Ownership structure and innovation: An emerging market perspective

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Abstract Considerable attention has been focused on the ways in which emerging market firms can obtain and mobilize the knowledge and resources required for innovation. Innovation is a particular challenge in emerging markets because of inadequate external institutions. In this study, we focus on the importance of ownership structure, and in particular on ownership type diversity and ownership concentration. Using transaction cost and agency theories embedded in an emerging market context, we argue that ownership structure provides an important mechanism by which firms can assemble and direct the resources necessary for innovation in the context of inadequate external institutions. Specifically, we hypothesize that ownership type diversity improves innovation performance and that increasing ownership concentration has the same effect, but only up to a point. Using a panel dataset of 487 and 475 Chinese listed companies during 2004–2005 and 2005–2006 respectively, we find supportive empirical evidence for our hypotheses. Our findings also suggest that ownership type diversity is a more important factor in explaining innovation performance than ownership concentration, although most of the extant literature focuses on the latter.

Keywords Ownership type · Ownership concentration innovation · Emerging markets

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Innovation is a particular challenge in an emerging market (EM) because of inadequate external institutions, associated with market failures (Khanna & Palepu, 1997), highly bureaucratic and corrupt legal-political governance (Bruton, Filatotchev, Chahine, & Wright, 2010; Khanna & Palepu, 1997), and weak property-rights regimes (Zhao, 2006). Such underdeveloped external institutions pose challenges for firms seeking to acquire and direct the resources necessary for innovation (Choi, Lee, & Williams, 2011; Choi, Park, & Hong, 2012). For example, factor market failures without compensating institutions create high transaction costs for firms seeking long-term capital and skilled labor; corrupt legal-political governance allows government officials to misuse their power and behave opportunistically, thus generating considerable policy uncertainty for firms. We thus examine how an important mechanism, ownership structure, can both respond to and mitigate the negative consequences of inadequate institutions for firms' innovation activities. Prior studies have suggested that owners of different types provide different resources to the firm (Choi et al., 2011, 2012), and that ownership concentration affects the efficiency of utilizing these resources (Baysinger, Kosnik, & Turk, 1991; Hill & Snell, 1988). Our study extends prior studies by examining the role of ownership structure from the perspective of *both* ownership type diversity and ownership concentration, in particular when these are embedded in the context of the inadequate institutions that characterize EMs. The different institutional context in an EM therefore presents an opportunity to enrich the corporate governance literature on ownership structure and innovation.

Specifically, we use and adapt extant theories in order to examine the effect of ownership structure on innovation performance in the context of inadequate external institutions. First, relying primarily on transaction cost (TC) theory (e.g., Hennart, 1988; North, 1990; Williamson, 1979), we argue that a firm with different ownership types (i.e., state, domestic non-state, and foreign) is more capable of securing the complementary set of key economic and political resources necessary for innovation by internalizing inefficient economic and political markets (Hennart, 1988). We further argue that conflicts of interest between different types of owners are alleviated by the fact that in a catch-up EM, innovation is a common agenda of private and foreign owners as well as the state. Second, using principle–agent (PA) or agency theory and incorporating the problems in EMs identified by a principal–principal (PP) perspective, we argue that moderate levels of ownership concentration enable a firm to minimize the expropriation costs associated with both controlling owners and unmonitored senior management, and thus to more efficiently direct resources to innovation.

Empirically, using a self-tailed panel dataset of 487 and 475 Chinese listed companies during 2004–2005 and 2005–2006 respectively, we find supportive evidence for these arguments. Thus we conclude that ownership type diversity builds channels for sourcing and assembling the key resources required for innovation, whereas ownership concentration affects the efficiency of utilizing these resources in innovative activities. Our findings also suggest that the explanatory power of ownership type diversity is much more salient and robust across specifications than is ownership concentration, although most of the extant literature focuses on the latter. This suggests that assembling the resources necessary for innovation is critical to innovation performance in EMs.

This study makes three contributions to the literature. First, our focus on the context of inadequate external institutions allows us to add insights to extant studies on the

ownership–performance relationship, which are primarily grounded in developed markets (for a review, see Belloc, 2011). By moving beyond the context of efficient markets, stable and accountable legal-political institutions, and strong property-rights regimes, this study shows that two features of ownership structures—unitary private ownership (Boardman & Vining, 1989) and high ownership concentration (Alchian & Demsetz, 1972)—that are found to drive firm performance in a developed market do not have the same effects in an EM. First, by relaxing the implicit assumptions underlying Boardman and Vining's (1989) results (e.g., efficient markets), we find that different ownership types co-exist to enhance innovation performance in EMs. Second, in addition to conflicts between owners and managers identified in the standard agency theory (Jensen & Meckling, 1976), we acknowledge PP conflicts in EMs between controlling and minority owners because of weak legal protection of small shareholders (Su, Xu, & Phan, 2007; Young, Peng, Ahlstrom, Bruton, & Jiang, 2008). We argue that in the presence of both PP and PA conflicts, total expropriation costs by either senior management or controlling owners will be exaggerated when ownership is either too diffused or too concentrated. Our study is among the first to incorporate both types of conflicts into the analysis of the relationship between ownership concentration and innovation.

Our second contribution is to the literature on firm strategies in EMs. Besides the use of diversified business groups (Khanna, Palepu, & Sinha, 2005) and interpersonal networks (Hoskisson, Eden, Lau, & Wright, 2000), our study suggests that firms can adjust their ownership structures to respond to inadequate external institutions. For instance, a diversified co-existence of ownership types under a shared goal (e.g., innovation in this study) can create an efficient internal organization for key resources that are critical to firm innovation.

Finally, and not least, our study advances the understanding of ownership structure and innovation in an EM by investigating the innovation impact of a noticeable yet underexplored ownership characteristic of EM firms, that is, the co-existence of different types of owners. Previous studies have tended to treat different ownership categories separately, for example by including a variable for percentage ownership by the state or by foreign entities (Choi et al., 2011, 2012). We suggest that doing so ignores the potential complementarity among ownership types, and the importance of diversity. In addition, we posit a nonlinear relationship between ownership concentration and innovation performance and compare the impacts of ownership type diversity and ownership concentration.

The rest of this paper is organized as follows. The next section reviews the extant literature on EM institutions and their resultant constraints on firm innovation, and develops our theoretical arguments. Then, we describe our empirical method, and analyze the results. The last section concludes the paper by discussing its implications.

Theory development and hypotheses

Inadequate external institutions and their impact on innovation

The absence of external institutions such as efficient factor markets, accountable legal-political governance, and strong property-rights regimes is a common feature of EMs (Hoskisson et al., 2000; Khanna et al., 2005). These institutional characteristics create major constraints on firm innovation: high transaction costs for acquiring key resources

and PP conflicts in corporate governance that deflect attention from innovative activities. We explain them in detail below using China, our empirical context, as an example.

