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The impacts of family involvement on R&D investment intensity in firms: Evidence from China

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Abstract

Drawing on the perspective of socioemotional wealth, this paper explores the types of family involvement in family firms and their impacts on R&D investment intensity. Using data from the forecasts issued by A-share family firms listed on Chinese stock markets between 2008 and 2019, the study finds that the separation of ownership and control is negatively associated with R&D investment intensity in non-high-tech firms, whereas potential gains of socioemotional wealth from R&D activities by high-tech firms produce a positive influence that offsets the negative impact of the separation of ownership and control on R&D investments. It reveals the importance of gains of socioemotional wealth. In contrast to the separation of ownership and control, family involvement in management is negatively associated with firms' R&D investment intensity in both high-tech firms and non-high-tech firms. Our results capture the diversity of family members' identity recognition, which leads to family members' different evaluations of the potential gains and losses of socioemotional wealth. Overall, the distinction between high-tech family firms and other family firms is shown to be significant, as is the distinction between the impacts of different types of family involvement.

Keywords Socioemotional wealth · Family involvement · R&D investment intensity · High-tech firms

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Introduction

Family firms are quite common around the world, especially in Asian countries. In China, family businesses have made a significant contribution to the rapid development of the economy. Family members hold many different positions in family firms, making family involvement an important characteristic of family firms. Because of this characteristic and its consequences, such as nepotism, family firms are often seen as an outdated business style or a temporary stage of enterprise development. R&D is a key factor that has become essential for the survival and development of enterprises, including family firms. A survey on Chinese family businesses from Pricewaterhouse Coopers in 2018 reported that leaders of family firms in mainland China believe that their main challenge is securing the innovation they need to gain competitive advantages. Their concern impels us to explore the impacts of family involvement on R&D investment intensity in family firms.

Investments in R&D can affect a firm's ability to develop new products and create innovative technologies. However, there is considerable uncertainty in enterprise R&D. It is possible that investments in R&D may be fruitless if they are not used efficiently and promptly. Family involvement is an influential factor of R&D investment intensity because family owner-managers are considered to be more risk-averse than the owner-managers of nonfamily firms (Gomez-Mejia et al., 2007), inclined to extract private benefits rather than maximizing firm value (Boyd & Solarino, 2016), and restricted to the family circle without incorporation of new high-level knowledge (Camisón-Zornoza et al., 2020). Meanwhile, family firms are also presumed to have a long-term investment orientation, and scholars argue that family involvement has a positive influence on R&D intensity (Schmid et al., 2014; Zahra, 2005). This argument suggests that the impacts of family involvement vary according to the type of family involvement.

A substantial share of empirical studies focus on the differences in R&D investments between family firms and nonfamily firms, while there are limited empirical studies centred on the relationship between a concrete measurement of family involvement and R&D investment. Moreover, even fewer studies distinguish between high-tech family firms and non-high-tech family firms. According to Piva et al. (2013), high-tech industries feature high-speed environments in which knowledge plays a crucial role. Compared with traditional industries, high-tech industries are changing more quickly and are more competitive. Therefore, it is reasonable that R&D may be seen in a unique way by families involved in high-tech firms. Does family involvement in high-tech firms make any difference? If so, how? Employing a sample of 16,301 R&D investment intensity observations from Chinese A-share listed family firms between 2008 and 2019, this paper intends to explore the impacts of family involvement on R&D investment intensity and analyse the underlying reasons or motivations for it, especially with regard to the distinction between high-tech family firms and non-high-tech family firms.

This paper contributes to the literature in several ways. First, unlike the simple dichotomy between family and nonfamily firms, we study the impact of family

involvement on R&D investments from the perspective of ownership and management. Different from other dimensions of family involvement, the two dimensions we use in this study are also the most directly and centrally related to family involvement. Second, we intend to go beyond agency theory and focus on the theory of socioemotional wealth (hereafter referred to as SEW). This paper differs from prior research in that it attaches greater importance to the potential gains of SEW and enriches the literature by providing new evidences for high-tech firms and non-high-tech firms. Finally, the results also suggest that family members' evaluations of the potential SEW gains and losses associated with R&D investments are different largely due to the diversity of their identity recognition.

The rest of the paper is organized as follows. A literature review and hypotheses are offered in Sect. 2. Section 3 focuses on the empirical strategy and data. In Sect. 4, we present the empirical results and discussion. Section 5 concludes.

Hypotheses development

Findings on family business and innovation appear to be mixed. Some studies have argued that family businesses have a more long-term investment vision (Berrone et al., 2010; Le Breton-Miller & Miller, 2006). Ashwin et al. (2015) affirmed that family shareholding and family control have a positive and significant influence on firms' R&D investments in India. According to Calabrò et al. (2019), in the comparative studies of nonfamily firms and family firms published between 1961 and 2017, only approximately 33% indicate that family firms are less innovative than nonfamily firms. On the other hand, De Massis et al. (2013a) proposed that the limited professional competence of family managers is harmful to technological innovation. Classen et al. (2014), Muñoz-Bullón and Sanchez-Bueno (2011), and Yang et al. (2019) all reported some evidence indicating that family firms invest less intensively than their nonfamily counterparts. A major reason for the mixed findings may be that family firms are actually heterogeneous rather than homogeneous. Therefore, instead of the simple dichotomy of family and nonfamily firms, we study the impacts of family involvement on R&D investment intensity through concrete measurements of family involvement.

