Asia Pacific Journal of Management (2021) 38:1085–1111
https://doi.org/10.1007/s10490-019-09702-z

Owner type, pyramidal structure and R&D Investment in China's family firms

Jin-hui Luo[1] · Xue Li[1] · Linda C. Wang[2] · Yue Liu[1]

Published online: 11 December 2019

Abstract

Drawing on socioemotional wealth perspective and agency theory, this paper holds that lone-founder firms tend to engage more actively in R&D projects than do family-controlled firms involving multiple family members as owners, while family ownership structure moderates that effect. Using a large sample of 5808 firm-year observations in China, the study found that lone-founder firms do more R&D than family-controlled firms, though the positive effect is less pronounced when founder' ownership is higher and more pronounced when the divergence between founders' ownership and control (resulted from pyramidal structures) is higher. These findings indicate that properties of family ownership structure, and particularly pyramidal ownership structure, are important contingencies of family firms' R&D decisions. This yields implications for family business and researchers, as well as policymakers seeking to encourage innovativeness in the large family business sector.

Keywords China · Family firms · Owner type · R&D · Family ownership structure · Socioemotional wealth (SEW) · Agency theory

✉ Jin-hui Luo
jinhuiluo@xmu.edu.cn

Xue Li
lixuecgrs@163.com

Linda C. Wang
linda.wang@cityu.edu.hk

Yue Liu
liuyuexmu@163.com

[1] School of Management, Xiamen University, No. 422, Siming South Road, Xiamen, Fujian, People's Republic of China 361005

[2] Department of Management, City University of Hong Kong, Kowloon Tong, Hong Kong

How innovative are family firms, and are some types more innovative than others? These are key questions (Liu, Chen, & Wang, 2017) not only because of the importance of family firms to the world's economy (Carney, 2005; Memili, Fang, Chrisman, & De Massis, 2015), but also due to concerns about family firm risk aversion and a purported lack of commitment to innovation (Chen & Hsu, 2009; Hiebl, 2013). The answers are also vital given the importance of innovation to the competitiveness and growth of firms (Ahlstrom, 2010; Griffith, Redding, & Van Reenen, 2004; Muñoz-Bullón & Sanchez-Bueno, 2011). Researchers, managers, and policymakers alike are thus concerned with the management of family business and particularly the key drivers of innovation in those firms (Perri & Peruffo, 2017; The Economist, 2009).

In examining family business and innovation, past research has suggested that family ownership and its level of active involvement in management are major factors impacting firm innovativeness (Daspit, Chrisman, Sharma, Pearson, & Mahto, 2018; Muñoz-Bullón & Sanchez-Bueno, 2011; Sciascia, Nordqvist, Mazzola, & Massis, 2015). Yet findings on family business and innovativeness have proven to be mixed (Block, 2012; Bloom, Sadun, & Van Reenen, 2015; Chrisman & Patel, 2012; Kim, Kim, & Lee, 2008; Llach & Nordqvist, 2010). Researchers have gradually reached a consensus that family firms are not homogenous (Fang, Siau, Memili, & Dou, 2019) and differ from one another in several ways such as in top management organization, ownership structure and governance (Cannella, Jones, & Withers, 2015; Miller & Le Breton-Miller, 2011; Miller, Le Breton-Miller, & Lester, 2011), which may be a major reason for the mixed findings. Therefore, research is needed to explore important factors that contribute to the heterogeneity in family business population (Chua, Chrisman, Steier, & Rau, 2012; Fang, Kotlar, Memili, Chrisman, & De Massis, 2018).

In this study, we focus on the different types of owners of family firms and examine this as a key factor in shaping family firms' innovation strategies (Cannella et al., 2015; Miller & Le Breton-Miller, 2011; Miller et al., 2011), and how this also can help reconcile mixed findings on the innovativeness of family firms. Scholars have long focused on Jensen and Meckling's (1976) agency framework to argue that family firms may engage in more R&D activities through effectively monitoring managerial myopia (Block, 2012; Schmid, Achleitner, Ampenberger, & Kaserer, 2014). However, the principal-principal (PP) perspective of agency theory (Young, Peng, Ahlstrom, Bruton, & Jiang, 2008) suggests that family owners as majority shareholders may tend to extract private benefits of control rather than maximizing firm value (Boyd & Solarino, 2016; Dunbar & Ahlstrom, 1995; Luo, Wan, & Cai, 2012; Miller & Le Breton-Miller, 2006).

In terms of R&D expenditures itself, the empirical evidence is mixed: some studies find that family ownership is good for R&D investment (Kim et al., 2008; Block, 2012; Schmid et al., 2014; Zahra, 2005), while others find it is not (Chen & Hsu, 2009; Chrisman & Patel, 2012; Duran, Kammerlander, Van Essen, & Zellweger, 2016; Gomez-Mejia et al., 2014). Thus, this study responds to the call of Miller and Le Breton-Miller (2011) as well as Cannella et al. (2015) regarding this tension to go beyond the agency view (that family owners are similar), and examine the effects of family ownership structure. This study does so by drawing on *socioemotional wealth* (SEW) perspective and *agency theory*, in arguing that the type of family owners and ownership structure are important determinants of R&D across family firms.

The owner type represents owners' identities and shape owner behavior (Ashforth & Mael, 1989; Hogg, Terry, & White, 1995; Miller & Le Breton-Miller, 2011; Miller et al.,

2011). Since lone founders interact with a diverse set of stakeholders without much input from other family members, they embrace a more entrepreneurial role (Hitt, Ireland, Camp, & Sexton, 2002; Miller & Le Breton-Miller, 2011) due to their interactions with stakeholders (Langlois, 2007; Loasby, 2007; Miller et al., 2011; Stets & Burke, 2000). In contrast, given non-founder family owners' close association with other firm family members, they may adopt identities as family nurturers and protectors (Bertrand & Schoar, 2006; Morck, Wolfenzon, & Yeung, 2005; Schulze, Lubatkin, & Dino, 2001). SEW suggests that family owners usually think highly of socioeconomic benefits such as family control, social status, and succession (Block & Wagner, 2014; Chrisman & Patel, 2012; Gómez-Mejía, Haynes, Núñez-Nickel, Jacobson, & Moyano-Fuentes, 2007; Sanchez-Bueno & Usero, 2014). Therefore, R&D priorities may be different in lone-founder versus family-controlled firms. Moreover, since the family ownership structure has effects on owner priorities (Berrone, Cruz, & Gomez-Mejia, 2012; Gómez-Mejía et al., 2007; Miller, Le Breton-Miller, & Lester, 2010), family ownership structure may moderate the impact of owner type on R&D.

We test this in the context of China, which is striving towards an innovation-based economy (Casey & Koleski, 2011). Having emerged and developed for about four decades since China's initial reform and opening-up policy of 1978, many family firms in China are still relatively young and owned by the founders (Cai, Luo, & Wan, 2012). About 54% of family firms are lone-founder firms in our sample, which is much higher than the 8% in Miller et al. (2011). Thus, China's large proportion of lone-founder firms creates greater variation in the data, making statistical inference more feasible and convincible. Third, we develop our hypotheses mainly based on SEW, which emphasizes how the desire to satisfy the need of family members influences the decisions of owners in family firms. The impact of SEW on family owners' decision could be much higher in China where there is a long history of family commercial culture (Ahlstrom, Young, Chan, & Bruton, 2004). We also explore the potential effect of the pyramidal structure, which is common in family firms particularly in emerging economies like China (Claessens, Djankov, & Lang, 2000; Cai et al., 2012; Luo et al., 2012). Therefore, China also provides a useful setting and also responds to the call to broaden the diversity of entrepreneurship research (Ahlstrom & Ding, 2014; Barkema, Chen, George, Luo, & Tsui, 2015; Welter, Baker, Audretsch, & Gartner, 2017).

Using 5808 firm-year observations of Chinese family listed firms from 2007 to 2015, we found that lone-founder firms significantly invest more in R&D projects than family-controlled firms. Further analyses reveal that the positive association between the type of family owners and R&D investment is attenuated when family ownership is high, but is stronger when the divergence between family control and ownership resulted from pyramidal structures is large. Overall, this study contributes to theory on family firms in responding to the calls of Miller and Le Breton-Miller (2011) as well as Cannella et al. (2015) to go beyond the agency perspective to differentiate the type of family owners in shaping R&D strategies in family firms. It also contributes to empirical research on emerging economies and their differing institutional context (Young, Tsai, Wang, Liu, & Ahlstrom, 2014). The properties of family ownership structure have an important impact on R&D activities thereby contributing to the reconciling of the various findings on the effect of family ownership on R&D investment. We also contribute to pyramidal ownership structure research by indicating that pyramidal structures can allay owners' concerns of wealth loss due to the failure of R&D activities and thus promoting R&D investment in family firms. This empirical contribution holds that the low ownership of the pyramidal structure shows

the family can reduce the riskiness of R&D activities through increased investment diversification. In addition, valuable practical implications emerge for family owners and policymakers who aspire to motivate R&D activities for achieving long-term firm survival as well adding to growth firms in their countries or regions (Ahlstrom, Chang, & Cheung, 2019; Memili et al., 2015).

Theoretical background and hypotheses

Theoretical background

Family firms, which often have fairly concentrated ownership, voting rights, and other distinct elements as part of their governance structure (Chrisman, Chua, Le Breton-Miller, Miller, & Steier, 2018; Daspit et al., 2018; Liu, Wang, Zhao, & Ahlstrom, 2013), have drawn much attention in the literature in recent years with respect to key strategic decisions such as R&D investment and internationalization (Boyd & Solarino, 2016; Fang et al., 2018; Luo, Xiang, & Zhu, 2017). As R&D activities demand multi-stage commitments of resources and involve high failure risk (Hall & Lerner, 2010; Kumar & Langberg, 2009), self-serving and "myopic" managers are thought to be reluctant to invest in these long-term R&D projects (Block, 2012; Muñoz-Bullón & Sanchez-Bueno, 2011). According to the principal-agency (PA) perspective of agency theory, family owners with block ownership have incentives (and power) to monitor managerial myopia and boost long-term investment such as R&D (Anderson, Duru, & Reeb, 2012; Grossman & Hart, 1980; Jensen & Meckling, 1976; Miller & Le Breton-Miller, 2006). In this view, family firms should perform better with respect to R&D and innovation. Consistent with this, Zahra (2005) finds that family ownership can promote entrepreneurial risk-taking such as supporting R&D activities in the U.S. family manufacturing firms. Schmid et al. (2014) also find that family-influenced firms engage in more R&D activities in Germany. Likewise, Kim et al. (2008) show that Korean family firms are more willing to invest in R&D projects.