First, factor markets for labor, capital, and knowledge, among others, are inefficient and distorted in an EM, creating high transaction costs for their acquisition. In China, for example, the *Hukou* regime, a rigid household registration system that restricts the provision of social security, child education, healthcare, and many other public benefits to non-resident workers, hinders efficient mobility of skilled workers across different locations. Compared to state-owned enterprises (SOEs), which can resort to their ownership ties to the government to help their R&D workers obtain resident status, non-state-owned firms have to bear excessive costs to attract high skilled labor by purchasing alternative benefit services from private providers such as life insurance companies. Additionally, the Chinese capital market is dominated by four state-controlled banks (Agricultural Bank of China, Bank of China, China Construction Bank, and Industrial and Commercial Bank of China), with the majority of other banks also being controlled by central or local governments (Morck, Yeung, & Zhao, 2008). Therefore, non-SOEs in China usually find it difficult to borrow long-term capital through banks for their risk-taking activities such as R&D (Morck et al., 2008). Last, market intermediaries such as consulting specialists for localization strategies and market intelligence are underdeveloped (Khanna et al., 2005), which makes it difficult for innovators to find timely and accurate information for adapting their technologies to rapidly changing local markets.

Second, compared to developed markets, the legal-political system in EMs is highly bureaucratic, and corruption is rampant at all levels of government (Khanna et al., 2005). Such a highly bureaucratic and corrupt legal-political governance allows government officials to misuse political power (Bruton et al., 2010; Khanna & Palepu, 1997) and behave opportunistically against firms (North, 1990), thus creating uncertain "political markets" for firms to secure government support for innovation (North, 1990: 355). For instance, in China, legal-political governance is not based on rules but interpersonal relationships, and political decisions and legal enforcement are selective and "capricious" (Firth, Rui, & Wu, 2011: 573). Moreover, the Chinese government maintains monopoly control in some key areas such as banking and land use, enabling officials at various levels to seek rents from firms that depend on these sectors. Since innovation activities often require access to both finance and land (e.g., building R&D centers), a firm might face serious policy uncertainty when conducting such activities. Furthermore, although the Chinese government actively promotes innovation activities in strategic industries through provisions of funding and favorable policies (Choi et al., 2011), firms' benefits from government support are highly uncertain in a political environment with limited accountable and rule-based enforcement (Firth et al., 2011).

Last, weak property-rights regimes in EMs further "erode the appropriate value of innovation … [and keep] knowledge-intensive activities away" (Zhao, 2006: 1185). The constraints of weak property-rights regimes on firm innovation are twofold. First, weak protection of intellectual property rights (IPR) allows widespread piracy such as illegal use of patents without licensing fees and thus discourages firms from conducting indigenous innovation and patenting their innovation outcomes (Zhao, 2006). The weak IPR protection also discourages foreign technological suppliers from licensing their technologies to domestic firms (Zhao, 2006). Second, weak property-rights regimes

breed PP conflicts, that is, misuse of firm resources by powerful controlling shareholders at the expense of smaller shareholders (Su et al., 2007; Young et al., 2008). In fact, controlling shareholders, with a less risk-diversified portfolio, might engage in self-beneficial trade and forgo high-risk projects such as product innovation that benefit smaller shareholders.

In summary, factor market failures, corrupt legal-political governance, and weak property-rights regimes hinder firms' ability to innovate. As a strategic response, firms can adjust their ownership structures to internalize provision of key resources for innovation, reduce transaction costs in both factor and political markets, and minimize PP conflicts. Below, we elaborate on this point by drawing on insights from a diverse set of theories.

Ownership type diversity and innovation performance

Boardman and Vining (1989) found that, in developed markets, firms with mixed ownership (state and private) often perform worse than SOEs and substantially worse than private firms. These findings are based on the following implicit assumptions associate with developed markets: (1) the market is efficient and competitive; (2) the state is accountable, enforcing its policies in a transparent and unambiguous way; and (3) the state's goal is socio-political such as high wages and large employment, which is incompatible with the agenda held by non-state partners. However, these assumptions do not hold in an EM like China. As discussed above, factor markets are inefficient and distorted, and corrupt legal-political governance creates considerable policy uncertainty. In addition, we suggest that the Chinese state, committed to accelerate the process of industrialization, shares with non-state counterparts the pursuit of innovation.

We apply TC theory (Hennart, 1988; North, 1990; Williamson, 1979) to address the question of why ownership type diversity can represent an efficient response to factor market failures and corrupt legal-political governance in an EM. TC theory is among the most important perspectives to explain the existence and consequence of diverse organization structures in different market structures and institutional environments (Hillman, Withers, & Collins, 2009). Transaction costs can result from transaction partners' opportunist behavior and from the monitoring and enforcement of economic and political agreements (North, 1990; Williamson, 1979). If transaction costs are negligible, "any advantages one mode of organization appears to hold over another will simply be eliminated by costless contracting" (Williamson, 1979: 233). This, however, is not the case in an EM. Transaction costs can be reduced "under common ownership and with the assistance of hierarchical incentive and control systems" (Williamson, 1979: 237). Applying this theory to ownership research, Hennart (1988) found that joint ownership is an efficient mode when: (1) markets fail for the key resources held by each owner; and (2) replicating these resources is too costly. Using China as an exemplar context, we list the unique and critical innovation-related resources provided by each type of owner, and discuss how these resources meet both of Hennart's (1988) conditions.

State owners The state provides key resources such as long-term financial capital, resident status and related public benefits, land, policy information and support, all of

which are critical to firm innovation. First, long-term capital is critical because innovation typically involves a long period of payback and a high likelihood of failure (Choi et al., 2011, 2012). Second, local resident status in China is associated with numerous public benefits and is thus important to attract high skilled labor. Third, access to land contributes to firm innovation because limited land availability and high estate prices remain a major constraint on innovation activities that often require large R&D centers (e.g., Tan, 2006). Finally, in an environment featured by widespread piracy and broken agreements (Li & Atuahene-Gima, 2001), gaining government support in research funding and legal protection of patents encourages firms to innovate and increases their innovation performance (Choi et al., 2011).

In China, markets for these resources provided by the state are inefficient for the following reasons. Markets for financial resources are inefficient because they are largely controlled by the state and diverted to the state sector (Morck et al., 2008), forcing non-state-owned firms to alleviate their financial constraints in more costly ways such as informal financing from friends, families, and even underground banks (Allen, Qian, & Qian, 2005). Even as publically listed companies, private firms still face higher costs of financing via debt or equity markets than do SOEs, because without potential political bailouts, they are considered by investors to have higher default rates (Boubakri, Guedhami, & Mishra, 2010).

