turn, strive to obtain advanced and critical resources in order to augment and develop their arrays of capabilities (Wu, Lao, Wan, & Li,

2019). Any increases in the host country sales of the MNCs have beneficial effects on the growth and survival rates of the local firms. Similarly, local firms benefit from any localized knowledge spillovers by keeping track of the activities conducted by their foreign competitors. By increasing their R&D investments, the local firms may enhance their ability to absorb the external knowledge coming from the MNCs.

Against this background, we argued that the presence of IFDI in competitive communities increases the pressure placed on local firms to increase their R&D investments in order to absorb external knowledge through commensalism interdependence and develop new technologies. Research shows that knowledge spillover is not quasi-automatic because the successful absorption of the technology brought in by the MNCs depends on the local firms’ ability to assimilate it (Murphree & Anderson, 2018), as shown by Kathuria (2000) in the context of India. Studies also reveal that competitive interdependence may lead to industry-wide knowledge and technology spillovers through both demonstration effects and the transfer of personnel from MNCs to local emerging market firms (Fu, 2008; Haskel et al., 2007). Demonstration effects operate through observation and subsequent imitation; those MNC-trained individuals that move to local firms bring with them the tacit knowledge that enables these firms to develop key capabilities (Cheung & Lin, 2004). Moreover, any increase in R&D investments helps local firms to develop more innovative products or services, thus upgrading their product quality (Wu, Zhou, Park, Khan, & Meyer, 2021; Yang, Tipton, & Li, 2011). We thus expected competition in IFDI-concentrated communities to stimulate local firms’ investments in R&D activities. Thus, we proposed the following.

Hypothesis 2. *Higher levels of IFDIs in competitive communities result in higher levels of R&D intensity in the domiciled local firms.*

3.3. Community-related IFDI concentration and foreign ownership

To gain a better understanding of how IFDI shapes the strategies of local firms, we further examined whether local firms under partial foreign ownership are more likely to engage in R&D to benefit from their interdependent relationships with MNCs in both symbiotic and competitive communities. IFDI exists not only in local firms’ communities but also in the form of joint ventures with some such firms. International joint ventures (IJVs), as cooperative arrangements between local and foreign firms, are a common form of IFDI in emerging markets. The RDT perspective posits that bridging—i.e., establishing connections with other firms—is an important strategy for focal firms to manage any external uncertainties and resource asymmetries (Pfeffer & Salancik, 1978; Wry et al., 2013). Bridging ties can take on many forms, such as strategic alliances, directorate interlocks, associations, business groups, etc. Ownership ties signify the mutual dependence of exchange partners who strive to manage their common external uncertainties (Casciaro &

Piskorski, 2005; Pfeffer & Nowak, 1976; Pfeffer & Salancik, 1978).

The rich international business literature on IJVs has demonstrated that such arrangements may provide partners with complementary assets and opportunities for collusion and the reduction of environmental uncertainties (Buckley & Casson, 1998; Lyles & Salk, 1996). Both local and foreign partners may benefit from undertaking IJVs in many different ways, as such arrangements play an important role in the knowledge acquisitions of local firms based in emerging markets (cf. Khan et al., 2015; Lyles & Salk, 1996). From the RDT, foreign ownership allows MNCs to obtain natural resources (e.g., minerals, timber, agricultural products, and fishery) and intangible resources (innovation-based knowledge) to increase their power in emerging markets (Deng & Yang, 2015). For example, Buffett's Berkshire Hathaway investment in BYD in 2006 is a good example of foreign ownership in a symbiotic community⁵. It provided BYD with a large amount of investment in R&D and helped it become one of the most successful electric vehicle manufacturers in China⁶. In terms of foreign ownership in a competitive community, Siemens Healthcare Diagnostics Ltd acquired Delhi-based Dade Behring Diagnostics India Pvt Ltd to expand its imaging and healthcare products in emerging markets (Sharma, 2009).

Numerous studies have focused on the benefits reaped by MNCs by co-managing such ventures with local partners, including bridging any cultural gaps, managing local uncertainties, and leveraging distribution channels (Hennart & Larimo, 1998). Local firms placed under greater community-related IFDI pressures are also likely to benefit from foreign partnerships by leveraging their advantages, such as ownership ties with MNCs, to pursue R&D strategies (Li, Zhou, & Zajac, 2009; Zhang et al., 2007). In the presence of foreign ownership, the FDI in local communities is beneficial for R&D intensity because such ownership acts as an information source in emerging markets and helps firms make appropriate investment plans that can reduce failure risks yet promote R&D intensity (Vahlne & Wu, 2021). Further, at the high level of foreign ownership, IFDI in local communities can promote R&D intensity because emerging market firms are better able to overcome their lack of knowledge and technical expertise through a close connection with foreign partners (cf. Lyles & Salk, 1996). As such, foreign ownership by MNCs may help local firms to grow and survive because they themselves also have a stake in the ventures, especially when they have high ownership shares in them. We thus introduce foreign ownership as a moderator and argue that it may amplify the influence of IFDI communities on the strategic efforts of local firms.