Previous studies have addressed the impacts of family involvement on enterprise performance and strategies from the perspective of agency theory (Block, 2012; Chung, 2013; Villalonga & Amit, 2006). A limitation of studies relying on the agency theory framework is that the noneconomic factors of family firms are usually underestimated (Prencipe et al., 2014). In this paper, we intend to go beyond agency theory and focus on the theory of SEW. The SEW theoretical framework is quite popular since Gomez-Mejia et al. (2007) put forward this concept to illustrate the nonfinancial benefits the family receives from the enterprise that can satisfy its emotional needs. According to SEW theory, decision-makers in family businesses will take SEW as a strategic decision-making reference point, which is very different from the practice of those in nonfamily firms. If a strategic decision will threaten the existing SEW of the family, the aversion to SEW losses will drive family decision-makers to avoid this strategy, even if such avoidance may

increase business risk (Gomez-Mejia et al., 2007; Tsao et al., 2019). Berrone et al. (2010) claimed that there is compelling evidence of SEW's importance for family-controlled organizations. Family firms are found to be less entrepreneurially oriented than nonfamily firms due to the SEW protection motives (Garcés-Galdeano et al., 2016). The importance of SEW and its variations are linked to heterogeneous strategic behaviours (Martínez-Romero et al., 2020). It is also noted that the conservative attitude towards R&D investment in family businesses is not due to the aversion to uncertainty and a high risk of R&D but to the losses of SEW caused by R&D activities (Gomez-Mejia et al., 2011).

According to Gomez-Mejia et al. (2007), the types of SEW include the ability to exercise authority, the satisfaction of needs for belonging, affect, and intimacy, the perpetuation of family values, the preservation of the family dynasty, the conservation of the family firm's social capital, the fulfilment of family obligations based on blood ties, and the opportunity to be altruistic to family members. Berrone et al. (2012) proposed that SEW should include five dimensions: family control and influence, the identification of family members with the firm, binding social ties, the emotional attachment of family members, and the renewal of family bonds to the firm through dynastic succession. These dimensions are extensively recognized (Hernández-Perlines et al., 2019). Although SEW is endowed with different structural dimensions, from the studies of Gomez-Mejia et al. (2007) and Berrone et al. (2012), the motivations behind SEW can be classified into two categories: one is to maintain the long-term management and control of the family business; the other is to implement altruistic behaviours in the family.

The theory of SEW is a theory uniquely applied to family business research based on the characteristics of family firms. Regarding the evaluation of family involvement, Astrachan et al. (2002) proposed an F-PEC scale that contains power (P), experience (E), and culture (C) dimensions. However, family involvement through experience and culture is often related to value accumulation and generational succession (Liang et al., 2013). Hence, most recent studies concerning family involvement (e.g.,Chung, 2013; Muñoz-Bullón & Sanchez-Bueno, 2011; Zahra et al., 2007) focus mainly on family ownership and management. In this paper, we concentrate on R&D in family firms and distinguish the impacts of family involvement on R&D investment intensity. Accordingly, we also limit the measurements of family involvement in terms of management and control.

Family ownership has been used in empirical studies as a proxy for SEW (e.g., Berrone et al., 2010; Gomez-Mejia et al., 2011). In addition to the simple dichotomy of family and nonfamily firms, it is reasonable to presume that a greater concentration of firm ownership in family hands will increase SEW. However, family ownership is complicated by a pyramidal ownership structure. The pyramidal ownership structure has been noted as a common phenomenon in family business studies (Cai et al., 2012; Claessens et al., 2000; Shleifer & Vishny, 1997), characterized by the separation of ownership and control. The voting rights of large family shareholders generally exceed the cash flow rights. Therefore, given small family ownership, there is probably an unexpectedly large ultimate control right. Luo et al. (2019) reported that the properties of the family ownership structure, particularly a pyramidal ownership structure, are important for family firms' R&D decisions. Simply considering

family ownership using the percentage of shares owned by the family may be questionable. Accordingly, this paper focuses on the separation of ownership and control.

In contrast to Luo et al.'s (2019) view that the separation of ownership and control may relieve controllers' concerns about avoiding SEW losses due to the failure of R&D activities, we feel that the separation of ownership and control will have negative impacts on the R&D investments of family firms. Since the separation of ownership and control helps the controllers maintain and strengthen their control of the family firms, it is consistent with the pursuit of SEW, especially given the first motivation behind SEW mentioned above, namely, to maintain the long-term management and control of the family business. Hence, it is conceivable that the separation of ownership and control in family firms may suggest a high importance of SEW. Aversion to SEW losses may grow with the extent of the separation of ownership and control. Regarding the second motivation for pursuing SEW mentioned above, although the separation of ownership and control is often related to agency problems caused by the conflicting financial interests of large and small shareholders, we cannot deny that obtaining private financial benefits at the expense of minority shareholders and sharing them with other family members can be seen as altruistic, which represents potential SEW gains in the short term. In summary, because of the greater importance of SEW and potential SEW gains in the short term, the controller of the family firm may be reluctant to increase R&D investments. Thus, we propose the following hypothesis:

Hypothesis 1 The separation of ownership and control is negatively associated with R&D investment intensity in family firms.

