International Journal of Business, Economics and Management
2019 Vol. 6, No. 5, pp. 289-302
ISSN(e): 2312-0916
ISSN(p): 2312-5772
DOI: 10.18488/journal.62.2019.65.289.302

FAMILY LEADERSHIP AND SMALL TO MEDIUM SIZED ENTERPRISES' RESEARCH AND DEVELOPMENT INVESTMENTS

Zhichuan Li

School of Economics and Finance, Shanghai International Studies University, Shanghai, P. R. China.
Email: zhichuan.li@shisu.edu.cn Tel: +86 13677635162

Article History
Received: 9 May 2019
Revised: 14 June 2019
Accepted: 23 July 2019
Published: 13 September 2019

Keywords
Family leadership
SMEs
Innovation
R&D intensity.

JEL Classification:
C31; L25; L26; O32; L11.

ABSTRACT

Family businesses are the most widespread and ancient of all economic entities, and the vast majority of small to medium-sized enterprises (SMEs) in every country re family owned. In consequence, their innovation and productivity are critical to economic growth. However, current academic research tends to focus on large, high-profile corporations, with few studies of SMEs. Further, the relationship between family leadership and SMEs' innovation capability has been likewise neglected. This study aims to investigate the effects of family leadership on an enterprise's investment in innovation within the context of small firms based on the European Firms in a Global Economy (EFIGE) survey data and relavent literature. By utilizing the ordinary least squares (OLS) model with several robust checks, the empirical results indicate that innovation investment behavior is more complex and multifaceted with respect to family leadership and firm size. On the one hand, family Chief Executive Officers (CEOs) generally exhibit a greater performance in innovation than non-family CEOs. On the other, family leaders in small firms do conduct less innovation investment.

Contribution/Originality: This study contributes to the existing literature mainly in two aspects. First, our work theorizes as to why family leaders are either conducive or obstructive of innovation investment. Second, we utilize a unique survey dataset to investigate empirically the nexus between family CEOs and firms' research and development (R&D) activities, especially for small firms.

1. INTRODUCTION

The productivity and innovation of small businesses are linked intrinsically to a country's capacity for economic growth. Additionally, the distribution of firm size is positively skewed (the tail on the right side is longer and thinner than it on the left), which indicates that a large group of SMEs is combined with a modicum of large and very large companies (Bottazzi and Secchi, 2003). Furthermore, a large proportion of them are established, owned or managed either by the founders or the family members (Miller *et al.*, 2003). Hence, innovation activities conducted by family firms[1] have increasingly become a topic of interest both in management and economics research. A series of studies have attempted to demonstrate the distinction between the innovation processes of family versus non-family firms (De Massis *et al.*, 2013). However, much attention has been focused on those large,

[1]A family firm is defined by a family's involvement in ownership and governance (leadership) and a vision for how the firm will benefit the family, potentially over generations Bennedsen, Gonzalez and Wolfenzon, (2010).

listed family firms over a long time-frames (Chen and Hsu, 2009; Munari *et al*., 2010; Block, 2012; Chrisman and Patel, 2012) such as *Fortune 500 and S&P 500*. Empirical studies on how family leadership affects innovative performance in the context of SMEs remain scarce, possibly due to the Pareto principle (20 percent of large firms conduct the 80 percent of innovation activities) or the availability and reliability of systematic data on family SMEs. But given that there is a preponderance of family SMEs in many industrial sectors, their contributions, positive or otherwise) to innovation and development should not be understated. Nor should influence of family CEOs on strategic decision-making be overlooked.

On top of that, although innovative activities are crucial for firms to sustain competitive advantages and development, innovative endeavors also involve more risks due to irrecoverable expenses and uncertain returns (Shi, 2003). In order to get more insights into the impacts of family leadership on innovation, researchers have utilized an array of theories such as "agency" (Schulze *et al*., 2001; Schulze *et al*., 2003) "stewardship" (Miller *et al*., 2008) "socioemotional wealth" (Gomez-Mejia *et al*., 2011) and the resource-based view of the firm (Habbershon and Williams, 1999; Sirmon and Hitt, 2003). In addition, numerous preceding studies regarding family leadership/management involved in innovation activities mainly concentrate on product innovation, R&D investments or R&D intensity, while few of them shed light on process innovation. Meanwhile, emerging empirical results regarding product innovation or R&D intensity are also mixed and unconvincing for various reasons. Some authors contend that family-CEOs are disposed towards innovation (e.g. Naldi *et al*. (2007)) while others contend that family leadership is detrimental to innovation (Chen and Hsu, 2009; Munari *et al*., 2010).

