The impact of domestic diversification and top management teams on international diversification of Chinese firms

ABSTRACT

Despite increasing research on outward foreign direct investment (OFDI) by firms from emerging economies, our understanding of the relationship between domestic operations and international diversification of these firms is still limited. Using a unique dataset of Chinese listed firms, we examine the impact of domestic diversification on their international diversification. We find that international diversification is positively affected by firms' domestic industrial and domestic regional diversification. We also find that top management team (TMT)'s previous international experience strengthens the impact of domestic diversification on firms' international diversification, whereas TMT's prior political connections weakens the impact of domestic diversification on international diversification.

Keywords: Domestic Diversification; International Diversification; Top Management Team; Emerging Economies

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1. Introduction

Interest in the globalization of markets is increasingly focusing upon the drivers of outward foreign direct investment (OFDI) from emerging economies (EEs) (Child & Rodrigues, 2005; Hennart, 2012; Liu, Xiao & Huang, 2008; Lu, Liu & Wang, 2011; Luo & Tung, 2007; Wang, Hong, Kafouros, & Boateng, 2012) due to the substantial increase of OFDI from EEs. In addition to the liability of foreignness, these "new multinationals" must deal with the liability and competitive disadvantage of being latecomers who lack the resources and knowledge to internationalize from an environment characterized by institutional voids (Guillén & Garcia-Canal, 2009; Meyer, Mudambi & Narula, 2011). Observing that EE MNEs had become a major source of FDI in the world, scholars tried to explain the motivations of OFDI from EEs (e.g., springboard in Luo & Tung, 2007 and escapism in Witt & Lewin, 2007). However, it is still a puzzle why some EE MNEs are capable of diversifying widely across countries while others are not.

Using the knowledge-based view (KBV) of the firm as the theoretical lens, we study the relationship between firms' domestic diversification and international diversification which has been underexplored in existing literature. We also consider how important contingency factors, notably international experience and political connections of a top management team (TMT), affect this relationship. Specially, we identify two distinctive aspects of EE MNEs for the study of the drivers of international diversification. International diversification refers to the extent to which a firm is expanded beyond its domestic market and undertakes value-adding activities in foreign countries and geographic regions (Hitt, et al., 2006). First, domestic *industrial* diversification may enhance international diversification through

development of expertise and knowledge in managing complex activities (Nadkarni & Perez, 2007). Second, large EEs have substantial inter-regional disparity and exhibit different levels of economic and institutional development, and protection for segmented regional markets introduces a distinctive context for domestic regional diversification that may provide a learning resource that fosters international diversification of EE firms (Yang, Leone & Alden, 1992). For example, China is well known for regional diversity in income disparity, institutional differences and cultural diversity. Firms undertaking domestic regional diversification in this context may have built certain advantages which help them to expand abroad. However, the transferability of benefits from domestic industrial and domestic regional diversification experience to internationalization may be limited. The impact of domestic diversification on international diversification therefore likely depends on whether the advantage associated with domestic diversification can be transferred across borders or is location-specific (Meyer, Wright & Pruthi, 2009).

More specifically, EE firms are distinctive in terms of the importance of knowledge associated with political connections of top management team (TMT) members that may not be transferable to international contexts. This deficit in commercial and international knowledge may create a barrier to transferring knowledge developed through domestic diversification. At the same time, several EEs have recently experienced a substantial inflow of "returnee executives", or TMT members who have studied and worked in foreign countries and returned to EEs (Filatotchev, Liu, Buck & Wright, 2009). In China, these returnee executives are called "sea turtles". Studying and/or working abroad, they exit local networks and have no deep roots in the domestic political system and its web of personal connections and patronage. However, they often possess unique international knowledge built up from experiences abroad and global networks (Xiang & Shen, 2009). We argue that there are opposite moderating impacts of the knowledge embodied in these two types of TMT's human

capital on international diversification. TMT international experience may reinforce the positive impact of domestic diversification on international diversification, while political baggage may impede effective domestic learning in internationalization.

We therefore address the neglect of domestic diversification experiences in international diversification studies by providing insights into the impact of domestic industrial and regional diversification, and TMT characteristics on internationalization through OFDI in the context of EEs. We focus on two principal research questions: To what extent does domestic industrial and regional diversification affect the international diversification of EE firms? To what extent do international experience and political connections of TMT's membersmoderate the impact of domestic industrial and domestic regional diversification on international diversification?

We make several contributions. First, we build theoretical links between domestic diversification and international diversification by EE firms and provide empirical evidence that strongly supports this relationship. We emphasize the impact of domestic industrial and regional diversification in EE has largely been neglected in the literature. As research on international diversification is an important domain both within strategic management and IB, we therefore contribute to both these literatures. Second, we link TMT's characteristics and domestic diversification and investigate how they jointly affect international diversification of EE firms. We show that organizational knowledge established through domestic diversification is a necessary but not sufficient condition for international diversification as there are limits to how such knowledge and capabilities can be transferred to other contexts. It is then important to recruit individuals with the appropriate international experiences. We highlight that competitive advantages derived from TMT's political connections are location-specific and difficult to leverage in international diversification, while TMT's international experiences help EE firms conduct OFDI through leveraging domestically

developed competitive advantages. These novel perspectives provide better understanding of the strategic behavior of "new multinationals" in EEs.

2. Theoretical framework and hypotheses

Previous studies argue that MNEs need firm-specific competitive advantages that can be applied competitively in a foreign country (Markides & Williamson, 1996). Compared to MNEs in developed economies (Meyer et al., 2011; Benito, Lunnan & Tomassen, 2011), the "new multinationals" from EEs seem disadvantaged in terms of their resource endowments, and thus should have limited capacity for OFDI (Guillén & Garcia-Canal, 2009). As latecomers in global markets, EE firms may lack accumulated internationalization experience compared to developed economy MNEs. The KBV proposes that knowledge is the firm's most valuable strategic resource and the principal basis for creating competitive advantages (Kogut & Zander, 1992). Knowledge is a multi-dimensional organizational feature consisting of information, know-how and organizational capabilities (Grant, 1996). Firms may undertake international diversification to maximize knowledge-based assets in multiple locations without incurring the full costs of recreating them (Kogut & Zander, 1992; Martin & Salomon, 2003). We extend these arguments concerning the importance of knowledge for internationalization by suggesting that, despite their disadvantages, EE firms can build unique heterogeneous knowledge bases at home as a foundation for international diversification as previous strategic decisions generate "internal momentum" impacting future strategic behavior (Child & Rodrigues, 2005; Liu & Buck; 2009;Yang et al., 1992).

From the KBV, pursuing domestic industrial and domestic regional diversification strategies helps EE firms develop organizational knowledge for international diversification (Wiedersheim-Paul, Olson & Welch, 1978). These firms can learn at home how to invest abroad. Specifically, domestic diversification in EEs with fragmented sub-regional markets

enables firms to create unique knowledge and develop organizational capabilities, including how to gain legitimacy and overcome the liability of 'foreignness' in other regions within the same country. This diversification allows firms to develop coordination skills and knowledge about how to manage increased diversity of domestic activities. This generic capability can underpin international diversification as it is built on similar knowledge bases relating to how to manage complex product portfolios and institutional variations. Hence, domestic diversification may serve as a stepping-stone to international diversification (Nadkarni & Perez, 2007; Tseng, Tansuhaj, Hallagan, & McCullough, 2007).

However, this strategic experience may not be sufficient for international diversification. A resource constituting an advantage in one country may not present an advantage in another (Cuervo-Cazurra, Maloney, & Manrakhan, 2007). This is particularly relevant to EE firms as their competitive advantages are even more home-country specific, given that they rely heavily on social networks and political ties to compete (Wright, Hoskisson, Filatotchev & Peng, 2005). Unfamiliarity with global markets and environments induces uncertainties and risks further hindering EE firms' international diversification (Li & Meyer, 2009).