Families can exert additional control beyond their ownership stake by placing their members in important positions. Moreover, the more family members are involved in the firm, the more emotionally attached the controller tends to be. The proportions of family members among board members or executives reflect the controller's innate desire to maintain long-term management and control. They are also consistent with the controller's willingness to be altruistic to family members. From the pre-employment perspective, it seems unlikely that an indifferent controller will have other family members in the firm. From the post-employment perspective, because of the involvement of family members in the firm, the controller will engage more in preserving family loyalties, reciprocity, and altruism (Ahlstrom et al., 2004; Luo et al., 2019). Hence, the family member ratio can be seen as a proxy variable for SEW. Since a higher ratio of family members often appears along with greater importance attached to SEW, we propose the following hypothesis:

Hypothesis 2 The proportions of family members among board members or senior executives are negatively associated with R&D investment intensity in family firms.

Furthermore, we intend to pay more attention to high-tech family firms, in which the consequences of R&D underinvestment are more severe than those in other family firms. Although R&D investment represents a risk due to its uncertain payoffs,

the risk of investing in innovation is sometimes lower than the risk of not doing so, especially in high-tech firms (Gomez-Mejia et al., 2011). Gomez-Mejia et al. (2011) claimed that among technology-intensive firms, family control is associated with lower R&D expenditures as a percentage of sales because more R&D investments may diminish SEW. The reasons for this may be that R&D forces the family to draw on expertise from outside the family circle and that high-tech firms usually finance R&D by ceding some ownership to parties outside the firm, among others. This kind of SEW loss aversion increases the risk of the firm. Using S&P 500 data for R&D-intensive firms, Block (2012) reported that family ownership decreases the level of R&D intensity. Gomez-Mejia et al. (2014) added a study on the potential gains of SEW to the literature in addition to concerns about SEW losses. However, most studies using SEW theory have focused on the preservation of SEW and emphasized the incompatibility between family goals and enterprise goals. Few empirical studies have considered the potential gains of SEW (Llanos-Contreras et al., 2021). This paper attaches greater importance to the study of potential gains of SEW and highlights the trade-off between SEW losses and gains. Since R&D underinvestment in high-tech family firms leads to a survival crisis in firms that contradicts the motivations behind SEW mentioned above, we propose the following hypothesis:

Hypothesis 3 The potential gains of SEW provided by R&D investments in high-tech firms tend to be more significant than those in non-high-tech firms.

Empirical strategy and data

To investigate family involvement and other factors that affect R&D investment intensity, this paper estimates various forms of the model below:

$$y_{it} = \alpha_0 + \alpha_1 Familyinvolvement_{it} + \beta Controls_{it} + \varepsilon_{it} \quad (1)$$

where i indexes the firm and t indexes the year. $Familyinvolvement_{it}$ refers to two main forms of family involvement, namely, the separation of ownership and control, which deals with family ownership, and the ratio of family members to board members and senior executives, which deals with family management. For the separation of ownership and control, we traced each firm's control chains disclosed in annual reports. Family ownership is calculated as the sum of the products of all equity stakes along the control chains. Meanwhile, family control is calculated as the sum of the minimal equity stake along the control chains (Claessens et al., 2000; La Porta et al., 1999). $Controls_{it}$ refers to a control variable vector that includes firm-level characteristics and year, region, and industry fixed effects. For region fixed effects, we use dummy variables for each region, including Northeast China, North China, Northwest China, East China, Central China, Southwest China, and South China. Definitions of the main variables are shown in Table 1.

The paper uses data from the forecasts issued by A-share family firms listed on Chinese stock markets between 2008 and 2019. The forecast data are obtained from the CSMAR database (China Stock Market & Accounting Research Database). Additionally, we distinguish high-tech family firms from other family firms.

Table 1 Variable definitions

	Variable names	Variable definitions
Dependent variable	y	(R&D expenditure + R&D input)/operating revenue*100
Independent variables	separationdummy	The value of this dummy variable is 1 if the ultimate controller's cash flow rights are not equal to his/her voting rights, and 0 otherwise
	separationtate_d	This variable is measured by the ultimate controller's voting rights share divided by his/her cash flow rights share
	separationtate_m	This variable is measured by the ultimate controller's voting rights share subtracted by his/her cash flow rights share
	famdirnumratio	This variable is measured by number of family members on the board divided by number of all directors on the board
	famexecnumratio	This variable is measured by number of executive family members divided by number of all executives
	famdirexecratio	This variable is measured by number of family members on the board or in executive roles divided by number of people on the board or in executive roles
Control variables	revgrowthrate	This variable stands for the revenue growth rate, referring to the amount of revenue increase for the year divided by the operating revenue for the same period of last year
	firmage	(Data collection date—firm establishment date)/365
	firmsize	This variable is measured by the natural logarithm of the firm's total assets
	lev	This variable is measured by the family firm's total liabilities divided by its total assets

We delete samples that show abnormal ownership and control data, namely, when cash flow rights appear to be greater than voting rights. We delete samples with special treatment with an ST mark in the database. Samples in finance or insurance industries are also deleted. All the continuous variables are winsorized at 1%. The descriptive statistics for the main variables are shown in Table 2. To increase clarity, we insert a dummy variable *high-tech* into Table 2 that is equal to 1 if a firm is in a high-tech industry.

