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Published online: 12 Oct 2021.

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Behavioural investigation of the impact of different types of CEOs on innovation in family firms: moderating role of ownership divergence between cash flow rights and voting rights

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ABSTRACT

In what way different types of CEOs within family firms, based on control diversity, behave towards R&D investment and how excess voting rights alter this behaviour of CEOs? This study has aimed to investigate the R&D investment behaviour of CEOs in family firms. This study has also investigated the moderating role of ownership divergence. The Pooled Ordinary Least Square (POLS) regression method is applied for data analysis purpose. Moreover, the Tobit regression model is also applied for robustness check. We obtained data (2008–2018) on Chinese A-share firms from CSMAR. The study found non-family CEOs exhibit negative behaviour towards R&D investment and that CEOs from family firms exhibit the same behaviour when do not have actual control rights. Family CEOs with actual control rights are more willing to R&D investment. The moderating effect of excess voting rights on family CEOs with actual control rights who change their willingness from positive to negative. The non-family CEOs and family CEOs without actual control rights show positive behaviour with existence of excess voting rights. This study is novel and pioneered the exploration of effects of different types of CEOs within family firms on R&D investment behaviour. This study is useful for directors to understand and select a suitable CEO for their firm, also for managers to devise an optimal level of ownership discrepancy to attain maximum benefits from R&D investment decisions.

1. Introduction

The CEO's role in the family business is vital in formulating strategic decisions in business and in determining whether to finance research and management ventures (Barker & Mueller, 2002; Blagoeva et al., 2020). Scientists have focused on the

institutional framework (Jensen & Meckling, 1979) and believe that family companies can engage in more research and development (R&D) activities by effectively monitoring administrative myopia (Block, 2012; Schmid et al., 2014). The internal development of R&D activities is known as the making strategy and the outsourced strategy, on the other hand, represents the firm's decision to externalize R&D operations (Cruz-Cázares et al., 2013). It is necessary to invest in research and development, because it can improve the company's innovation capabilities, thereby providing opportunities for the company's renewal and organizational development (David et al., 2001). Family businesses are prevalent corporate entities all around the world (Tobak & Nábrádi, 2020). Different research practitioners reach different conclusions about family firms' R&D investment strategy. Top management teams in family businesses play unique roles in shaping a company's R&D strategy. Significant changes in R&D strategy occur as a result of new ownership and/or the hiring of a non-family CEO.

CEOs have a unique role and are mostly accountable for strategic capital allocations (Cannella et al., 2009). CEOs are more likely to directly integrate their potential business capabilities into business innovations (Soriano & Martínez, 2007). Hypothetical opinions support this view, outside CEOs in a family-owned business can limit the absence of external work experience and general organizational information in family firms (Maseda et al., 2015). Notwithstanding its significance in the financial literature, moderately limited research has investigated the effects of professional CEOs on investment decision family organization Chen and Hsu (2009) called for additional research on this issue (Muñoz-Bullón & Sanchez-Bueno, 2011). Financial investment is one of the most significant corporate choices that administrators can make, with a huge effect on the probability of a family business's endurance.

Although family business owners tend to invest longer than other investors, family CEO may also avoid investing in R&D because large investments in this area often require external financing, such as issuing new shares and borrowing money through loans or debt. Therefore, external financing may lead to a reduction in the control of the family owner, which in turn has a negative effect on the family owner's SEW. The chairman has strong power to bind senior management and approve strategic decisions (Krause et al., 2014) when the business owner has more direct control of the company. At the time of power, the board members are family members.

The principal goal of this paper is to investigate the effects of external and internal CEOs on the level of R&D investment in the family firm. Specifically, we observe whether a non-blooded CEO builds high-risk aversion in family firms, prompting lower levels of R&D investment. Based on the assumption that the risk-taking behaviour of CEOs can be affected by singular contrasts in personal style, aptitude, and business information (Hambrick & Mason, 1984). We also study whether family investment decisions are affected by longer-term outside CEOs. As a one-of-a-kind and helpful feature of this research, we also test whether the effect of an outside CEO on family business investment decisions is directed by family contribution in the decision-making process (the so-called familiarity). In addition to family involvement, we also recommend that the quality of the internal governance components signified by related aspects to the separation of CEO or independence of the board may

condition the risk-bearing attitude of non-family CEO. The misfit of the internal governance system is probable to lead to negative effects on performance (González-Cruz et al., 2020).

When CEOs' interest for control retention decreases due to higher cash flow rights of controlling shareholders, firms are more likely to engage in higher R&D activities (Sung et al., 2017). Sung et al. (2017) concluded that a negative relationship exists between cash-flow rights of the controlling shareholders and with agency cost, and a positive relationship exists between cash-flow rights of controlling shareholders and R&D intensity. The author also found that R&D intensity is higher for group-affiliated firms when either the difference between cash-flow rights and voting rights is lower or cash-flow rights of group-controlling shareholders are higher. So, the effect of voting rights is important to investigate linked with CEOs and R&D investment.

Therefore, for the first time, we distinguish CEOs within family firms in three types based on control diversity. We also investigate the R&D investment of different types of family holding companies with and without excessive voting rights. Excessive voting rights refers to the controller of the family business having more control/voting rights than cash flow rights. The absence of excess voting rights means the controller of the family business has the same control/voting rights as cash flow rights. Our findings help in determining how a corporate governance structure for the R&D investment of family businesses is formed. We contribute to behavioural agency theory and identified that different types of CEOs have different behaviours in the presence and absence of excess voting rights towards innovation input. Previous studies have focused only on family and non-family CEOs and ignored the moderating effect of voting rights between CEO type and R&D investment.

1.2. Theoretical review

Agency theory and behaviour agency theory have very different expectations on the effectiveness of non-family CEOs in family businesses. Agency theory believes that agents are often opportunistic, but they are carefully checked and significantly encouraged to ensure shareholder interests (Miller et al., 2014). Based on this definition, the family CEO as a major shareholder of the company and/or whose interests overlap with the owner's family will prevail over non-family CEOs who are only agents (Miller & Le Breton-Miller, 2006).

Otherwise, behavioural agency practitioners will expect mutual benefit. They believe that risk-taking is a universal function of prevailing benefactions. For instance, to protect the socioemotional wealth of their divested business, family CEOs will sacrifice the economic performance of the business to avoid wise business risks (Gómez-Mejía et al., 2007). Socio-emotional goals include maintaining control over family business affairs, hiring family leaders, developing corporate resources, and avoiding investment in uncertain investment projects (Gomez-Mejia et al., 2011; Miller et al., 2013). Therefore, family CEOs with effective control rights are more likely to exert pressure on these socioemotional wealth goals than non-family CEOs who have no right to control and do not care about protecting the interests of the owner.