Specifically, the community effect of IFDI on the R&D intensity of local firms can be amplified by the partial foreign ownership of a local firm. The basic reason for this is that bridging through ownership ties, which shifts organizational boundaries, may have a 'coalition effect' against external uncertainties (Emerson, 1962). According to Emerson (1962), the coalition effect occurs when, in an A-B-C triad, two members coalesce during the process to deal with the third member in the form of (AB)-C. In our research context, a foreign investor (A) and a local firm (B) may coalesce through ownership ties—i.e., form an (AB) coalition—to deal with other MNCs (C) in the same community. When the coalition is formed based on ownership linkage, local firms become responsive and balance the power of foreign firms by providing resources, bargaining power, or industrial protection (Xia et al., 2014), and therefore act as a boundary condition for the relationship between IFDI in local communities and R&D intensity. Hence, it can be argued that foreign ownership ties may support the beneficial effect of IFDI on local firms' R&D efforts.

⁵ <https://www.reuters.com/business/buffetts-berkshire-sells-13-mln-byd-h-shares-47-million-hkex-filing-2022-08-30/>

⁶ <https://cleantechnica.com/2022/09/06/byd-sells-more-plugin-vehicles-than-tesla-but-tesla-makes-11-times-more-profit/#:~:text=Looking%20at%20revenue%2C%20Tesla%20took,terms%2C%20that's%20a%20massive%20difference.>

Moreover, ownership ties, which are built on mutual dependence (Pfeffer & Nowak, 1976), give exchange partners access to any needed resources. MNCs often hold certain advantages in emerging markets—such as superior knowledge, advanced technologies, or marketing networks (Chang & Xu, 2008; Delios & Henisz, 2000; Luo, 2002). By establishing ownership ties, MNCs make their technological resources available to local firms, which will thus also become more likely to engage in R&D activities by taking advantage of the technology spillovers caused by the shared assets, products, and personnel with their foreign investors (Buckley et al., 2007; Griffith, Redding, Van Reenen, 2004; Tian, 2007). We thus hypothesized the following.

Hypothesis 3a. *Foreign ownership in symbiotic communities enhances the positive effect of IFDI on the R&D intensity of the domiciled local firms.*

Hypothesis 3b. *Foreign ownership in competitive communities enhances the positive effect of IFDI on the R&D intensity of the domiciled local firms.*

4. Method

4.1. Data and sample

We tested our hypotheses using a large sample of manufacturing firms operating in China, which we drew from the Industrial Statistics Survey database. This database, which has been widely used in earlier studies (Li et al., 2009; Park, Li, & Tse, 2006; Tian, 2007; Zhang, Li, & Li, 2014), is based on an annual survey conducted by China's National Bureau of Statistics (NBS, 2007). It covers all manufacturing firms with annual sales in excess of RMB 5 million. These firms are required by Chinese law to accurately report their registration and financial information. The NBS is responsible for checking the accuracy and consistency of such reporting by means of a set of financial ratios and statistical tests that assess data consistency and integrity. If any inconsistencies are detected, the NBS data collectors contact the firm to verify the information (Pan, Li, & Tse, 1999).

Our observation window was limited to the 2005–2007 period because the firm's R&D information in the NBS database was available only for these three years. In our sampling process, we took several steps to identify the potential participant firms. As our focus was on the strategies followed by local firms, we excluded any foreign-invested firms from further analysis. We further excluded those firms with missing values in our variables of interest (e.g., registered capital by ownership, sales, and number of employees). This resulted in an unbalanced panel dataset. After excluding any observations with missing values, our final sample included panel data of 239,327 firm-year observations of 161,632 firms across 525 four-digit-coded industries.

4.2. Variables and measures

4.2.1. Dependent variables

Our dependent variable, R&D intensity, was measured as the ratio of a firm's R&D expenditures to its total sales (Greve, 2003; Hoskisson & Johnson, 1992; Hoskisson, Hitt, & Hill, 1993). We lagged the time-varying independent and control variables by one year in all the analyses.

4.2.2. Independent variables

We operationalized IFDI in a symbiotic community to which a local firm belonged in three steps. First of all, to capture the degree of interdependence in terms of the buyer–supplier relationship, we followed prior studies (e.g., Burt, 1980; Casciaro & Piskorski, 2005; Wu et al., 2021) and relied on the information on the Input-Output (I-O) accounts for the China economy. We defined the input–output transactions between local firm industry *i* and foreign firm industry *j* as a buyer–supplier relationship. In line with earlier studies (Casciaro & Piskorski, 2005; Finkelstein, 1992), we defined each sample industry based on the four-digit Chinese industrial codes (Buckley, Clegg, & Wang, 2002; Li

et al., 2009; Zhang et al., 2010).