Empirical results and analysis

Multivariate regression results

This subsection presents the results of the regressions. All the regressions use robust standard errors to eliminate heteroskedasticity. In addition, all the regressions are estimated using Stata 15. First, we use OLS regressions to explore the impacts of the separation of ownership and control on R&D investment intensity. Table 3 shows the regressions based on the total sample. In Table 4, we distinguish between high-tech firms and other firms. Second, we use OLS regressions to explore the impacts of the proportions of family members among board members or executives on R&D investment intensity. Table 5 shows regressions based on the total sample. We distinguish between high-tech firms and other firms in Table 6.

From the results in Table 3, we can see that the separation of ownership and control is negatively associated with R&D investment intensity in family firms, which supports Hypothesis 1. The year, region, and industry fixed effects are all controlled. In columns (2), (4), and (6), we also control for the effects of the revenue growth rate, firm age, firm size, and asset-liability ratio. In Table 3, columns (2), (4), and (6), the effects of *separationdummy*, *separationrate_d,* and *separationrate_m* are weaker than those presented in columns (1), (3), and (5). However, the coefficients on the above three variables are all negative and statistically significant at the 1% significance level. Based on the regressions on three

Table 2 Descriptive statistics

Variable	Obs	Mean	Std.Dev	Min	Max
y	16301	4.529	5.596	0	33.040
separationtate_d	16147	1.288	0.599	1	4.556
separationtate_m	16147	5.052	7.486	0	29.177
separationdummy	16154	0.514	0.500	0	1
famdirnumratio	9903	0.226	0.116	0	0.750
famexecnumratio	9901	0.168	0.158	0	1
famdirexecratio	9902	0.199	0.113	0	0.530
revgrowthrate	14425	0.226	0.498	-0.607	3.324
firmage	16301	15.526	5.904	1.010	61.710
firmsize	16301	21.605	1.090	15.58	26.860
lev	16301	0.371	0.199	0.042	0.859
high-tech	16301	0.376	0.484	0	1

Table 3 Impacts of the separation of ownership and control on firm R&D investment intensity

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	y	y	y	y	y	y
separationdummy	-0.6067***	-0.3353***				
	(0.0777)	(0.0838)				
separationrate_d			-0.4927***	-0.2111***		
			(0.0576)	(0.0613)		
separationrate_m					-0.0354***	-0.0177***
					(0.0042)	(0.0046)
revgrowthrate		-0.4783***		-0.4841***		-0.4790***
		(0.0814)		(0.0816)		(0.0816)
firmage		-0.0844***		-0.0835***		-0.0854***
		(0.0077)		(0.0079)		(0.0077)
firmsize		-0.1133***		-0.1213***		-0.1122***
		(0.0417)		(0.0417)		(0.0423)
lev		-5.1403***		-5.1556***		-5.1724***
		(0.2436)		(0.2433)		(0.2440)
Constant	-0.8847***	4.7274***	-0.4106	5.0402***	-0.9921***	4.6486***
	(0.3331)	(0.9000)	(0.3496)	(0.8928)	(0.3304)	(0.9114)
Year	Control	Control	Control	Control	Control	Control
Region	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control
Observations	16154	14290	16147	14285	16147	14285
R-squared	0.273	0.315	0.273	0.315	0.272	0.315

Robust standard errors in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$

measurements of the separation of ownership and control, we can safely conclude that our results are robust. The reason for the results may be that the separation of ownership and control is intentionally formed to strengthen family control, with greater importance attached to SEW. Meanwhile, once the pyramidal structure exists, regardless of its cause or goal (e.g., to maintain family control or to enlarge the scale of enterprise debt financing), the ultimate controller may be induced to have short-term interests instead of caring about the long-term development of the enterprise to which R&D is often related, which accords with researchers' concerns about the agency conflict between the controlling and minority shareholders (La Porta et al., 1999). Potential SEW gains in the short term negatively impact R&D investments.