Markets for political resources are also inefficient in a highly bureaucratic and corrupt country. In a country with efficient political markets, competitive tensions exist between the suppliers of political resources (e.g., the government) and the recipients of these resources (e.g., the firms) (North, 1990). For instance, no major policies can be made without public hearings and questioning; the government distributes its resources with high transparency; a large pool of professional lobbyists exists to counterbalance governmental power and help firms shape policies in their favor. All these competitive tensions can alleviate rent-seeking and opportunist behavior by the government, ultimately reducing the transaction costs for political resources (North, 1990). However, China lacks such a competitive market for government resources. For example, without checks and balances, as a monopolist supplier of privileged political resources such as resident status, land use, and policy support, government officials might distribute these resources to firms in order to maximize their own rents (Firth et al., 2011). As a result, non-state-owned firms might spend considerable time and money on (possibly illegitimate) activities such as entertainment and gifts for government officials and even on illegal activities such as bribery, and might face severe punishment if any illegal activities were revealed by their competitors (Firth et al., 2011). Non-state-owned firms, therefore, face high transaction costs when seeking innovation-related political resources.

It is not only difficult to secure the resources provided by the state owners from markets but also difficult to replicate these resources within firms. Since many Chinese firms compete on price and are in relatively low-margin businesses, they have limited ability to quickly accumulate retained earnings for re-investment (Khanna et al., 2005). As for political resources, replication by non-state owners is almost impossible, because the state is the sole agent that grants changes in resident status, decides land use, establishes and manages science parks, and designs and implements innovation policies (Firth et al., 2011).

Foreign owners Foreign firms often have critical resources for innovation activities (Teece, 1986), which include both codified technological knowledge and, more important, tacit knowledge embodied in their global networks and experiences (Hitt, Hoskisson, & Kim, 1997). Specifically, technological assets include patents, inventions, scientific research reports, and progress logs of product development (Teece, 1986). Tacit knowledge encompasses familiarity with global trends in new products and services (Hitt et al., 1997), the ability to integrate knowledge through multiple R&D centers in the world (Zhao, 2006), and the ability to source technological inputs in a global market (Teece, 1986).

Markets in China are underdeveloped for both codified and tacit knowledge. First, as discussed earlier, the market for technology transfer is distorted by weak IPR protection and widespread piracy. As a result, firms face high transaction costs in contract enforcement to prevent, for example, technology leakage to third parties (Zhao, 2006). Second, transfer of tacit knowledge would be even more difficult to achieve in a market due to the non-tradable nature of such knowledge (Kogut & Zander, 1993). In fact, tacit knowledge transfer usually requires frequent interactions within a firm through internal worker mobility, collaboration, and experiential learning (Kogut & Zander, 1993).

The knowledge possessed by foreign owners is also difficult to replicate by domestic owners because such knowledge accumulation is closely tied to prior experiences and established international networks. As an example for codified knowledge, although the structure of a patent can be explicitly articulated, it is difficult for a domestic user to understand all the contingent factors that may affect its application without experiments (Kogut & Zander, 1993). As an example for tacit knowledge, it is almost impossible for a domestic owner to quickly imitate a global network of diverse technological inputs (e.g., specialists in particular scientific areas) because it takes a long time to find these global inputs and to build collaborative relationships with them.

Domestic non-state owners Domestic non-state investors primarily include corporate founders and their families and affiliates, domestic firms, and institutional investors (Choi et al., 2011, 2012). Compared to the state and foreign investors, domestic non-state investors typically possess larger social networks in the home market, blended within their familial, kin, and other interpersonal relationships (Filatotchev, Zhang, & Piesse, 2011). These social relationships are found to be more reliable in weak institutional environments, where formal, contractual relations are hard to build (Filatotchev et al., 2011). They enable local non-state investors to be quickly informed about local trends and thus more responsive to local environments (Carney, 2005). Thus, domestic owners are more capable of finding timely and accurate information relevant to technology localization and local innovation opportunities, especially in niche markets (Carney, 2005).

Local knowledge possessed by domestic non-state owners is difficult to purchase from the market because China lacks such a competitive market with professional consultants who specialize in technology localization and local market intelligence (Khanna et al., 2005). Moreover, since local knowledge is tacit and embodied in prior experiences and complex social networks (Carney, 2005; Filatotchev et al., 2011), foreign owners, with their liability of foreignness and the lack of deep understanding of the Chinese culture, find it very challenging to enter the trust circle of local firms

and build information-sharing social networks. The state, as a public administrator, does not view developing local business intelligence as its major task.

The above discussion suggests that the state, foreign, and domestic non-state owners each provide important resources for innovation activities that are difficult to purchase or replicate. Following Hennart (1988), we suggest that joint ownership among these resource suppliers is an efficient mode that creates an internal system for assembling these resources in a complementary way. For example, domestic non-state owners' localization ability complements foreign owners' technologies and know-how in creating innovative products that fit local markets; to facilitate this R&D collaboration, the state can provide long-term capital and land for building necessary R&D facilities and provide resident status quota for attracting high skilled researchers.

Furthermore, the potential conflict of interest between different types of owners, a common problem identified in the ownership type diversity literature (Hoskisson, Hitt, Johnson, & Grossman, 2002), is alleviated by the fact that achieving innovation is a shared agenda in China. Unlike Boardman and Vining's (1989) argument in developed markets, where state and non-state owners have conflicting objectives, the state in a catch-up EM like China shares with its non-state partners in pursuing innovation as a strategic objective. In fact, developing domestic innovation capabilities is one of the national development priorities of the Chinese government,[1] and administrative agents are motivated by political performance evaluations that consider firm innovation as an important criterion (National Development and Reform Commission, 2011). Foreign investors are also motivated to transfer their technologies and know-how to enhance their subsidiaries' competitiveness in the host country (Zaheer, 1995). Such technology transfer is further encouraged by various host-government incentives such as tax exemption (The Ministry of Science and Technology of China, 2002).

In summary, since joint ownership effectively combines critical, non-tradable, inimitable resources provided by state, foreign, and domestic non-state owners and their potential conflicts are alleviated by their common objective of pursuing innovation performance, we expect that ownership structures that include diverse ownership groups will enhance innovation performance.[2] Stated formally:

Hypothesis 1 In an emerging market like China, *ceteris paribus*, the more diversified the ownership types (state, foreign, domestic non-state) in a firm, the higher its innovation performance.

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[1] For instance, supporting domestic firms to build indigenous innovation capabilities was emphasized in Chapter Ten of *The Tenth Five-Year (2001–2005) Plan of China*, Chapters Three and Seven of *The Eleventh Five-Year (2006–2010) Plan of China*, and Chapters Three and Seven of *The Twelfth Five-Year (2011–2015) Plan of China*. Full documents can be downloaded from the National Development and Reform Commission of China (NDRC) (http://www.sdpc.gov.cn/).