Second, to capture the effect of high levels of FDI found in a symbolic community on the local firms embedded in it, we deemed it more realistic to focus on local firms domiciled in a geographically proximate area, rather than in distant ones. We took this view because firms domiciled in geographically distant areas are less likely to form communities. Moreover, in China, each province is highly motivated by its own economic achievements, as evidenced by the rapid growth of the regional economy, which sees the implementation of various policies and regulations aimed at protecting local firms while banishing those from other provinces (Kim et al., 2020). In other words, the various legal barriers and local protections found in each province tend to hinder the flow of capital, people, and information from one province to another. This made the definition of our sample communities as bounded by provincial borders more relevant, appropriate, and realistic. As such, we matched the interdependence and panel data accordingly, constructing our sample symbiotic communities with interdependent foreign and local firms located in the same province but operating in different industries.

Third, following prior studies (e.g., Javorcik, 2004; Xia et al., 2014), we constructed IFDI concentration along three dimensions as the ratios of the revenues, assets, and number of employees of the foreign firms to those of all firms in the symbiotic community, respectively. We then checked the reliability and validity of the measure for our sample symbiotic communities. For reliability, we conducted an inter-item reliability analysis, assessing the internal consistency among the multiple items used to measure the construct of IFDI concentration in a symbiotic community. The Cronbach alpha for the three variables was found to be 0.970, indicating acceptable inter-item reliability (Fornell & Larcker, 1981). For validity, we performed a principal component analysis followed by a Varimax rotation to condense the data. As a rule, the three variables would be required to exhibit relatively high loadings—i.e., close to 1.0 (Dess & Beard, 1984). In our study, the loadings for the three variables were found to be 0.947 for revenue, 0.942 for assets, and 0.901 for employees. We thus combined the three factors into a composite index to measure IFDI concentration in a symbiotic community.

We operationalized a competitive community to which a local firm belonged as a situation in which the sample foreign and local firms were based in the same province and operated in the industry at the four-digit-code level. We measured IFDI in a competitive community by the ratios of the revenues, assets, and number of employees of the foreign firms to those of the whole competitive community, respectively. The loadings were found to be 0.968 for revenue, 0.978 for assets, and 0.934 for employees. We also created a composite index to measure IFDI concentration in a competitive community.

We measured foreign ownership, the moderating variable in this study, as the ratio of foreign capital to the total capital invested in a local firm (Chen, Paik, & Park, 2010; Li et al., 2009; Zhang et al., 2010). Foreign capital included that invested by MNCs, including firms from Hong Kong, Macao, and Taiwan (Zhang et al., 2007, 2010). The four variables were lagged by one year. Consistently, all time-varying control variables described below were also lagged by one year.

4.2.3. Control variables

We included firm-, industry-, and year-level control variables to exclude any possible alternative explanations. In regard to firm-level variables, we controlled for firm age by calculating the number of years between each sample year and a firm's founding one; we did so because older firms are less likely to make strategic changes due to structural inertia. Then, as larger firms may have more resources available to engage in various strategic activities to catch up, we controlled for firm size by using the logarithm of total assets. As we expected firm performance to positively affect a firm's R&D investments (Subramaniam & Youndt, 2005), we included a firm's performance, measured by its return on assets (ROA). As a firm's productivity may be

affected by its R&D spending—which may increase a firm's productivity and competitiveness in the market exchange (Griffith, Redding, & Van Reenen, 2004)—we measured firm productivity using the ratio of sales to number of employees. As a firm's debt position may affect its R&D investments (Li, Xia, Long, & Tan, 2012), we controlled for a firm's annual debt-to-equity ratio. We also controlled for a market concentration, which we computed by means of the Herfindahl-Hirschman index (HHI) of industry concentration (Flammer, 2015).

For industry-level variables, we took into account the potential effect of market concentration on firm-level R&D intensities (Greenhalgh & Rogers, 2006; Wu, 2012). To do so, we used the Herfindahl index to control for industry-level market concentration. Such index was generated based on the sales of all firms in the four-digit code manufacturing industries (Li et al., 2009). We obtained the annual data from the China Industrial Statistics Survey database. Moreover, we fixed the industry effect by including industry dummies at the two-digit-code level to control for the fact that firms in some industries are more likely than others to engage in R&D activities. For temporal variables, we fixed the year effects to capture the possible effect of China's institutional and economic changes over time (Zhang et al., 2014).