However, both the PP perspective of agency theory (Young et al., 2008) and the SEW perspective (Gómez-Mejía et al., 2007) suggest that family owners may maximize their own utility rather than to pursue growth strategy such as R&D investment at the expense of nonfamily minority shareholders (Gomez-Mejia et al., 2014; Kim et al., 2008; Morck et al., 2005; Shleifer & Vishny, 1997; Young et al., 2008). According to the PP perspective, family firms are not expected to be active innovators because family owners with block ownership may be risk averse and tend to extract short-term private benefits rather than pursuing long-term growth through investing in R&D projects (Kim et al., 2008; Morck et al., 2005; Young et al., 2008). For different reasons, the SEW perspective also predicts lower investment in R&D. In this view, family owners think highly of family control and survival, social status and reputation, and firm succession, which largely deviate from strict firm economic goals (Block & Wagner, 2014; Cennamo, Berrone, Cruz, & Gomez-Mejia, 2012; Gómez-Mejía et al., 2007; Gomez-Mejia, Cruz, Berrone, & De Castro, 2011; Gomez-Mejia et al., 2014; Miller, Le Breton-Miller, & Scholnick, 2008). In seeking to preserve SEW, family owners would be reluctant to engage in R&D projects with highly uncertain payoffs. For example, Anderson et al. (2012) find that family owners with block ownership suffer from more

exposure to the R&D failure risk and thus are more cautious and conservative in R&D investment. Similarly, Chrisman and Patel (2012), Gomez-Mejia et al. (2014), and Duran et al. (2016) have found that family firms invest less in R&D activities than their nonfamily counterparts even in high-technology sectors.

Regarding this, Miller, Le Breton-Miller, Lester, and Cannella (2007) and Miller et al. (2011) suggest that the social identity of family owners also seems to matter. From the perspective of social identity, family owners' social positions can influence their identities and strategic priority in operating family firms (Hogg et al., 1995; Tajfel, 1974). Founders tend to identify themselves as business builders, while non-founder family owners tend to perceive themselves as family nurturers or protectors, thereby possessing different attitudes to entrepreneurial orientation and growth strategy. Miller et al.'s (2011) and Miller and Le Breton-Miller's (2011) analyses of a sample of Fortune 1000 firms found compelling support for these arguments. Recently, Cannella et al. (2015) also found that identities of family owners reflect unique desires of control and influence, which in turn yield different choices of board structure in family firms. In this way, family firms are different at least in terms of owner type, which goes beyond agency theory and SEW perspective, where the former treats lone-founder and family-controlled firms as synonymous because of their similarities in agency costs and the latter also categorizes family firms as about the same and protective of SEW.

Taken as a whole, previous studies yield mixed findings on the association between family ownership and R&D investment. However, these studies are unable to explain potential differences across family firms by regarding family ownership as synonymous, thereby failing to recognize key variables with respect to family ownership. Hence, this study follows Miller et al. (2007, 2011) and Cannella et al. (2015) to suggest that owner type should be an important contingency in shaping family firms' R&D strategy, thereby reconciling extant inconsistent findings and contributing to the literature.

Hypothesis development

Drawing briefly on the perspective of society identity (Ashforth & Mael, 1989; Hogg et al., 1995; Tajfel, 1974), there are two types of firms in family firms because of the difference between firm owners: lone-founder firms and family-controlled firms (Miller et al., 2007; Cannella et al., 2015). A lone-founder firm is the one that is owned and controlled by the founder without any other family members as significant owners at present or historically. On the other hand, a family-controlled firm is the one that is owned and controlled by multiple family members including the founder and other (non-founder) owners. Because of the difference in concerning about the need of other family members, there should be different preferences to R&D investment between lone-founder firms and family-controlled firms.

In family-controlled firms, because of the involvement of family members in the firm, family owners will be influenced by family loyalties, reciprocity and altruism, and become more emotionally attached to other family members (Ahlstrom et al., 2004; Chrisman & Patel, 2012). Those would motivate family owners to manage the firm to satisfy family members' need, such as stable incomes, long term security, reputation, and control of the firm, which means that they are more emotionally motivated and prefer to pursue the non-economic benefits (Berrone et al., 2012; Dunbar & Ahlstrom, 1995; Gomez-Mejia et al.,

2014; Miller & Le Breton-Miller, 2005; Morck et al., 2005; Schulze et al., 2001). Considering that R&D investment is associated with threats to family SEW through loss of control (Chrisman & Patel, 2012; Gomez-Mejia et al., 2014), family owners are more likely to adopt more of a conservation or risk-avoidance strategy for protecting the SEW of the family over the more traditional objective of wealth maximization (Miller et al., 2011; Miller & Le Breton-Miller, 2011), and thus the R&D investment will be curtailed.

In contrast, in lone-founder firms, since no other family members are present as significant owners, there are few emotionally constraining family ties for lone founders, which may monopolize their attention (Miller & Le Breton-Miller, 2011). In particular, the choice itself that founders exclude their family members from their businesses may indicate that founders want to reserve much discretion for themselves (Cannella et al., 2015). In addition, because of less interaction with family members, lone founders would instead interact more with diverse market-oriented stakeholders such as investors, customers, suppliers, and employees, thereby focusing more on addressing demands from a broader group of stakeholders, thus embracing a more entrepreneurial role (Hitt et al., 2002; Miller & Le Breton-Miller, 2011; Miller et al., 2011). In that way, lone founders tend to distinguish themselves from "mere" general managers or administrators but regard themselves as a member of successful entrepreneurs due also to interactions with peer entrepreneurs (Ashforth & Mael, 1989; Langlois, 2007; Loasby, 2007; Miller et al., 2011; Stets & Burke, 2000).

Such identification may be reinforced in China's social and commercial culture (Ahlstrom & Ding, 2014; Bruton, Zahra, & Cai, 2018). That is, there is a rooted culture: "win and you are king; lose and you are the outcast" in China (Xu, 2012), which encourages dreams of successful entrepreneurship. Meanwhile, successful entrepreneurs (e.g., founders of large listed firms) have strong pro-social motives to contribute to social or public good for the betterment of the society in China (Barkema et al., 2015; Li & Liang, 2015). All of these suggest that the firms dominated by lone founders is likely more concerned with innovation and economic pursuits relative to family owners and may find more alignment with the traditional shareholder-wealth maximization goals (Achleitner, Kaserer, & Kauf, 2012; Miller et al., 2011; Cannella et al., 2015).

In short, since innovation is one of the three core dimensions of entrepreneurial orientation and largely reflects in the form of R&D activities characterized by high failure risk and uncertain payoffs (Chrisman & Patel, 2012; Hall & Lerner, 2010; Kumar & Langberg, 2009), lone-founder firms may engage more in R&D investment than family-controlled firms which tend to adopt a risk-avoidance strategy to preserve family SEW. Therefore, we hypothesize,

> *Hypothesis 1:* Ceteris paribus*, lone-founder firms will invest more in R&D than family-controlled firms.*

It should be noted that a family firm is a close combination of the family and the firm regardless of *who* the owners are (Gomez-Mejia et al., 2011). Although lone founders may tend to be more economically motivated, they should also consider their potential loss of financial interest, which largely depends on *how much* ownership of the firm lone founders hold (Berrone et al., 2012; Sanchez-Bueno & Usero, 2014; Sciascia

et al., 2015; Zellweger & Dehlen, 2012). Therefore, family ownership may moderate lone founders' preference for R&D investment.

Theoretically, the financial motivation is rooted in the ownership levels of lone founders. Lone founders invest and commit more to the firm because of their majority stake, which means that there will be stronger financial bond between lone founders and their firms with the increase of their ownership and hence they would have more to lose (Le Breton-Miller & Miller, 2008; Duran et al., 2016; Souder, Zaheer, Sapienza, & Ranucci, 2017). Although investment in R&D activities is crucial to the survival and success of firms, it is also considered as risky activities (Chen & Hsu, 2009). R&D investment is characterized with high failure risks and unpredictable returns such as no payoffs or payoffs only occurring after many years (Schmid et al., 2014). Lone founders, who have concentrated wealth in the firms, would be sensitive to uncertainty. The more ownership they hold, the more financial loss they need to burden. As to lone founders with higher ownership, they will not support such investment without any guarantees of financial success (Zahra, 2005), and thus they are less likely to devote resource to the investment in R&D which can bring about the fluctuations in firm value and performance.

On the basis of discussions above, the higher ownership may intensify lone founders' consideration of avoiding financial loss in the business, which would attenuate their priority for firm growth and business success through promoting R&D investment. Therefore, we hypothesize,

> *Hypothesis 2: The firm ownership negatively moderates the positive association between lone founders and R&D investment in family firms.*

Since high family ownership would bear much cost, the rule is minority ownership regardless of *who* are the owners of family firms (Cannella et al., 2015). It then raises an important question: *how* do family and lone-founder owners maintain control of the firm? We posit that one important means is through the pyramidal ownership structure, which allows family owners to hold a majority of the stock of rather than full stock of one firm which in turn holds a majority of the stock of another, thereby enhancing their voting rights relative to their cash flow rights.

Several studies have shown that pyramidal structure is common in family firms in the world particularly in emerging economies like China (Cai et al., 2012; Claessens et al., 2000; Luo et al., 2012; Morck et al., 2005; Shleifer & Vishny, 1997). One distinctive characteristic of pyramidal structures is the divergence between cash flow rights and voting rights (Claessens et al., 2000; Kuan, Li, & Chu, 2011). As to lone founders with higher divergence between their control and ownership caused by the pyramidal structure, they could take and maintain control of the firm with less stakes, which means that family owners may have weaker financial bonds with the firm (French & Rosenstein, 1984), and less concern for avoiding their financial loss (Miller et al., 2011; Zellweger & Dehlen, 2012). Therefore, a pyramidal structure allows lone founders to embrace a growth strategy without the heavy disturbance of their interest considerations.

In addition, a pyramidal structure can help to create an internal capital market and thus provide more financial resources to the family firm (Almeida & Wolfenzon, 2006; Fan, Wong, & Zhang, 2005; Masulis, Pham, & Zein, 2011; Newman, Schwarz, & Ahlstrom, 2017; Stein, 1997). This can enable lone founders to better implement growth strategies

requiring adequate financial support (such as with new product development) as opposed to conservation strategies (Almeida & Wolfenzon, 2006; Block, 2012; Hall, 2002; Hall & Lerner, 2010). Recently, Bena and Ortiz-Molina (2013) provided cross-national evidence that the pyramidal structure can help to facilitate early firm development and hence can be an important underpinning of entrepreneurial activities.

Taken together, since the divergence between family control and family ownership can help lone founders maintain control over the firm with a minority ownership, it may relieve lone founders' concerns about avoiding loss and reinforce their tendency to adopt a market-oriented strategy and pursue an entrepreneurial identity by actively engaging in R&D activities. Therefore, we hypothesize:

> *Hypothesis 3: The divergence between family control and family ownership will positively moderate the association between lone founders and R&D investment in family firms.*

Methods

Data and sample

The original sample includes all family listed firms in China's Shanghai and Shenzhen Stock Exchanges during the period of 2007–2015. We gathered information on each firm-year's control chain and significant owners from their annual reports. Based on this, we identify the name of each firm's founder or family members, and the familial relationship among firms' large owners to confirm whether they are related to firms' founders. Drawing on prior literature (Cannella et al., 2015; Miller et al., 2011; Miller & Le Breton-Miller, 2011), we define family-controlled firms as those in which there are multiple members from the same family involved as significant owners with at least 10% voting rights as a whole, and lone-founder firms as those in which there are no other family members beyond the founder-owner who have no less than 10% voting rights. When alternatively taking 15% voting rights as a cut-off point to define family firms, we get highly consistent results (not reported here). The financial accounting data was collected from the China Stock Market & Accounting Research (CSMAR) database (http://www.gtarsc.com). In addition, R&D expenditure data were obtained from the WIND database. Both CSMAR and WIND databases are main providers of China data. The regional marketization index across China's provinces is from the National Economic Research Institute's (NERI) marketization index (Fan, Wang, & Zhu, 2011; Luo, Wan, Cai, & Liu, 2013).