[2] We note that resource dependence theory (RDT) would likely lead to similar conclusions as TC theory (Pfeffer & Salancik, 1978). The uniqueness of the resources contributed by each ownership type results in strong resource dependence. Pfeffer and Salancik (1978) suggest that in such circumstances some form of joint ownership among the three types of owners will result in order to reduce resource dependence and the resulting environmental uncertainties.

Ownership concentration and innovation performance

The separation of ownership and control in publicly listed corporations creates tensions between shareholders and management, an issue termed PA conflicts (Jensen & Meckling, 1976). Although shareholders (i.e., the principal) are wealth maximizers whose primary objective is to foster the long-term value of their shareholdings, managers (i.e., the agent) are utility maximizers whose goal is to advance personal power, security, status, and wealth (Jensen & Meckling, 1976). Such differences might lead to different strategies (e.g., innovation versus diversification) pursued by shareholder-controlled firms (i.e., firms with concentrated ownership) and management-controlled firms (i.e., firms with diffused ownership). Compared to managers, shareholders are more willing to pursue risky innovation projects because they usually hold a more diversified investment portfolio (Hill & Snell, 1988). Relative to managers whose utility (e.g., bonus) is often based on short-term performance, large shareholders tend to be more strategic and patient and be more likely to pursue long-term innovation projects (Hoskisson et al., 2002). Moreover, concentrated ownership enables large shareholders to work closely with the top management team and carefully review its managerial decisions; by doing so, they ensure that the management team is pursuing the shareholders' interests in innovation activities (Alchian & Demsetz, 1972). These arguments suggest that when a firm's ownership shifts from diffused to concentrated, control is transferred from senior management to large shareholders; consequently, the firm is more likely to pursue innovation activities and experience better innovation performance.

However, conflicts of interest exist not only between shareholders and management but also among shareholders themselves. Controlling shareholders tend to extract private benefits of control from company resources (Dyck & Zingales, 2004). Such benefits are not shared with other shareholders, creating tensions between large and small shareholders or, more formally, PP conflicts (Su et al., 2007; Young et al., 2008). For example, controlling shareholders tend to appoint unqualified friends or family members as senior managers, engage in self-beneficial trades that jeopardize corporate value, build a multi-tier business pyramid that only maximizes the value of the top-tier holding company, and advance personal and political agendas that create no economic and financial value to the company (Chen, Li, & Shapiro, 2011). PP conflicts have been identified to be more salient in EMs, because these markets lack the internal and external mechanisms that are available in developed markets to mitigate such conflicts. Such missing mechanisms include, among others, an efficient financial market for potential takeovers if corporate value falls, legal protection of minority shareholders based on a developed property-rights regime, and strong legal monitoring and tax regimes on internal transfers (Dyck & Zingales, 2004). For instance, as Su et al. (2007: 18) suggest, "in [EMs], because property rights are difficult to enforce, small shareholders are confronted with the possibility of expropriation by large shareholders, who frequently control the decisions made at the boardroom through their appointed directors."

Specifically, with respect to innovation as a corporate objective, as a firm's ownership becomes too concentrated, large shareholders will become more cautious and risk averse and less interested in innovation projects both because of the risk that they entail, and because they begin to pay more attention to alternative projects.

Although smaller shareholders might prefer high-risk, high-return innovation projects due to their more diversified portfolio, very large shareholders may come to see these as too risky, particularly given alternatives. Instead, large shareholders might direct firm resources to diversify their individual risks associated with large blockholding. For instance, they can use firm resources to build their own pyramidal business groups that direct resources towards complex relational trading at the expense of innovation (Chen et al., 2011). Therefore, in an EM with weak property-rights regimes, when ownership shifts from moderate to high concentration, controlling owners are more likely to breach a shared agenda with other owners and to forgo innovation.

Combining the insights from both agency theory and the literature on PP conflicts, we expect that an optimal level of ownership concentration exists to minimize agency costs as well as expropriation of small shareholders. Formally, we propose the following:

Hypothesis 2 In an emerging market like China, *ceteris paribus*, ownership concentration has an inverted U-shaped (first positive, then negative) relationship with innovation performance.

Methods

Data and sample

Our sample is based on the 2005 and 2006 editions of China's Annual Census of Industrial Enterprises (hereafter the Census data) and Shenzhen GTA data for A-share listings on the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE)[3] from 2004 to 2005 (hereafter the GTA data). First, collected by the National Bureau of Statistics of China (NSBC), the Census data contain industrial companies' detailed operational profiles, such as production output, new product value, firm assets, and number of employees. The Census dataset is one of the most often used for academic research on business and management in China (Quer, Claver, & Rienda, 2007). Second, as one of the most often used datasets for studying Chinese listed corporations (Sun & Tong, 2003), the GTA dataset provides detailed information on financial performance, ownership, corporate governance, and transaction history. We merged the two datasets by matching a company's legal Chinese name—a unique and consistent identity used for legal registration. After removing missing observations, we built an unbalanced longitudinal sample with 485 companies in China for the period 2004–2005 and 475 for the period 2005–2006 respectively. These companies were situated in all the 34 provinces and municipalities in mainland China and predominantly in the manufacturing and utility industries.

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[3] A-share listings refer to shares that are traded in Renminbi, the currency in mainland China, in contrast to B-share listings, which are traded in foreign currencies. The Appendix has a detailed description of all share types in the Chinese stock exchanges.

Variables

Dependent variable We used product innovation, perhaps the most widely used innovation indicator (for a review, see Garcia & Calantone, 2002), to measure *innovation performance*. This information was collected from the Census data. New products are described in the Census data as either those products using completely new scientific principles, technologies, or designs, or those products substantially improved in comparison with existing products in terms of performance and functionality through significant changes in structure, materials, design, or manufacturing processes (NBSC, 2006: 292). Specifically, we calculated product innovation as the percentage of a firm's market value[4] of total production accounted for by its new products, and divided it by the mean value of such percentage in the firm's industry and region to control for industry and location heterogeneity such as competition and clustering effects. We followed the NBSC single-digit industry code to classify the industries. The regions were grouped into two: the first includes the three major economic centers, Bohai Gulf (Beijing, Tianjin, Shandong, Hebei, and Liaoning), Yangtze River Delta (Shanghai, Zhejiang, and Jiangsu), and Pearl River Delta (Guangdong and Fujian), and the second group includes all other regions. In the context of an EM, product innovation measures are better than patent counts and patent citations because the latter may underestimate a firm's innovation performance. Under weak IPR protection, firms are less reliant on the patent registration for IP protection.