Proponents of the behavioural agency theory claim that some agents and owner prefer non-financial goals (Wiseman & Gomez-Mejia, 1998). The socioemotional wealth paradigm may be used to define non-financial goals(Bujan, 2020). Therefore, (Gomez-Mejia et al., 2011; Gómez-Mejía et al., 2007) in a family business the family members focus socioemotional wealth of (for example, family control of the company, risk aversion, and family members' stubbornness as CEO) may balance financial goals but may be detrimental to the company's performance. Therefore, when non-family CEOs are required to deal with controlling family members with equal formal power and regular organizational responsibilities, these socioemotional wealth priorities can balance the market-oriented measures of non-family CEOs (Minichilli et al., 2010).

Therefore, the duties of non-family business executives will need to be supervised by a group of informed key holders whose collective, opportunistic knowledge may inhibit them. In contrast, behavioural agency theory, especially a part of SEW, usually applies to the CEO's daily management behaviours, in which family members directly participate in these interactions. In this case, senior executives of non-family companies will be allowed to act alone, rather than with the consent of the common family CEO, to conduct financial bargaining on the SEW's priorities.

This research will confirm that behavioural agency and agency theories have inherent meaning. Socioemotional views are a variant of the behavioural agency theory and reflect the non-economic goals of certain executives in the family. However, this is subject to all aspects of governance and helps determine when external CEOs of the family will perform well. In particular, agency theory usually applies to the relationship between agents and company owners and the relationship between frequency and appropriately spaced interactions and strategic control.

2. Hypothesis development

2.1. Non-family CEOs and R&D investment

The literature generally investigated that companies run by family CEOs are inferior to companies run by non-family CEOs (Xu et al., 2015). The literature attributed this performance defect to family members' lack of management knowledge (Bennedsen et al., 2007) and fierce competition between grandchildren (Bertrand et al., 2008). In this case, the condition of Chinese family businesses is different from that of Western economies. First, most Chinese family businesses are conducted quietly under the control of their founders, and disputes over power are rare (Cheng, 2014). Thus, even when the company is managed by the next generation, their management knowledge is more professional because it is easier to transfer knowledge on the business between the founder and his children than between the founder and the non-family chief executive officer (Bertrand & Schoar, 2006). But at the same time, the parents uphold a high degree of control because.

The two facets of incumbents that can serve as salient boundary conditions: the incumbents' narcissistic nature and the degree to which their family and job functions are entangled (Huang et al., 2020). Since narcissistic incumbents have an excessively high sense of self-importance and superiority, as well as a propensity to ignore and

belittle the worth and efforts of others (Chatterjee & Hambrick, 2007), they are less usually concerned with the values of their child-successors and hence influenced by the two-fold phenomenon. As a result, the parent-incumbents with a strongly narcissistic disposition would be likely to retain their superiority over their child heirs, regardless of the qualities of the child-successors.

First, for non-family CEOs with limited firm shares, their key economic benefits are from the financial compensation, the status of the managerial labour market, and invisible benefits (Burkart et al., 2003). However, because of the deficiency of the managerial labour market and equity-based incentive mechanism in China, they may seek more invisible benefits. They may forgo financial returns to maximize their utility (Bertrand & Schoar, 2006). Family business literature has not paid adequate attention to the distinctive impact that non-family CEOs have on the investment in R&D of family businesses. Investments in R&D are peculiar in that their intrinsic function brings them at risk for big agency issues. Their long pay-off horizons, challenges and risks make professional CEOs particularly hesitant to invest in R&D (Baysinger et al., 1991). It is also imperative to discuss how non-family specialist CEOs have an influence on the R&D strategy in family businesses and whether they are more or less likely to engage in R&D. Le Breton-Miller et al. (2011) can serve as effective monitors, inducing non-family CEOs to spend more on R&D. However, the involvement of family successors can also push CEOs to produce good short-term performance, prompting non-family CEOs to become risk-averse and hence to spend less in R&D.

Compared to family CEOs, non-family CEOs have far less sustainability over family business. As contracted staff Davis et al. (1997), they are not responsible for the identity of the family. Long-term sustainability and the spread of a family business is not their end goal (Chang & Shim, 2015). While CEOs from families have both financial and emotional stakes in the company, non-family CEOs do not have an encouragement and incentive to look out for the long-term interests of the firm excluding for their own financial and employment benefits. As a result, non-family CEOs will be less concerned with the company's long-term prospects like R&D investment. Thus, we propose a hypothesis in the following discussion.

> *H1*: *Non-family CEOs within the family firms have negative behaviour toward R&D investment.*

2.2. Family CEOs control diversity and R&D investment

Innovation is critical to the long-term endurance of the company (Aghion et al., 2013). The authors believe that the CEOs' internal control site is particularly interesting in explaining the control options of SMEs because a considerable amount of proof support the view that SMEs are usually dominated by 'ubiquitous' CEOs who try to control the entire company and this control directly affects the development and implementation of the strategy (Mintzberg & Waters, 1982). Scholars believe that CEOs with stronger internal control have greater openness to the innovative technique of service and production (Miller et al., 1982). The literature on SMEs indicated that CEOs with fixed shares have more freedom to propose ideas and plans, and compared with (professionals) outside directors, they have a more direct

influence on the formulation and implementation of strategies (Ward, 1988). Indeed, higher-level theories regard stock ownership as an aspect of 'management discretion', which is said to enhance the influence of the psychological characteristics of executives on their strategy and management decisions (Finkelstein & Peteraf, 2007). In this research, we examine the CEOs of family businesses of different identities that have actual control rights and do not have actual control rights as well as their behaviours in investing in research and development.

Looking at family and non-family firms and the relationship with R&D investment, past research has investigated how CEOs influence R&D investment in a family firm. Company CEOs assume an essential role in choosing the measure of assets distributed to innovation, give direction for innovation investment, which is the background of organizational structures, and elevate a culture helpful for innovation (Duran et al., 2016). Family firm CEOs, in general, maintain a strategic distance from R&D investment because it frequently requires the family firm's owner to get external financing. Doing so can weaken the family owner control over their organizations (Duran et al., 2016). Subsequently, family firms with family CEOs invest smaller amounts in R&D than firms without family CEOs. Thus, we can extend the study and categorise family CEOs into two types (family CEOs with actual control and family CEOs without actual control).

The force of small firm CEOs extend to their capacity in board structure and is especially valid for small private firms, where the convergence of ownership characteristic of these firms Mace (1971) provides extra capacity to the CEO, even to over-ruling board decisions and selecting and eliminating directors (Mace, 1971). However, if the CEO is not a member of the family, R&D investment will reduce the control of the family owner. When non-family members serve as chairman, family firm owners have difficulty to contribute actively to R&D decisions and monitor resource allocation. The lack of effective corporate control mechanisms and the inability to monitor R&D investment decisions make the loss of emotional social wealth a major concern for family owners. Therefore, although these investments may be important for maintaining emotional social wealth in the long run, they may still choose to avoid risky R&D investments. Based on the above discussion, a gap clearly exists and the behaviour of different types of CEOs within family firms towards R&D investment need to be investigated. Thus, we propose the following hypotheses.