Inspired by the ubiquity of family SMEs, the significance of innovation activities and the ambiguous relationship between family leadership and innovation, this article attempts to examine the impact of family leadership on firms' innovation, measured by R&D investment intensity, and employing EFIGE data[2]. Part two of the article presents a brief retrospect of prior theoretical and empirical research on family firms' innovation (mainly focusing on the empirical part). Part three includes a description of the data and the empirical approach. The results of the empirical analysis are shown in part four, with discussion and the conclusion in part five.

2. LITERATURE REVIEW

As indicated, there are competing arguments about the impact of family leadership on firms' innovation. Hence, the theoretical background is reviewed from both perspectives, favorable and adverse.

2.1. Arguments Supporting the Positive Relations

2.1.1. Intimacy and Familiarity

Family-CEOs usually are either the founders of the enterprise or their progeny who have undertaken a lengthy apprenticeship. Their tenure with the business may last for decades. They are often regarded as dedicated to the business, trustworthy, and caring of employees, customers, and other stakeholders (Gómez-Mejía *et al*., 2007). Indeed, their ability to 'speak for the firm' renders the family leader an ideal resource for the establishment of productive and cordial working relationships with clients, suppliers, and employees alike (Miller *et al*., 2009). This kind of capability is considered to be a useful form of social capital (Sirmon and Hitt, 2003). In addition, familiarity with the business' ethos - unwritten rules, customs and informal culture - is likewise a valuable resource (Miller *et al*., 2009; Cruz *et al*., 2010) that also empowers family executives in a way not accessible to an outsider. According to this argument, family-CEOs are more familiar with the whole operational process, both explicit and implicit, which is beneficial to the implementation of innovative practices.

[2] http://bruegel.org/publications/datasets/efige/.

2.1.2. Long-Term Orientation

Generally, family-CEOs pay much more attention to the long-term survival of their business over subsequent generations. That is, family leaders would rather transfer control of the firm to their descendants than consume wealth during their tenure (Chang *et al.*, 2010). This aspiration to sustain the business over several generations of the family – in effect to establish a dynasty – will enable family members to allocate their capital more effectively according to Lim *et al.* (2010). Additionally, family leaders will attach more importance to the reputation, tradition, and spirit of the family business. They are prone to favor "patient financial capital", *viz* capital without the threat of liquidation for long periods (Habbershon and Williams, 1999; Lim *et al.*, 2010). Therefore, family executives are expected to advocate long-term investments such as R&D (Kim *et al.*, 2008; Chen and Hsu, 2009; Munari *et al.*, 2010). By contrast, leaders in non-family companies may be overly concerned with the costs and risks associated with R&D, and more likely to pursue investments with smaller returns, rather than uncertain projects with long-term payoffs (Craig and Dibrell, 2006). In short, family-CEOs are apt to be more far-sighted than non-family leaders (Salvato and Moores, 2010) and thus more likely to facilitate firm innovation.

2.1.3. Organizational Structure Flexibility

Family leadership is also more innovative when it comes to decision-making procedures. In other words, a number of family firms tend to employ a more flexible or malleable organizational framework and utilize unconventional supervision and control mechanisms than non-family firms which usually adhere to strongly standardized or rigid rules (Craig and Dibrell, 2006). Family leaders are also more motivated to take on alternate roles within the business as needs dictate. Such characteristics better enable them to address significant challenges with confidence (Habbershon and Williams, 1999). For example, commercializing certain R&D outputs usually needs some organizational flexibility (Sanchez and Mahoney, 1996). As some degree of flexibility in organizational structure is necessary for R&D investment, open channels of communication and unconventional decision-making (Craig and Dibrell, 2006) in such scenarios may be conducive to R&D intensity.