Therefore, managing business portfolio diversity at home and exposure to heterogeneous domestic environments helps develop knowledge and organizational capabilities for international diversification, but represents only one element of "market expansion ability" (Yang et al., 1992). Application of organizational knowledge to a new context is also related to TMT characteristics, including knowledge embodied in their human capital (Argote & Todorova, 2007; Gupta & Govindarajan, 2002). Two opposite types of knowledge underpinning EE business strategies are identified: "whom you know" versus "what you know" (Peng & Heath, 1996). These two types of knowledge are expected to have different impacts on international diversification through either enhancing or impeding learning capabilities associated with domestic diversification. Prior research has found that TMT's

characteristics, such as international experience and networks, affect international diversification (Athanassiou & Nigh, 2002; Hambrick, & Mason, 1984; Reuber & Fischer, 1997). We go beyond the direct impact of TMT's human capital by arguing that international experiences of TMT may enhance the impact of organizational knowledge accumulated through domestic diversification on international diversification and help facilitate international diversification (Tihanyi, Ellistrand, Daily, & Dalton, 2000). In contrast, TMT political connections may represent a cognitive barrier to international diversification and constrain the firm's ability to leverage domestic diversification-related knowledge, reducing the likelihood of its OFDI. Building on this framework, we present our theoretical model in Figure 1 and develop testable hypotheses below.

[Insert Figure 1 near here]

2.1. Domestic diversification and international diversification

Firms need to learn different types of new knowledge when engaging in internationalization. For example, experiential knowledge of foreign countries is crucial in international diversification, and firms can acquire such knowledge incrementally through experiential learning in foreign countries (Johanson & Vahlne, 1977; 1990). Experiential knowledge can be further divided into internationalization knowledge and experiential market knowledge (Eriksson, Johanson, Majkgård, & Sharma, 1997). The former represents experiential knowledge of the capabilities and resources to engage in international operation and the latter includes foreign business and institutional knowledge. Several studies have examined how firms acquire such knowledge through directly engaging in international diversification (Erramilli, 1991; Luo & Peng, 1999).

In contrast, a "leapfrog" strategy enables latecomers to catch up with earlier movers' competitive position while avoiding the risks of technological obsolescence and technology spillovers to rivals (Dore, 1990; Anderson and Engers, 1994). Latecomers may even leapfrog well established MNEs as early-movers and may not necessarily follow the international process model (Johanson & Wiedersheim-Paul 1975). These literatures, however, have neglected the knowledge base developed by firms when they operate domestically which can indirectly help firms acquire new knowledge for internationalization. More specifically, domestic industrial and regional diversification enables firms to accumulate different types of knowledge for international diversification (Chandler, 1990). Below, we explain how.

First, when internationalizing operations, firms which have engaged in domestic diversification will likely have developed organizational knowledge about how to manage scope economies and achieve effective management and integration of business units located in different countries. Domestic diversification helps firms develop organizational knowledge, skills, experience and teamwork at all levels (Chandler, 1990). Competing in different industries and regional markets enhances TMT knowledge and skills in terms of coordination, strategic planning and resource allocation across industries and regions. It also helps develop middle managers' skills in managing functional activities as well as the skills of lower management and the workforce. These organizational, capability-based competitive advantages can be exploited in international diversification (Luo & Tung, 2007; Luo & Wang, 2012).

Firms may need to establish appropriate organizational structures, such as a multidivisional organizational form, during domestic diversification which provides the means to coordinate and integrate different subunits. This provides key organizational knowledge on how to manage subsidiaries with varying degree of independence that may be useful when some have been moved overseas (Bartlett & Ghoshal, 2000). Firms diversified

across several domestic regions acquire organizational knowledge about how to manage sub-regional diversity and develop capabilities to deal with the liability of 'foreignness' in other regions. This liability arises because new entrants to the region may initially be unfamiliar with local regulations or may not have established the local networks necessary to gain access to markets. Learning may be strengthened as firms exploit their organizational knowledge but in a different geographical context (Boisot & Meyer, 2008). Such organizational knowledge constitutes the experiential knowledge accumulated through domestic industrial and regional diversification which can be shared in multiple locations, thus providing the foundation for international diversification (Martin & Salomon, 2003).

Second, to achieve international diversification, firms must develop higher market orientation (Cadogan & Diamantopoulos, 1995). Market orientation is embodied in processes and routines that encourage managers/employees to generate, disseminate and respond to information concerning customers, competitors and the external environment (Kohli & Jaworski, 1990). Research in this area has focused largely on domestic activities (Kirca, Jayachandran, & Bearden, 2005), but has recently been extended to the international context (Cadogan, Diamantopoulos, & Siguaw, 2002; Zhou, Brown, Dev, & Agarwal, 2007; He, Brouthers & Filatotchev, 2013). Domestic industrial diversification helps firms build organizational knowledge associated with market orientation. In addition, domestic regional diversification helps firms understand what is needed to sell new products to new customers, some of whom will be in different regions (Boddewyn, Halbrich, & Perry, 1986). Again, this type of organizational knowledge may be fungible for international diversification (Meyer *et al.*, 2009).

Third, firms engaging in internationalization need to obtain experiential market knowledge through foreign entry (Johanson & Vahlne; 1977; 1990). Firms engaged in domestic industrial diversification may have more opportunities to learn from competitors and

demanding customers due to exposure to competition in different industries. Having organizational teams dealing with different product markets, diversified firms may have developed organizational knowledge about how to manage information effectively. They may find this knowledge particularly important when expanding overseas which provide growth opportunities but also challenges associated with local competition and new customer base (Lu, et al., 2011).

Entering geographically and institutionally distant regions within the home country carries greater risks and informational asymmetries associated with the new context. By exploiting their superior proprietary knowledge, firms likely develop the ability to deal with risks and uncertainties associated with this new context that can be applied in internationalization. For instance, organizational knowledge developed about how to gather market information through domestic regional diversification may be utilized to acquire new knowledge for international diversification more easily than for firms without regional diversification (Liu & Buck, 2009). The ability to acquire new knowledge about foreign markets effectively is thus more important than specific knowledge. Hence:

Hypothesis 1a: In large emerging economies, a firm's international diversification will be positively related to the level of domestic industrial diversification.

Hypothesis 1b: In large emerging economies, a firm's international diversification will be positively related to the level of domestic regional diversification.

2.2.The moderating effect of characteristics of TMTs

TMTs or decision-makers with international experience play an important role in overcoming difficulties associated with internationalization (Levy, Schon, Taylor, & Boyacigiller, 2007). Domestic diversification provides vital knowledge regarding how to

manage scope economies and develop coordination capabilities aimed at effective management and integration of different business units. However, to be effective abroad this knowledge needs to be combined with understanding national differences in market conditions, government regulations, etc. TMT members with international experience are more likely to have experiential knowledge about host countries than those without international experience, thus augmenting their firms' existing knowledge base. International experience may help them develop the ability to leverage existing organizational knowledge more effectively in a new context (Reuber & Fisher 1997; Sambharya 1996).