Independent variables We used a Herfindahl measure, a widely used method of calculating diversification and concentration (Zhou & Li, 2008), for both *ownership type diversity* and *ownership concentration*. Specifically:

$$Ownership\ type\ diversity = 1 \bigg/ \sum_i \left[\left(\frac{Cummulative\ ownership\ of\ type\ i\ blockholder}{Total\ ownership\ by\ all\ blockholders} \right)^2 \right],$$

where *i* can be state, foreign, or domestic non-state;

$$Ownership\ concentration = \sum_{i=1}^{5} (Ownership\ percentage\ of\ the\ ith\ largest\ shareholder)^2$$

We retrieved the information for both measures from the GTA data. The GTA data have detailed classifications of ownership types for each shareholder, including state-owned shares (state shares and state legal person shares), foreign shares (B shares, H shares, S shares, foreign legal person shares, and foreign natural person shares), and domestic non-state shares (A shares, domestic non-state legal person shares, domestic natural person shares). Such a classification responds to the suggestion that the Chinese legal persons should be divided into state- and non-state (Delios, Wu, & Zhou, 2006). The Appendix shows detailed statistics of ownership types in our sample.

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[4] Market value suggests the value estimated in the goods and services markets. This information is given in the Census data.

For the *ownership type diversity* measure, we only included block-holdings, that is, ownership greater than 5 % in a firm (Thomsen, Pedersen, & Kvist, 2006). By doing so, we have removed the diffused and relatively less influential investors, predominantly individuals, since these investors have been found to be motivated by short-run speculation and unable to actively contribute key resources to the company (Yuan, Xiao, & Zou, 2008). Following recent corporate governance studies focusing on China (e.g., Yuan et al., 2008), we constructed our Herfindahl measure for ownership concentration based on the five largest shareholders.[5] A higher value of *ownership type diversity* suggests a more diverse presence of mixed ownership types among the blockholders, whereas a higher value of *ownership concentration* suggests more concentrated control by the largest owners. We also included the squared term of ownership concentration *(ownership concentration)^2* to test for the inverted U-shaped relationship between ownership concentration and innovation performance that we have hypothesized.

Control variables Following the R&D literatures (e.g., Baysinger et al., 1991), we used *R&D intensity* to measure a firm's R&D effort, calculated as the per employee R&D expenditure normalized by the mean value of the industry and region. We used the same method to categorize industries and regions as we did for the dependent variable. The R&D information is from the Census data. Prior studies also suggest that a firm's innovation performance is affected by *firm size* and *firm age* (for a review, see Hoffman, Parejo, Bessant, & Perren, 1998). Firm size captures a firm's scale of resources available for innovation activities as well as level of organizational complexity that might hinder innovation management (Cohen & Levin, 1989). Firm age reflects a firm's experience and knowledge intensity and entrepreneurial flexibility, which in turn affects a firm's ability and willingness to take risks such as innovation. We measured them as the natural logarithm of total assets and the natural logarithm of years since incorporation. Following prior literature (e.g., Choi et al., 2011), we also controlled for *leverage* (the debt-to-equity ratio), *cash flow* (the ratio of net operating cash flow to current liability), and *profitability* (return on assets). Last, to control for the effects of regional economic agglomeration, we included a cluster dummy *economic center*, measured as one if the firm is located in any of the three major economic centers (Bohai Gulf, Yangtze River Delta, and Pearl River Delta) and zero otherwise.

Estimation strategy

Our study seeks to test the effects of *ownership type diversity* and *ownership concentration* on *innovation performance*. We used a random-effects, lagged panel

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[5] Compared with cumulative ownership by the largest shareholders, the Herfindahl measure captures both the number of shareholders and their differences in shareholdings, and puts higher weight on larger shareholders than smaller ones (e.g., Su et al., 2007). Our Herfindahl measure is based on the five largest owners as opposed to, for instance, ten, because the ownership concentration in a Chinese listing is so high that usually only the top five owners collectively take the majority control (i.e., greater than 50 %). Indeed, the cumulative ownership percentage by the top five owners is higher than 50 % in 760 out of the total 930 (i.e., 82 %) observations in our sample. The more shareholders we include, the smaller variations we will have in ownership concentration.

Tobit estimation model for the empirical analyses. An important feature of our dependent variable is that a significant portion (44 %) of firms recorded zero new products. Since firms choose their optimal level of new products subject to the constraint that such choice has to be non-negative, our dependent variable can only be partially observed for firms whose optimal choice of new products takes values other than the corner solution of zero. The unconstrained optimal *Innovation performance*[*] for firm i in year t has the following functional form:

$$Innovation\ performance^*_{it} = x'_{it}\beta + \varepsilon_{it}$$

where x_{it} is a vector of covariants and ε_{it} is the error term. *Innovation performance*[*] can be fully observed only when it is greater than zero. Hence, what we actually have in the sample is as follows:

$$Innovation\ performance_{it} = \begin{cases} 0; & if\ Innovation\ performance^*_{it} \leq 0 \\ Innovation\ performance^*_{it}; & if\ Innovation\ performance^*_{it} > 0 \end{cases}$$

To accommodate the censored nature of the dependent variable, we used the Tobit method to estimate the model (Tobin, 1958). Essentially, the Tobit model takes into account the fact that the underlying distribution of the model's error term is truncated. The model is estimated by the maximum likelihood method, which yields consistent estimators for the model parameters.

Furthermore, we adopted random-effects rather than fixed-effects models because fixed-effects models are technically unavailable in non-linear models such as Tobit (Greene, 2004). In addition, compared to fixed-effects models, random-effects models are less likely to generate estimation bias when the time span of the panel data is less than 5 years (Greene, 2004).

Prior studies suggest that ownership structure could be endogenous (e.g., Demsetz & Villalonga, 2001); innovation performance might affect ownership structure, or some unobserved firm factors might affect both ownership and performance. To deal with the potential reverse causality problem, following Granger (1969) we lagged the independent variables by 1 year to take into account the time lag for converting R&D inputs into new products. To deal with unobserved firm heterogeneity, we attempted to adopt a two-stage model with an instrument that is correlated with ownership structures but uncorrelated with performance. However, we failed to find such an instrument, a common problem shared by prior studies on similar topics. As a robustness check, we therefore adopted the method introduced by Hausman and Taylor (1981) that assumes the existence of endogeneity due to an unobserved individual factor.

Results

Table 1 presents the descriptive statistics and correlation matrix for our variables. Using the "rule of thumb" that severe multicollinearity requires a correlation greater than .8 (e.g., Farrar & Glauber, 1967: 98), we found no severe multicolinearity among independent and control variables.