2.1.4. Agency Costs: Principle-Agent Relationship

In family firms, agency issues between owners and managers tend to be less frequent in the context of innovation investments because:

1. In most SMEs, the founder and the family members usually play a dual role: owners and senior managers. In such cases, the alienation between control and ownership mostly is negligible because their personal wealth and the company's fate are inextricably intertwined.
2. Family owners in senior management have unlimited access to relevant internal information. They are strongly motivated to commit themselves to effective monitoring, which can minimize the issue of asymmetric information and opportunistic behavior detrimental to the firms' wellbeing (Kim *et al.*, 2008; Chang *et al.*, 2010). From this perspective, family-CEOs are more likely to embrace R&D investment than nonfamily-CEOs.

2.2. Arguments Supporting the Negative Relations

2.2.1. Limited Ability of Family-CEOs

Ability here means the family-CEOs' discretion to allocate, replenish, or dispose of a firm's resources (De Massis *et al.*, 2014). It includes latitude in setting firms' goals, and selecting among a range of feasible strategic, structural, and tactical options (Hambrick and Finkelstein, 1987; Morck *et al.*, 1998). The ability of firm leaders is one of the key dimensions that can theoretically lead to disparities in behavior and performance between family firms and non-family firms. On account of the desire to retain ownership and control of the firm, and mitigate conflicts of interests, family firms prefer to recruit managers from within the family (Kim *et al.*, 2008; Gomez-Mejia

et al., 2010). By contrast, external candidates usually have more competitive advantages enabling them to promote and manage innovative activities. They may have more professional managerial skills or possess more creative characteristics and other intangible skills (Chen and Hsu, 2009; Chang *et al*., 2010). Hence, a restricted candidate pool restricted to family members may significantly constrain the family CEOs' capability or expertise to evaluate and implement worthwhile R&D projects, which in turn can be detrimental to the firms' R&D intensity (Chen and Hsu, 2009; Chang *et al*., 2010).

2.2.2. CEOs' Tenure and Age

With a preponderance of family members in the top excutive positions, and perhaps motivated by a thirst for control, some family CEOs may seek to extend their tenure at the firm's apex (Gomez-Mejia *et al*., 2003), and older CEOs with longer tenures may be reluctant to innovate, and be content merely with the status quo. This may be due to an inherent aversion to risk, or because they just consider any major change to be personally threatening.

2.2.3. Agency Cost: Nepotism

As indicated, there is less agency cost when family ownership overlapping with senior leadership ~~overlap~~. However, agency theory might be "Janus-faced" in its application to issues concerning family leadership and ownership. A nepotistic family CEO may cause new agency troubles (Chang *et al*., 2010) because of their propensity tofavor family members regardless of their competence resulting in adverse effects on the firms' performance. It may also lead to corrupt conduct such as embezzlement to sustain an extravagant lifestyle for family members (Schulze *et al*., 2003; Lim *et al*., 2010). Clearly, nepotism is detrimental to a firm's governance as a whole (Chang *et al*., 2010). In such circumstances, family CEOs may be said to lower the R&D intensity compared with non-family CEOs.

2.2.4. Agency Costs: Principal–Principal Relationship

Another argument of agency theory is the "principal-principal agency problem" which posits that family leadership tends to restrain innovation (Morck *et al*., 2005) because family CEOs may operate principally for the family's benefit, abusing their power to the detriment of other shareholders (Chang *et al*., 2010; Salvato and Moores, 2010). This may adversely affect R&D activities, especially when family wealth is closely related to their stock holding in the company. A possible explanation is that investment in R&D can spoil the value of traditional capital. As evidence of these arguments, Morck *et al*. (2002) found that Canadian firms managed by offspring were significantly less active in R&D than benchmark firms of the same size and age within the same industrial sectors. This argument implies that family-CEOs are more reluctant to foster R&D intensity relative to non-family CEOs.

2.2.5. Risk-Taking Attitude

Because family-CEOs often consider family wealth and the wealth of the firm to be essentially interchangeable, their primary focus is to ensure the maintenance of their family's control of the business which in turn may induce them favor adherence to the status quo and risk-averse business practices (Naldi *et al*., 2007; Chen and Hsu, 2009; Chang *et al*., 2010). By failing to invest in R&D, opportunities to raise the firm's profile may be lost (Munari *et al*., 2010).