The external orientation in managerial mindsets emanating from international experience helps learning through being more open to foreign contexts and the need to adapt to them and thus complement market orientation expertise gained within an EE. TMT therefore need to augment EE-specific expertise through managers with international expertise (Meyer et al., 2009). Many recent internationalization cases of firms in EEs such as China and India were led by top executives with international experiences, and especially returnee top executives. These returnees may act as a new source of international knowledge, enhancing the internationalization capability of local firms (Filatotchev et al., 2009). For example, Lenovo's acquisition of IBM PC division and China National Offshore Oil Co. (CNOOC)'s attempt to acquire Unocal were led by top executives with international experiences**.** Returnee TMT may also have developed specific knowledge associated with networks abroad (Adler & Kwon, 2002) which provides access to information not available internally in EEs (Athanassiou & Nigh, 2000). Therefore, international knowledge and expertise of TMT members may augment domestically developed market orientation when the EE firm expands abroad.

TMT's international expertise may also contribute to setting up effective information systems as it brings an information processing ability and adaptable mindset that helps identify and internationalize suitable product lines (Tihanyi et al. 2000; Wally & Beccerra,

2001). Further, it may help to apply domestic diversification expertise to be more effective in international diversification (Filatotchev et al., 2009; Sambharya 1996). These benefits may be distinctive in EEs where firms lack knowledge about how to run a business in an international context. There may be a complementary effect between TMT's international experiences, a firm's organizational knowledge derived from domestic industrial and domestic regional diversification, and OFDI. TMT members with international experience may also support market orientation-based capabilities compared to incumbent directors, especially those who were trained during the period of central planning. While industrial reconfigurations, R&D, foreign trade and new products and processes were mainly the subject of strategic choices at a ministerial level, enterprise-level management was predominantly concerned with the fulfillment of centrally-determined output targets (Filatotchev, Buck & Zhukov, 2000). Although economic reforms in China have led to a gradual change in managerial skills and mindsets, having TMT members with international experience and exposure to Western business practices may be an invaluable booster to the firm's market orientation. We argue that TMT's international experience may enhance learning and capability development associated with domestic diversification, and increase the impact of domestic diversification on international diversification. Thus:

Hypothesis 2a: In large emerging economies, the level of TMT's international experience positively moderates the relationship between a firm's domestic industrial diversification and its international diversification.

Hypothesis 2b: In large emerging economies, the level of TMT's international experience positively moderates the relationship between a firm's domestic regional diversification and its international diversification.

Meanwhile, although political connections are proved to be helpful for EE firms to acquire resources and to achieve better performance (Faccio, 2006; Li & Zhang, 2007), political connections are generally local-specific and may discourage firms from expanding beyond domestic markets. A TMT's focus on political connections as a source of competitive advantage may undermine learning and capability development associated with domestic diversification (Gargiulo & Benassi, 1997). First, while domestic diversification provides vital knowledge regarding how to manage different business units, politically connected firms may be significantly affected by political influences instead of commercial interests when they pursue diversification strategies. In EEs such as China, local governments have strong incentives to create jobs to secure social stability, and hence may encourage politically connected firms to enter into unrelated industries which help generate employment (Fan, Wong, & Zhang, 2007). This "forced diversification" may impede the learning capability of managers or generate less market-based knowledge. Hence, the political connections of TMTs may not help enhance organizational capabilities developed in domestic diversification. Politically connected firms may develop only limited capabilities to manage regional diversification in a competitive market environment, and may face difficulties leveraging these limited regional diversification-related experiences abroad.

Second, politically well-connected firms may obtain various benefits including favorable regulatory or tax conditions (Faccio, 2006), better access to key resources (Bai, Lu, & Tao, 2006), and obtaining relationship-based contracts (Li, Meng, Wang, & Zhou, 2008). Such Guanxi-based local advantages may imply that firms have developed less market-based knowledge, thus, creating a barrier to international diversification (Siegel, 2007; Wan, 2005). We argue that TMT's political connections may undermine learning and capability development associated with domestic diversification, and thus reduce the impact of domestic diversification on international diversification. Hence:

Hypothesis 3a: In large emerging economies, the extent of TMT's political connections negatively moderates the relationship between a firm's domestic industrial diversification and its international diversification.

Hypothesis 3b: In large emerging economies, the extent of TMT's political connections negatively moderates the relationship between a firm's domestic regional diversification and its international diversification.

3. Methods

3.1.Sample

China offers a particularly useful laboratory for evaluating the framework developed above. First, China's corporate sector is dominated by large, diversified firms that recently have started to pursue OFDI. China is becoming an important source of global FDI, with OFDI increasing dramatically from US$0.9 billion in 1990 to US$56.5 billion in 2009 (MOFCOM, 2009). It is important to examine factors affecting China's OFDI. Second, economic reform and fiscal decentralization have induced local protectionism and encouraged development of many sub-national markets instead of an integrated market (Meyer, 2008). This feature is common in some large EEs (Milanovic, 2005), and China offers a great opportunity to investigate the relationship between domestic regional diversification and international diversification. Third, the role of political connections in doing business in China is extraordinarily important (Peng & Luo, 2000), and it is worth examining how politically connected firms internationalize and whether political connections act as a barrier to internationalization. Fourth, recently many *"sea turtles"* have returned to China to start their own business or work for local companies. These returnee executives have become a new channel for international knowledge spillovers, enhancing the managerial capability of

local firms (Liu, Lu, Filatotchev, Buck, & Wright, 2010), and provide an excellent opportunity to assess how TMT's international experiences through human mobility affect OFDI by EE firms.

Sample firms are drawn from publicly listed firms on the Shanghai and Shenzhen Stock Exchanges. We collect information on all subsidiaries, including domestic and overseas subsidiaries, of listed firms during 2002-2009 from their annual reports[1]. We define a subsidiary as any entity in which the parent firm holds at least 20 percent of the equity. The annual reports contain information on locations, industries, and investment in each subsidiary. We focus on firms listed in all eight years during 2002-2009 and whose annual reports can be obtained from the Shanghai and Shenzhen Stock Exchanges, the China Security Regulation Committee (CSRC), and websites of listed firms. We exclude firms in the financial sector since this sector is tightly regulated by the government (Lien, Piesse, Strange & Filatotchev, 2005). We use a one year lag for our explanatory variables. As a result, our sample includes 1,027 listed firms during 2003-2009 with 7,189 firm-year observations. Our sample includes 554 firms in manufacturing, 440 firms in services, and 33 firms in the primary sector. At the end of 2009, these 1,027 firms had 12,557 subsidiaries in total, among which 553 (4.4 percent of the total subsidiaries) were overseas subsidiaries in 52 countries established by 199 firms (19.4 percent of all firms). Investment in overseas subsidiaries accounts for 5.5 percent of the total investment in the overall sample firms and 13.3 percent of total investment of 199 firms with overseas subsidiaries. Table 1 presents information on the provincial distribution of headquarters of the sample firms. Headquarters of the sample firms are located in all 31 provinces in mainland China with Guangdong and Shanghai having the largest number of firms (118 each) and Tibet and Qinghai having the smallest number of firms (7 and 9, respectively).

[Insert Table 1 near here]

3.2.Variable definition

Dependent variables. We measure international diversification with the extent of firms' investment across countries. Specially, *International Diversification* is defined as $\sum_c [S_c * \ln(1/S_c)]$, where S_c is the share of investment stock in country *c* to total investment stock.[2] The measure considers both the number of countries in which the firm operates and the relative importance of each country in terms of the firm's overseas investment (Hitt et al., 2006).

Independent variables. We operationalize domestic diversification through two variables. *Domestic industrial diversification* is defined as $\sum_i [S_i * \ln(1/S_i)]$, where S_i is the share of domestic investment stock in industry *i* to total domestic investment stock. Weighting the firm's industry portfolio with the relative importance of each industry helps to measure the business conditions managers at the corporate level confront when making internationalization decisions (Wiersema & Bowen, 2008). Similarly, *Domestic regional diversification* is defined as $\sum_p [S_p * \ln(1/S_p)]$, where S_p is the share of domestic investment stock in province *p* to total domestic investment stock.