> **H2**: *Family CEOs with an actual controller within the family firms are inclined to have a positive behaviour towards R&D investment.*

> **H3**: *Family CEOs without actual control have negative behaviour towards R&D investment.*

2.3. CEO types, R&D and excess voting rights

This research examines the effects of ownership discrepancy between cash flow and voting rights on a firm's soft asset investment decision in a large business organization. Therefore, when the controlling shareholder has higher voting rights rather than cash flow rights, they have a higher motivating force to condense the firm's

investment that is basic for business accomplishment in long-term strategic perspectives (Kang & Kim, 2015).

The ownership structure is one of the most crucial determinants of its innovative activity (Jakimowicz & Rzeczkowski, 2019). Highly concentrated ownership provides decision-making power (capacity) and incentives (desire) based on greater possibilities. When directors are less interested in maintaining control because of the increased cash flow rights of controlling shareholders, companies are more likely to engage in higher R&D activities (Sung et al., 2017). Sung et al. (2017) concluded that a negative association between the cash flow rights of controlling shareholders and agency costs can be observed and a positive association between the cash flow rights of controlling shareholders and R&D intensity.

In this case, the controlling shareholder has more voting/control rights than cash flow rights. Redundant voting rights are widely known worldwide, especially in family businesses (La Porta et al., 1999a). This privilege is usually obtained through the practice of sharing from a dual-class or hierarchical ownership structure. In the double-class share structure, the company is issued two types (A and B) of common stocks. Class A shares are equivalent to one vote per share, and Class B shares can be equal to ten votes per share. Usually, family businesses purchase Class B shares because they seek additional control over the company. Double class shares allow the company to obtain equity financing from the capital market without losing control of the company. When companies have more control rights than cash flow rights, this kind of behaviour can lead to inter-agency issues (La Porta et al., 1999a).

When cash-flow rights are smaller, controlling owners often externalize the risk of investment decisions (Bebchuk et al., 2000). The disparity between voting and cash-flow rights is closely linked to managing shareholder opportunity as a result of poor investment decisions. Bebchuk et al. (2000) has claimed that the disparity between cash-flow rights and voting rights should have a derogatory association with R&D operations, regardless of whether the expropriation is the result of suboptimal investment decisions or tunnelling procedures. Excess voting rights allow an actual controller to gain further advantages from the company by lowering the cost of management by lower financial engagements. However, this additional advantage of being a majority shareholder comes at the detriment of other shareholders (Miller & Le Breton-Miller, 2006). The excess voting rights give the family CEOs both the authority and the ability to manage the companies for their own gain. For example, a family CEO with actual control rights and excess voting rights may use their discretionary authority to set high pay agreements for controllers and their family members. Moreover, family CEOs might use family resources of financing, instead of firm resources (Soriano, 2010).

As a result, we contend that excessive voting rights alter family CEOs' inclination to engage in R&D. We anticipate that other categories of CEOs with excess vote rights (non-family CEOs and family CEOs without actual control rights) would behave positively towards an R&D investment. With actual ownership privileges and self-opportunistic behaviour, family CEOs disregard the rights of minority shareholders. They should not work for the economic well-being of the other participants notwithstanding the fact that they have a disproportionate number of voting privileges. Thus, we also propose the following hypotheses.

H4: Non-family CEOs in a family firm without actual controlling rights in case of excess voting rights as a moderating factor will tend to affect R&D investment positively.

H5: Family firm CEOs with actual controlling right in case of excess voting rights as a moderating factor will tend to affect R&D investment negatively.

H6: Family firm CEOs without actual controlling right in case of excess voting rights behaviour as a moderating factor will tend to affect R&D investment positively.

3. Study design

3.1. Methodology

The study used winsor2 method at 1% and 99% to remove outlier. The same approach was used to remove extreme values from many scholars (Carney et al., 2019). This study reduced the probable biases in the empirical model from omitted variables and endogeneity by applying these two actions, first by controlling the year and industry effect by creating dummies of both and second by taking the 1-year lag on all independent variables. We control for possible serial correlation and heteroscedasticity using the Robust standard errors parenthesis and Tobit Multiplicative Heteroscedasticity Regression (tobithetm). The CEO type variables used in this study are the dichotomous variable, and normally, most CEOs do not change their status over the period. Thus, this study opted to use the Pooled Ordinary Least Square (POLS) regression for the outcomes.

3.1.1. Robustness testing strategy. We check the robustness of our results in several ways to authenticate our results. First, we change the measure of our dependent variable reported in Table 1. Second, we changed our moderating variables from dummy to continuous values and also changed the regression technique from PLOS to the fixed effect model reported in Table 2. Lastly, we applied the Tobit regression model reported in Table 3. We used the robustness testing strategy by following previous research (Bozec & Di Vito, 2019; Zulfiqar et al., 2021).

3.2. Sample and data

The study focused on different types of CEOs in family businesses and collected data from the China Stock Exchange and Accounting Research (CSMAR). The study collected data of A-share firms listed on the Shenzhen Stock Exchange and the Shanghai Stock Exchange. The CSMAR is a comprehensive and appropriate database for publicly available Chinese companies (Carney et al., 2019). We excluded all firms owned by SOEs and firms with missing values of total revenues, assets or liabilities. Data were used from 2008 to 2018 and included 5462 observations.

3.3. Control proportion or voting rights

The control proportion of the actual controller in a listed company is also known as a voting right, for which data are obtained from the CSMAR. The database followed

Table 1. R&D sale.