2.2.6. Reluctant to External Financing

Family CEOs usually are also frequently unwilling to use external financing which may diminish their overall control (Kim *et al*., 2008; Gomez-Mejia *et al*., 2010), specifically "the possibility of losing the freedom to dictate business policies, which may be limited by conditions imposed by the lending banks" (Gallo *et al*. 2004). Another reason for this reluctance is the high agency costs of debt (Steijvers and Voordeckers, 2009) including the fact that

excessive levels of debt could seriously impede access to sources of finance in the future (Gallo *et al.*, 2004). However, innovative activities generally need significant capital investment in new technology, sophisticated equipment, and technical expertise, the cost of which the firm may be unable to meet just by using internal capital.

2.3. Brief Review of Empirical Evidence

All 12 recent studies on this subject are empirical. They adopted an operational definition of family firms that presupposes family control of ownership and senior management. In addition, the firms were situated in developed countries or regions such as the EU and the US to neglect of Latin America and Asia (Llach and Nordqvist, 2010). Further, most of the analysis focused on the medium to large publicly listed firms, with few SMEs examined. Results were mixed and contentious (see Table 1).

3. DESCRIPTION OF DATA AND VARIABLES

This study is based mainly on the EFIGE data, a unique dataset of manufacturing firms covering seven European Union countries: Germany (GER), France (FRA), Italy (ITA), Spain (SPA), the United Kingdom (UK), Austria (AUT) and Hungary (HUN). This dataset consists of the following features:

1. It is a representative of the manufacturing structure of the countries involved as a stratified sample. Specifically, they are stratified by industry, region, and firm size.
2. This dataset is totally comparable across countries, since they utilize not only the same questionnaire, but also the same timeframe (January to May 2010).
3. A wide range of questions within the EFIGE survey that enabled us to investigate more than just balance sheet information, but also to unravel important issues related to the link between family leadership and innovation.

This survey includes both quantitative and qualitative data on firms' characteristics and activities, with around 150 different variables categorized into six parts (proprietary structure of the firm; the structure of the workforce; investment, technological innovation, and R&D; internationalization; finance; market and pricing). The majority of questions refer to 2008, some to 2009, and some to years antedating 2008. This was done in order to obtain a more complete picture of the effects of the global financial crisis (GFC) as well as the evolution of each firm's dynamic activities.

Businesses in EFIGE survey were defined as "family firms" if they answered "yes" to the question: "*Is your firm directly or indirectly controlled by an individual or family-owned entity*?" Family leadership was measured by whether the CEO or company head was the founder of the firm or a member of the family that owns or controls it.

Table-1. Selected studies on the impact of family ownership/leadership on innovation.

Authors	Topic	Data and background	Analytical methodologies	Main Findings
Steeger and Hoffmann (2016)	Innovation and family firms:ability and willingness and German SMEs	A large cross-sectional sample of German small and medium-sized enterprises	Tobid model	Based on agency theory and the ability and willingness paradox in family firm's innovation, they find that family firms to be less innovative only if both ability and willingness conditions are fulfilled.
Cucculelli *et al.* (2016)	Product innovation, firm renewal, and family governance	220 Italian companies	Two-step Heckman sample selection model	Family governance/leadership tend to impede the new product introductions that renew firms' competencies, especially in successor generations.
Basco and Calabrò (2016)	Open innovation search strategies in family and non-family SMEs: Evidence from a Natural resource-based cluster in Chile	A sample of 264 Chilean firms	Logistic regression and robust check	Family SMEs tend to search new ideas and knowledge within their closest network of relationships (e.g. customers, suppliers, and competitors), while non-family SMEs mainly turns to broader network relationships (e.g. universities, public institutions, and fair-trade organizations).

Table-1. (Continued).

Authors	Topic	Data and background	Analytical methodologies	Main Findings
Broekaert *et al.* (2016)	Innovation processes in family firms: the relevance of organizational flexibility	A sample of 2604 firms and 3140-year observations	Browne's asymptotically distribution-free (ADF) estimation method	Family firms invest less in R&D but are more flexible in their organizational structure, and then this flexibility enables them to successfully develop new products and even outperform non-family owned businesses when it comes to process innovation.
Sciascia *et al.* (2015)	Family ownership and R&D intensity in small and medium-sized firms	264 Italian firms in 2006	OLS regression	They find that when there is a high overlap between family wealth and firm equity (i.e., most of the family's wealth is invested in the firm) the relationship between family ownership and R&D intensity is negative, vice versa, the relationship is positive.
Choi *et al.* (2015)	Family ownership and R&D investment: The role of growth opportunities and business group membership	Korean firms' data over ten years (1998~2007)	Generalized estimating equations	The study shows that family ownership has a negative influence on R&D investment, but the relationship becomes positive when growth opportunities are present. These findings imply that family owners invest more in R&D when their family control goals are threatened by the loss of growth potential.
Ashwin *et al.* (2015)	Family firms in India: family involvement, innovation and agency and stewardship behaviors	Indian pharmaceutical firms listed on the Bombay Stock Exchange (BSE) between 2003 and 2009	Panel Tobit/Random effects model	The results show that family leadership and family control over both CEO and chairperson positions have a significant and positive impact on the firms' R&D investments, generally supporting the stewardship theory.