TMT's Political Connections are defined as the percentage of senior managers who were formerly government officers or members of the Chinese People's Congress (CPC) or the Chinese People's Political Consultative Conference (CPPCC)[3] at county levels and above. We identify whether a senior manager was a government official before joining the listed firm from the "Profile of Directors and Senior Managers" section of the company's annual reports. *TMT's international experience* is defined as the percentage of returnees among the total number of TMT members. Returnee TMT members are those who had worked and/or obtained higher-education degrees abroad before joining the focal firm (Filatotchev et al., 2009). We obtain information on a senior manager's overseas work and education experiences

also from "Profile of Directors and Senior Managers" section of the company's annual reports. Given the length limit of biographies of TMT members, our proxies of TMT's political connections and international experiences may only reflect their significant experiences.

Control variables. In EEs, governments are often involved in promoting internationalization through shaping industrial policies, and this role is particularly pronounced in China (Child & Rodrigues, 2005). Thus, we control for the role of government policies in firms' international diversification. Although it is hard to measure government support of a particular firm as this information is strictly confidential in China, we can approximate this by measuring the overlap between the firm's industry affiliations and those industries supported by the government through its OFDI industrial policies (Luo, Xue & Han, 2010). In 2003, the government announced a new strategy of encouraging Chinese companies to "step out" into the global economy through both exporting and investing overseas (Buckley, Clegg, Cross, Tan, Voss & Liu, 2008). *OFDI policy preferred investment* measures the extent to which domestic investments across industries match with government OFDI supportive industrial policies, and is defined as the ratio of the firm's domestic investment in industries preferred by the government's OFDI supportive policies to the firm's total domestic investment. Chinese central government has issued three versions of *Guidance Catalogue of Countries and Industries for Overseas Investment*. We relate catalogues issued in 2004, 2005 and 2007 to the nearest years in the sample. We expect that the *OFDI policy preferred investment* variable is positively associated with the extent of internationalization.

We control for other firm-, industry-, and region-level factors that are identified as important determinants of internationalization. We include *State shareholding* as the percentage of shares owned by the government and state-owned enterprises to control for the effects of state ownership. We followed Delios, Wu & Zhou's (2006) method to update ownership categories in Chinese listed firms for the period of 2002-2009 according to the

ultimate identity of shareholders.

Previous research emphasizes the high resource requirement associated with international diversification (He et al., 2013). A firm's *Debt-to-equity ratio* is used as a proxy to control for slack resources. *Firm size* is also controlled for as larger firms typically have more slack resources for internationalization. We measure firm size with the logarithm of total assets. *Firm age* is measured with the number of years since establishment and is a proxy of experience and resources as older and well-established firms usually have more experience and resources than younger firms (e.g. Delmar & Shane, 2004; Zahra, 2008). We control for previous performance as measured by *Return on assets* with one year lag. We expect that these firm-level characteristics will have positive effects on OFDI. Industry competition at home is believed to be an important determinant of the international venturing of firms in EEs (Yiu, Lau, & Bruton, 2007). We measure *Concentration of the industry* with a 2-digit industry Herfindahl index. The Herfindahl index equals the squared sum of sales percentages of firms in each 2-digit industry. We measure *Globalization of the industry* by each industry's non-domestic sales to its total sales. Data on industries' non-domestic sales, including both export and sales of overseas subsidiaries, are collected from the WIND database, widely regarded as one of the most comprehensive and authoritative data sources on publicly listed firm in China (Peng, Sun, & Tan, 2008). We expect that these industry-level factors positively affect the firm's OFDI.

We use the *Coastal region dummy* as there are significant regional disparities between the coastal region and inland area in terms of economic and institutional development (Meyer, 2008). Firms in different sectors may be systematically different in terms of internationalization (Brouthers & Brouthers, 2003). Thus, we use sector dummies to control for firms in the manufacturing sector and the primary sector. We also control for time effects by using year dummies. To address endogeneity, we used lagged independent variables in all

analyses.

4. Results

Table 2 presents means, standard deviations, and correlations. Most correlation coefficients have the predicted signs, and are mostly statistically significant. We adopt the mean-centering approach in our regressions to deal with potential multicollinearity. The variance inflation factors of all variables are well below 10, the acceptable cut-off point (Neter, Wasserman, & Kutner, 1996). Thus, multicollinearity is not a concern.

[Insert Table 2 near here]

As both dependent variables are censored, the appropriate estimation method is the Tobit model (Greene, 2003). Since we use panel data, there may be concerns about lack of independence across observations of the same firm in different years. We control for unobserved firm characteristics that may influence the dependent variables by using a panel Tobit model. The results report the feasibility of using a random effect panel Tobit model by comparing it with the pooled Tobit model.

Table 3 presents main results of factors affecting international diversification. In Column 1, we include control variables and introduce independent variables testing hypotheses 1a and 1b. Among firm level controls, firm size and firm age are positively and significantly associated with firms' international diversification, while state shareholding is negatively and significantly related to international diversification. The result for state shareholding confirms Buckley et al.'s (2008) argument that although the Chinese government has considerable influence over the internationalization of Chinese firms, state ownership does not necessarily invoke a state-directed international strategy. Globalization of the industry has significant

positive effects on internationalization. The marginal effect of OFDI policy preferred industry is positively related to a firm's international diversification. This finding supports the argument that EE governments can leverage policy support to EE MNEs in the process of global competition (Luo et al., 2010). The results presented in Table 3 reveal that a firm's international diversification is negatively and significantly related to the lagged variable of TMT's political connections, implying that top executives' political capital reduces a firm's international diversification. The marginal effects of TMT's international experiences on a firm's international diversification are positive and significant, suggesting that top executives' international experiences increase the extent of firm international diversification. Firm international diversification is positively and significantly related to firms' previous domestic industrial diversification and domestic regional diversification. The results support hypotheses 1a and 1b.

In Table 3, Column 2 includes interaction variables between top executives' international experiences and firms' domestic diversification, Column 3 includes interaction variables between top executives' political connections and firms' domestic diversification, while Column 4 includes all interaction variables. The chi-square statistic testing the joint significance of the interactions reveals strong significance for the full model (Column 4) over the partial models without interactions (Columns 2 and 3), and suggests the importance of including these interaction variables for explaining the degree and scope of international diversification.

In the full model (Column 4 of Table 3), all estimated marginal effects of the interactions have predicted signs, and are statistically significant at the 5% level. For the two interactions between lagged domestic regional and industrial diversification and TMT's international experiences, coefficients are both positive and statistically significant, suggesting the higher the TMT's international experiences the higher will be the increase in international

diversification as firm's domestic industrial and domestic regional diversification increases. The results support hypotheses 2a and 2b. For the interaction between the two lagged domestic (industrial and regional) diversification and TMT's political connections, the coefficients are both negative and statistically significant. Thus, hypotheses 3a and 3b are supported.

[Insert Table 3 near here]

We conduct several robustness checks. First, we constructed a sample of observations for the non-consecutive years 2003, 2006 and 2009, and run analyses similar to the main specification. The reason for this robustness test is that the amount of intra-firm variance in consecutive years with regard to dependent variables and the key independent variables is quite small for some firms. T-tests show that the mean values of the key variables for these three non-consecutive years are large in magnitude and statistically different. Results of analyses with this subsample (Column 1 of Table 4) are largely consistent with the main specification with only one exception that the coefficient of the interaction between domestic regional diversification and TMT's international experience was positive but statistically insignificant.