Variables	M7 R&D	M8 R&D	M9 R&D	M10 R&D	M11 R&D	M12 R&D
Non_Family CEO	−0.00032			0.00008		
	(0.00153)			(0.00219)		
Family CEO & Actual Controller		0.00265*			0.00192	
		(0.00150)			(0.00207)	
Family CEO			−0.00443***			−0.00813***
			(0.00121)			(0.00158)
With_Excess Voting Rights				0.00208	0.00272	0.00208
				(0.00203)	(0.00216)	(0.00183)
Non-Family CEO X With_Excess				0.00022**		
				(0.00294)		
Family CEO & Act_Controller X With Excess					−0.00070	
					(0.00293)	
Family CEO X With Excess						0.00388*
						(0.00233)
Leverage	−0.02580***	−0.03160***	−0.02290***	−0.02370***	−0.02350***	−0.02360***
	(0.00461)	(0.00462)	(0.00469)	(0.00476)	(0.00474)	(0.00471)
No. of Board Meeting	0.00114***	0.00115***	0.00105***	0.00110***	0.00109***	0.00106***
	(0.00033)	(0.00032)	(0.00033)	(0.00033)	(0.00033)	(0.00033)
ROE	−0.02760***	−0.02900***	−0.02140***	−0.02170***	−0.02180***	−0.02210***
	(0.00868)	(0.00858)	(0.00818)	(0.00816)	(0.00820)	(0.00819)
CEO Power	0.00614	0.00280	0.00875	0.00913	0.00790	0.00803
	(0.01170)	(0.01190)	(0.01120)	(0.01110)	(0.01110)	(0.01130)
Family Firms	0.00183	0.00115	0.00212	0.00197	0.00190	0.00251
	(0.00170)	(0.00168)	(0.00171)	(0.00176)	(0.00174)	(0.00182)
Patent Application	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Ultimate Owners	−0.00026***	−0.00031***	−0.00026***	−0.00028***	−0.00028***	−0.00028***
	(0.00006)	(0.00006)	(0.00006)	(0.00007)	(0.00007)	(0.00007)
Firm Age	−0.00005	−0.00008	−0.00026	−0.00037	−0.00033	−0.00032
	(0.00024)	(0.00024)	(0.00024)	(0.00025)	(0.00025)	(0.00025)
Ind_Director_Ratio	0.01330	0.01450	0.01960	0.02010	0.01860	0.02080
	(0.01580)	(0.01580)	(0.01560)	(0.01560)	(0.01550)	(0.01540)
Institutional_Shareholding	0.00027*	0.00027*	0.00027*	0.00029*	0.00028*	0.00028*
	(0.00014)	(0.00014)	(0.00015)	(0.00015)	(0.00015)	(0.00015)
Board Size	−0.00126*	−0.00130*	−0.00139*	−0.00150**	−0.00149**	−0.00145*
	(0.00072)	(0.00072)	(0.00074)	(0.00074)	(0.00074)	(0.00074)
Audit_Big4	0.00414	0.00598	0.00678	0.00641	0.00657	0.00718
	(0.00651)	(0.00637)	(0.00644)	(0.00645)	(0.00649)	(0.00649)
Is_Chairman_Family	−0.00612***	−0.00661***	−0.00603***	−0.00599***	−0.00632***	−0.00540**
	(0.00221)	(0.00218)	(0.00230)	(0.00229)	(0.00226)	(0.00228)
Constant	0.0217	0.0286**	0.0205	0.0207	0.0208	0.0199
	(0.0142)	(0.0143)	(0.0150)	(0.0150)	(0.0151)	(0.0149)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.150	0.173	0.141	0.140	0.131	0.122

Note: Variables definition are located in Table 8. Robust standard errors are in parenthesis.
***, **, and * indicates $P < $ 1%, 5%, and 10%.
Source: The authors.

the calculation method of (La Porta et al., 1999a). The indicators of these data are examined from the viewpoint of the family as a whole. The proportion of the control rights of the listed firm owned by all actual controllers in the family participants is determined and if the actual controllers of the firm are multiple persons, then we adopted combined calculation.

Table 2. Regression results with continuous moderating variables (Fixed Effect).

Variables	M13 R&D	M14 R&D	M15 R&D
Non_Family CEO	−0.00199***		
	(0.00062)		
Family CEO & Actual Controller		0.000989	
		(0.000638)	
Family CEO			0.00108
			(0.00133)
With_Excess Voting Rights	0.00837***	0.00735***	0.01650***
	(0.00273)	(0.00193)	(0.00201)
Non-Family CEO X With Excess	0.01100***		
	(0.00251)		
Family CEO & Actual Controller X With Excess		−0.00619**	
		(0.00252)	
Family CEO X With Excess			0.00460*
			(0.00421)
Leverage	0.00241	0.00246	0.00222
	(0.00175)	(0.00178)	(0.00172)
No. of Board Meeting	0.00001	0.00001	0.00003
	(0.00005)	(0.00005)	(0.00005)
ROE	−0.00144	−0.00040	−0.00068
	(0.00241)	(0.00244)	(0.00241)
CEO Power	0.00407	0.00475*	0.00410
	(0.00258)	(0.00264)	(0.00260)
Family Firm	0.00037	0.00016	0.00044
	(0.00074)	(0.00075)	(0.00074)
Patent Application	0.00001	0.00001	0.00000
	(0.00001)	(0.00001)	(0.00001)
Ultimate Owners	0.00001	−0.00001	0.00001
	(0.00001)	(0.00002)	(0.00002)
Firm age	0.00041***	0.00039***	0.00025***
	(0.00013)	(0.00013)	(0.00009)
Ind_Director_Ratio	−0.00431	−0.00499	−0.00388
	(0.00516)	(0.00523)	(0.00517)
Institutional_Shareholding	0.00008**	0.00009**	0.00008**
	(0.00003)	(0.00003)	(0.00003)
Board Size	0.00005	0.00011	0.00007
	(0.00021)	(0.00022)	(0.00021)
Audit_Big4	0.00228	0.00170	0.00207
	(0.00306)	(0.00311)	(0.00307)
Is_Chairman_Family	−0.00105	−0.00183**	−0.00122*
	(0.00070)	(0.00071)	(0.00071)
Constant	−0.00022	0.00148	−0.00130
	(0.00823)	(0.00833)	(0.00822)
R-squared within	0.156	0.129	0.144

Note: Variables definition are located in Table 8. Robust standard errors are in parenthesis.
***, **, and * indicates $P < 1\%$, 5%, and 10%.
Source: The authors.

3.4. Ownership proportion or cash flow rights

The ownership percentage of the actual controller in a listed company is also known as cash flow rights. It refers to the ownership of a scheduled company owned by the actual controller through concerted action, multiple holdings and cross-shareholdings. The database followed the calculation method of (La Porta et al., 1999a). The indicators of these data were examined from the viewpoint of the family as a whole. The cash flow rights proportion of the listed firm owned by all actual controllers in the family participants were identified and we adopted combined calculation if the actual controllers of the firm are multiple people.

Table 3. Robust regression results with Tobit model.