We choose the year 2007 as the starting year because the R&D expenditure data was first made available in 2007. To minimize the influence of nonrepresentative firms, we excluded financial firms that are heavily regulated by the government, firms that are under the transaction status of special treatment (ST) and thus face delisting risk due to two consecutive annual losses, firms that have issued debt exceeding asset value, cross-listed firms that face different regulation environments and financing requirements, and firms that have missing data for measuring variables. The final sample included 1235 family listed firms and a total of 5808 firm-year observations.

Measures

Dependent variable In this study, the dependent variable is the intensity of R&D investment. Compared with the absolute amount of R&D, the R&D ratio could control for the size effect and heteroscedasticity and better reflects a firm' commitment to innovation (Chen & Hsu, 2009; Kim et al., 2008; Munari, Oriani, & Sobrero, 2010). Following previous studies (Block, 2012; Duran et al., 2016; Miller et al., 2011; Muñoz-Bullón & Sanchez-Bueno, 2011), we measured it by using two variables, i.e., *RD_SIZE* and *RD_SALE*. Specifically, *RD_SIZE* is calculated as the percentage of R&D expenditure over total assets, and *RD_SALE* is calculated as the percentage of R&D expenditure over total sales. High value of *RD_SIZE* or *RD_SALE* corresponds to high intensity of R&D investment. It is worthy that there were lots of missing values for R&D expenditure since many firms may not invest in R&D activities at all or disclose the information about R&D investment. Hence, we coded those missing values as zero (Chen & Miller, 2007; Muñoz-Bullón & Sanchez-Bueno, 2011). It means that the dependent variables, *RD_SIZE* and *RD_SALE*, are censored at zero. To solve any bias caused by the left-censored sample, we followed previous studies in using the Tobit model to estimate the determinants of R&D investment (Anderson et al., 2012; Tobin, 1958). For the sake of robustness check, we also used the absolute amount of R&D investment as a measure and got highly consistent results (not reported here).

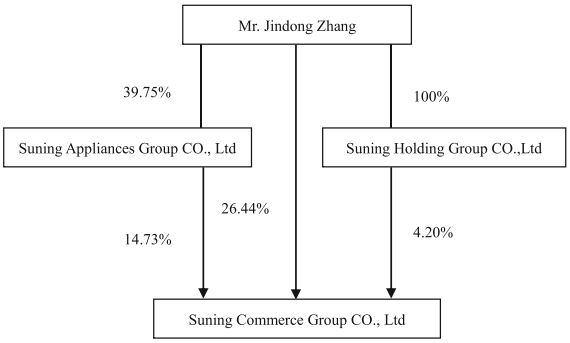
Independent variables Our independent variable is the type of family owners, that is, whether a firm is controlled by the lone founder or by multiple family owners. According to extant studies (Cannella et al., 2015; López-Delgado & Diéguez-Soto, 2015), we constructed a dummy variable to measure it, denoted as *LONE*, which takes one if a firm is controlled by the lone founder with no other family members as significant owners at present or historically, and zero otherwise.

Moderating variables We have two moderating variables - family ownership and the divergence between family control and ownership - for testing H2 and H3 respectively. Given that most family listed firms have pyramidal ownership structures in China (Cai et al., 2012; Luo et al., 2013), we traced each firm's control chain disclosed in annual reports to calculate family owners' ultimate ownership according to previous studies (Claessens et al., 2000; Faccio & Lang, 2002). Specifically, family ownership, denoted as *Ownership*, is calculated as the sum of the products of all equity stakes along the control chains, while family control is calculated as the sum of the minimal equity stake along the control chains. The divergence between family control and ownership, denoted as *Divergence*, is measured by the ratio of family control over family ownership (Cai et al., 2012; Claessens et al., 2000). High value of the variable *Divergence* corresponds to severe divergence between family control and ownership.

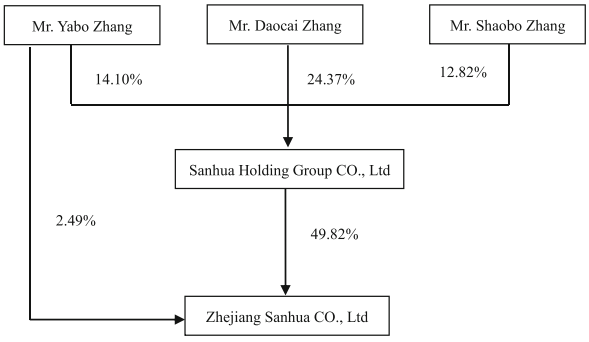
In order to elaborate how we calculate family ownership and control, Fig. 1 presents two examples. Fig. 1(a) is the pyramidal ownership structure of Suning Commerce Group CO., Ltd. (002024.SZ), which is a lone-founder (i.e., Mr. Jindong Zhang) firm according to our definition. Mr. Zhang's ownership is the sum of the all products of equity stakes along the three control chains, which equals 36.50% (26.44% + 39.75%*14.73% + 100%*4.20%), while his control rights is the sum of the minimal equity stakes along the three control chains, which equals 45.37% (26.44% + 14.73% +

4.20%). Then, the divergence between his control and ownership equals 1.24, which is computed as the quotient of 45.37% and 36.50%. Fig. 1(b) displays the pyramidal ownership structure of a family-controlled firm, i.e., Zhejiang Sanhua CO., Ltd. (002050.SZ), which is controlled by Mr. Daocai Zhang and his two sons, Mr. Yabo Zhang and Mr. Shaobo Zhang. According to our definition, their family ownership equals 28.04% (2.49% + (14.10% + 24.73% + 12.82%)*49.82%), their control rights equals 52.31% (2.49% + 49.82%), and the divergence between their control and ownership equals 1.87 (52.31% / 28.04%).

Control variables According to previous studies taking R&D investment as the dependent variable (Chen & Hsu, 2009; Schmid et al., 2014; Gomez-Mejia et al., 2014; Sciascia et al., 2015), we control a series of factors that may be systematically associated with R&D investment. We include family management involvement (*Management*, measured as a dummy variable, which takes one if family members are involved in management, and zero otherwise), intergeneration succession (*Succession*, measured as a dummy variable, which takes one if there are second-generation family members involved in management, and zero otherwise), firm size (*SIZE*, measured by



(a) Pyramidal ownership structure of Suning Commerce Group CO., Ltd (002024.SZ)



(b) Pyramidal ownership structure of Zhejiang Sanhua CO., Ltd (002050.SZ)

Fig. 1 Two real examples of pyramidal ownership structure of family firms

the natural logarithm of total assets), financial leverage (*LEV*, measured by the ratio of total debt to total assets), market-to-book value (*MTB*, calculated as the market value of equity divided by the book value of equity), firm profitability (*ROA*, measured by the net income divided by total assets), operating cash flow (*CFO*, measured as the ratio of operating cash flow to total assets), firm growth (*Growth*, calculated as the change ratio in sales income year-on-year), firm age (*AGE*, measured as the natural logarithm of years since the listing year), firm liquidity (*Liquidity*, measured as the ratio of current assets to total assets), and regional marketization level (*Market*, measured by regional marketization index of NERI across China's diverse provinces). Finally, we include industry and year dummy variables to control for industry and time fixed effects respectively.

The model

Since 2007, listed firms in China have to disclose the details of R&D expenditure in their annual reports. If listed firms do not have any R&D expenditures, a zero value was entered for them, which accounted for about 24% of our total sample. The dependent variables, *RD_SIZE* and *RD_SALE*, therefore, were typically limited dependent variables without a fine normal distribution. Since OLS regression produces inconsistent estimations for limited dependent variables, we followed previous studies in using the Tobit model to estimate the determinants of R&D investment (Anderson et al., 2012; Miller et al., 2008; Tobin, 1958). In addition, for the sake of alleviating potential endogeneity of the regressors, we lagged the independent variable and control variables. The problem of multicollinearity also appears insignificant because the average variance inflation factor (VIF) for each regression model is less than the common cut-off point of 10. We employed the Huber-White-sandwich estimator to mitigate the potential conditional heteroscedasticity of unknown form (White, 1980). In addition, all continuous variables were winsorized at the 1% and 99% levels to control for the influence of extreme values.

Results

Descriptive statistics

Table 1 presents descriptive statistics for main variables used in this study. In the sample, about 54% of family firms are controlled by lone founders, as opposed to the 8% in Miller et al. (2011). Family firms in China are relatively young and many have not yet experienced generation succession in China (Cai et al., 2012; Li & Liang, 2015). The mean value of *RD_SIZE* (*RD_SALE*) is 1.70 (3.20), which is much lower than 7.20 (10.40) reported in Block (2012) based on family firms in the S&P 500, indicating that family firms generally engage less in R&D investment in China. The mean value of *Ownership* is 0.35, which indicates that on average family owners ultimately hold 35% cash flow rights of the firm, displaying a high level of family ownership in China. The mean (median) value of *Divergence* is 1.46 (1.11), suggesting that the majority of family firms adopt the pyramidal structure accompanied by a

divergence between family control and family ownership in China. In addition, other control variables also have a fine distribution.

Table 1 also displays the Pearson correlation matrix of main variables. Both *RD_SIZE* and *RD_SALE* are negatively and significantly correlated with *LONE* (*RD_SIZE*: $r = -0.07$, $p < 0.01$; *RD_SALE*: $r = -0.07$, $p < 0.01$). It should be noted that the correlation coefficient between *Ownership* and *Divergence* is very high ($r = -0.53$, $p < 0.01$) since they represent two related dimensions of pyramidal ownership structures. Also, we noted that our two moderating variables, *Ownership* and *Divergence*, are significantly related with the independent variable, *LONE*, which may biased our regression results. Therefore, we centered the interaction variables, *LONE*×*Ownership* and *LONE*×*Divergence*, in our regression model to address this concern. Apart from this case, all pair-wise correlation coefficients among independent and control variables are less than 0.50, indicating no problems of multicollinearity.

Multivariate regression tests of hypotheses

Table 2 presents the Tobit regression results. The dependent variable is *RD_SIZE* in Models 1–5, while is *RD_SALE* in Models 6–10. We conducted a hierarchical regression approach to test the hypotheses. Specifically, Model 1 and Model 6 are the baseline models with only control variables. In Model 2 and Model 7, we introduced the independent variable *LONE* to examine H1. We entered *Ownership*, square term of *Ownership* (*Ownership*^{2}) and the centered interaction *LONE*×*Ownership* into Model 3 and Model 8 to test H2, while entered *Divergence* and the centered interaction *LONE*×*Divergence* into Model 4 and Model 9 to test H3. Model 5 and Model 10 are the full models. Both industry and year indicators are included in all regression models.

H1 predicted that compared with family-controlled firms, lone-founder firms will have more R&D investment. As Table 2 shows, *LONE* gets a significant and positive regression coefficient regardless of taking *RD_SIZE* or *RD_SALE* as the dependent variable (Model 2: $\beta = 0.18, p < 0.01$; Model 7: $\beta = 0.23, p < 0.05$). These results therefore fully support H1 that lone founders may tend to embrace an entrepreneurial identity and implement a growth strategy and thus promote R&D investment in lone-founder firms.