Second, to address the possibility of autocorrelation and unobserved heterogeneity, we include a lagged dependent variable on the right-hand side of models (Holburn & Zelner, 2010). To avoid specification errors, we followed Shamsie, Martin, & Miller (2009) and employed an instrument variable for the lagged dependent variable which is calculated by regressing the lagged (t-1) dependent variable against all lagged (t-2) independent variables in the models, and then substituting the lagged dependent variable with the predicted value (the instrument variable). To avoid problems of autocorrelation we use the Prais-Winsten iterative

procedure. Durbin-Watson and Durbin H diagnostics showed that a first order autocorrelation adjustment was appropriate. Results of models using lagged dependent variables to control for autocorrelation are reported in Column 2 of Table 4. The results are largely consistent with the main specification with only one exception that the coefficient of the interaction between domestic regional diversification and TMT's government experience was negative but statistically insignificant.

Third, we checked for possible endogeneity of OFDI decision in that some firms have not made any international investments. Specifically, we used a Heckman selection model in which we first implemented Heckman Probit models to estimate the likelihood of a firm made international investments (Heckman, 1979). We used firm size, firm age, ROA, intangible assets ratio, debt equity ratio, state shareholding, foreign shareholding, TMT's political connections and TMT's international experience as our predictors of the probability that a firm engaged in OFDI. We then included the inverse Mills' ratio from the first model in the second-stage of Tobit models. Results for this the stage models reported in Column 3 of Table 4 were similar to the main specification reported in Table 3, supporting all of the hypotheses.

[Insert Table 4 near here]

Finally, we graphically display the effects of domestic diversification at different levels of TMT international experience and TMT government experience. To construct the interaction plots, we follow Feinberg & Gupta (2009) and used a linear random-effects regression model to avoid the issues raised by Ai and Norton (2003) concerning interpreting interactions in nonlinear models. The results obtained in the linear random-effects regressions reported in Column 4 of Table 4 are quite similar to the Tobit results. Figure 2a shows that, as one goes from mean minus one standard deviation to mean plus one standard deviation of

domestic industry diversification, the slop of increasing international diversification for firms with high TMT international experiences is steeper than that for firms with low TMT international experience. Figure 2b shows a similar pattern for domestic regional diversification. These plots are consistent with the predictions of Hypotheses 2a and 2b. Figure 3a shows that, as one goes from mean minus one standard deviation to mean plus one standard deviation of domestic industry diversification, international diversification increases for firms with low TMT government experience, but slightly decreased for firms with high TMT government experience. Figure 3b also shows that, the gap between firms with high and low TMT government experience widened as one goes from low domestic regional diversification to high domestic regional diversification. These plots are consistent with the predictions of Hypotheses 3a and 3b.

[Insert Figures 2 and 3 near here]

5. Discussion

This study takes a first step towards examining the role of domestic diversification and the complex inter-play between organizational knowledge accumulated through domestic diversification and TMT's characteristics in international diversification in the context of a large EE. Our results suggest that domestic industrial and domestic regional diversification strategies are important drivers of international diversification by Chinese firms. This extends previous studies which have ignored the importance of domestic regional diversification by treating regional diversification only as international regional diversification. Our results suggest domestic diversification helps firms learn to coordinate complex activities across regions when they operate in fragmented regional markets in a large EE. Market-based

knowledge and capabilities gained through domestic diversification play a significant role in international diversification through OFDI. The highly competitive nature of operating in different industrial and regional markets serves as a rigorous training ground for the firm's internationalization through OFDI.

However, TMT characteristics, specifically political connections and international experiences, are also important factors that moderate the impact of domestic diversification on international diversification. TMT's political connections seem to constrain the choices of a firm's growth strategies as the advantage derived from political connections tends to be localized and immobile across national borders. The results suggest that political connections may act as a barrier to internationalization and induce firms to have an inward/domestic focus due to the fear of losing advantages based on political connections when going abroad, as well as a source of difficulties with transferring the advantages in different institutional context abroad. Relying on political connections may reduce learning through domestic diversification, resulting in the focal firm having few capabilities that can be transferred to foreign countries.

In contrast, there is complementarity between domestic diversification and TMT's international experiences. TMT's international experiences enable firms to leverage organizational knowledge accumulated through domestic diversification and overcome the liability of newness and foreignness in pursuing international diversification. This finding suggests that OFDI from EEs is driven by organizational knowledge and strategic capabilities developed at home, augmented by the fungible nature of TMT's international knowledge. The international experiences of TMT help augment the lack of experiential knowledge needed for international diversification.

These findings suggest that a synthesis of diversification growth strategies and the characteristics of TMT based on KBV offers new insights into the distinctive strategic

behavior of "new multinationals" from EEs. These perspectives help develop theories towards an integrated view of the internationalization strategies of EE MNEs. Our findings highlight that domestic diversification and international experiences of TMT jointly affect international diversification of Chinese MNEs.

We offer several contributions to the literature. First, we have explored a neglected factor, the role of domestic diversification, in EE MNE's internationalization. It is particularly important to incorporate domestic diversification into the internationalization of firms from large EEs which consist of many regional markets with different levels of economic and institutional development. Domestic diversification enables EE firms to accumulate organizational knowledge which can be leveraged in internationalization.

Second, we capture the moderating impact of TMT's domestic political connections on OFDI. Previous research on business strategies in EEs generally considers political connections as an important resource that helps firms survive and grow in turbulent economic and political environments (Peng, 2003). But previous studies have not distinguished between domestic and international aspects. Our analysis tells a more complex story. The negative moderation effects of TMT's political connections implies that firms with strong political connections at home tend to be inward looking and have less desire to seek growth through OFDI.

Third, we have incorporated a new phenomenon into the investigation of OFDI, returnee TMT whose special characteristics and international background facilitate adoption of internationalization strategies. This finding suggests that international experiences as tacit knowledge have an important complementary effect on domestic diversification and help transfer knowledge and organizational capabilities accumulated through domestic diversification effectively in internationalization. The advantage built on the international mobility of TMT is fungible across national borders.

Our findings offer some policy and managerial implications. In 2007 China launched the "Thousand Person Plan" aimed at enticing "sea turtles" home to work in state companies, educational institutions and business parks (Financial Times, July 28th, 2009). Our evidence shows that attracting returnees complements the government 'step out' policy of encouraging Chinese firms to 'go abroad'. Our findings also have implications for other large EEs that share similar features such as regional inequality and institutional variations. The common characteristics of large EEs such as India, Russia and Brazil, constitute a distinctive context in which the domestic diversification of EE firms plays an important role in internationalization, which has been largely ignored in the IB literature. For example, India and Russia have experienced a similar brain drain, but have now attracted many returnees and should consider how to utilize these talents to promote internationalization strategies of local firms. For EE firms, our findings show that organizational knowledge accumulated through domestic diversification are the foundation of international diversification. Firms' reliance on TMT's political connections in domestic diversification reduces the value of domestic diversification in international diversification, while TMT's international experience helps leverage domestic competitive advantages in international diversification.