Variables	M16 R&D	M17 R&D	M18 R&D	M19 R&D	M20 R&D	M21 R&D
Non_Family CEO	−0.00042*			−0.00057*		
	(0.00023)			(0.00031)		
Family CEO & Actual Controller		0.00060***			0.00094***	
		(0.00023)			(0.00030)	
Family CEO			−0.00078*			−0.00192***
			(0.00042)			(0.00062)
With_Excess Voting Rights				−0.00021	0.00033	−0.00021
				(0.00030)	(0.00032)	(0.00024)
Non-Family CEO X With_Excess				0.00040		
				(0.00044)		
Family CEO & Act_Controller X With Excess					−0.00078*	
					(0.00044)	
Family CEO X With Excess						0.00207**
						(0.00083)
Leverage	−0.00415***	−0.00415***	−0.00424***	−0.00420***	−0.00417***	−0.00418***
	(0.00071)	(0.00071)	(0.00071)	(0.00072)	(0.00072)	(0.00072)
No. of Board Meeting	0.00015***	0.00015***	0.000151***	0.00015***	0.00015***	0.00014***
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
ROE	0.00199	0.00171	0.00171	0.00172	0.00169	0.00155
	(0.00154)	(0.00155)	(0.00155)	(0.00155)	(0.00155)	(0.00155)
CEO Power	−0.00081	−0.00085	−0.00058	−0.00066	−0.00088	−0.00053
	(0.00152)	(0.00152)	(0.00152)	(0.00152)	(0.00152)	(0.00152)
Family Firms	0.00002	0.00004	0.00014	0.00001	0.00003	0.00011
	(0.00023)	(0.00023)	(0.00024)	(0.00024)	(0.00024)	(0.00024)
Patent Application	0.00001**	0.00001**	0.00001**	0.00001**	0.00001**	0.00001**
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Ultimate Owners	−0.00005***	−0.00004***	−0.00004***	−0.00004***	−0.00004***	−0.00004***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Firm Age	−0.00005	−0.00004	−0.00005	−0.00005	−0.00004	−0.00004
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
Ind_Director_Ratio	0.00593**	0.00411	0.00476*	0.00422*	0.00404	0.00454*
	(0.00236)	(0.00251)	(0.00250)	(0.00252)	(0.00251)	(0.00251)
Institutional_Shareholding	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Board Size	−0.00013	−0.00015	−0.00015	−0.00016*	−0.00015*	−0.00015*
	(0.00009)	(0.00009)	(0.00009)	(0.00009)	(0.00009)	(0.00009)
Audit_Big4	0.00030	0.00033	0.00035	0.00029	0.00039	0.00052
	(0.00079)	(0.00079)	(0.00079)	(0.00079)	(0.00079)	(0.00079)
Is_Chairman_Family	−0.00072**	−0.00073**	−0.00052*	−0.00069**	−0.00067**	−0.00052*
	(0.00031)	(0.00031)	(0.00031)	(0.00032)	(0.00031)	(0.00031)
Constant	0.00358*	0.00378*	0.00354	0.00425*	0.00353	0.00379*
	(0.00211)	(0.00218)	(0.00218)	(0.00220)	(0.00218)	(0.00218)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Log likelihood	12729.102	12764.086	12762.396	12762.474	12765.625	12765.773

Note: Variables definition are located in Table 8. Tobit Multiplicative Heteroscedasticity Regression (tobithetm) tested. Robust standard errors are in parenthesis.
***, **, and * indicates $P < 1\%$, 5%, and 10%.
Source: The authors.

3.5. Separation proportion (two rights deviation rate) between voting rights & cash flow rights

The actual controller has the ownership ratio and control ratio, and the deviation rate is calculated by dividing the ownership ratio/control ratio. This indicator is

investigated from the family viewpoint. When family firms have voting rights greater than cash flow/ownership rights, in this situation, the firm is supposed to be endowed excess voting rights (Bozec & Di Vito, 2019).

For analysis, this study created two dichotomous (binary) variables of voting rights and cash-flow rights. When the voting rights were equal to cash flow rights, then this study considered it without excess voting rights. Meanwhile, the ratio of voting rights was greater than the cash flow rights, we categorised it with excess voting rights.

3.6. Empirical model

$$R\&D_{i,t} = \alpha_o + \alpha_1 CEO\ type \cdot_{i,t} + \alpha_2 with\ exess\ voting\ rights \cdot_{i,t}$$
$$+ \ \alpha_3\ CEO\ type \cdot_{i,t} * with\ excess\ voting\ rights \cdot_{i,t} + \ \alpha_j \sum Controls_{i,t} + \varepsilon_{i,t}$$

4. Results and discussion

4.1. Mean comparison analysis

The difference of means test is run for the three types of family CEO, and Table 4 reports the t-statistics value. All the variables were significant according to the t-statistics values except patent application in non-family CEOs, and Leverage and ROE in non-family CEO without actual control rights.

4.2. Descriptive analysis & VIF

Table 5 represents the descriptive statistics. Chinese family firms invest 0.19% of total assets in R&D. The non-family CEO's mean value was 0.5330, which means our data had 53% of CEOs who do not belong to the family. In our dataset, 40% of CEOs belonged to the family and are also the actual controller of the family firms. The

Table 4. Mean comparison table.

Variables	Others	Non-family CEO	T-test Score	Other	Family CEO & Actual Controller	T-test Score	Other	Family CEO	T-test Score
R&D	0.0023	0.0015	6.35***	0.0014	0.0025	−8.37***	0.0019	0.0010	3.75***
With Excess Voting Rights	0.4148	0.6394	−24.64***	0.6292	0.3931	25.48***	0.5337	0.5464	−1.97*
Leverage	0.3265	0.4093	−20.93***	0.4055	0.3182	21.72***	0.3699	0.3759	−0.75
NOB_Meetings	9.2176	9.9917	−10.51***	9.8350	9.3212	6.84***	9.7015	8.5893	7.53***
ROE	0.0808	0.0679	6.01***	0.0687	0.0818	−6.01***	0.0739	0.0748	−0.21
CEO Power	0.2375	0.2297	4.48***	0.2289	0.2401	−6.34***	0.2341	0.2224	3.40***
Family Firm	0.7373	0.5079	25.86***	0.5608	0.6961	−14.70***	0.5887	0.9880	−22.24***
Patent Application	24.0982	28.819	−1.68*	27.3777	24.9916	0.85	26.8821	18.3907	1.68*
Ultimate Owners	56.6756	51.1548	18.26***	51.5905	56.9490	−17.37***	53.6418	55.0451	−2.29**
Firm Age	4.2218	7.9369	−33.13***	7.6742	3.9916	32.29***	6.1869	5.6415	2.31**
Ind_Director_Ratio	0.3792	0.3703	8.76***	0.3704	0.3805	−9.71***	0.3747	0.3716	1.65*
Institutional_ Shareholding	5.2678	5.6801	−3.71***	5.5921	5.3298	2.31**	5.5289	4.8942	2.85**
Board Size	8.2407	8.4157	−6.17***	8.4155	8.2115	7.07***	8.3412	8.4433	−1.74*
Is_Chairman_ Family	1.0078	0.6711	41.84***	0.7235	0.9849	−30.92***	0.8058	1.1472	−19.99***

Source: The authors.

Table 5. Descriptive analysis & VIF.