4.3. Analysis

To determine an appropriate regression method for our data analyses, we used the Breusch-Pagan Lagrange multiplier test to decide whether a panel data method or a pool OLS approach was more appropriate (Zhang et al., 2014). The results indicated that unobserved individual effects associated with the same units existed in the data. We thus adopted panel data regression for our data analyses; a model that produces more efficient, unbiased regression coefficients (Fuller & Battese, 1974). We fixed the firm effect to control for the unobservable effects (Baltagi, 2008; Cameron & Trivedi, 2009). This approach enabled us to account for time-invariant effects, such as the initial conditions of the local firms. Our results were estimated using maximum likelihood with the STATA program.

One concern was any endogeneity issue that may arise from omitted variables influencing both FDI and R&D intensity⁷. We thus took several steps to address this concern. First, we made substantial efforts to include as many relevant explanatory variables as possible in the regression model. These relevant explanatory variables included not only firm-level ones, but also industry-level and temporal ones. In relation to firm-level variables, we controlled not only for surface-level firm characteristics—such as firm age, firm size, and firm performance—but also for operation-level ones such as firm productivity, firm debt-to-equity ratio and firm performance. In regard to industry-level variables, we controlled for both industrial effect (by including industrial dummy variables) and industry-specific characteristics (by including industrial market concentration). Second, we employed a time lag in the regression analyses, that is, while all the explanatory variables were at year t , the dependent variable was at year $t + 1$. The introduction of a time lag partially alleviated the endogeneity issue (Wu et al., 2021).

Third, organizational form is important as, for example, a more flexible organizational form may attract more FDIs to its local community and also act as a strong incentive for a higher R&D intensity (Buckley et al., 2002). To address the potential endogeneity issue caused by leaving organizational form out of the regression model, we used the data on firm ownership as a proxy for it. This was adequate because state-owned enterprises have long been considered to be cumbersome and rigid, whereas privately owned ones are dynamic and flexible. Between these two extremes are collectively owned and limited liability enterprises, which show moderate levels of flexibility (Wu & Zhao,

⁷ We would like to express our thanks to one reviewer for making this good point.

2015; Wu, 2011). As such, we used state-owned enterprises as the comparison group and controlled for the other types (i.e., collectively owned, privately owned, and limited liability enterprises).

Fourth, another potential endogeneity issue was that some variable (e.g., IFDI in other provinces beyond the local communities) could affect both IFDI in a local community and the level of R&D intensity of the firms domiciled in it. To address such omitted variable bias, we created a variable, *IFDI in remote community*, to take into account any potential external IFDI effect. A remote community was operationalized as one in which foreign and local firms are based in different provinces and operated in different industries at the four-digit-code level. IFDI in remote community was then calculated by the ratio of the revenues, assets, and number of employees of the foreign firms to those of all firms in the remote community, respectively. The loadings were found to be 0.932 for revenue, 0.941 for assets, and 0.926 for employees. A composite index was created to measure IFDI concentration in a remote community.

5. Results

Table 1 reports the descriptive statistics and correlations of the variables used in this study. We investigated any potential multicollinearity problems by using variance inflation factors (VIFs). The maximum VIF was found to be 2.653, well below the cutoff value of 10 (Li et al., 2007; Ryan, 1997). All independent variables were mean-centered for the interaction terms (Aiken & West, 1991).

Table 2 presents the results of the panel data regressions for R&D intensity. Model 1 only included the control variables. Model 2 added the main effects of the predictors. Models 3 and 4 in Table 2 added the individual interaction terms. Model 5 is the full model, including all the main effects and interaction terms. The R-square F tests showed that our theoretical variables added significant value to the respective baseline models (i.e., Models 1). Given that the full model was found to best fit the data, we interpreted our results based on it.

Hypothesis 1 predicted that higher levels of IFDI in a symbiotic community would result in higher levels of R&D intensity in its local firms. As shown in Table 2, the coefficient for IFDI in the symbiotic community, Model 4, was found to be positive and significant ($\beta = 0.150, p < 0.001$). We plotted the estimated coefficient in Fig. 2, in which the horizontal axis represents low vs. high levels of IFDI in a symbiotic community, whereas the vertical axis represents the level of R&D intensity of its domiciled local firms. The line that represents the relationship between the two dimensions goes linearly upwards, indicating that the relationship between the level of IFDI in a symbiotic community and the level of R&D intensity of its local firms is positive and significant. Hence, Hypothesis 1 was found to be supported.

Hypothesis 2 predicted that higher levels of IFDI in a competitive community would result in higher levels of R&D intensity of its local firms. The coefficient for IFDI in the competitive community (Model 4) was found to be positive and significant ($\beta = 0.072, p < 0.001$). We plotted the estimated coefficient in Fig. 3, in which the horizontal axis represents the low vs. high level of IFDI in a competitive community, whereas the vertical axis represents the level of R&D intensity of its local firms. The line representing the relationship between the two dimensions goes linearly upwards, indicating that the relationship between the levels of IFDI in a competitive community and the levels of R&D intensity of its local firms is positive and significant. Hypothesis 2 was hence found to be supported.