H2 pertained to the moderating role of family ownership on the association between lone founders and R&D investment. As Table 2 shows, regardless of taking *RD_SIZE* or *RD_SALE* as the dependent variable, the regression coefficient of the interaction *LONE*×*Ownership* is significantly negative (Model 3: $\beta = -1.29$, $p < 0.01$; Model 8: $\beta = -2.05$, $p < 0.10$). These results are consistent with H2 that family ownership may negatively moderate the positive association between lone founders and R&D investment because the higher ownership may intensify lone founders' consideration of avoiding financial loss in the business, which would attenuate their priority for firm growth and business success through promoting R&D investment.

H3 related to the moderating role of the divergence between family control and ownership. As Table 2 shows, when taking *RD_SIZE* as the dependent variable, the interaction *LONE*×*Divergence* gets a significant and positive coefficient (Model 4: $\beta = 0.25$, $p < 0.01$). Similarly, the interaction gets a positive but marginally significant coefficient when taking *RD_SALE* as the dependent variable (Model 9: $\beta = 0.26$, $p = 0.15$). Taken together, H3 is also partially supported, indicating that the divergence between family control and ownership resulted from pyramidal structure positively

Table 1 Descriptive statistics and correlations

Variables	Mean	S. D.	P50	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 *RD_SIZE*	1.70	1.87	1.32	1														
2 *RD_SALE*	3.20	3.96	2.64	0.80***	1													
3 *LONE*	0.54	0.50	1	−0.07***	−0.07***	1												
4 *Ownership*	0.35	0.18	0.33	0.11***	0.12***	−0.49***	1											
5 *Divergence*	1.46	0.83	1.11	−0.15***	−0.18***	0.25***	−0.53***	1										
6 Management	0.84	0.37	1	0.22***	0.20***	−0.23***	0.26***	−0.27***	1									
7 Succession	0.18	0.38	0	−0.04***	−0.07***	−0.21***	0.11***	−0.04***	0.10***	1								
8 SIZE	21.41	0.96	21.29	−0.11***	−0.17***	−0.01	0.02	0.07***	0.01	0.07***	1							
9 LEV	0.39	0.20	0.39	−0.32***	−0.42***	0.08***	−0.18***	0.18***	−0.14***	−0.01	0.48***	1						
10 MTB	2.65	1.60	2.17	0.21***	0.21***	0.03*	0.03***	−0.08***	−0.04***	−0.10***	−0.40***	−0.28***	1					
11 ROA	0.05	0.05	0.05	0.25***	0.14***	−0.02*	0.14***	−0.08***	0.11***	0.02	0.05***	−0.32***	0.35***	1				
12 CFO	0.04	0.09	0.04	0.11***	0.05***	0.01	−0.04***	0.02	0.02	0.00	−0.02*	−0.14***	0.17***	0.33***	1			
13 Growth	0.21	0.44	0.14	0.03**	−0.03**	−0.03**	0.05***	−0.04***	0.04***	−0.02	0.09***	0.09***	0.10***	0.26***	0.01	1		
14 AGE	1.82	0.68	1.72	−0.31***	−0.32***	0.24***	−0.44***	0.30***	−0.37***	−0.04***	0.26***	0.44***	−0.03**	−0.17***	0.04***	−0.01	1	
15 Liquidity	0.62	0.18	0.62	0.15***	0.16***	−0.06***	0.21***	−0.14***	0.11***	0.01	0.00	−0.04***	0.03**	0.15***	−0.23***	0.06***	−0.20***	1
16 Market	9.43	1.94	9.87	0.25***	0.17***	−0.15***	0.18***	−0.12***	0.19***	0.10***	0.05***	−0.07***	−0.05***	0.07***	0.02	−0.01	−0.25***	0.12***

This table presents the descriptive statistics and the Pearson correlation coefficients of main variables for the sample firms between 2007 and 2015. *RD_SIZE* is measured as the percentage of R&D expenditures over total assets. *RD_SALE* is measured as the percentage of R&D expenditures over total sales. *LONE* is a dummy variable that takes one if a firm is controlled by the lone founder without any other family member present as significant owners in the business, and zero otherwise. *Ownership* is measured as the sum of ultimate cash flow rights held by family owners or an individual. *Divergence* is measured as the ratio of ultimate voting rights to cash flow rights of family owners. *SIZE* is measured as the natural logarithm of total assets. *LEV* is calculated as the ratio of total debt to total assets. *MTB* is measured as the market value of equity divided by the book value of equity. *ROA* equals the net income divided by total assets. *CFO* is calculated as the ratio of operating cash flow to total assets. *Growth* is measured by the change ratio in sales year-on-year. *AGE* equals the natural logarithm of years since the listing year. *Liquidity* is measured by the ratio of current assets to total assets. *Market* equals the NERI's regional marketization index. All continuous variables are winsorized at the top and bottom 1%, respectively

Table 2 Tobit regression results for testing hypotheses

Variables	Dependent variable: *RD_SIZE*					Dependent variable: *RD_SALE*				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
LONE		0.18***	0.03	0.21***	0.07		0.23**	−0.04	0.26**	−0.00
		[3.55]	[0.55]	[3.95]	[1.24]		[2.29]	[−0.36]	[2.41]	[−0.04]
LONE×Ownership			−1.29***		−0.77*			−2.05***		−1.50*
			[−3.50]		[−1.87]			[−2.58]		[−1.71]
Ownership			1.54*		1.34			2.13		1.04
			[1.89]		[1.45]			[1.25]		[0.54]
LONE×Divergence				0.25***	0.30***				0.26	0.31
				[3.01]	[3.06]				[1.43]	[1.49]
Divergence				−0.14*	−0.23**				−0.13	−0.32
				[−1.75]	[−2.49]				[−0.77]	[−1.62]
Ownership²			−2.79***		−2.87***			−4.38**		−3.56*
			[−3.23]		[−3.04]			[−2.41]		[−1.78]
Management	0.39***	0.42***	0.43***	0.46***	0.46***	0.82***	0.86***	0.90***	0.91***	0.90***
	[4.91]	[5.26]	[5.53]	[5.87]	[5.79]	[5.38]	[5.62]	[5.84]	[5.94]	[5.83]
Succession	−0.32***	−0.28***	−0.26***	−0.27***	−0.26***	−0.79***	−0.73***	−0.71***	−0.73***	−0.70***
	[−5.85]	[−5.02]	[−4.81]	[−4.87]	[−4.68]	[−8.12]	[−7.43]	[−7.29]	[−7.33]	[−7.17]
SIZE	0.09**	0.10***	0.13***	0.09**	0.13***	0.37***	0.38***	0.44***	0.37***	0.44***
	[2.48]	[2.63]	[3.48]	[2.51]	[3.37]	[5.08]	[5.20]	[6.01]	[5.12]	[5.98]
LEV	−0.31*	−0.30*	−0.35*	−0.28	−0.34*	−4.76***	−4.75***	−4.85***	−4.73***	−4.83***
	[−1.69]	[−1.65]	[−1.94]	[−1.55]	[−1.89]	[−12.84]	[−12.82]	[−13.02]	[−12.76]	[−12.98]
MTB	0.13***	0.13***	0.15***	0.13***	0.15***	0.26***	0.27***	0.30***	0.27***	0.30***
	[5.05]	[5.16]	[5.82]	[5.16]	[5.78]	[5.03]	[5.10]	[5.68]	[5.06]	[5.64]
ROA	4.89***	4.78***	4.69***	4.80***	4.73***	−1.39	−1.53	−1.67	−1.51	−1.61
	[7.06]	[6.91]	[6.80]	[6.93]	[6.83]	[−1.01]	[−1.12]	[−1.23]	[−1.10]	[−1.18]
CFO	1.42***	1.45***	1.38***	1.48***	1.42***	1.27*	1.30**	1.19*	1.32**	1.22*

Table 2 (continued)

Variables	Dependent variable: *RD_SIZE*					Dependent variable: *RD_SALE*				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
	[4.00]	[4.09]	[3.90]	[4.16]	[4.00]	[1.95]	[2.00]	[1.83]	[2.03]	[1.88]
Growth	−0.03	−0.02	−0.02	−0.01	−0.02	−0.44***	−0.43***	−0.44***	−0.42***	−0.44***
	[−0.39]	[−0.27]	[−0.36]	[−0.21]	[−0.36]	[−3.50]	[−3.41]	[−3.46]	[−3.38]	[−3.46]
AGE	−0.38***	−0.41***	−0.52***	−0.42***	−0.52***	−0.81***	−0.85***	−1.06***	−0.86***	−1.05***
	[−7.73]	[−8.23]	[−9.57]	[−8.20]	[−9.46]	[−8.76]	[−8.96]	[−10.15]	[−8.85]	[−10.09]
Liquidity	0.79***	0.78***	0.90***	0.80***	0.90***	1.17***	1.16***	1.36***	1.17***	1.36***
	[4.84]	[4.81]	[5.50]	[4.86]	[5.47]	[3.39]	[3.37]	[3.93]	[3.39]	[3.89]
Market	0.14***	0.14***	0.14***	0.14***	0.14***	0.10***	0.11***	0.10***	0.11***	0.11***
	[11.29]	[11.50]	[11.49]	[11.65]	[11.55]	[4.24]	[4.36]	[4.29]	[4.41]	[4.35]
Constant	−3.63***	−3.87***	−4.56***	−3.62***	−4.12***	−5.73***	−6.04***	−7.14***	−5.79***	−6.53***
	[−4.09]	[−4.37]	[−4.99]	[−4.05]	[−4.41]	[−3.36]	[−3.55]	[−4.14]	[−3.35]	[−3.69]
Observations	5808	5808	5808	5808	5808	5808	5808	5808	5808	5808
VIF value	6.78	6.64	7.66	6.69	8.18	6.78	6.64	7.66	6.69	8.18
F value	90.22	88.25	83.28	84.50	79.95	78.53	76.64	71.90	74.10	69.44
Log likelihood	−9152.44	−9146.13	−9111.72	−9138.83	−9106.66	−12,166.74	−12,164.10	−12,137.91	−12,162.10	−12,136.42

RD_SIZE is measured as the percentage of R&D expenditures over total assets. *RD_SALE* is measured as the percentage of R&D expenditures over total sales. *LONE* is a dummy variable that takes one if a firm is controlled by the lone founder without any other family member present as significant owners in the business, and zero otherwise. *Ownership* is measured as the sum of ultimate cash flow rights held by family owners or an individual. *Divergence* is measured as the ratio of ultimate voting rights to cash flow rights of family owners. *SIZE* is measured as the natural logarithm of total assets. *LEV* is calculated as the ratio of total debt to total assets. *MTB* is measured as the market value of equity divided by the book value of equity. *ROA* equals the net income divided by total assets. *CFO* is calculated as the ratio of operating cash flow to total assets. *Growth* is measured by the change ratio in sales year-on-year. *AGE* equals the natural logarithm of years since the listing year. *Liquidity* is measured by the ratio of current assets to total assets. *Market* equals the NERI's regional marketization index. All continuous variables are winsorized at the top and bottom 1%, respectively. Both industry and year fixed effects are controlled in all regression models. Z-statistics, based on robust standard errors, are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% level (two sided) respectively

moderates the association between lone founders and R&D investment by relieving lone founders' concerns about avoiding loss and reinforcing their tendency to adopt a market-oriented strategy and pursue an entrepreneurial identity by actively engaging in R&D activities..