Our study has some limitations which provide opportunities for further research. First, we focus on public listed Chinese firms as their overseas operation information is publicly available. Although our findings explain a significant part of China's OFDI as listed firms are its major source, non-listed SMEs have become an important source of OFDI in recent years (MOFCOM, 2009). With carefully collected survey data, further studies may find SMEs, which lack ownership advantages accumulated domestically, respond to economic and institutional opportunities and threats differently in conducting OFDI (Luo & Tung, 2007). Second, our study is restricted to China. An important area for further studies is research on multi-countries including other large EEs such as Brazil, Russia and India, which are

emerging from different contexts and pursuing different development trajectories. The relationship between firm OFDI and its domestic regional diversification may vary across countries. Future studies based on multi-country samples may provide more generalized empirical evidence. Third, based on their biographies in annual reports, we adopted a broad measure of TMT's official political connections and international experience. However, their indirect and informal ties may be equally important (Li & Zhang, 2007). In particular, we are unable to differentiate the impact of the international experience of returnee TMT members from that of overseas Chinese or foreign senior managers employed by Chinese firms. Further research might extend this analysis to adopt more detailed measures for TMT's international experiences and other aspects of their international experience (Takeuchi, Tesluk, & Yun, 2005). However, reliably capturing the extent and nature of these "unofficial" connections is challenging for a longitudinal quantitative study. Information on sensitive issues like relationships with government officials from questionnaires is likely to be biased (e.g., Kaplan & Pathania, 2010), it would be technically difficult, if not impossible, to contact all TMT members (including current and past) and persuade them to provide information about their informal ties with the government, and there is a likely problem of recall bias in seeking to identify relationships in the past with government officials. Fourth, our study mainly focuses on how firms learn to internationalize through domestic diversification. However, we are unable to cover a broader context through which Chinese firms accumulate knowledge and capabilities needed for internationalization, such as learning from foreign firms that operate in China or forming strategic alliances with foreign MNEs. Future studies should include more channels through which EE firms learn how to engage in OFDI. Sixth, while we have captured the moderating effect of returnee TMT international experience on international diversification, we are unable to measure experiential market knowledge due to the lack of availability of data. Future research should examine whether the international experience of

TME complements or substitutes for experiential market knowledge. Finally, most variables in our research capture organizational outcomes of domestic diversification rather than specific learning processes though our panel data reflects a time dimension of processes. While this is a general feature of many empirical, strategy-grounded research designs based on secondary company data, this approach also represents a significant limitation of our study. Future research may use more qualitative data to explore learning processes and mechanisms that link domestic diversification and OFDI.

6. Conclusions

Using a unique dataset of Chinese listed firms, we provide new conceptual and empirical insights into the internationalization of firms from large EEs. Specifically, we examine the determinants of OFDI by EE firms by looking at what they have learned at home, and the abilities of their managers to apply this knowledge abroad. We have found that internationalization strategies of Chinese listed firms are affected by domestic diversification. We showed that TMT's international experiences enhance the impact of domestic diversification, whereas TMT's political capital constrains the role of domestic diversification in firms' international diversification. Future studies may extend our analysis by focusing on other unique capabilities of EE firms that shape their international diversification.

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FOOTNOTES

1. We chose 2002 as the starting year for two reasons: first, OFDI by Chinese firms surged after China's access to WTO at the end of 2001, and second, annual reports for years earlier than 2002 provide less detailed information on subsidiaries.

2. Mainland China is treated as one investment destination. Thus, for firms investing only in Mainland China, OFDI Breadth equals zero.

3. CPC is the highest organ of state power in China, while CPPCC is the advisory body to CPC and China's government. Previous studies showed that membership of CPC or CPPCC provide business people with powerful political capital (Bai et al., 2006). We ranked the government hierarchy for the identification of TMT's political connections, and considered prior government officials and members of the Standing Committees of CPC and CPPCC at county levels and above.

Figure 1: Hypothesized Model

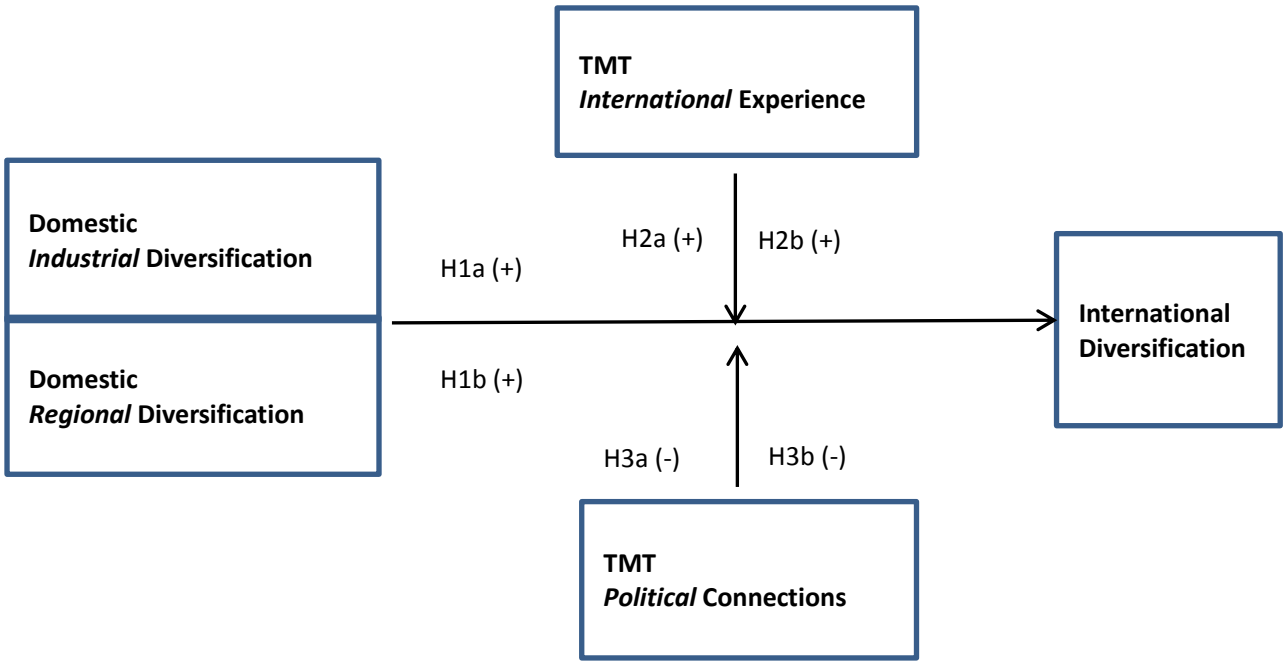


Table1: Provincial distribution of headquarters of the sample firms

Province of listed firm headquarters	Number of listed firms	Number of observations	Province of listed firm headquarters	Number of listed firms	Number of observations
Guangdong	118	826	Chongqing	21	147
Shanghai	118	826	Jilin	21	147
Beijing	73	511	Xinjiang	20	140
Jiangsu	63	441	Jiangxi	19	133
Zhejiang	56	392	Shanxi(1)	19	133
Shandong	52	364	Shanxi(3)	19	133
Sichuan	51	357	Guangxi	18	126
Hubei	48	336	Hainan	18	126
Anhui	33	231	Yunnan	15	105
Liaoning	33	231	Inner Mongolia	13	91
Hunan	32	224	Gansu	11	77
Fujian	29	203	Guizhou	11	77
Tianjin	24	168	Ningxia	10	70
Hebei	22	154	Qinghai	9	63
Heilongjiang	22	154	Tibet	7	49
Henan	22	154	Total	1027	7189

Note: Provinces in the table are sorted in descending order of the number of listed firms in the sample;

Shanxi (1) represents the province with Taiyuan as its capital, while Shanxi (3) represents the province with Xi'an as its capital. These are different names in Chinese. The number in brackets represents the tone in Chinese pronunciation.