Hypothesis 3a predicted that foreign ownership would enhance the positive effect of IFDI in a symbiotic community on the R&D intensity of its local firms. As shown in Model 4 of Table 2, the interactive effect of foreign ownership and IFDI in a symbiotic community was found to be positive and highly significant ($\beta = 0.009, p < 0.001$). Moreover, as shown in Fig. 2, while both lines represent the relationship between low vs. high levels of IFDI in a symbiotic community and the level of R&D intensity of its local firms, they differ in regard to low vs. high levels of

Table 1
Means, standard deviations, and correlation matrix.

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 R&D intensity	0.00	0.01	1.00													
2 Firm age	8.32	8.65	0.01	1.00												
3 Firm size	228.12	966.45	0.03	0.10	1.00											
4 Return on assets	0.10	10.28	0.00	-0.00	0.00	1.00										
5 Debt to equity ratio	4.56	68.55	-0.00	0.01	-0.00	0.00	1.00									
6 Productivity	627.18	21713.82	0.00	0.03	-0.00	0.00	-0.00	1.00								
7 Market concentration	0.02	0.03	0.03	0.03	0.03	0.00	0.01	0.01	1.00							
8 Collective dummy	0.06	0.24	-0.02	0.18	-0.01	0.00	0.00	-0.00	-0.01	1.00						
9 Private dummy	0.41	0.49	-0.06	-0.20	-0.09	0.00	0.00	-0.01	-0.05	-0.22	1.00					
10 Limited liability dummy	0.02	0.14	0.00	0.05	0.07	0.00	0.00	-0.00	0.02	-0.04	-0.12	1.00				
11 IFDI in a symbiotic community	0.14	0.21	0.03	0.02	0.01	-0.00	0.00	0.00	-0.01	-0.04	-0.09	0.00	1.00			
12 IFDI in a competitive community	0.02	0.06	0.06	-0.01	0.04	-0.00	0.00	0.00	0.04	-0.04	-0.07	-0.03	0.40	1.00		
13 IFDI in a remote community	0.71	0.29	0.02	-0.08	-0.01	0.00	-0.00	0.00	-0.04	-0.08	-0.03	-0.07	0.20	0.06	1.00	
14 Foreign ownership	0.17	0.24	0.10	-0.05	0.07	0.00	-0.01	0.00	0.03	-0.18	-0.58	-0.09	0.20	0.15	0.21	1.00

Notes: N = 239,327. Significant at the 0.05 level (two-tailed test) when Pearson correlations ≥ 0.017 or ≤ -0.017 .

Table 2
Estimates of panel data regression for R&D intensity.

	Model 1	Model 2	Model 3	Model 4
Firm age	0.00 (0.18)	-0.00 (-1.61)	-0.00 (-0.79)	-0.00+ (-1.80)
Firm size	0.02*** (9.43)	0.02*** (9.31)	0.02*** (8.92)	0.02*** (9.05)
Return on assets	40.73** (2.74)	26.67+ (1.78)	24.59+ (1.66)	20.14 (1.35)
Debt to equity ratio	-0.00** (-2.68)	-0.00+ (-1.92)	-0.00* (-2.16)	-0.00+ (-1.74)
Productivity	-0.00 (-0.14)	-0.00 (-0.60)	-0.00 (-0.71)	-0.00 (-0.79)
Market concentration	0.00*** (4.79)	0.00*** (4.63)	0.00*** (4.46)	0.00*** (4.47)
Collective dummy	0.01*** (5.33)	0.01*** (8.38)	0.01*** (5.82)	0.01*** (8.09)
Private dummy	0.01*** (4.04)	0.01*** (8.09)	0.01*** (6.27)	0.01*** (8.57)
Limited liability dummy	0.01*** (3.53)	0.01** (3.05)	0.01** (3.20)	0.01** (2.96)
IFDI in a symbiotic community	0.08*** (6.53)	0.13*** (8.58)	0.13*** (10.57)	0.15*** (10.66)
IFDI in a competitive community	0.07*** (8.77)	0.07*** (9.20)	0.07*** (10.60)	0.07*** (10.65)
IFDI in a remote community	-0.05*** (-8.06)	-0.03*** (-5.68)	-0.04*** (-6.48)	-0.03*** (-5.19)
Foreign ownership	0.02*** (23.30)	0.02*** (23.09)	0.02*** (23.79)	0.02*** (24.00)
IFDI in a symbiotic community * Foreign ownership		0.01*** (12.97)		0.01*** (10.07)
IFDI in a competitive community * Foreign ownership			0.05*** (15.91)	0.03*** (11.50)
Constant	-0.01*** (-16.01)	-0.01*** (-18.72)	-0.01*** (-18.82)	-0.00*** (-19.66)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes

a. N = 239,327 firm-year observations.
 b. Significance levels: *** p < 0.001, ** p < 0.01, * p < 0.05, † p < 0.1.
 c. Estimated coefficients and t-value (in parentheses) are reported.