In the full models, the coefficients of *LONE×Ownership* are negative as predicted but become insignificant (Model 5: $\beta = -0.77$, $p < 0.10$; Model 10: $\beta = -1.50$, $p < 0.10$), while the coefficients of *LONE×Divergence* are consistently positive and significant/ marginally significant (Model 5: $\beta = 0.30$, $p < 0.01$; Model 10: $\beta = 0.31$, $p = 0.14$). Therefore, as a whole, the results of the full models provide empirical support to our hypotheses as well.

To facilitate interpretation of the moderating effect in H2, we plot the moderating effect of family ownership. Specifically, we partition our sample into two subgroups according to *Ownership—Low Ownership* (below the median) and *High Ownership* (above the median), and then estimate the effects of *LONE* on *RD_SIZE* and *RD_SALE* for both subgroups respectively. As shown in Fig. 2(a) and 2(b), regardless of taking *RD_SIZE* or *RD_SALE* as the dependent variable, the positive association between *LONE* and R&D investment is much stronger in the subgroup of *Low Ownership* than in the subgroup of *High Ownership*. In fact, the association between *LONE* and R&D investment turns to be negative in the subgroup of *High Ownership*. Similarly, we partition our sample into two subgroups according to the divergence between family control and ownership—*Low Divergence* (below the median) and *High Divergence* (above the median) – so as to depict the moderating effect of the divergence between family control and ownership in H3. As shown in Fig. 3(a) and 3(b), no matter taking *RD_SIZE* or *RD_SALE* as the dependent variable, the positive association between *LONE* and R&D investment is much stronger in the subgroup of *High Divergence* than in the subgroup of *Low Divergence*. Taken as a whole, Figs. 2 and 3 illustrate the support for H2 and H3 respectively.

A robustness check using the Heckman two-stage model

One important issue of our regression model is the potential endogeneity of our regressors, such as the problems of sample selection bias and omitted variables. To address those problems, we adopted Heckman two-stage model as a robustness check to control for those endogeneity problems. Specifically, in the first stage, we ran a probit regression by

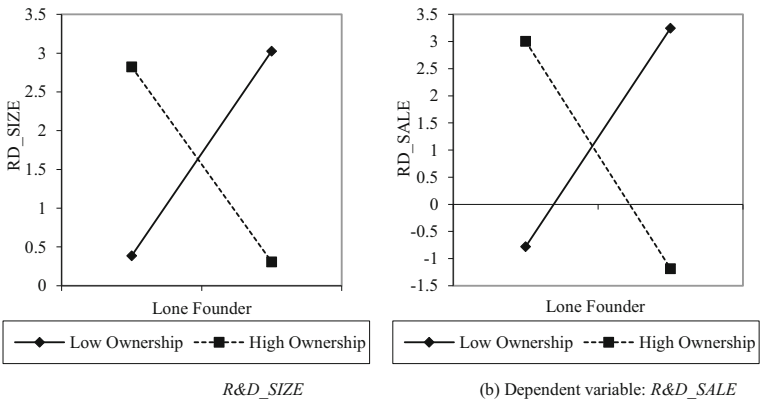
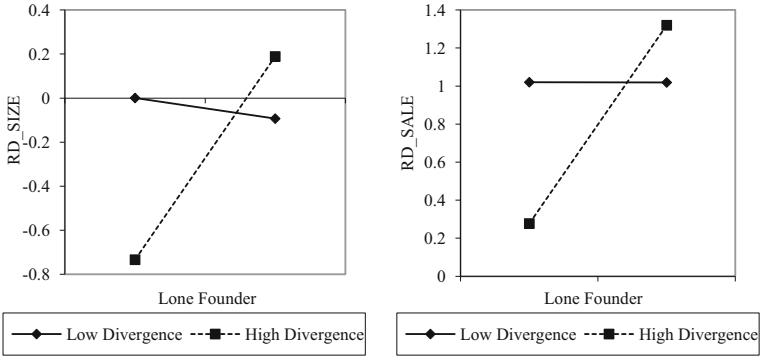


Fig. 2 The moderating effect of family ownership



(a) Dependent variable: *R&D_SIZE* (b) Dependent variable: *R&D_SALE*

Fig. 3 The moderating effect of the divergence between family control and ownership

regressing *LONE* against the same control variables used for our regression model, i.e., *Management*, *Succession*, *SIZE*, *LEV*, *MTB*, *ROA*, *CFO*, *Growth*, *AGE*, *Liquidity*, *Market* and industry and year indicators. In particular, we followed previous studies to add a new instrumental variable, *Lonesale*, which is the fraction of industry sales that comes from lone-founder firms (Amit, Ding, Villalonga, & Zhang, 2015; Campa & Kedia, 2002; Duran & Ortiz, 2019). We can expect that *Lonesale* is naturally correlated with the probability that a firm in the industry is a lone-founder firm, yet is independent of the second-stage dependent variable (R&D investment). Then in the second stage, the inverse Mills ratio (*Invmills*), which was computed as the ratio of the probability density function to the cumulative distribution function from the first stage regression, was included as a control variable to correct for possible selection bias and omitted variables (Greene, 2003; Miller et al., 2007). We reported the results of Heckman two-stage model in Table 3.

As shown in Table 3, the coefficients of *LONE* are positive and significant in Model 2 and Model 7 (Model 2: $\beta = 0.17$, $p < 0.01$; Model 7: $\beta = 0.22$, $p < 0.05$). The interaction *LONE×Ownership* gets significantly negative coefficients in Model 3 and Model 8 (Model 3: $\beta = -1.30$, $p < 0.01$; Model 8: $\beta = -2.07$, $p < 0.01$). Likewise, the interaction *LONE×Divergence* gets significant/marginally significant and positive coefficients in Model 4 and Model 9 (Model 4: $\beta = 0.26$, $p < 0.01$; Model 9: $\beta = 0.27$, $p < 0.15$). The regression results are similar in the full models of Model 5 and Model 10. Taken together, these results are qualitatively similar with those in Table 2, indicating that our findings are robust after controlling for potential endogeneity problems.

Discussion

Contributions

This study makes several contributions. First, this study adds to theory regarding R&D investment in family firms. Although researchers have paid much attention to the effect of family ownership on R&D investment, there are ongoing debates and conflicting findings (Boyd & Solarino, 2016; Chrisman & Patel, 2012; Gomez-Mejia et al., 2014).

Table 3 Regression results using Heckman two-stage model

Variables	Dependent variable: *RD_SIZE*					Dependent variable: *RD_SALE*				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
LONE		0.17***	0.03	0.20***	0.07		0.22**	−0.04	0.25**	−0.01
		[3.46]	[0.51]	[3.88]	[1.20]		[2.21]	[−0.39]	[2.35]	[−0.07]
LONE×Ownership			−1.30***		−0.78*			−2.07***		−1.51*
			[−3.53]		[−1.88]			[−2.60]		[−1.73]
Ownership			1.53*		1.33			2.12		1.02
			[1.88]		[1.44]			[1.24]		[0.53]
LONE×Divergence				0.26***	0.31***				0.27	0.32
				[3.11]	[3.11]				[1.50]	[1.52]
Divergence				−0.14*	−0.23**				−0.14	−0.32*
				[−1.83]	[−2.53]				[−0.82]	[−1.65]
Ownership²			−2.77***		−2.85***			−4.33**		−3.51*
			[−3.20]		[−3.02]			[−2.39]		[−1.75]
Management	0.52***	0.53***	0.53***	0.60***	0.56***	1.05***	1.06***	1.05***	1.13***	1.06***
	[4.36]	[4.43]	[4.39]	[4.94]	[4.64]	[4.52]	[4.57]	[4.51]	[4.82]	[4.54]
Succession	−0.08	−0.08	−0.1	−0.04	−0.08	−0.4	−0.39	−0.44	−0.35	−0.42
	[−0.49]	[−0.47]	[−0.62]	[−0.21]	[−0.47]	[−1.20]	[−1.18]	[−1.33]	[−1.06]	[−1.26]
SIZE	0.12***	0.12***	0.15***	0.12***	0.15***	0.41***	0.41***	0.46***	0.41***	0.47***
	[2.90]	[2.94]	[3.63]	[2.92]	[3.58]	[5.27]	[5.30]	[5.96]	[5.28]	[5.96]
LEV	−0.25	−0.25	−0.31*	−0.22	−0.3	−4.66***	−4.67***	−4.78***	−4.64***	−4.76***
	[−1.34]	[−1.35]	[−1.66]	[−1.20]	[−1.59]	[−12.24]	[−12.26]	[−12.48]	[−12.16]	[−12.43]
MTB	0.14***	0.14***	0.16***	0.15***	0.16***	0.28***	0.29***	0.31***	0.29***	0.31***
	[5.29]	[5.32]	[5.90]	[5.40]	[5.91]	[5.16]	[5.18]	[5.68]	[5.19]	[5.67]
ROA	4.40***	4.36***	4.36***	4.32***	4.35***	−2.19	−2.24	−2.22	−2.27	−2.19
	[5.78]	[5.73]	[5.76]	[5.67]	[5.75]	[−1.44]	[−1.47]	[−1.46]	[−1.49]	[−1.44]
CFO	1.55***	1.56***	1.47***	1.60***	1.51***	1.47**	1.48**	1.33**	1.52**	1.37**
	[4.23]	[4.26]	[4.02]	[4.38]	[4.14]	[2.22]	[2.23]	[2.01]	[2.28]	[2.06]
Growth	0.00	0.00	−0.01	0.01	−0.00	−0.39***	−0.39***	−0.41***	−0.38***	−0.40***

Table 3 (continued)

Variables	Dependent variable: *RD_SIZE*					Dependent variable: *RD_SALE*				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
	[0.01]	[0.07]	[−0.08]	[0.18]	[−0.05]	[−3.00]	[−2.95]	[−3.06]	[−2.90]	[−3.04]
AGE	−0.53***	−0.54***	−0.62***	−0.57***	−0.63***	−1.05***	−1.06***	−1.23***	−1.09***	−1.23***
	[−4.78]	[−4.82]	[−5.52]	[−5.06]	[−5.57]	[−4.77]	[−4.79]	[−5.43]	[−4.89]	[−5.44]
Liquidity	0.77***	0.77***	0.89***	0.78***	0.89***	1.15***	1.14***	1.35***	1.15***	1.34***
	[4.73]	[4.72]	[5.43]	[4.76]	[5.39]	[3.30]	[3.29]	[3.86]	[3.30]	[3.81]
Market	0.15***	0.15***	0.15***	0.15***	0.15***	0.12***	0.12***	0.12***	0.12***	0.12***
	[10.75]	[10.81]	[10.60]	[11.04]	[10.73]	[4.30]	[4.32]	[4.12]	[4.41]	[4.19]
Invmills	−0.55	−0.47	−0.38	−0.55	−0.42	−0.90	−0.79	−0.62	−0.86	−0.66
	[−1.54]	[−1.31]	[−1.05]	[−1.52]	[−1.17]	[−1.25]	[−1.10]	[−0.87]	[−1.19]	[−0.92]
Constant	−3.80***	−4.00***	−4.66***	−3.76***	−4.23***	−6.00***	−6.27***	−7.31***	−6.02***	−6.71***
	[−4.26]	[−4.50]	[−5.09]	[−4.20]	[−4.51]	[−3.53]	[−3.69]	[−4.25]	[−3.50]	[−3.79]
Observations	5808	5808	5808	5808	5808	5808	5808	5808	5808	5808
F value	87.61	85.80	81.17	82.2	77.98	76.45	74.67	70.24	72.27	67.89
Log likelihood	−9151.20	−9145.23	−9111.14	−9137.60	−9105.94	−12,165.91	−12,163.45	−12,137.51	−12,161.34	−12,135.98