Table 1 Descriptive statistics and correlation matrix

	1	2	3	4	5	6	7	8	9	10
1 Innovation performance	1.0000									
2 Ownership type diversity	.2156*	1.0000								
3 Ownership concentration	−.0193	−.4192*	1.0000							
4 R&D intensity	.1190*	.0086	−.0550	1.0000						
5 Firm size	.0072	−.0444	.3462*	.0649	1.0000					
6 Firm age	.0636	.1090*	−.0394	−.0125	.1177*	1.0000				
7 Leverage	.0220	−.0241	−.0380	−.0212	−.0108	−.0638	1.0000			
8 Cash flow	.0283	−.0277	.0394	.0168	.0077	.0180	−.0056	1.0000		
9 Profitability	.0748	−.0134	.0652	.0826	.1260*	.0177	−.0025	.0550	1.0000	
10 Economic centers	.0218	.0567	.0106	.1312*	.0785	.0742	−.0212	.0347	.0536	1.0000
Mean	1.1440	1.2889	.2238	.0690	14.2077	2.5784	1.3080	.1148	.0297	.4906
Standard deviation	1.6908	.4693	.1319	.1855	1.2235	.7509	5.2544	3.4564	.0779	.5002
Number of observations	960	960	960	960	960	960	960	960	960	960

* $p < .01$

The regression results are found in Table 2, and are supportive of our hypotheses. First, ownership type diversity has a statistically significant and positive effect on innovation performance across all models. The χ^2 values, which indicate the quality of our model specification (Andrews, 1988), increase significantly after ownership type diversity is included in the regressions (e.g., χ^2 value increases from 20.59 in Model 1 to 59.86 in Model 2, with $p < .01$), suggesting that ownership type diversity is an important explanatory factor determining innovation performance.

Figure 1 illustrates the relationship between ownership type diversity and innovation performance. Based on the estimation results in Model 5, Fig. 1 depicts the changing pattern of innovation performance in response to different ownership combinations. This figure suggests that ownership type diversity is found to yield the best results in terms of innovation when diversity is relatively balanced, that is, the accumulated ownership by state, foreign, and non-state blockholders is each around 33.33 %. This finding is consistent with previous studies arguing that a balanced combination of different resource providers will ensure mutual forbearance and collaboration. Zhou and Li (2008), for example, studied international joint ventures in China and found that a balanced equity contribution by foreign and local partners leads to more product innovation than a skewed equity structure.

Second, the effect of ownership concentration on innovation performance is statistically insignificant when we impose a linear specification (Model 3) but turns significant when we impose a curvilinear specification (Models 4 and 5). Specifically,

Table 2 Random-effects panel Tobit regression results

	Model 1	Model 2	Model 3	Model 4	Model 5
Step 1					
Constant	−3.25*	−4.78**	−3.34*	−4.09**	−5.28**
R&D intensity	.83†	.76†	.80†	.79†	.80†
Firm size	.18†	.19†	.20†	.20†	.15
Firm age	.21	.12	.20	.20	.14
Leverage	.02*	.02*	.02*	.02*	.02*
Cash flow	−.01	−.01	−.01	−.01	−.01
Profitability	1.72†	1.99*	1.75†	1.78†	1.94*
Economic centers	.37	.31	.37	.39	.32
Step 2					
Ownership type diversity		1.24**			1.38**
Ownership concentration			−.69	5.66†	6.47*
(Ownership concentration)^2				−11.47*	−8.33†
Model χ^2	20.59**	59.86**	21.04*	25.98**	67.33**
$\Delta\chi^2$		39.27**	.45*	5.39**	46.74**
Number of observations	960	960	960	960	960
Number of groups	478	478	478	478	478
Number of left-censored observations	425	425	425	425	425

The dependent variable is the percentage of total production accounted for by new products