Table 4 reports the impacts of the separation of ownership and control on high-tech firms' and other firms' R&D investment intensity. The results show that the separation of ownership and control does not have any significant influence on R&D investments in high-tech firms, while the coefficients on *separationdummy*, *separationrate_d,* and *separationrate_m* remain negative and statistically significant at the 1% significance level for other firms. The results suggest that high-tech family firms are less vulnerable to the separation of ownership and control. The

Table 4 Impacts of the separation of ownership and control on high-tech firms' and other firms' R&D investment intensity

VARIABLES	(1) y	(2) y	(3) y	(4) y	(5) y	(6) y	(7) y	(8) y	(9) y
	Total sample			High-tech firm sample			Non-high-tech firm sample		
separationdummy	-0.3353***			0.0042			-0.4464***		
	(0.0838)			(0.1421)			(0.1007)		
separationrate_d		-0.2111***			-0.0445			-0.1906***	
		(0.0613)			(0.1100)			(0.0732)	
separationrate_m			-0.0177***			-0.0037			-0.0195***
			(0.0046)			(0.0081)			(0.0055)
revgrowthrate	-0.4783***	-0.4841***	-0.4790***	-0.7608***	-0.7632***	-0.7617***	-0.3702***	-0.3703***	-0.3680***
	(0.0814)	(0.0816)	(0.0816)	(0.1665)	(0.1667)	(0.1666)	(0.0920)	(0.0922)	(0.0922)
firmage	-0.0844***	-0.0835***	-0.0854***	-0.0834***	-0.0826***	-0.0828***	-0.0727***	-0.0733***	-0.0750***
	(0.0077)	(0.0079)	(0.0077)	(0.0129)	(0.0132)	(0.0130)	(0.0094)	(0.0098)	(0.0094)
firmsize	-0.1133***	-0.1213***	-0.1122***	-0.2275***	-0.2239***	-0.2227***	-0.1226***	-0.1337***	-0.1203**
	(0.0417)	(0.0417)	(0.0423)	(0.0831)	(0.0824)	(0.0828)	(0.0473)	(0.0475)	(0.0485)
lev	-5.1403***	-5.1556***	-5.1724***	-6.7122***	-6.7053***	-6.7110***	-3.7305***	-3.7646***	-3.7680***
	(0.2436)	(0.2433)	(0.2440)	(0.4417)	(0.4410)	(0.4427)	(0.2868)	(0.2866)	(0.2872)
Constant	4.7274***	5.0402***	4.6486***	8.2299***	8.2263***	8.1691***	4.5328***	4.8208***	4.3746***
	(0.9000)	(0.8928)	(0.9114)	(1.8331)	(1.7986)	(1.8226)	(1.0227)	(1.0184)	(1.0423)
Year	Control	Control	Control	Control	Control	Control	Control	Control	Control
Region	Control	Control	Control	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control	Control	Control	Control
Observations	14290	14285	14285	5978	5977	5977	8312	8308	8308
R-squared	0.315	0.315	0.315	0.285	0.285	0.285	0.315	0.314	0.314

Robust standard errors in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$

Table 5 Impacts of family member ratios on firm R&D investment intensity

VARIABLES	(1) y	(2) y	(3) y
famdirnumratio	-1.4856***		
	(0.4127)		
famexecnumratio		-0.9143***	
		(0.3055)	
famdirexecratio			-1.9466***
			(0.4389)
revgrowthrate	-0.4509***	-0.4421***	-0.4472***
	(0.0890)	(0.0889)	(0.0890)
firmage	-0.1046***	-0.1037***	-0.1051***
	(0.0087)	(0.0088)	(0.0088)
firmsize	-0.1860***	-0.1901***	-0.1992***
	(0.0514)	(0.0519)	(0.0517)
lev	-5.0820***	-5.0742***	-5.1215***
	(0.3119)	(0.3113)	(0.3128)
Constant	5.9893***	5.9041***	6.3288***
	(1.0878)	(1.1006)	(1.0996)
Year	Control	Control	Control
Region	Control	Control	Control
Industry	Control	Control	Control
Observations	8641	8640	8641
R-squared	0.300	0.300	0.301

Robust standard errors in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$

reason for this may be that high-tech industries are changing much more quickly and are more competitive. Hence, innovation is more pressing for high-tech firms than for firms in traditional industries. Potential SEW gains from R&D activities in high-tech firms produce a positive and significant influence that offsets the negative impact of the separation of ownership and control on R&D investments. Hypothesis 3 is supported. After all, if the enterprise cannot survive, preserving SEW is impossible for the controlling family.

According to Table 5, the proportions of family members among board members or executives are negatively associated with R&D investment intensity in family firms, while the effects of the revenue growth rate, firm age, firm size, and asset-liability ratio are controlled. Moreover, the proportion of family members among all the board members and senior executives is also negatively associated with R&D investment intensity. The results support Hypothesis 2. The coefficients on *famdirnumratio, famexecnumratio,* and *famdirexecratio* are all negative and statistically significant at the 1% significance level. It is reasonable that a higher ratio of family members involved in the firm makes SEW more important for the firm's decision-making. The probability of conflicts between SEW losses and R&D investments increases. Therefore, involving more family members on the board or among executives tends to decrease R&D investment intensity.