Variables	Mean	Std. Dev.	Min	Max	VIF
R&D Investment	0.001905	0.006013	0	0.037546	
Non_Family CEO	0.533082	0.498926	0	1	1.22
Family CEO & Actual Controller	0.400928	0.490108	0	1	1.18
Family CEO	0.06599	0.248275	0	1	1.09
With_Excess Voting Rights	0.53457	0.498825	0	1	1.15
Leverage	0.370338	0.205617	0.046011	0.860081	1.37
No. of Board Meeting	9.627486	3.917045	0	44	1.08
ROE	0.073988	0.114391	−0.51967	0.455307	1.05
CEO Power	0.233364	0.080283	0	0.486203	1.04
Family Firms	0.615088	0.486596	0	1	1.12
Patent Application	26.25886	104.8948	0	5431	1.09
Ultimate Owners	53.73613	15.70906	18.1888	88.5133	1.58
Firm Age	6.150333	5.873582	0	22	1.47
Ind_Director_Ratio	0.374522	0.052052	0.333333	0.571429	1.45
Institutional_Shareholding	5.486553	5.196521	0.12	26.519	1.04
Board Size	8.333365	1.443995	5	12	1.46
Audit__Big4	0.018836	0.135951	0	1	1.07
Is_Chairman_Family	0.828374	0.460847	0	1	1.21

Source: The authors.

third type of CEO belongs to the family but is not an actual controller of the family firms. The ratio of the third type of CEO in our presented dataset was around 7%. Our dataset had a mean value of with excess voting rights 0.5345, which means 53% of firms have excess voting rights and 47% do not have excess voting rights. Moreover, 47% of firms have voting rights equal to cash flow rights and 53% have more than cash flow rights. The last column of Table 5 showed the value of variance inflation factors. All VIF values were less than 2, which means our dataset had no multicollinearity.

4.3. Pairwise correlations

Table 6 shows the outcomes of correlation analysis. The correlation analysis demonstrates that our sample data set was free from multi-collinearity, which is a fundamental prerequisite of regression analysis. The correlation analysis of our results indicated statistical correlations among our study variables, control variables and R&D investment. The dependent variable R&D investment negatively correlated with non-family CEO and family CEO & non-controller, and positively correlated with family CEO and controller. Excess voting rights have a negative correlation with R&D investment.

4.4. Regression results and discussion

4.4.1. R&D assets
Table 7 shows the regression outcomes, which indicated that the non-family CEOs are less willing to invest in R&D, while family CEOs with full control rights are more willing to invest in long term risky projects. Hence, HI and H2 are accepted. The third type of CEO, which belongs to the family but does not have actual control rights, also showed less willingness towards R&D investment. Hence, H3 is also accepted. For the first time, we introduced three types of CEO within Chinese family

Table 6. Pairwise correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
R&D investment	1.00																	
Non_Family CEO	−0.06*	1.00																
Family CEO & Actual Controller	0.08*	−0.87*	1.00															
Family CEO	−0.04*	−0.28*	−0.22*	1.00														
With_Excess Voting Rights	−0.08*	0.22*	−0.23*	0.01	1.00													
Leverage	−0.13*	0.20*	−0.21*	0.01	0.21*	1.00												
No. of Board Meeting	0.05*	0.10*	−0.06*	−0.07*	0.02	0.26*	1.00											
ROE	0.01	−0.06*	0.06*	0.00	0.01	−0.10*	−0.00	1.00										
CEO Power	−0.04*	−0.05*	0.07*	−0.04*	0.03	−0.00	−0.07*	0.03*	1.00									
Family Firms	−0.04*	−0.24*	0.14*	0.20*	−0.18*	−0.06*	−0.04*	0.07*	0.01	1.00								
Patent Application	0.02	0.02	−0.01	−0.02	0.06*	0.10*	0.04*	0.10*	0.01	0.01	1.00							
Ultimate Owners	−0.05*	−0.18*	0.17*	0.02	−0.04*	−0.21*	−0.06*	0.21*	−0.01	0.24*	0.03	1.00						
Firm Age	−0.03*	0.32*	−0.31*	−0.02	0.29*	0.44*	0.18*	−0.10*	0.02	−0.19*	0.01	−0.46*	1.00					
Ind_Director Ratio	0.04*	−0.09*	0.09*	−0.02	−0.08*	−0.04*	0.02	−0.02	0.00	0.02	0.02	0.03*	−0.01	1.00				
Institutional Shareholding	0.07*	0.04*	−0.02	−0.03*	0.03*	0.02	0.08*	0.11*	0.05*	−0.06*	0.01	−0.12*	0.11*	−0.01	1.00			
Board Size	−0.04*	0.06*	−0.07*	0.02	0.08*	0.09*	−0.02	0.05*	−0.04*	−0.05*	0.07*	−0.05*	0.02	−0.59*	0.03	1.00		
Audit Big4	0.02	0.01	−0.02	0.01	0.06*	0.07*	0.04*	0.05*	−0.04*	−0.01	0.17*	0.08*	−0.00	0.01	0.01	0.01	1.00	
Is_Chairman_Family	0.03*	−0.36*	0.28*	0.18*	−0.19*	−0.14*	−0.06*	0.09*	−0.03*	0.28*	−0.05*	0.21*	−0.32*	0.03*	−0.02	−0.02	−0.02	1.00

Note: This table reports the pairwise correlations between the dependent and explanatory variables.
*shows significance at the 0.1 level.
Source: The authors.

Table 7. R&D assets.