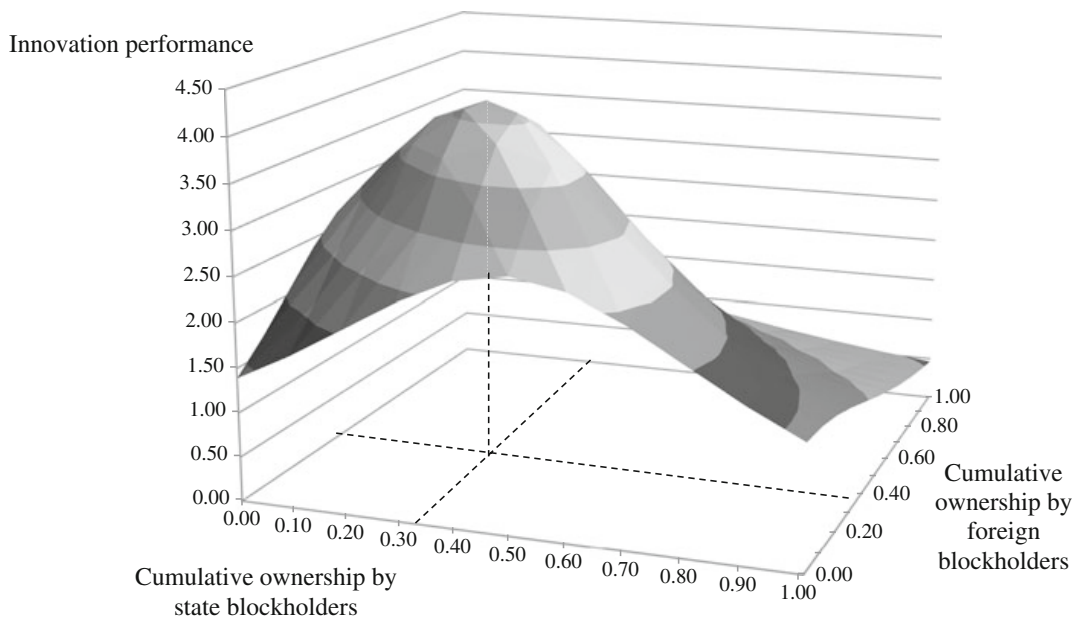† $p < .1$; * $p < .05$; ** $p < .01$

Fig. 1 Effects of state and foreign block ownership on innovation performance

Models 4 and 5 show that ownership concentration has a statistically significant and positive effect on innovation performance, whereas its squared term has a statistically significant and negative effect, suggesting that innovation performance first increases and then decreases as ownership concentration increases. Our findings support our second hypothesis that the relationship between ownership concentration and innovation performance is not linear but an inverted U-shape. The χ^2 values suggest that ownership concentration variables increase the quality of our model specification. For instance, the χ^2 values increased from 20.59 in Model 1 to 21.04 in Model 4 ($p < .01$) after we included the ownership concentration variables. We further simulated this inverted U-shaped relationship in Fig. 2. We used the estimation results in Model 5,
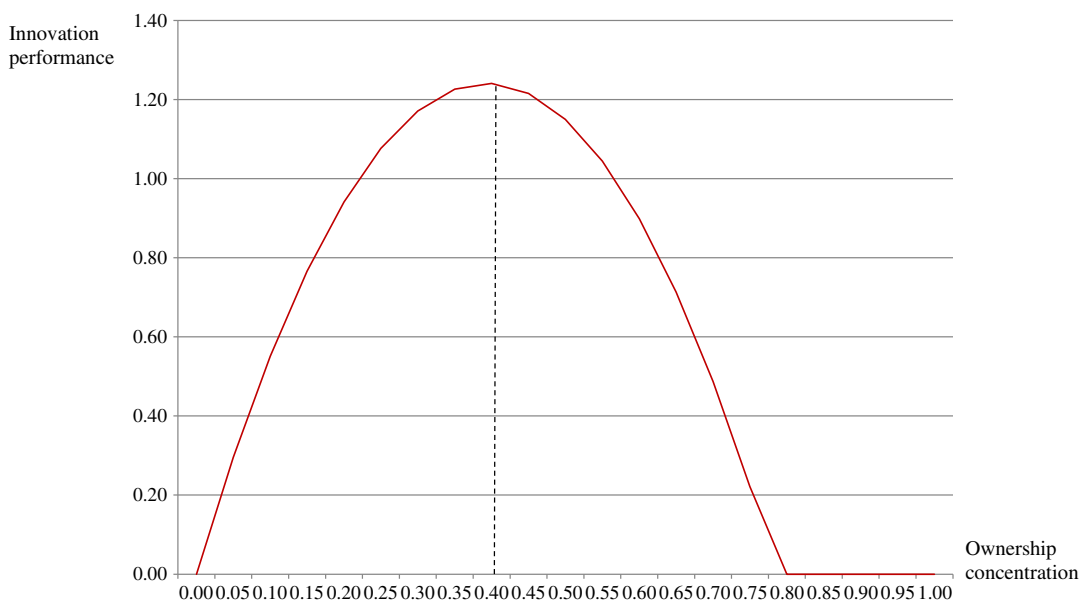

Fig. 2 Effects of ownership concentration on innovation performance

which include all the independent and control variables. Figure 2 suggests that increasing ownership concentration increases innovation performance, but only up to the point where concentration equals .38 and innovation performance equals 1.22, after which innovation performance declines.

We also noted that R&D intensity has a consistent and statistically significant, positive effect on innovation performance, a finding in line with previous studies (e.g., Baysinger et al., 1991). In addition, firm size has a statistically significant and positive effect on innovation performance, suggesting that large firms have economies of scale, market power, and capacity to explore new technology (e.g., Hoffman et al., 1998). Leverage and profitability, which reflect firms' financial ability to conduct innovation activities, are also found to be statistically significant and positive determinants of innovation performance.

Last, the changes in χ^2 values ($\Delta\chi^2$), the indicator of our model fit, suggest that compared to ownership concentration, ownership type diversity is a much more important determinant of innovation performance. Specifically, compared to χ^2 value of Model 1 that has control variables only, χ^2 value increases by 39.27 ($p < .01$) after including ownership type diversity (Model 2), while it increases by only 5.39 ($p < .01$) after including the ownership concentration variables (Model 4). This finding suggests that with regard to innovation performance, the importance of resource provision internalization is likely to outweigh that of an optimal degree of ownership concentration in emerging markets.

Robustness checks

First, we replicated our estimations using an alternative measure of innovation performance, the ratio of the market value of new products to sales. This measure reflects a firm's new product intensity with respect to its sales, whereas our previous measure focuses on a firm's new product intensity with respect to its production capacity. The correlation between these two measures is low (.23), and thus this new measure is a good alternative for testing our hypotheses. We summarized the results based on the new measure in Table 3, which suggests findings consistent with our main estimations (Table 2). Specifically, ownership type diversity has a consistently positive effect on innovation performance (Models 7 and 10) and ownership concentration has an inverted U-shaped relationship with innovation performance (Model 9). χ^2 values increase when either ownership type diversity or ownership concentration variables are included into the model, suggesting that both factors are important in explaining the new products to sales ratio. Between the two factors, ownership type diversity again has greater explanatory power (χ^2 value increases 33.09 from Model 6 to Model 7, with $p < .01$) than ownership concentration variables (χ^2 value increases 4.69 from Model 6 to Model 9, with $p < .01$).

Next, we replicated our main regressions using the techniques in Hausman and Taylor (1981) to examine whether our results in Table 2 would be affected by the assumption of endogeneity. This method allows for the time-invariant regressors (e.g., the dummy variable for economic centers, ownership type diversity, ownership concentration, and its squared term) to be correlated with the latent individual effects. This approach requires the number of exogenous time-varying explanatory variables to be equal to or greater than the number of endogenous time-invariant variables. Our

Table 3 Robustness check: Random-effects panel Tobit regression results using an alternative measure for dependent variable

	Model 6	Model 7	Model 8	Model 9	Model 10
Step 1					
Constant	−3.40*	−4.90**	−3.50*	−4.24**	−5.37**
R&D intensity	.90[†]	.84[†]	.88[†]	.87[†]	.88[†]
Firm size	.19[†]	.20[†]	.21[†]	.22[†]	.16
Firm age	.20	.11	.19	.19	.13
Leverage	.02*	.03*	.02*	.02*	.03**
Cash flow	−.02	−.02	−.02	−.02	−.02
Profitability	1.47	1.71[†]	1.51	1.53	1.67
Economic centers	.39	.33	.39	.41	.34
Step 2					
Ownership type diversity		1.20**			1.33**
Ownership concentration			−.72	5.45[†]	6.16*
(Ownership concentration)^2				−11.15*	−8.03
Model χ^2	20.33**	53.42**	20.78*	25.02**	59.36**
$\Delta\chi^2$		33.09**	.45*	4.69**	39.03**
Number of observations	960	960	960	960	960
Number of groups	478	478	478	478	478
Number of left-censored observations	425	425	425	425	425

The dependent variable is the ratio of the market value of new products to sales

[†] $p < .1$; * $p < .05$; ** $p < .01$

data satisfies this requirement: there are six exogenous and time-varying control variables. The time-varying control variables serve as instruments for the endogenous time-invariant variables, and the method is more efficient than fixed- and random-effects models because it produces less biased estimates for the coefficients of time-invariant variables (Hausman & Taylor, 1981). Table 4 summarizes the new results, which suggest that the relationship between ownership type diversity and innovation performance remains significantly positive. However, the inverted U-shaped effect of ownership concentration becomes statistically insignificant. Similar to our main regressions, compared to ownership concentration, the inclusion of ownership type diversity has a much higher effect on χ^2 values. These findings provide further evidence that ownership type diversity has a much stronger and more consistent effect on innovation performance than does ownership concentration.