Table 6 Impacts of family member ratios on high-tech firms' and other firms' R&D investment intensity

VARIABLES	(1) y	(2) y	(3) y	(4) y	(5) y	(6) y	(7) y	(8) y	(9) y
	Total sample			High-tech firm sample			Non-high-tech firm sample		
famdirnumratio	-1.4856***			-1.9849***			-0.9685**		
	(0.4127)			(0.7101)			(0.4796)		
famexecnumratio		-0.9143***			-1.0553**			-0.9287**	
		(0.3055)			(0.4878)			(0.3839)	
famdirexecratio			-1.9466***			-2.3980***			-1.5661***
			(0.4389)			(0.7415)			(0.5212)
revgrowthrate	-0.4509***	-0.4421***	-0.4472***	-0.6254***	-0.6138***	-0.6177***	-0.3684***	-0.3626***	-0.3672***
	(0.0890)	(0.0889)	(0.0890)	(0.1901)	(0.1899)	(0.1902)	(0.0956)	(0.0954)	(0.0955)
firmage	-0.1046***	-0.1037***	-0.1051***	-0.1007***	-0.0991***	-0.1004***	-0.0972***	-0.0976***	-0.0985***
	(0.0087)	(0.0088)	(0.0088)	(0.0145)	(0.0145)	(0.0145)	(0.0108)	(0.0109)	(0.0109)
firmsize	-0.1860***	-0.1901***	-0.1992***	-0.2422***	-0.2411***	-0.2630***	-0.1907***	-0.1977***	-0.1995***
	(0.0514)	(0.0519)	(0.0517)	(0.0910)	(0.0915)	(0.0915)	(0.0623)	(0.0629)	(0.0625)
lev	-5.0820***	-5.0742***	-5.1215***	-6.7010***	-6.7105***	-6.7527***	-3.5821***	-3.5894***	-3.6231***
	(0.3119)	(0.3113)	(0.3128)	(0.5373)	(0.5389)	(0.5400)	(0.3781)	(0.3768)	(0.3788)
Constant	5.9893***	5.9041***	6.3288***	8.9410***	8.7063***	9.3604***	5.2373***	5.3275***	5.5386***
	(1.0878)	(1.1006)	(1.0996)	(1.9801)	(1.9904)	(1.9990)	(1.2959)	(1.3165)	(1.3111)
Year	Control	Control	Control	Control	Control	Control	Control	Control	Control
Region	Control	Control	Control	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control	Control	Control	Control
Observations	8641	8640	8641	3665	3665	3665	4976	4975	4976
R-squared	0.300	0.300	0.301	0.283	0.283	0.284	0.298	0.298	0.299

Robust standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

The regressions in Table 6 differentiate high-tech firms from other family firms. In Table 6, the results show that the coefficients on *famdirnumratio, famexecnumratio,* and *famdirexecratio* are negative and statistically significant at the 1% or 5% significance level for both high-tech firms and other firms. It is also noteworthy that the impacts of the family member ratios are larger in high-tech firms than in other family firms, especially when we look at the coefficients on *famdirnumratio.* In contrast to the influence of the separation of ownership and control, potential SEW gains from R&D investments in high-tech firms can hardly offset the negative impact of the family member ratios. The reason for this may be that the separation of ownership and control mainly affects the decision-making of the controllers who are inclined to recognize themselves more as entrepreneurs, in contrast to family members on the board or among executives who probably identify themselves more as family stewards and tend to implement strategies that can be much more conservative. The evaluation and balancing of potential SEW gains and losses are different for members of the controlling family. Heterogeneity appears not only among family firms with specific types of family involvement but also among family members in different positions.

Table 7 Impacts of pyramidal structure on high-tech firms' and other firms' R&D investment intensity

VARIABLES	(1) y	(2) y	(3) y
	Total sample	High-tech firm sample	Non-high-tech firm sample
pyrastrudummy	-0.3486***	-0.0475	-0.4344***
	(0.0833)	(0.1415)	(0.1000)
revgrowthrate	-0.4753***	-0.7515***	-0.3715***
	(0.0802)	(0.1661)	(0.0903)
firmage	-0.0832***	-0.0832***	-0.0713***
	(0.0076)	(0.0129)	(0.0093)
firmsize	-0.1141***	-0.2182***	-0.1246***
	(0.0413)	(0.0826)	(0.0468)
lev	-5.0863***	-6.6656***	-3.6932***
	(0.2415)	(0.4391)	(0.2838)
Constant	4.7320***	8.1545***	4.5324***
	(0.8895)	(1.8209)	(1.0095)
Year	Control	Control	Control
Region	Control	Control	Control
Industry	Control	Control	Control
Observations	14413	6011	8402
R-squared	0.317	0.285	0.317

Robust standard errors in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$

Table 8 Impacts of the number of the controller's children in the enterprise on high-tech firms' and other firms' R&D investment intensity

VARIABLES	(1) y	(2) y	(3) y
	Total sample	High-tech firm sample	Non-high-tech firm sample
childrennum	-0.2681***	-0.2803***	-0.2296***
	(0.0281)	(0.0470)	(0.0335)
revgrowthrate	-0.4762***	-0.6836***	-0.3796***
	(0.0888)	(0.1935)	(0.0943)
firmage	-0.0978***	-0.0942***	-0.0917***
	(0.0087)	(0.0146)	(0.0108)
firmsize	-0.1520***	-0.1785*	-0.1714***
	(0.0512)	(0.0912)	(0.0618)
lev	-5.1101***	-6.7494***	-3.6251***
	(0.3092)	(0.5399)	(0.3725)
Constant	5.3123***	7.6573***	4.9199***
	(1.0756)	(1.9558)	(1.2847)
Year	Control	Control	Control
Region	Control	Control	Control
Industry	Control	Control	Control
Observations	8640	3663	4977
R-squared	0.304	0.287	0.301