Table 2: Descriptive statistics and correlation matrix

	Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1	International diversification	0.026	0.102													
2	Firm size	20.715	1.720	0.139												
3	Firm age	11.732	4.405	0.059	-0.056											
4	Return on assets	0.017	0.083	0.025	0.364	-0.032										
5	Intangible assets ratio	0.046	0.068	-0.022	-0.144	0.094	-0.047									
6	Debt equity ratio	0.526	0.188	0.026	0.045	0.119	-0.262	0.009								
7	State shareholding	0.860	0.169	-0.041	0.085	0.012	0.050	-0.018	-0.036							
8	Concentration of the industry	0.045	0.062	0.009	0.003	0.006	0.056	0.025	-0.035	0.018						
9	Globalization of the industry	0.111	0.061	0.062	0.144	-0.034	0.057	0.144	-0.100	0.038	-0.099					
10	OFDI policy preferred investment	0.641	0.265	0.050	0.097	-0.101	-0.027	0.006	-0.094	0.019	-0.079	0.237				
11	TMT government experience	0.065	0.096	-0.037	0.026	-0.027	0.041	0.066	0.004	0.073	0.166	0.016	-0.034			
12	TMT international experience	0.017	0.044	0.148	0.139	0.047	0.044	-0.012	-0.008	-.077	0.043	-0.012	-0.007	0.083		
13	Domestic industry diversification	0.835	0.570	0.083	0.081	0.085	-0.018	0.039	0.067	-0.007	0.024	0.043	0.089	0.037	-0.018	
14	Domestic regional diversification	0.449	0.500	0.144	0.133	0.048	0.003	-0.045	0.035	-0.128	-0.051	-0.026	0.042	-0.050	0.099	0.281

N=7,189; Correlations whose absolute value exceeds 0.025 are significantly different from zero at 5% level of significance (2-tailed).

Table 3: Random effect Tobit models of factors affecting international diversification

Control variables	**(1)**	**(2)**	**(3)**	**(4)**
Firm size	0.031***	0.031***	0.030***	0.030***
	(0.003)	(0.003)	(0.003)	(0.003)
Firm age	0.005***	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Return on assets	-0.013	-0.013	-0.011	-0.012
	(0.012)	(0.012)	(0.012)	(0.012)
Intangible assets ratio	-0.140*	-0.132*	-0.134*	-0.122+
	(0.064)	(0.064)	(0.063)	(0.063)
Debt equity ratio	-0.018	-0.021	-0.016	-0.019
	(0.021)	(0.021)	(0.020)	(0.020)
State shareholding	-0.096***	-0.093***	-0.096***	-0.091***
	(0.021)	(0.021)	(0.021)	(0.021)
Domestic industry concentration	-0.083	-0.089	-0.078	-0.085
	(0.096)	(0.097)	(0.095)	(0.095)
Domestic industry globalization	0.321***	0.321***	0.309***	0.305***
	(0.067)	(0.066)	(0.066)	(0.066)
OFDI policy preferred investment	0.062***	0.061***	0.062***	0.062***
	(0.015)	(0.015)	(0.015)	(0.014)
TMT government experience	-0.095*	-0.125**	-0.098*	-0.140**
	(0.041)	(0.043)	(0.041)	(0.043)
TMT international experience	0.631***	0.631***	0.700***	0.711***
	(0.068)	(0.067)	(0.070)	(0.070)
Sector, region, year dummies	yes	yes	yes	yes
Independent variables				
Domestic industry diversification (H1a)	0.050***	0.049***	0.053***	0.052***
	(0.006)	(0.006)	(0.006)	(0.006)
Domestic regional diversification (H1b)	0.068***	0.068***	0.071***	0.071***
	(0.007)	(0.007)	(0.007)	(0.007)
Domestic industry diversification * TMT international experience (H2a)		0.120+		0.161*
		(0.071)		(0.071)
Domestic regional diversification * TMT international experience (H2b)		0.136+		0.159*
		(0.076)		(0.075)
Domestic industry diversification * TMT government experience (H3a)			-0.250*	-0.291**
			(0.105)	(0.105)
Domestic regional diversification * TMT government experience (H3b)			-0.270*	-0.307**
			(0.107)	(0.107)
Chi-squared	1070.67	1081.00	1088.83	1104.71
Log-likelihood	-1789.95	-1784.78	-1780.87	-1772.93
N	7189	7189	7189	7189

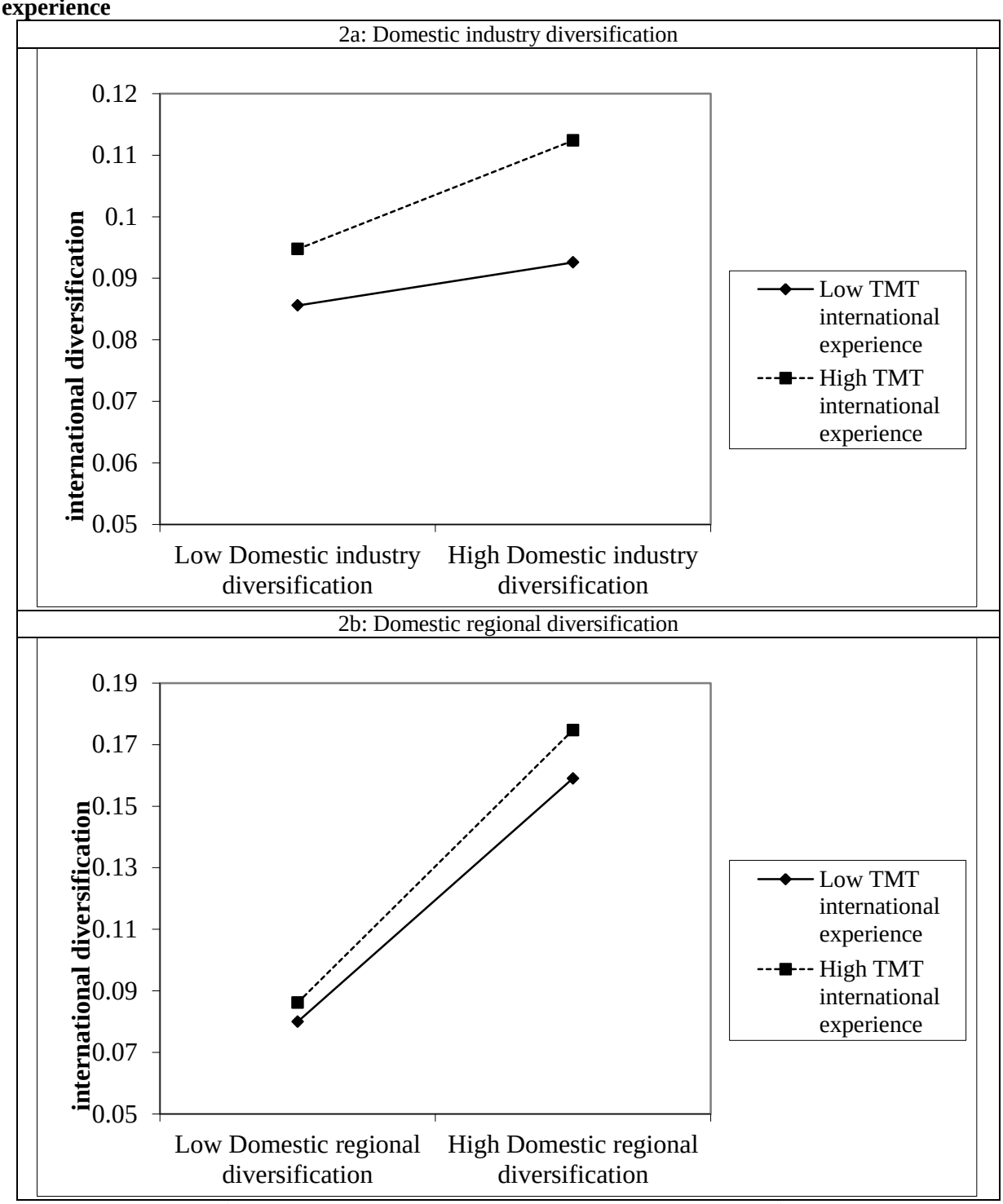
+ p<0.1,* p<0.05, ** p<0.01, *** p<0.001. Robust standard errors are in parentheses.