This table reports the regression results of the Heckman two-stage model. We ran a probit regression by regressing *LONE* on *Lonesale*, *Management*, *Succession*, *SIZE*, *LEV*, *MTB*, *ROA*, *CFO*, *Growth*, *AGE*, *Liquidity*, *Market* and industry and year indicators. *Invmills* is calculated as the probability density function of the normal distribution divided by the cumulative distribution function of the normal distribution from the first-stage regression for *LONE*. *RD_SIZE* is measured as the percentage of R&D expenditures over total assets. *RD_SALE* is measured as the percentage of R&D expenditures over total sales. *LONE* is a dummy variable that takes one if a firm is controlled by the lone founder without any other family member present as significant owners in the business, and zero otherwise. *Ownership* is measured as the sum of ultimate cash flow rights held by family owners or an individual. $Ownership^2$ is measured as the square of *Ownership*. *Lonesale* is measured as the ratio of sales income for lone-founder firms to all family firms within a given industry. *Management* is a dummy variable that takes one if family members are involved in management, and zero otherwise. *Succession* is a dummy variable that takes one if there are second-generation members involved in management, and zero otherwise. *Divergence* is measured as the ratio of ultimate voting rights to cash flow rights of family owners. *SIZE* is measured as the natural logarithm of total assets. *LEV* is calculated as the ratio of total debt to total assets. *MTB* is measured as the market value of equity divided by the book value of equity. *ROA* equals the net income divided by total assets. *CFO* is calculated as the ratio of operating cash flow to total assets. *Growth* is measured by the change ratio in sales year-on-year. *AGE* equals the natural logarithm of years since the listing year. *Liquidity* is measured by the ratio of current assets to total assets. *Market* equals the NERI's regional marketization index. All continuous variables are winsorized at the top and bottom 1%, respectively. Both industry and year fixed effects are controlled in all regression models. Z-statistics, based on robust standard errors, are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% level (two sided) respectively

In this study, we sought to identify key properties of family ownership structure in shaping family firms' R&D activities. According to the SEW perspective, compared with non-founder family members, founders are less likely to be motivated by SEW and are mainly motivated by economic interest. Our findings show that owner type shapes family firms' strategic priorities in promoting R&D investment, while family ownership and the divergence between family control and ownership moderate that owner type effect. Thus, this study can help reconcile mixed findings regarding the association between family ownership and R&D investment by taking properties of family ownership structure into account. In a word, this study is an extension of the literature regarding the heterogeneity of family business from the view of owner type, and is among the first to examine the interaction between owner type and ownership structure.

Second, this study is among the first to provide empirical evidence supporting the more positive side of pyramidal ownership structure, particularly in China's emerging economy. The pyramidal structure has drawn much attention in the past two decades generally for its negative effect on firm governance and other managerial activities whereby family owners are able to utilize the pyramidal ownership structure to undermine minority shareholders by tunneling assets from the public to the private divisions of a firm among other expropriation methods (Claessens et al., 2000; Luo et al., 2012; Young et al., 2008). Given its pervasiveness (Claessens et al., 2000; Faccio & Lang, 2002), pyramidal ownership structures require a second look from researchers. Pyramidal structures may help family business in that if otherwise well governed, family owners can maintain control of the firm with minority ownership and pursue entrepreneurial growth strategies by relieving their concern about losing wealth caused by the failure of risky activities (Almeida & Wolfenzon, 2006; Cai et al., 2012; Fan et al., 2005; Masulis et al., 2011). Moreover, such structures may also be beneficial in relieving family firms' external financial constraints by constructing internal capital markets (Almeida & Wolfenzon, 2006; Bena & Ortiz-Molina, 2013; Stein, 1997), which is particularly important in emerging economies such as China where family firms face financing difficulties (Allen, Qian, & Qian, 2005; Au, Craig, & Ramachandran, 2011; Bruton, Ahlstrom, & Obloj, 2008).

Third, in terms of theory, we respond to the calls of Miller and Le Breton-Miller (2011) and Cannella et al. (2015) to go beyond the agency framework to differentiate family firms in terms of the type of owners. Because of the difference in owner type, lone founders tend to perceive themselves more as entrepreneurs, thus embracing more of a market-oriented growth strategy, while non-founder family owners may identify more as family nurturers or stewards and implement a conservation strategy (Boivie, Lange, McDonald, & Westphal, 2011; Langlois, 2007; Loasby, 2007; Stets & Burke, 2000; Wasserman, 2006; Bertrand & Schoar, 2006; Gómez-Mejía et al., 2007; Schulze et al., 2001). Both of Miller et al. (2011) and Miller and Le Breton-Miller (2011) indeed find that lone-founder firms exhibit higher entrepreneurial orientation/growth strategy tendency than family-controlled firms. However, we mainly focus on R&D investment, a characteristic indicator of entrepreneurial orientation or growth strategy. More importantly, we found that lone-founder firms do more R&D than family-controlled firms by using a large sample of China's listed family firms, while Miller and Le Breton-Miller (2011) found that lone founder firms do not do more (or less) R&D investment than other firms in the US. Thus, in this study, we extend this theory application in showing that *lone-founder firms invest more in R&D* than do family-controlled firms in

China. Overall, this study provides new evidence in explaining key differences among family firms.

Finally, we extend the ongoing debate on the impact of family ownership on R&D investment to the underexplored but noteworthy context of China. Given that much work has addressed such issues in developed economies (Boyd & Solarino, 2016; Schmid et al., 2014), we sought to examine the boundaries of extant theories in an emerging economy. In particular, China's economy is experiencing a transition from "made in China" to "created in China," and Chinese firms (particularly family firms) are struggling to improve their absorptive capacity and innovative capabilities by promoting R&D activities (Bruton & Ahlstrom, 2004; Casey & Koleski, 2011; Griffith et al., 2004; Li & Liang, 2015). Significant research is needed to explore such concerns as well as offering recommendations to family owners and policymakers of interest (Peng, Ahlstrom, Carraher, & Shi, 2017; Wang, Ahlstrom, Nair, & Hang, 2008).

This study provides practical contributions as well. For family owners who aspire to strengthen their firms' competitive advantages through R&D investment, we suggest that the type of owners matters. According to our results, lone-founder firms are more active innovators than family-controlled firms. This finding is of particular value for Chinese family firms that are now encouraged by government to innovate more on their own and start doing cross border business. It is time for them to consider the generation succession of the firm. Combined with those of Miller et al. (2011) and Miller and Le Breton-Miller (2011), we suggest that family firms should adopt a gradual succession of generations with founders staying with later generation successors for facilitating the cultivation of market strategies and abilities at the initial stage. As weak legal protection of property rights makes family owners more vulnerable to outside threats such as losing their control and the exploitation of intellectual property, family owners usually have to hold higher ownership and are reluctant to invest in R&D activities, though our findings suggest that lone founders are more able to invest in R&D and manage it well. In terms of policy, our findings suggest that policymakers should continue to improve legal protection of property rights to alleviate family owners' worries which could in turn promote their support for R&D commitments. Therefore, regulators should not prohibit family firms from constructing pyramidal structures without exception but provide improved protection for minority shareholders in this regard (Young et al., 2008).

Limitations and future research

This study contains certain limitations that suggest avenues for future research. First, since family listed firms are relatively large firms, caution should be used in generalizing our findings to small family firms. We believe that there would be substantial differences in strategy priorities and also R&D investment between large and small family firms. Therefore, it is valuable to examine the findings for small family firms in future studies. Second, we did not distinguish different types of R&D investment. As Patel and Chrisman (2014) suggest, R&D investment can be classified into two types: exploitative and exploratory R&D investment. Given considerable differences between these two types of R&D investment, it can naturally anticipate that lone-founder firms may have different priorities to them relative to family-controlled firms. Thus, future

studies can further deepen our understanding of R&D investment in lone-founder versus family-controlled firms by differentiating the types of R&D activities. Third, we focused on R&D investment, which is a proxy for the innovation input. Since innovation output (e.g., patents and new products) is what firms seek, future research should investigate the effects of the type of owners and properties of family ownership structure on innovation output.

Finally, this study focused on China, as a major emerging economy somewhat representative of other emerging economies, but sometimes different also in that it has attained middle income, or aspirant status (Bruton, Ahlstrom, & Chen, 2019). China has some fairly unique culture and institutions (Ahlstrom et al., 2004). This suggests that future work should examine the boundary of our arguments across various emerging economies, particularly large ones such as that of India, and varying institutional environments and government-linked firms, which are important in many parts of the world (Bruton, Peng, Ahlstrom, Stan, & Xu, 2015; Jain, Nair, & Ahlstrom, 2015).

Conclusion

Although there is a consensus that R&D investment is vital for firms to innovate and absorb new technology in pursuit of good performance (Ahlstrom, 2010; Griffith et al., 2004), past findings on the commitment of family business to innovation have shown mixed results (Duran et al., 2016; Liu, Gong, Zhou, & Huang, 2017). To help to further clarify this line of research, which has commonly treated family firms as fairly homogenous and generally under the framework of agency theory, this study has drawn more on the socioemotional wealth perspective to further open the black box of family ownership structure. In doing so, this paper has argued that family firms exhibit significant differences according to properties of family ownership structure, that is, a firm is owned by a lone founder will behave differently if jointly held by multiple family members. These differences create different preferences for R&D, which is essential to firm innovation and competitiveness (Griffith et al., 2004). The effect of the type of family owners is moderated by both family ownership and the divergence of family control and ownership resulted from pyramidal structures.

The findings, based on a sample of family listed firms from China, provide solid support for our arguments, which can also help to reconcile mixed evidence and provide meaningful implications for family owners and policymakers. If this paper could provide one overall message, it would be that family firms can innovate, as our findings from China suggest that lone founders in charge of their firms are more able to invest in R&D and manage it well. Indeed, top managers play a key role in major decisions (Luo et al., 2017). Family firms that want to innovate and grow may be able to learn from the decisive lone founder who maintains control of major strategic decisions, and invests in R&D, rather than just seeking a comfortable position in the market and focusing on building barriers to entry with the help of industry (and government) allies. In creating innovative new products, and even entering new industries, the family firm creates more of a moving target for competitors, one that is more dynamic and opportunity-seeking. In addition, such family firms will have to hire management outside of the family. Although this may move the family firm

outside of its comfort zone, this innovation and growth will not only benefit the firm, but also its shareholders, customers, and even the economy (Tomizawa, Zhao, Bassellier, & Ahlstrom, 2019). Policymakers can thus encourage family firms toward innovative activities as well as continuing to improve the legal protection of intellectual property rights and the rights of all shareholders (Young et al., 2008). Researchers can also continue to build further understanding of the sources of innovation and the links to both entrepreneurship and family business, and particularly in the emerging economy context (Audretsch, Lehmann, & Link, 2019; Young et al., 2014) as entrepreneurship and innovation are major sources of the growth of economies and employment they provide.