Robust standard errors in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$

Robustness tests

We use multiple ways to measure the separation of ownership and control and the family member ratio. The results remain robust. Meanwhile, our regressions use robust standard errors to correct for heteroscedasticity. The regressions also control for the time, region, and industry to eliminate the measurement error caused by unobservable fixed effects. The continuous variables are winsorized at 1% in the data processing to eliminate the influence of outliers.

In this subsection, we carry out further robustness tests. First, we use the existence of a pyramidal structure as an alternative measurement of the separation of ownership and control, since a pyramidal structure is characterized by this separation. The value of *pyrastrudummy* is 1 if a pyramidal ownership structure appears in the firm's control chain and 0 otherwise. The results are shown in Table 7. A pyramidal structure does not have any significant influence on the R&D investments of high-tech firms, while the coefficient on *pyrastrudummy* is negative and statistically significant for other firms. These results align with our main estimations.

Second, we conduct an analysis with a substitute variable *childrennum* referring to the number of the controller's children participating in the enterprise. For a family firm, the controller's children are important family members. De Massis et al. (2013b) claimed that incumbents' attitude towards intrafamily succession

of leadership is positively related to the number of children the incumbents have. The intrafamily succession intention aligns with the first motivation behind SEW mentioned above, namely, to maintain the long-term management and control of the family business. Thus, the controller having a higher number of children may strengthen the pursuit of SEW and aversion to SEW losses. As seen in Table 8, the coefficients on *childrennum* are negative and statistically significant. The level of future family involvement is also negatively associated with R&D investment intensity, confirming the robustness of our results.

Conclusions

Past findings on the impacts of family involvement have shown mixed results, commonly under the assumption of family firm homogeneity and the framework of agency theory. To further clarify this line of research, this paper draws on the SEW perspective, especially with regard to SEW gains, to which few empirical studies have paid attention in comparison with SEW losses. Focused on the relationship between family involvement and R&D investment intensity, we find that the separation of ownership and control as well as the proportions of family members among board members or executives are all negatively associated with R&D investment intensity in family firms. Based on data on family listed firms from China, the empirical findings provide solid support for our propositions. Overall, a higher level of family involvement often implies that the firm attaches greater importance to SEW or greater family control of the firm that can induce the ultimate controller to obtain short-term SEW gains, which is unfavourable for R&D investments.

Furthermore, it is noteworthy that the separation of ownership and control does not have any significant influence on R&D investments in high-tech family firms, in contrast to its negative impact on R&D investments in non-high-tech family firms. This result highlights the function of potential SEW gains provided by R&D investments, which tends to be more significant in high-tech firms considering the survival and development of these firms. Additionally, compared with the influence of the separation of ownership and control, we find that potential SEW gains from R&D activities in high-tech firms can hardly offset the negative impact of the proportions of family members among board members or executives. This result indicates the diversity of family members' identity recognition and the consequent diversity of family members' evaluation and balancing of potential SEW gains and losses. The results provided in this paper have shown that the distinction between high-tech firms and other firms is significant, as is the distinction between the impacts of the separation of ownership and control and the proportions of family members among board members or executives.

There are several policy implications. First, the impacts of family involvement on R&D investments largely depend on the trade-offs between SEW losses and gains, which can be very different according to various industries. To encourage R&D investments, it may be helpful for the government to increase potential SEW gains provided by R&D investments while taking the characteristics of different industries

into consideration. Second, both government and family firms need to be aware that members of the controlling family have diverse evaluations of SEW losses and gains. In addition to the concern for the controllers, giving proper guidance to other family members is also important.

As an indication for future research, it may be helpful to pay more attention to the study of SEW gains and the diversity of family members' evaluation and balancing of potential SEW gains and losses. Moreover, this paper is focused mainly on impacts of existing family involvement and pays less attention to the causes of different types of family involvement. Thus, researchers can also continue to build further understanding of the causes of different types of family involvement and study both the causes and later impacts to obtain a dynamic perspective on SEW.

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Declarations

Conflict of interest No potential conflict of interest were reported by the authors.

References

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*, 263–285.

Ashwin, A. S., Krishnan, R. T., & George, R. (2015). Family firms in India: Family involvement, innovation and agency and stewardship behaviors. *Asia Pacific Journal of Management, 32*(4), 869–900.

Astrachan, J. H., Klein, S. B., & Smyrnios, K. X. (2002). The F-PEC scale of family influence: A proposal for solving the family business definition problem. *Family Business Review, 15*(1), 45–58.