Table 4: Robustness checks of factors affecting international diversification

	Subsample of years 2003, 2006,and 2009	Using lagged DV to control autocorrelation	Second stage models of Heckman two-stage model	Linear random-effects model
Control variables	**(1)**	**(2)**	**(3)**	**(4)**
Firm size	0.031***	0.023***	0.048**	0.002**
	(0.004)	(0.003)	(0.016)	(0.001)
Firm age	0.005***	0.003**	0.009**	0.001
	(0.001)	(0.001)	(0.003)	(0.001)
Return on assets	-0.021	-0.005	-0.023	0.001
	(0.019)	(0.014)	(0.016)	(0.002)
Intangible assets ratio	-0.127	-0.118	-0.173*	0.001
	(0.093)	(0.073)	(0.077)	(0.016)
Debt equity ratio	-0.028	-0.047+	-0.04	0.018*
	(0.030)	(0.024)	(0.027)	(0.007)
State shareholding	-0.085**	-0.107***	-0.154**	-0.001
	(0.031)	(0.025)	(0.058)	(0.007)
Domestic industry concentration	-0.057	-0.223+	-0.219	0.010
	(0.125)	(0.130)	(0.149)	(0.037)
Domestic industry globalization	0.283**	0.245**	0.403***	0.055+
	(0.099)	(0.081)	(0.108)	(0.030)
OFDI policy preferred investment	0.062**	0.080***	0.101**	0.031***
	(0.022)	(0.017)	(0.037)	(0.005)
TMT government experience	-0.141*	-0.087+	-0.164***	-0.036**
	(0.068)	(0.049)	(0.048)	(0.016)
TMT international experience	0.616***	0.428***	1.000***	0.076*
	(0.103)	(0.083)	(0.259)	(0.031)
Sector, region, year dummies	yes	yes	yes	yes
Independent variables				
Domestic industry diversification (H1a)	0.054***	0.035***	0.052***	0.090***
	(0.010)	(0.008)	(0.006)	(0.023)
Domestic regional diversification (H1b)	0.068***	0.053***	0.072***	0.082**
	(0.010)	(0.008)	(0.007)	(0.029)
Domestic industry diversification * TMT international experience (H2a)	0.240*	0.160+	0.169*	0.106*
	(0.109)	(0.082)	(0.071)	(0.003)
Domestic regional diversification * TMT international experience (H2b)	0.137	0.248**	0.166*	0.108**
	(0.115)	(0.088)	(0.076)	(0.003)
Domestic industry diversification * TMT government experience (H3a)	-0.290+	-0.414***	-0.314**	-0.163***
	(0.153)	(0.122)	(0.107)	(0.045)
Domestic regional diversification * TMT government experience (H3b)	-0.296+	-0.188	-0.344**	-0.110*
	(0.153)	(0.125)	(0.113)	(0.047)
Lagged DV (instrument)		1.731***		
		(0.068)		
Inversed Mills ratio from 1st stage OFDI dummy model			0.105	
			(0.090)	
Chi-squared	481.59	3151.40	1106.06	221.19
Log-likelihood	-744.55	-456.59	-1772.25	--
N	3081	6162	7189	7189

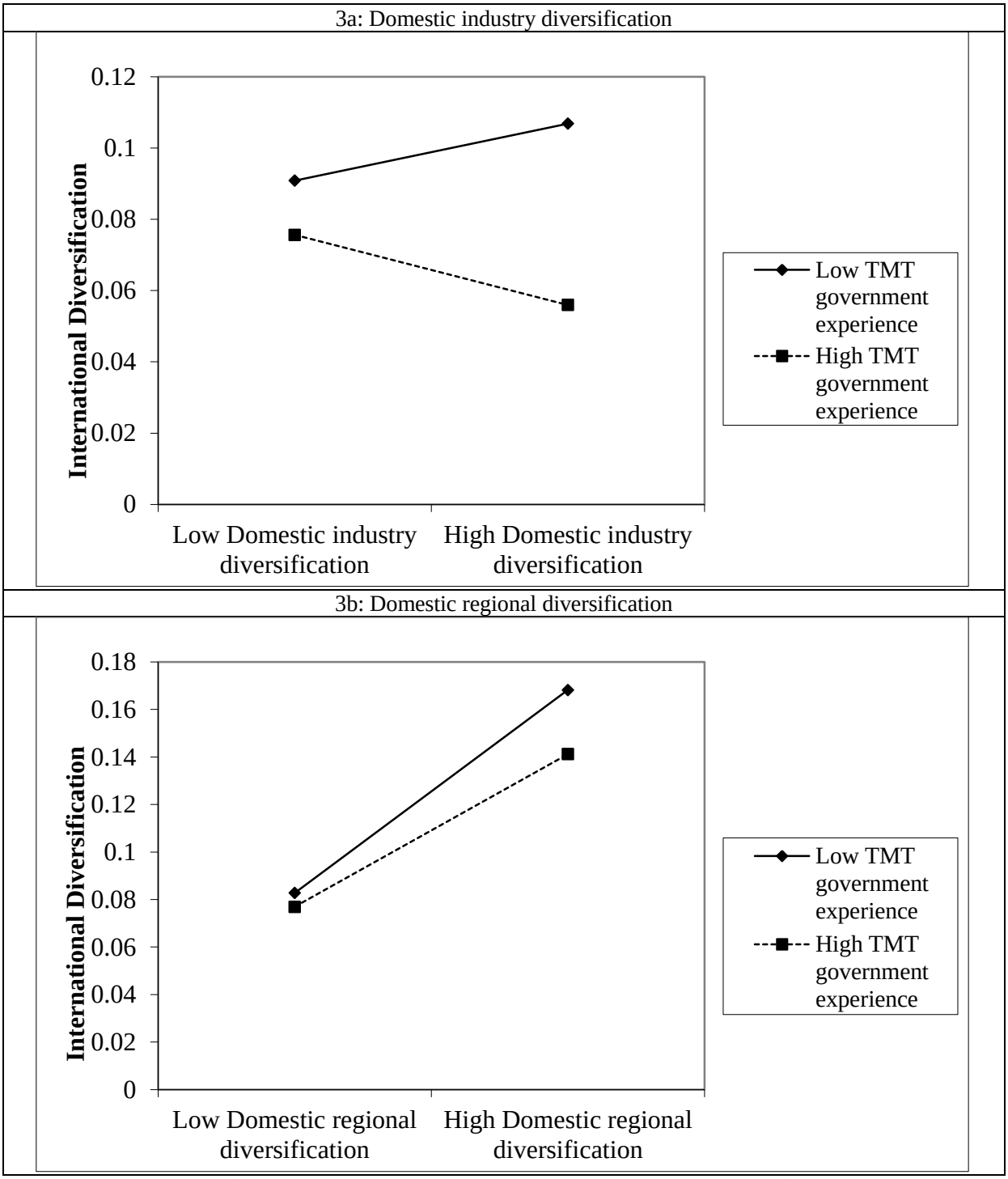
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001; Robust standard errors are in parentheses.

Figure 2: Plots of interaction effects between domestic diversification and TMT international experience



Note: Low value points are defined as mean value minus one standard deviation; High value points are defined as mean value plus one standard deviation.

Figure 3: Plots of interaction effects between domestic diversification and TMT government experience



Note: Low value points are defined as mean value minus one standard deviation; High value points are defined as mean value plus one standard deviation.