Discussion

We have incorporated insights from TC theory (Hennart, 1988; North, 1990; Williamson, 1979), agency theory (Jensen & Meckling, 1976), and the literature on PP conflicts (Su et al., 2007; Young et al., 2008) to analyze the impact of ownership

Table 4 Robustness check: Hausman-Taylor panel regression results

	Model 11	Model 12	Model 13	Model 14
Exogenous covariates				
Constant	−1.68*	.40	−.07	−2.32**
R&D intensity	.47[†]	.46	.47	.53[†]
Firm size	.05	.05	.05	.02
Firm age	.01	.08	.08	.04
Leverage	.02**	.01*	.01*	.02**
Cash flow	.00	.00	.00	.00
Profitability	1.36*	1.18[†]	1.20*	1.27*
Time-invariant covariate				
Economic centers	−.06	.02	.03	−.06
Endogenous variables (assumed)				
Ownership type diversity	1.58**			1.70**
Ownership concentration		−1.28	3.29	5.34[†]
(Ownership concentration)^2			−7.83	−6.28
Model χ^2	89.91**	16.13[†]	18.63*	96.16**
Number of observations	960	960	960	960
Number of groups	478	478	478	478

The dependent variable is the percentage of total production accounted for by new products

[†] $p < .1$; * $p < .05$; ** $p < .01$

structure on the innovation performance of firms in China. Our findings highlight that ownership type diversity, an ownership structure found to be detrimental in developed markets (e.g., Boardman & Vining, 1989), is a major factor that contributes to the innovation performance of Chinese firms. Indeed, ownership type diversity might be more important than ownership concentration, although the literature has typically focused on the latter (Choi et al., 2011, 2012). This result suggests that in environments characterized by inadequate external institutions, it is relatively more important for firms to address high transaction costs in gathering critical economic and political resources than to deal with corporate governance issues (i.e., PA/PP conflicts) because the former prevents firms from assembling a complete set of innovation inputs. Our broad overall conclusion is therefore that ownership structure (ownership type diversity and ownership concentration) are important determinants of innovation performance in EMs but ownership type diversity might be more important because it provides an effective mechanism by which EM firms can assemble the resources necessary for innovation in the context of inadequate external institutions.

Our study has important implications for management research in corporate governance. First, our study has emphasized the importance of firm owners' role in non-financial resource provisions (e.g., public benefits, land, knowledge, information, and policy support). We have argued that the provision of these resources is also critical to firm innovation because external institutions for acquiring these resources are inadequate. Therefore, institutional environments matter in the investigation of

ownership structure on firm performance. Second, our study proposes a nonlinear relationship between ownership concentration and innovation, taking into consideration both expropriation costs by senior management (commonly emphasized in countries with both good and bad institutional environments) and those by controlling owners (particularly emphasized in EMs with bad institutional environments). This proposition receives empirical support, suggesting again that future research should view institutions as an important factor that determines optimal ownership structure. Third, whereas prior studies have focused on the contributions of each type of owner to firm performance (e.g., Choi et al., 2011, 2012), our study has emphasized and found the importance of the interplay between different types of owners. In particular, it is important to understand the effect of the degree of resource complementarity among different owners on the ownership structure that most enhances firms' innovation performance.

Limitations and future research

Our study is focused on one EM, that is, China, and future studies should examine the generalizability of our findings to other EMs. We suspect that the benefits of the co-existence of different types of owners are also considerable in politically centralized EMs such as Brazil, Kenya, Malaysia, Mexico, Venezuela, and Zimbabwe (Khanna et al., 2005; Magaloni & Kricheli, 2010). Similar to the Chinese government, governments in such economies provide important financial and political resources (Magaloni & Kricheli, 2010), often distribute these resources in a non-transparent way due to corruption (Khanna et al., 2005), and view innovation as one of the national strategic priorities (Choi et al., 2011, 2012). It is worth noting that our groupings of ownership types (state, local non-state, and foreign owners) are China specific. Research focusing on other EMs might find different ways to group owners based on the uniqueness of resources they provide.

In our study, the benefits of ownership type diversity exceed the costs associated with ownership conflicts because achieving high innovation performance is a shared agenda among different owners. It is possible that for other types of activities and in other countries whose governments do not view innovation as a national priority, our conclusion that ownership type diversity contributes to firm performance would not hold. Indeed, the literature has well recognized that including owners that hold conflicting objectives with other owners will create dissonance among decision makers, discourage shareholders from contributing valuable resources, and ultimately jeopardize firm performance. Therefore, future research, in studying the effect of ownership type diversity, needs to carefully consider the different objectives among owners and the conditions under which their objectives converge.

Conclusion

This study has provided both theoretical reasoning and empirical evidence in support of the broad hypothesis that ownership structure is an important determinant of innovation performance in an EM context. Our theory and results

clearly point to the importance to innovation of both ownership type diversity and ownership concentration, and the nature of their impact is in turn determined by the context of inadequate external institutions so common in EMs. In this context, ownership structure serves as an effective internal mechanism through which an EM firm can assemble and direct key resources into innovation activities. We also find that ownership type diversity is possibly more important than ownership concentration in explaining firm innovation and thus deserves more attention in future studies.

Appendix

Table 5 Descriptive statistics of ownership by different types of blockholders

	2004					2005				
	Number of firms	Mean	SD	Min.	Max.	Number of firms	Mean	SD	Min.	Max.
State blockholders	485	36.59	25.27	.00	85.00	475	35.14	24.81	.00	84.97
State	485	9.26	19.06	.00	85.00	475	8.36	17.84	.00	77.89
Legal persons	485	27.32	26.79	.00	84.65	475	26.77	25.98	.00	82.56
Foreign blockholders	485	2.79	8.31	.00	55.76	475	3.02	9.12	.00	65.38
Tradable B	485	.38	2.57	.00	30.62	475	.38	2.49	.00	31.04
Tradable H	485	.76	4.89	.00	43.07	475	.86	5.32	.00	49.53
Tradable S	485	n/a	n/a	n/a	n/a	475	n/a	n/a	n/a	n/a
Legal persons	485	1.64	6.44	.00	55.76	475	1.79	7.17	.00	65.38
Natural persons	485	.01	.31	.00	6.80	475	n/a	n/a	n/a	n/a
Domestic non-state blockholders	485	21.70	24.13	.00	75.00	475	20.93	22.68	.00	75.00
Tradable A	485	n/a	n/a	n/a	n/a	475	n/a	n/a	n/a	n/a
Legal persons	485	19.60	22.45	.00	75.00	475	19.02	21.47	.00	75.00
Natural persons	485	2.10	9.70	.00	69.56	475	1.92	8.85	.00	63.84
All blockholders	485	61.08	11.48	20.68	94.06	475	59.10	12.16	12.20	94.06

SD Standard deviation, *Blockholders* Shareholders who hold at least 5 % ownership of a firm (Thomsen et al., 2006), *Tradable B* A Chinese firm's shares that are traded in foreign currencies, targeting foreign investors, *Tradable H* A Chinese firm's shares that are traded on the Hong Kong Stock Exchange, targeting Hong Kong investors, *Tradable S* A Chinese firm's shares that are traded on the Singapore Stock Exchange, targeting Singaporean investors, *Tradable A* A Chinese firm's shares that are traded in Renminbi on either the Shanghai or Shenzhen Stock Exchange, targeting domestic investors

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