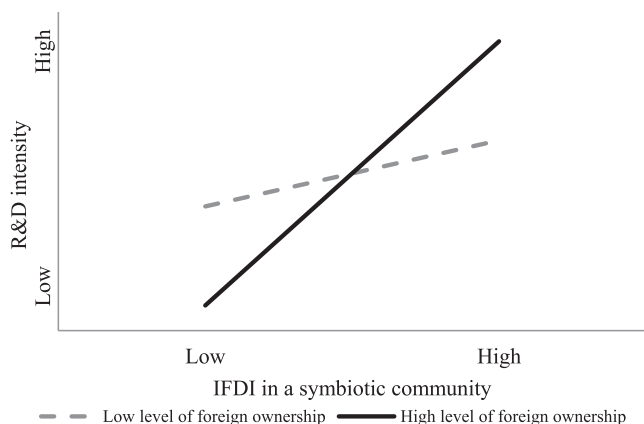


Fig. 2. Symbiotic IFDI community, foreign ownership, and R&D intensity.

foreign ownership. The continuous dark line represents high levels of foreign ownership, and the dotted gray line represents low ones. While both the lines go upward, the slope of the continuous dark line is steeper than that of the dotted gray one, indicating that a high level of foreign ownership enhances the positive effect of IFDI in a symbiotic community on the R&D intensity of its local firms. Hypothesis 3a was hence found to be supported.

Hypothesis 3b predicted that foreign ownership would enhance the

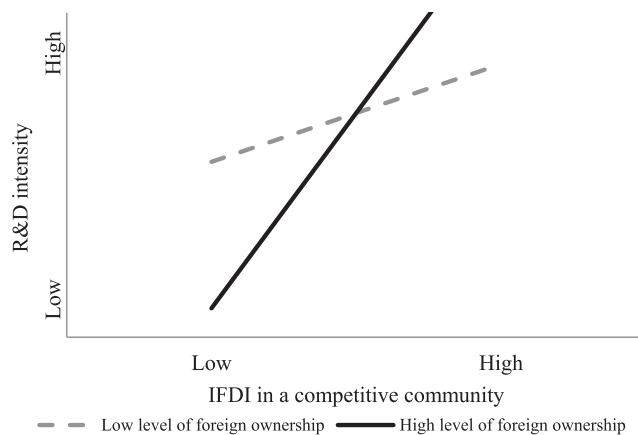


Fig. 3. Competitive IFDI community, foreign ownership, and R&D intensity.

positive effect of IFDI in a competitive community on the R&D intensity of its local firms. The interactive effect of foreign ownership and IFDI in a competitive community was also found to be positive and significant ($\beta = 0.028$, $p < 0.001$). Moreover, as shown in Fig. 3, while both lines represent the relationship between low vs. high levels of IFDI in a competitive community and the level of R&D intensity of its local firms, they differ in regard to low vs. high levels of foreign ownership. The continuous dark line represents high levels of foreign ownership, and the dotted gray one represents low levels of foreign ownership. While both lines go upward, the slope of the continuous dark line is steeper than that of the dotted gray one, indicating that high levels of foreign ownership enhance the positive effect of IFDI in a competitive community on the R&D intensity of its local firms. Hypothesis 3b was thus found to be supported.

For the significant control variables, both foreign ownership and firm size were found to have a positive effect on R&D intensity. Firm performance (return on assets) was found to increase a firm's R&D intensity, as expected. Interestingly, productivity was not found to have a significant impact on R&D intensity. Market concentration was found to positively relate to R&D intensity, indicating that high market concentration motivates firms to increase their R&D spending. In addition, privately owned and limited liability firms were both found to be more likely to invest in R&D than state-owned ones.

6. Discussion

There has been increasing interest in examining the impact of IFDI on local firms based in emerging and developing markets, with both positive and negative spillovers taking place through IFDI have been documented (cf. Meyer & Sinani, 2009; Wang & Kafourous, 2020). We focused on one of the underexplored channels—such as IFDI in communities and the R&D intensity of local firms—through which IFDI benefits local firms based in emerging markets. By drawing upon key insights from the RDT, our study addressed the question of how symbiotic and competitive IFDI communities affect the R&D intensity of local firms in an emerging market due to their interdependent relationships. The results, based on a sample of Chinese manufacturing firms, show that the R&D intensity of local firms is stimulated by the concentration of IFDI in both symbiotic and competitive communities. These results support our argument that the influence of local–foreign interdependence on the innovation strategies of local firms is a community-specific phenomenon, which is consistent with earlier research, which found that spillover is a region-specific phenomenon (e.g., Wang & Kafourous, 2020; Wang & Wu, 2016; Zamir & Saeed, 2020). Beyond the community-specific influences of IFDI, we also found that, in both symbiotic and competitive communities, foreign ownership enhances the effects of IFDI on the R&D intensity of local firms. These results have useful theoretical and

practical implications.