Acknowledgements We acknowledge financial support from the Fundamental Research Funds for the Central Universities. We greatly thank for valuable comments and suggestions from two anonymous reviewers and the senior editor Prof. David Ahlstrom, as well as the help from Zeyue Huang. All remaining errors are our own

References

Achleitner, A., Kaserer, C., & Kauf, T. 2012. The dynamics of voting ownership in lone-founder, family-founder, and heir firms. *Journal of Family Business Strategy*, 3(2): 79–96.

Audretsch, D. B., Lehmann, E. E., & Link, A. N. (Eds.) 2019. *A research agenda for entrepreneurship and innovation*. Cheltenham, UK:Edward Elgar Publishing.

Ahlstrom, D. 2010. Innovation and growth: How business contributes to society. *The Academy of Management Perspectives*, 24(3): 11–24.

Ahlstrom, D., & Ding, Z. 2014. Entrepreneurship in China: An overview. *International Small Business Journal*, 32(6): 610–618.

Ahlstrom, D., Young, M. N., Chan, E. S., & Bruton, G. D. 2004. Facing constraints to growth? Overseas Chinese entrepreneurs and traditional business practices in East Asia. *Asia Pacific Journal of Management*, 21(3): 263–285.

Ahlstrom, D., Chang, A. Y., & Cheung, J. S. T. 2019. Encouraging entrepreneurship and economic growth. *Journal of Risk and Financial Management*, 12(4): 178. https://doi.org/10.3390/jrfm12040178.

Allen, F., Qian, J., & Qian, M. 2005. Law, finance, and economic growth in China. *Journal of Financial Economics*, 77(1): 57–116.

Almeida, H. V., & Wolfenzon, D. 2006. A theory of pyramidal ownership and family business groups. *The Journal of Finance*, 61(6): 2637–2680.

Amit, R., Ding, Y., Villalonga, B., & Zhang, H. 2015. The role of institutional development in the prevalence and performance of entrepreneur and family-controlled firms. *Journal of Corporate Finance*, 31: 284–305.

Anderson, R. C., Duru, A., & Reeb, D. M. 2012. Investment policy in family controlled firms. *Journal of Banking & Finance*, 36(6): 1744–1758.

Ashforth, B. E., & Mael, F. 1989. Social identity theory and the organization. *Academy of Management Review*, 14(1): 20–39.

Au, K., Craig, J. B., & Ramachandran, K. (Eds.) 2011. *Family enterprise in the Asia Pacific: Exploring transgenerational entrepreneurship in family firms*. Cheltenham, UK:Edward Elgar.

Barkema, H. G., Chen, X., George, G., Luo, Y., & Tsui, A. S. 2015. West meets east: New concepts and theories. *Academy of Management Journal*, 58(2): 460–479.

Bena, J., & Ortiz-Molina, H. 2013. Pyramidal ownership and the creation of new firms. *Journal of Financial Economics*, 108(3): 798–821.

Berrone, P., Cruz, C., & Gomez-Mejia, L. R. 2012. Socioemotional wealth in family firms: Theoretical dimensions, assessment approaches, and agenda for future research. *Family Business Review*, 25(3): 258–279.

Bertrand, M., & Schoar, A. 2006. The role of family in family firms. *Journal of Economic Perspectives*, 20(2): 73–96.
Block, J. H. 2012. R&D investments in family and founder firms: An agency perspective. *Journal of Business Venturing*, 27(2): 248–265.
Block, J., & Wagner, M. 2014. Ownership versus management effects on corporate social responsibility concerns in large family and founder firms. *Journal of Family Business Strategy*, 5(4): 339–346.
Bloom, N., Sadun, R., & Van Reenen, J. 2015. Do private equity-owned firms have better management practices? *American Economic Review*, 105(5): 442–446.
Boivie, S., Lange, D., McDonald, M. L., & Westphal, J. D. 2011. Me or we: The effects of CEO organizational identification on agency costs. *Academy of Management Journal*, 54(3): 551–576.
Boyd, B. K., & Solarino, A. M. 2016. Ownership of corporations: A review, synthesis, and research agenda. *Journal of Management*, 42(5): 1282–1314.
Bruton, G. D., & Ahlstrom, D. 2004. Understanding venture capital in East Asia: The impact of institutions on the industry today and tomorrow. *Journal of World Business*, 39(1): 72–88.
Bruton, G. D., Ahlstrom, D., & Chen, J. 2019. China has emerged as an aspirant economy. *Asia Pacific Journal of Management*: 1–15. https://doi.org/10.1007/s10490-018-9638-0.
Bruton, G. D., Ahlstrom, D., & Obloj, K. 2008. Entrepreneurship in emerging economies: Where are we today and where should the research go in the future. *Entrepreneurship Theory and Practice*, 32(1): 1–14.
Bruton, G. D., Peng, M. W., Ahlstrom, D., Stan, C., & Xu, K. 2015. State-owned enterprises around the world as hybrid organizations. *The Academy of Management Perspectives*, 29(1): 92–114.
Bruton, G. D., Zahra, S. A., & Cai, L. 2018. Examining entrepreneurship through indigenous lenses. *Entrepreneurship Theory and Practice*, 42(3): 351–361.
Campa, J. M., & Kedia, S. 2002. Explaining the diversification discount. *The Journal of Finance*, 57(4): 1731–1762.
Cannella, A. A., Jones, C. D., & Withers, M. C. 2015. Family- versus lone-founder-controlled public corporations: Social identity theory and boards of directors. *Academy of Management Journal*, 58(2): 436–459.
Carney M. 2005. Corporate governance and competitive advantage in family-controlled firms. *Entrepreneurship Theory and Practice*, 29(3): 249–265.
Cai, D., Luo, J., & Wan, D. 2012. Family CEOs: Do they benefit firm performance in China? *Asia Pacific Journal of Management*, 29(4): 923–947.
Casey, J., & Koleski, K. 2011. Backgrounder: China's 12th five-year plan. US-China Economic and Security Review Commission.
Cennamo, C., Berrone, P., Cruz, C., & Gomez-Mejia, L. R. 2012. Socioemotional wealth and proactive stakeholder engagement: Why family-controlled firms care more about their stakeholders. *Entrepreneurship Theory and Practice*, 36(6): 1153–1173.
Chen, H. L., & Hsu, W. T. 2009. Family ownership, board independence, and R&D investment. *Family Business Review*, 22(4): 347–362.
Chen, W. R., & Miller, K. D. 2007. Situational and institutional determinants of firms' R&D search intensity. *Strategic Management Journal*, 28(4): 369–381.
Chrisman, J. J., Chua, J. H., Le Breton-Miller, I., Miller, D., & Steier, L. P. 2018. Governance mechanisms and family firms. *Entrepreneurship Theory and Practice*, 42(2): 171–186.
Chrisman, J. J., & Patel, P. C. 2012. Variations in R&D investments of family and nonfamily firms: Behavioral agency and myopic loss aversion perspectives. *Academy of Management Journal*, 55(4): 976–997.
Chua, J. H., Chrisman, J. J., Steier, L. P., & Rau, S. B. 2012. Sources of heterogeneity in family firms: An introduction. *Entrepreneurship Theory and Practice*, 36(6): 1103–1113.
Claessens, S., Djankov, S., & Lang, L. H. P. 2000. The separation of ownership and control in east Asian corporations. *Journal of Financial Economics*, 58(1): 81–112.
Daspit, J. J., Chrisman, J. J., Sharma, P., Pearson, A. W., & Mahto, R. V. 2018. Governance as a source of family firm heterogeneity. *Journal of Business Research*, 84: 293–300.
Dunbar, R. L. M., & Ahlstrom, D. 1995. Seeking the institutional balance of power: Avoiding the power of a balanced view. *Academy of Management Review*, 20(1): 171–192.
Duran, P., Kammerlander, N., Van Essen, M., & Zellweger, T. 2016. Doing more with less: Innovation input and output in family firms. *Academy of Management Journal*, 59(4): 1224–1264.
Duran, P., & Ortiz, M. 2019. When more is better: Multifamily firms and firm performance. *Entrepreneurship Theory and Practice, forthcoming.*
The Economist. 2009. Dynastie and durability. Available at http://www.economist.com/node/14517406.
Faccio, M., & Lang, L. H. 2002. The ultimate ownership of Western European corporations. *Journal of Financial Economics*, 65(3): 365–395.

Fan, G., Wang, X., & Zhu, H. 2011. *NERI index of marketization of China's provinces*. Beijing:Economic Science Press (in Chinese).

Fan, J. P. H., Wong, T. J., & Zhang, T. 2005. *The emergence of corporate pyramids in China*. Working paper: The Chinese University of Hong Kong.

Fang, H., Kotlar, J., Memili, E., Chrisman, J. J., & De Massis, A. 2018. The pursuit of international opportunities in family firms: Generational differences and the role of knowledge-based resources. *Global Strategy Journal*, 8(1): 136–157.

Fang, H. C., Siau, K. L., Memili, E., & Dou, J. 2019. Cognitive antecedents of family business bias in investment decisions: A commentary on "Risky decisions and the family firm bias: An experimental study based on Prospect Theory." Entrepreneurship Theory and Practice, 43(2): 409–416.

French, J. L., & Rosenstein, J. 1984. Employee ownership, work attitudes, and power relationships. *Academy of Management Journal*, 27(4): 861–869.

Gomez-Mejia, L. R., Campbell, J. T., Martin, G., Hoskisson, R. E., Makri, M., & Sirmon, D. G. 2014. Socioemotional wealth as a mixed gamble: Revisiting family firm R&D investments with the behavioral agency model. *Entrepreneurship Theory and Practice*, 38(6): 1351–1374.

Gomez-Mejia, L. R., Cruz, C., Berrone, P., & De Castro, J. 2011. The bind that ties: Socioemotional wealth preservation in family firms. *The Academy of Management Annals*, 5(1): 653–707.

Gómez-Mejía, L. R., Haynes, K. T., Núñez-Nickel, M., Jacobson, K. J. L., & Moyano-Fuentes, J. 2007. Socioemotional wealth and business risks in family-controlled firms: Evidence from Spanish olive oil mills. *Administrative Science Quarterly*, 52(1): 106–137.

Greene, W. H. 2003. *Econometric analysis*. Upper Saddle River, N.J:Prentice Hall.

Griffith, R., Redding, S., & Van Reenen, J. 2004. Mapping the two faces of R&D: Productivity growth in a panel of OECD industries. *Review of Economics and Statistics*, 86(4): 883–895.

Grossman, S. J., & Hart, O. D. 1980. Takeover bids, the free-rider problem, and the theory of the corporation. *The Bell Journal of Economics*, 11(1): 42–64.

Hall, B. H. 2002. The financing of research and development. *Oxford Review of Economic Policy*, 18(1): 35–51.

Hall, B. H., & Lerner, J. 2010. The financing of R&D and innovation. In B. H. Hall, & N. Rosenberg (Eds.). *Handbook of the economics of innovation, volume 1*: 609–639. Amsterdam: Elsevier.

Hiebl, M. R. W. 2013. Risk aversion in family firms: What do we really know? *The Journal of Risk Finance*, 14(1): 49–70.

Hitt, M. A., Ireland, R. D., Camp, S. M., & Sexton, D. L. 2002. *Strategic entrepreneurship: Creating a new mindset*. Oxford:Blackwell.