Variables	M1 R&D	M2 R&D	M3 R&D	M4 R&D	M5 R&D	M6 R&D
Non_Family CEO	−0.00038**			−0.00062		
	(0.00023)			(0.00039)		
Family CEO & Actual Controller		0.00050**			0.00099***	
		(0.00022)			(0.00031)	
Family CEO			−0.00062*			−0.00191***
			(0.00035)			(0.00025)
With_Excess Voting Rights				−0.00002	0.00041	−0.00022
				(0.00038)	(0.00028)	(0.00025)
Non-Family CEO X With_Excess				0.00109**		
				(0.00063)		
Family CEO & Act_Controller X With Excess					−0.00088**	
					(0.00043)	
Family CEO X With Excess						0.00207***
						(0.00056)
Leverage	−0.00415***	−0.00414***	−0.00383***	−0.00403***	−0.00413***	−0.00413***
	(0.00069)	(0.00069)	(0.00125)	(0.00121)	(0.00069)	(0.00069)
No. of Board Meeting	0.00015***	0.00015***	0.00012**	0.00013**	0.00015***	0.00014***
	(0.00003)	(0.00003)	(0.00006)	(0.00005)	(0.00003)	(0.00003)
ROE	0.00169	0.00168	−0.00010	−0.00016	0.00162	0.00153
	(0.00152)	(0.00152)	(0.00276)	(0.00276)	(0.00151)	(0.00151)
CEO Power	−0.00067	−0.00073	0.00058	0.00045	−0.00091	−0.00056
	(0.00155)	(0.00154)	(0.0019)	(0.00198)	(0.00155)	(0.00156)
Family Firm	0.00001	0.00003	0.00065	0.00064	0.00003	0.00010
	(0.00024)	(0.00024)	(0.00041)	(0.00045)	(0.00025)	(0.00026)
Patent Application	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Ultimate Owner	−0.00004***	−0.00004***	−0.00006***	−0.00007***	−0.00004***	−0.00004***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.000019)	(0.00001)
Firm Age	−0.00004	−0.00004	−0.00012**	−0.00014**	−0.00004	−0.00004
	(0.00003)	(0.00003)	(0.00005)	(0.00006)	(0.00003)	(0.00003)
Ind_Director_Ratio	0.00419*	0.00422*	0.00424	0.00429	0.00403*	0.00450*
	(0.00240)	(0.00236)	(0.00293)	(0.00289)	(0.00238)	(0.00237)
Institutional_Shareholding	0.00003	0.00003	0.00006	0.00007	0.00003	0.00003
	(0.00002)	(0.00002)	(0.00004)	(0.00005)	(0.00002)	(0.00002)
Board Size	−0.00016	−0.00015	−0.00011	−0.00013	−0.00016	−0.00015
	(0.00010)	(0.00010)	(0.00013)	(0.00012)	(0.00010)	(0.00010)
Audit_Big4	0.00029	0.00033	0.00038	0.00033	0.00041	0.00052
	(0.00059)	(0.00059)	(0.00063)	(0.00063)	(0.00059)	(0.00059)
Is_Chairman_Family	−0.00071**	−0.00069**	−0.00143*	−0.00136*	−0.00065**	−0.00052*
	(0.00030)	(0.00029)	(0.00078)	(0.00072)	(0.00029)	(0.00029)
Constant	0.00419**	0.00364*	0.00522**	0.00523*	0.00342	0.00374*
	(0.00214)	(0.00211)	(0.00246)	(0.00275)	(0.00211)	(0.00211)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.149	0.139	0.125	0.126	0.141	0.141

Note: Variables definition are located in Table 8. Robust standard errors are in parenthesis.
***, **, and * indicates $P < 1\%$, 5%, and 10%.
Source: The authors.

firms. The three types of CEOs showed significant results and have different behaviours towards R&D investment. Family CEO and controller have full control rights to take the decision. In this situation, he should have the confidence to decide and agency conflicts would also be at the minimum. Table 7 also shows the regression outputs with the moderating effect of excess voting rights and without excess voting

rights. We convert our continuous variable into the dummy variable to highlight the accuracy and remove the effects of minimum and maximum voting rights. We used the moderating variable as a dummy if the firms have excess voting rights, it represents 1 and otherwise 0 if the firms have voting right equal to the cash flow rights. We explored whether the excess voting rights altered the behaviours of CEOs. With the moderating effect of excess voting rights, the non-family CEOs have positive willingness towards R&D investment, which means without excess voting rights, the non-family CEOs have less willingness to invest in R&D. Hence, H4 is accepted. Family CEOs with actual control rights change their willingness to invest in long term risky project and become less willing. Thus, H5 is also accepted. Family CEOs without actual control rights but with excess voting rights want to invest more in risky projects and thus, H6 is also accepted.

4.5. Robustness

Table 1 show the robustness of our results. We changed the R&D scale from assets to sales. The R&D investment is measured by the total R&D expenditure divided by total sales. The robust results are partially accepted based on the significance level and fully accepted based on the predicted sign.

In Table 2, we checked our results for robustness. This time we used continuous values of our moderating (Excess voting rights) variables. Based on the Hausman test, statistically, we applied a fixed effect model because all the P values in the Hausman test were less than 0.05. The Hausman tests reported the chi square and P values for Table 2 models M13, M14 and M15, chi square 108.26, P 0.0000, chi square 87.07, P 0.0000 & chi square 84.85, P 0.0000 respectively. We reran our models M4, M5 and M6, consequently our results here in Table 2 models M13, M14 and M15 are quantitatively similar showed to the results presented in Table 7.

We again reran models M1, M2, M3, M4, M5 and M6 by Tobit regression model (Table 8). We censored our dependent variable R&D investment by the upper value. The Tobit model is proposed to estimate the linear relationship among variables when either a right or left censoring occurs in the dependent variable. A similar approach was used by (Bozec & Di Vito, 2019). Table 3 presents the output of the Tobit regression model, and our results in models M16, M17, M18, M19, M20 and M21 remained quantitatively similar to M1, M2, M3, M4, M5 and M6.

4.6. Discussion

The study explains the behaviours of different types of family firms towards R&D investment. Our study is a pioneer study, in which we categorise CEOs in three types with respect the nature of ownership nature and control diversity. We also explored how ownership discrepancy (between cash flow rights and voting rights) change the willingness of CEOs towards R&D investment. Non-family CEOs within family firms (H1) exhibit negative behaviour to innovation input. The type of family firm can be categorised as those managed by a CEO who is a family member versus those managed by a CEO from outside of the family. Variables usually connected with

Table 8. Variables description.

Variables name	Descriptions
Dependent variable	
R&D Investment	This study used R&D investment as a dependent variable, which was measured by annual R&D expenditure divided by total sales at the end of the year. This measure of R&D intensity has been used by several former studies such as (Alam et al., 2019; Xiang et al., 2019).
	This study used another measure of R&D investment by calculating the ratio of R&D expenditure and total assets at the end of the year (Tyler & Caner, 2016). The other measure of R&D investment was used to verify the robustness of our results.
Independent variable	
Family CEO + Actual Controller	CEO from family and the actual controller of the family firm benefits.
Family CEO	CEO from family but not an actual controller of the family firm
Non-Family CEO	CEO not from the family with in family firms (Burkart et al., 2003).
Moderator variable	
With Excess Voting Rights	In which the family firms' controllers have Voting Rights more than the Cash Flow Rights (Adams & Ferreira, 2008).
Control variables	
Leverage	Total debt divided by to assets (Zulfiqar et al., 2020).
NOB Meetings	The total number of board meetings in a year (Juhmani, 2017).
Ind_director Ratio	Independent director ratio measured as board size scaled by the number of independent director ratio (Jiang et al., 2020).
Firm Age	Log of total assets at previous year end (Bozec & Di Vito, 2019).
CEO Power	CEO pay divided by the sum of the pay of top five senior executives (Liu et al., 2020)
Family Firms	Dummy variable equalling 1 if a firm is controlled by a family and 0 otherwise (Yun et al., 2020).
Patent Application	Patent application is measured by taking the natural logarithm of total counts of patent application (Zulfiqar et al., 2020).
Ultimate Owners	The amount of stock owned by individual investors and large-block shareholders (Blanes et al., 2020).
ROE	Net earnings divided by equity at previous year end (Jiang et al., 2020).
Board Size	Total board size of the firm in a current year (F. Jiang et al., 2020; Zulfiqar & Hussain, 2020).
Institutional Shareholding	Total proportion of voting shares held by institutional investors at the end of the current year (Zulfiqar & Hussain, 2020).
Audit Big 4	If the audited firm has financial reports from big4 audit firm then the value assigned is assigned 1, otherwise is 0 (L. Jiang et al., 2021).
Is_Chairman_Family	The Chairman of the firm is a family member or not (Jiang et al., 2020).