6.1. Theoretical implications

The findings of this study have important implications. First, using the RDT as a theoretical lens, our study provides a more refined theoretical foundation suited to explain the extent to which IFDI concentration in given communities affects emerging market-based local firms' R&D strategies (Pfeffer & Salancik, 1978). We characterized local-foreign firm relationships as exhibiting reciprocal interdependence because such firms coexist and interact with each other. A fundamental argument in the RDT perspective is that mutual dependence and power imbalance coexist between exchange partners (Casciaro & Piskorski, 2005; Finkelstein, 1992; Pfeffer & Nowak, 1976; Pfeffer, 1972). Due to such interdependencies, local firms are likely to enhance their R&D intensity in order to take advantage of any technological spillovers by absorbing the external knowledge stemming from FDI externalities in different regions and industries to enhance their relative market positions (e.g., Ge et al., 2018; Kano et al., 2020). R&D intensity is vital for local firms to take advantage of any knowledge spillovers from IFDI.

Second, we contribute to the RDT literature by incorporating the concept of the IFDI community (Li et al., 2007) and, furthermore, we responded to the call for more research on geography or location to extend the theory (Clough et al., 2019; Meyer et al., 2020; Wang & Kafourous, 2020). Earlier studies had shown that IFDI communities affect the entry strategies of MNCs (Li et al., 2007) and the outward FDI of local firms, including their cross-border mergers and acquisitions (Deng & Yang, 2015; Gaffney et al., 2013; Xia et al., 2014). Our results reveal that IFDI concentration in distinct communities (e.g., competitive and symbiotic) influences both local firm R&D investment and MNC-local firm interdependence, which should not be ignored while examining the impact of IFDI on local firms based in emerging markets. Thus, our results identify the relative importance of distinct IFDI communities and speak to the emerging literature that suggests that geography is relevant when examining the benefit of IFDI spillovers to local firms (cf. Wang & Wu, 2016; Wang & Kafourous, 2020).

Third, our study adds to the IFDI literature by shifting the focus from MNCs to the influence of FDI concentration on the R&D strategies of local firms from an RDT perspective. Most prior FDI studies had traditionally focused on how host country conditions affect MNC strategies (Brouthers & Hennart, 2007; Buckley & Casson, 1998; Li & Li, 2010), and had called for new theoretical insights into the contribution of IFDI to the strategic efforts of local firms. An emerging stream of the literature shows that organization theories are important to understand this phenomenon in emerging markets (Kosová, 2010; Tian, 2007; Zhang et al., 2014). In line with earlier studies (e.g., Xia et al., 2014), our study shows that RDT (Pfeffer & Salancik, 1978) sheds important insights into this key topic.

Finally, our study shows that a local firm's R&D strategy responds to the interplay between the internal and external presence of IFDI. Strategies aimed at bridging local and foreign firms are commonly used in the context of emerging markets. To increase their relative power in market competition and economic exchange, local firms may strive to attract foreign investment for mutual benefit. For instance, in their study of productivity in international joint ventures in an emerging market, Li et al. (2009) found that foreign ownership enhances IJV productivity by contributing valuable proprietary resources. Moreover, local firms may benefit from foreign investors in terms of gaining access to advanced technologies and global sales networks through ownership ties (Zhang et al., 2007). In addition, studies show that foreign ownership may directly increase the likelihood that local firms will develop high-tech or new products (Buckley et al., 2002, 2007). Consistently, we found that foreign ownership stimulates local firms to increase their R&D spending. More importantly, we identified the moderating role played by foreign ownership in the relationship between community IFDI concentration and local firm R&D spending, clarifying an important contingency

condition of our predicted relationships. These findings are important as the boundary conditions are underexplored in RDT (cf. Hillman et al., 2009). We integrated foreign ownership in local firms as an important moderator in exploring the boundary conditions of the influence of MNC-local firm interdependence on the R&D intensity of the latter in emerging markets. Compared to their developed market counterparts, firms based in emerging markets lack technological know-how and key resources; therefore, foreign ownership provides such firms with vital resources and key know-how suited to develop their capabilities. Overall, these findings provide a more fine-grained understanding of the impact of IFDI on local firms based in emerging markets.

6.2. Practical implications

Our findings also have important implications for managers and policymakers. The managers of emerging-market firms should understand that IFDI externality is likely to influence the R&D strategy of local firms in both symbiotic and competitive communities. The presence of IFDI in the same business community provides both challenges and opportunities for local firms in emerging markets. To survive, managers of local firms must take appropriate strategic actions, such as engaging in more R&D activities as well as establishing knowledge-exchange linkages with MNCs in order to develop the absorptive capacity. Earlier studies had emphasized the spillover effects of IFDI on local firm productivity in emerging countries. Our findings imply that foreign resources may be complementary to, rather than a substitute for the R&D investment of local firms. Thus, the managers of local firms may not ignore their own strategic efforts to develop their key capabilities.