Hogg, M. A., Terry, D. J., & White, K. M. 1995. A tale of two theories: A critical comparison of identity theory with social identity theory. *Social Psychology Quarterly*, 58(4): 255–269.

Jensen, M. C., & Meckling, W. H. 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4): 305–360.

Jain, S., Nair, A., & Ahlstrom, D. 2015. Introduction to the special issue: Towards a theoretical understanding of innovation and entrepreneurship in India. *Asia Pacific Journal of Management*, 32(4): 835–841.

Kim, H., Kim, H., & Lee, P. M. 2008. Ownership structure and the relationship between financial slack and R&D investments: Evidence from Korean firms. *Organization Science*, 19(3): 404–418.

Kuan, T., Li, C., & Chu, S. 2011. Cash holdings and corporate governance in family-controlled firms. *Journal of Business Research*, 64(7): 757–764.

Kumar, P., & Langberg, N. 2009. Corporate fraud and investment distortions in efficient capital markets. *The RAND Journal of Economics*, 40(1): 144–172.

Langlois, R. N. 2007. The entrepreneurial theory of the firm and the theory of the entrepreneurial firm. *Journal of Management Studies*, 44(7): 1107–1124.

Le Breton-Miller, I., & Miller, D. 2008. To grow or to harvest? Governance, strategy and performance in family and lone founder firms. *Journal of Strategy and Management*, 1(1): 41–56.

Li, X., & Liang, X. 2015. A Confucian social model of political appointments among Chinese private entrepreneurs. *Academy of Management Journal*, 58(2): 592–617.

Liu, Y., Chen, Y. J., & Wang, L. C. 2017. Family business, innovation and organizational slack in Taiwan. *Asia Pacific Journal of Management*, 34(1): 193–213.

Liu, D., Gong, Y., Zhou, J., & Huang, J. 2017. Human resource systems, employee creativity, and firm innovation: The moderating role of firm ownership. *Academy of Management Journal*, 60(3): 1164–1188.

Liu, Y., Wang, L. C., Zhao, L., & Ahlstrom, D. 2013. Board turnover in Taiwan's public firms: An empirical study. *Asia Pacific Journal of Management*, 30(4): 1059–1086.

Llach, J., & Nordqvist, M. 2010. Innovation in family and non-family businesses: A resource perspective. *International Journal of Entrepreneurial Venturing*, 2(3–4): 381–399.

Loasby, B. J. 2007. A cognitive perspective on entrepreneurship and the firm. *Journal of Management Studies*, 44(7): 1078–1106.

López-Delgado, P., & Diéguez-Soto, J. 2015. Lone founders, types of private family businesses and firm performance. *Journal of Family Business Strategy*, 6(2): 73–85.

Luo, J., Wan, D., & Cai, D. 2012. The private benefits of control in Chinese listed firms: Do cash flow rights always reduce controlling shareholders' tunneling? *Asia Pacific Journal of Management*, 29(2): 499–518.

Luo, J., Wan, D., Cai, D., & Liu, H. 2013. Multiple large shareholder structure and governance: The role of shareholder number, contest for control, and formal institutions in Chinese family firms. *Management Organization Review*, 9(2): 265–294.

Luo, J., Xiang, Y., & Zhu, R. 2017. Military top executives and corporate philanthropy: Evidence from China. *Asia Pacific Journal of Management*, 34(3): 725–755.

Masulis, R. W., Pham, P. K., & Zein, J. 2011. Family business groups around the world: Financing advantages, control motivations, and organizational choices. *The Review of Financial Studies*, 24(11): 3556–3600.

Memili, E., Fang, H., Chrisman, J. J., & De Massis, A. 2015. The impact of small-and medium-sized family firms on economic growth. *Small Business Economics*, 45(4): 771–785.

Miller, D., & Le Breton-Miller, I. 2005. *Managing for the long run: Lessons in competitive advantage from great family business*. Boston, MA:Harvard Business School Press.

Miller, D., & Le Breton-Miller, I. 2006. Family governance and firm performance: Agency, stewardship, and capabilities. *Family Business Review*, 19(1): 73–87.

Miller, D., & Le Breton-Miller, I. 2011. Governance, social identity, and entrepreneurial orientation in closely held public companies. *Entrepreneurship Theory and Practice*, 35(5): 1051–1076.

Miller, D., Le Breton-Miller, I., & Lester, R. H. 2010. Family ownership and acquisition behavior in publicly-traded companies. *Strategic Management Journal*, 31(2): 201–223.

Miller, D., Le Breton-Miller, I., & Lester, R. H. 2011. Family and lone founder ownership and strategic behaviour: Social context, identity, and institutional logics. *Journal of Management Studies*, 48(1): 1–25.

Miller, D., Le Breton-Miller, I., Lester, R. H., & Cannella, A. A. 2007. Are family firms really superior performers? *Journal of Corporate Finance*, 13(5): 829–858.

Miller, D., Le Breton-Miller, I., & Scholnick, B. 2008. Stewardship vs. stagnation: An empirical comparison of small family and non-family businesses. *Journal of Management Studies*, 45(1): 51–78.

Munari, F., Oriani, R., & Sobrero, M. 2010. The effects of owner identity and external governance systems on R&D investments: A study of Western European firms. *Research Policy*, 39(8): 1093–1104.

Morck, R., Wolfenzon, D., & Yeung, B. 2005. Corporate governance, economic entrenchment, and growth. *Journal of Economic Literature*, 43(3): 655–720.

Muñoz-Bullón, F., & Sanchez-Bueno, M. J. 2011. The impact of family involvement on the R&D intensity of publicly traded firms. *Family Business Review*, 24(1): 62–70.

Newman, A., Schwarz, S., & Ahlstrom, D. 2017. Microfinance and entrepreneurship: An introduction. *International Small Business Journal*, 35(7): 787–792.

Patel, P. C., & Chrisman, J. J. 2014. Risk abatement as a strategy for R&D investments in family firms. *Strategic Management Journal*, 35(4): 617–627.

Peng, M. W., Ahlstrom, D., Carraher, S. M., & Shi, W. S. 2017. History and the debate over intellectual property. *Management and Organization Review*, 13(1): 15–38.

Perri, A., & Peruffo, E. 2017. *Family business and technological innovation: Empirical insights from the Italian pharmaceutical industry*. New York:Palgrave McMillan.

Sanchez-Bueno, M. J., & Usero, B. 2014. How may the nature of family firms explain the decisions concerning international diversification? *Journal of Business Research*, 67(7): 1311–1320.

Schmid, T., Achleitner, A. K., Ampenberger, M., & Kaserer, C. 2014. Family firms and R&D behavior - New evidence from a large-scale survey. *Research Policy*, 43(1): 233–244.

Schulze, W. S., Lubatkin, M. H., & Dino, R. N. 2001. Agency relationships in family firms: Theory and evidence. *Organization Science*, 12(2): 99–116.

Sciascia, S., Nordqvist, M., Mazzola, P., & Massis, A. D. 2015. Family ownership and R&D intensity in small- and medium-sized firms. *Journal of Product Innovation Management*, 32(3): 349–360.

Shleifer, A., & Vishny, R. W. 1997. A survey of corporate governance. *Journal of Finance*, 52(2): 737–783.

Souder, D., Zaheer, A., Sapienza, H., & Ranucci, R. 2017. How family influence, socioemotional wealth, and competitive conditions shape new technology adoption. *Strategic Management Journal*, 38(9): 1774–1790.

Stein, J. C. 1997. Internal capital markets and the competition for corporate resources. *Journal of Finance*, 52(1): 111–133.

Stets, J. E., & Burke, P. J. 2000. Identity theory and social identity theory. *Social Psychology Quarterly*, 63(3): 224–237.

Tajfel, H. 1974. Social identity and intergroup behavior. *Social Science Information*, 13(2): 65–93.
Tobin, J. 1958. Estimation of relationships for limited dependent variables. *Econometrica*, 26(1): 24–36.
Tomizawa, A., Zhao, L., Bassellier, G., & Ahlstrom, D. 2019. Economic growth, innovation, institutions, and the great enrichment. *Asia Pacific Journal of Management*: 1–25. https://doi.org/10.1007/s10490-019-09648-2.
Wang, L. C., Ahlstrom, D., Nair, A., & Hang, R. Z. 2008. Creating globally competitive and innovative products: China's next Olympic challenge. *SAM Advanced Management Journal*, 73(3): 4–16.
Wasserman, N. 2006. Stewards, agents, and the founder discount: Executive compensation in new ventures. *Academy of Management Journal*, 49(5): 960–976.
Welter, F., Baker, T., Audretsch, D. B., & Gartner, W. B. 2017. Everyday entrepreneurship - A call for entrepreneurship research to embrace entrepreneurial diversity. *Entrepreneurship Theory and Practice*, 41(3): 311–321.
White, H. 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*, 48(4): 817–838.
Xu, J. 2012. Social Darwinism in modern China. *Journal of Modern Chinese History*, 6(2): 182–197.
Young, M. N., Peng, M. W., Ahlstrom, D., Bruton, G. D., & Jiang, Y. 2008. Corporate governance in emerging economies: A review of the principal–principal perspective. *Journal of Management Studies*, 45(1): 196–220.
Young, M. N., Tsai, T., Wang, X., Liu, S., & Ahlstrom, D. 2014. Strategy in emerging economies and the theory of the firm. *Asia Pacific Journal of Management*, 31(2): 331–354.
Zahra, S. A. 2005. Entrepreneurial risk taking in family firms. *Family Business Review*, 18(1): 23–40.
Zellweger, T. M., & Dehlen, T. 2012. Value is in the eye of the owner: Affect infusion and socioemotional wealth among family firm owners. *Family Business Review*, 25(3): 280–297.

Jin-hui Luo (PhD, Xi'an Jiaotong University) is a professor of accounting at the School of Management, Xiamen University. His research interests focus on corporate governance and family business in China. His recent publications appear in the *Asia Pacific Journal of Management* (APJM), *Asian Business & Management* (ABM), *China Journal of Accounting Research* (CJAR), *China Journal of Accounting Studies* (CJAS), *Journal of Accounting and Public Policy* (JAPP), *Journal of Banking & Finance* (JBF), *Journal of Business Ethics* (JBE), *Journal of Corporate Finance* (JCF), *Management International Review* (MIR), and *Management and Organization Review* (MOR).

Xue Li (Bachelor, Shandong University of Finance and Economics) is a PhD candidate of accounting at the School of Management, Xiamen University. Her research interests focus on corporate governance and family business in China. Her recent publications appear in the *Asia-Pacific Journal of Accounting & Economics* (APJAE), *China Journal of Accounting Research* (CJAR) and *Journal of Business Ethics* (JBE).

Linda C. Wang (PhD, Michigan State University) is an assistant professor at The City University of Hong Kong. Her research interests include groups and teams, leadership and corporate governance, innovation, and research methods. She has published several articles and book chapters in *Personnel Psychology*, *Academy of Management Discoveries*, *Asia Pacific Journal of Management*, and the *Journal of Management History*. Her research has also twice earned Best Paper Awards at the Academy of Management Annual Meetings.

Yue Liu (Bachelor, Huazhong University of Science and Technology) is a PhD candidate of accounting at the School of Management, Xiamen University. Her research interests focus on financial accounting and corporate governance.