Source: information with the help of citations given in the table.

ownership structure refer to differences in finances, qualified staff, investment prospects, and risks. These heterogeneous attributes can prompt different export decisions and product innovation strategies, which are critical to company performance (De Massis et al., 2015; Liu et al., 2017) in addition to economics (Jain et al., 2015). Non-family CEOs might not stay for a longer period in a single-family firm which is why their willingness towards long term investment is low. Some agency issues exist and discourage non-family CEOs for long term investment. It is generally believed that external managers may weaken the family's influence in the work culture (especially in the difficult steps of internationalization), thereby weakening the cohesion of the top management team and increasing conflicts with family managers. It may also weaken the cohesion of the top management team, Increased asymmetry of information can also occur because they may have the experience that family managers lack (Gomez-Mejia et al., 2011). As such, because internationalization plans require long-term positioning, external managers may resist the long-term investment required for

internationalization, preferring short-term efficiency and profit-taking measures (Lin & Wang, 2021).

Family CEOs with full controlling rights (H2) have different behaviours than non-family CEOs because they are more willing to invest in long term risky projects. Aulakh et al. (2000) presented a structure within which export performance is related to product improvement and development, which indicates that continued research, development and innovation are essential to the competitiveness and growth of a company (Eriksson et al., 2015), and family businesses are prepared to participate in these important activities. The two main factors push family CEO with full controlling rights. First, family CEOs with full control rights stay for a long time in family firms. They might even be a founder of that firm, professional and experienced founders are good strategists (Rey-Martí et al., 2016). The second factor is that fewer agency issues arise because the actual controlling rights have only one man and he is also a family. When senior family managers seek significant social and economic wealth, it normally leads to the appointment of most family members as top managers, which can restrict the recruitment of excellent external talent (Jaskiewicz et al., 2015). Our third hypothesis is that CEOs from family firms without actual control (H3) have negative behaviour towards R&D investment. When family firms CEO do not have full control, an agency issue exists. CEOs are the supreme authority of firms, but the actual control rights have other top management. The CEO does not have full rights to utilise their abilities for research and development, leading to the behaviour of the family CEO without actual control rights to be negative.

We use the dummy moderating variable if the firm has excess voting right equal to 1 otherwise 0 if the firm has voting rights equal to cash flow rights. If the firms have non-family CEOs and do not have excess voting right, then the firm has the same attitude as H1. However, with excess voting rights, non-family CEOs (H4) change their behaviour from negative to positive. Non-family CEOs with excess voting rights have more willingness to invest in R&D. The controllers gain more confidence once firms have excess voting rights. With more controlling rights, actual controllers may give confidence to non-family CEOs to invest in long term risky projects and convince them to stay longer in the firm. Hired CEOs may believe that boosting R&D spending, entering new markets, or purchasing other businesses is a superior use of surplus cash (Mousa & Chowdhury, 2014). Therefore, some people believe the external CEO (or managing director) is not usually associated with SEW, which may also lead to an increase in the number of external directors hiring other senior administration positions alongside family members. According to Wang et al. (2019) restructuring of power among external and internal leaders has had a positive impact on business. These companies can find new and diverse sources of information and obtain resources and potential new alliance partners (Mueller, 1988). All of these efforts can encourage innovation. Therefore, specialized family businesses do not need international investments to manage their R&D strategies.

The family CEOs and actual controller (H5) of the firm with excess voting rights change their willingness towards R&D investment from positive to negative. In the absence of excess voting rights, the willingness towards R&D investment remains unchanged. It is a lower willingness. Family CEOs with actual control rights already

have full control to carry out the activities. Without excess voting rights, they need to obtain the trust of other majority and minority shareholders. They protect minority shareholders and invest in long term risky projects. Once they gain excess voting rights, their presence in the board would become more solid. They will start to protect their socio-emotional wealth and avoid to invest in long term risky project. They prefer short term earnings. For the first time in this study, we introduce the third type of CEOs in family firms (H6), that of family CEOs without actual control rights. Their behaviour towards long term risky project is positive in the presence of excess voting rights but negative in the absence of excess voting rights.

5. Conclusion

Family businesses show a high degree of heterogeneity. Our research shows that compared to companies without a family CEO, a family business with a family CEO is more willing to invest in R&D. This study extends the scope of research on family business governance by exploring the effects of family CEOs on R&D investment. We also studied the role of CEOs in strategic decision-making. We introduced three types of CEOs in Chinese family firms and obtained significant results by showing that these types of CEOs have different behaviours toward R&D investment. Family CEO and controller have full control rights to make decisions and have the confidence to decide on the time, which may keep agency conflicts at a minimum.

We have empirically tested the moderating role of voting rights and cash flow right in the relationship between R&D investment and CEO types. We determined that excess voting rights alter the behaviour of CEOs. With the moderating effect of excess voting rights, non-family CEOs have positive willingness towards R&D investment, which means without excess voting rights, non-family CEOs have less willingness to invest in R&D. This study also found supporting evidence that the advantage of information and arguments lies in longer investment periods rather than risk aversion, mainly because of the modest role of family CEO in cash flow rights and voting rights relationships. Finally, our analysis shows that non-family CEOs invest more in R&D than family firms. Compared with non-family firm investments in R&D and the increase the effectiveness of investment, for family businesses, the symbolic value is related to the growth rate. These results indicate that the family-based investment voting structure in R&D encourages professional executives of family businesses to participate in value-added R&D investments.

5.1. Limitations and future recommendations

This work has few limitations that offer future research opportunities. Firstly, this study has focused on Chinese family firms only, and it is important to discuss the cross-cultural generalizability of our proposed model. We thus did not obtain actual percentages of the CEOs ownership. We obtained data from CSMAR; however, CSMAR is a reliable database. CSMAR database obtained consolidated audited financial statements. We have added a control variable named 'audit big 4' which controls the audit quality of the financial statement. However, an audit opinion may also be

used for the control of audit quality of the data. The audit Big 4 and audit opinion type both are the measures for audit quality (Abid et al., 2018). Secondly, the CEOs can be categorized on the basis of different characteristics, whereas in the current study, family CEOs types have been considered on the basis of control diversity. The growth in the employment of scientists and engineers, and market power can be used in future to control the effect on R&D investment. The data has been collected up to 2018 due to the non-availability of data for the latest years.

Disclosure statement

No potential conflict of interest was reported by the authors.

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