Moreover, the interplay between internal efforts and external IFDI is more likely to enhance the strategic efforts of local firms in terms of their R&D intensity. Established ownership ties may have a coalition effect on whether local-firm managers may adopt bridging strategies to establish connections and direct communications with MNCs at home for mutual benefit. In response to the common external pressures stemming from IFDI concentration in the same community, an established local-foreign connection may enable local firms to access some important foreign resources in order to absorb external knowledge more effectively. The findings also suggest that foreign ownership of local firms can be beneficial for local firms to benefit from MNCs' knowledge and resources, thus managers of local firms need to identify potential foreign partners (MNCs) which are interested in forming partnerships with local firms, as having a stake in the local firm by an MNC will support the capability building and R&D activities of local firms.

Our results also provide implications for policymakers in emerging markets. First, the presence of IFDI will have a positive effect by enhancing domestic firm competitiveness via R&D investments and increasing their power relative to that of the MNCs at home. Second, our findings imply that reducing interregional protectionism may accelerate the R&D efforts of local firms to enhance their competitiveness. When policymakers design R&D programs, they may consider the needs of local firms in different IFDI communities and choose from a wide range of policy tools to support them.

6.3. Limitations and future research

The limitations of this study may suggest avenues for future research. In this study, we only explored a key construct (R&D intensity) to gauge local emerging country firm strategies in response to their interdependencies with MNCs in symbiotic and competitive communities. However, local firms may use a variety of strategies to manage their interdependence with foreign firms at home, such as joint ventures. It would be useful to extend the RDT to understand why firms use different strategies to manage interdependence, particularly in uncertain environments (Hillman et al., 2009). Future research may expand our theoretical framework to explore the influences of IFDI on the other types of local firm strategies, such as outward investment ones, once

they have acquired key resources and technological knowledge from MNCs. Future studies could also pay more attention to the country of origin of MNCs investing in symbiotic and competitive communities and examine whether the same country of origin also benefits MNCs equally in different communities compared to local firms.

Moreover, we focused only on manufacturing firms located in a single emerging country (i.e., China) to explore their R&D behaviors in response to IFDI externalities. However, national attractiveness and IFDI policies may vary across emerging countries. In addition, local-foreign dynamics are at different stages in these countries. Specifically, it is unclear whether our community-based approach to IFDI would be applicable to local firms in small emerging markets in Asia, Latin America, and Africa. Although the generalizability of our results is limited, we hope that our discussion of IFDI communities may spur broad research interest across other emerging markets, as well as the application of the RDT in understanding MNCs-local firms' interactions in different industry and country settings have given emerging markets, are quite heterogeneous. Compared to neighboring countries like Vietnam and Malaysia, China is a relatively large country with an uneven distribution of IFDI across various regions. Thus, it would be interesting for future studies to examine the community-based IFDI approaches for R&D intensity of local firms in different regions of smaller countries from Asia, Africa and Latin America. Such studies could also examine the learning intent and R&D intensity of local firms based in different IFDI communities and their impact on different types of innovation (Khan et al., 2019). Lastly, the symbiotic and competitive communities might not be mutually exclusive, and, therefore, it becomes difficult to accurately classify firms that are part of the same industry (such as biotechnology and pharmaceutical firms) belonging to the symbiotic or competitive IFDI community. In recent years, in some industries the industry boundaries are become blurred as firms from the same industry might develop different types of capabilities and simultaneously move into upstream and downstream value chains activities as we have witnessed in recent years manufacturing firms developing servitization strategies (cf. Baines, Lightfoot, Benedettini, & Kay, 2009; Gomes, Bustinza, Tarba, Khan, & Ahammad, 2019). Thus, it would be interesting for future studies to pay more attention to such industry characteristics and whether IFDI communities are mutually exclusive in host markets. Such studies could also examine the institutional and industry conditions and other factors such as deglobalization and protectionism and the ways these can change the interdependence of MNCs and local firms operating in emerging markets.

Despite these caveats, our study extends the RDT perspective by integrating a community-based approach and strengthens our understanding of the influences of IFDI communities on the innovative strategies followed by local firms. Given that IFDI has profoundly affected such strategies in many ways, our study may stimulate future research to advance our knowledge about this new frontier of IFDI research.

CRedit authorship contribution statement

Jie Wu: Writing – original draft, Supervision, Methodology, Investigation, Formal analysis, Conceptualization. **Nadia Zahoor:** Writing – review & editing. **Zaheer Khan:** Writing – review & editing. **Martin Meyer:** Resources.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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