Berrone, P., Cruz, C., Gomez-Mejia, L. R., & Larraza-Kintana, M. (2010). Socioemotional wealth and corporate responses to institutional pressures: Do family-controlled firms pollute less? *Administrative Science Quarterly, 55*, 82–113.

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.

Block, J. H. (2012). R&D investments in family and founder firms: An agency perspective. *Journal of Business Venturing, 27*, 248–265.

Boyd, B. K., & Solarino, A. M. (2016). Ownership of corporations: A review, synthesis, and research agenda. *Journal of Management, 42*(5), 1282–1314.

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.

Calabrò, A., Vecchiarini, M., Gast, J., Campopiano, G., De Massis, A., & Kraus, S. (2019). Innovation in family firms: A systematic literature review and guidance for future research. *International Journal of Management Reviews, 21*(3), 317–355.

Camisón-Zornoza, C., Forés-Julián, B., Puig-Denia, A., & Camisón-Haba, S. (2020). Effects of ownership structure and corporate and family governance on dynamic capabilities in family firms. *International Entrepreneurship and Management Journal, 16*, 1393–1426.

Chung, H. (2013). The role of family management and family ownership in diversification: The case of family business groups. *Asia Pacific Journal of Management, 30*, 871–891.

Classen, N., Carree, M., Van Gils, A., & Peters, B. (2014). Innovation in family and non-family SMEs: An exploratory analysis. *Small Business Economics, 42*(3), 595–609.

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.

De Massis, A., Frattini, F., & Lichtenthaler, U. (2013a). Research on technological innovation in family firms: Present debates and future directions. *Family Business Review, 26*(1), 10–31.

De Massis, A., Sieger, P., Chua, J. H., & Vismara, S. (2013b). Family firm incumbent's attitude toward intra-family succession: Antecedents and effects on intentions. *Academy of Management Annual Meeting Proceedings, 1*, 1097–1102.

Garcés-Galdeano, L., Larraza-Kintana, M., García-Olaverri, C., & Makri, M. (2016). Entrepreneurial orientation in family firms: The moderating role of technological intensity and performance. *International Entrepreneurship and Management Journal, 12*, 27–45.

Gomez-Mejia, L. R., Campbell, J. T., Martin, G., Hoskisson, R. E., Makri, M., & Sirmon, D. (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.

Gomez-Mejia, 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.

Hernández-Perlines, F., Moreno-García, J., & Yáñez-Araque, B. (2019). The influence of socioemotional wealth in the entrepreneurial orientation of family businesses. *International Entrepreneurship and Management Journal, 15*, 523–544.

La Porta, R., Lopez-De-Silanes, F., & Shleifer, A. (1999). Corporate ownership around the world. *The Journal of Finance, 54*, 471–517.

Le Breton-Miller, I., & Miller, D. (2006). Why do some family businesses out-compete? Governance, long-term orientations, and sustainable capability. *Entrepreneurship: Theory and Practice*, *30*(6), 731–746.

Liang, Q., Li, X., Yang, X., Lin, D., & Zheng, D. (2013). How does family involvement affect innovation in China? *Asia Pacific Journal of Management, 30*(3), 677–695.

Llanos-Contreras, O., Arias, J., & Maquieira, C. (2021). Risk taking behavior in Chilean listed family firms: A socioemotional wealth approach. *International Entrepreneurship and Management Journal, 17*, 165–184.

Luo, J., Li, X., Wang, L. C., & Liu, Y. (2019). Owner type, pyramidal structure and R&D Investment in China's family firms. *Asia Pacific Journal of Management*. https://doi.org/10.1007/s10490-019-09702-z

Martínez-Romero, M. J., Rojo-Ramírez, A. A., & Casado-Belmonte, M. (2020). Value creation in privately held family businesses: The moderating role of socioemotional wealth. *Canadian Journal of Administrative Sciences, 37*(3), 283–299.

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.

Piva, E., Rossi-Lamastra, C., & De Massis, A. (2013). Family firms and internationalization: An exploratory study on high-tech entrepreneurial ventures. *Journal of International Entrepreneurship, 11*(2), 108–129.

Prencipe, A., Bar-Yosef, S., & Dekker, H. C. (2014). Accounting research in family firms: Theoretical and empirical challenges. *European Accounting Review, 23*(3), 361–385.

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.

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

Tsao, S., Chang, Y., & Koh, K. (2019). Founding family ownership and myopic R&D investment behavior. *Journal of Accounting, Auditing & Finance, 34*(3), 361–384.

Villalonga, B., & Amit, R. (2006). How do family ownership, control and management affect firm value? *Journal of Financial Economics, 80*, 385–417.

Yang, J., Ma, J., Zhao, H., Cater, J., & Arnold, M. (2019). Family involvement, environmental turbulence, and R&D investment: Evidence from listed Chinese SMEs. *Small Business Economics, 53*, 1017–1032.

Zahra, S. A. (2005). Entrepreneurial risk taking in family firms. *Family Business Review, 18*(1), 23–40.

Zahra, S. A., Neubaum, D. O., & Larrañeta, B. (2007). Knowledge sharing and technological capabilities: The moderating role of family involvement. *Journal of Business Research, 60*(10), 1070–1079.