Lazzarotti and Pellegrini (2015)	An explorative study on family firms and open innovation breadth: do non-family managers make the difference?	A random selection of 182 firms from a survey	Linear regression	The study shows that family firms managed by non-family managers are motivated by an innovation strategy that is more aggressive, more oriented towards technological excellence and radical innovation when compared with family firms led by family members. In addition, they are more inclined to search for an external resource in terms of open innovation.
Matzler *et al.* (2015)	The impact of family ownership, management, and governance on innovation	German publicly traded firms between 2000 and 2009	Heckman's two-stage regression; Wu-Hausman test; IV-2SLS	They disclose that family leadership has a negative impact on innovation input and a positive influence on innovation output.

Table-1. (Continued).

Lodh *et al.* (2014)	Innovation and family ownership: Empirical evidence from India	an unbalanced panel of 395 Bombay Stock Exchange (BSE) listed Indian firms during the years 2001~2008	Fixed effects and IV-2SLS	Family ownership on innovation productivity is positive (after controlling for possible endogeneity); Further, the business group affiliation is conducive to family firms' innovative activities
Tsao and Lien (2013)	Family management and internationalization: The impact on firm performance and innovation	Taiwan's publicly listed firms during the period of 2000–2009	OLS regression	The evidence shows that family management helps mitigate the agency problems associated with internationalization so that family firms experience positive benefits from internationalization in terms of innovation and performance.
Anderson *et al.* (2012)	Investment policy in family-controlled firms	2000 largest, publicly traded US firms from 2003 through 2007	Tobit-ML estimation; Heckman model (control for self-selection bias); IV-2SLS for endogeneity	Family firms spend less capital on long-term investments than firms with decentralized ownership structure; Additional tests show that family firms receive fewer patent citations per dollar of R&D investment relative to non-family firms. In general, family leadership is more risk-aversion across all family subtypes, which affects R&D and capital expenditures.
Chrisman and Patel (2012)	Variations in R&D investments of family and nonfamily firms: Behavioral agency and myopic loss aversion perspectives.	964 manufacturing public-held family and nonfamily firms from the S&P 500 between 1998 to 2007	OLS regression and IV-2SLS	Family firms generally invest less in R&D due to the attempts of owners and managers to avoid perceived threats to their socio-emotional wealth.
Munari *et al.* (2010)	The effects of owner identity and external governance systems on R&D investments: A study of Western European firms	A unique dataset of 1000 firms publicly traded in six European countries.	Probit model; censored regression model with a stochastic threshold	The findings present that shareholding by families will exert a negative influence on R&D investment.
Chu (2009)	The influence of family ownership on SME performance: evidence from public firms in Taiwan	639 Taiwanese non-financial-sector public firms during the years 2002–2006.	OLS and stepwise regression models	Family ownership has a significant and positive impact on SMEs' performance.
Chen and Hsu (2009)	Family ownership, board independence, and R&D investment	369 Taiwanese-listed firms in the electronic industry covering the period of 2002~2007	A two-way fixed-effects regression	The findings show that family ownership is negatively correlated with R&D investment relationship. Such a relationship may also suggest that firms with high family ownership may use R&D investments more efficiently and thus need less R&D input relative to firms with low family ownership.

Source: Author's elaboration based on previous research.

Table 2 displays the distribution of family and non-family firms across countries. Figure 1 shows that more than half the firms were family firms. Germany owns the most family firms nearly accounting for 80 percent The ensuing countries are Spain and Italy over 70 percent each.In addition, another signal implied is that most family firms are controlled or managed by founders or family members, namely family members act as a dual role. With respect to firm size, two factors were considered: first, the number of employees; and second annual sales. The EFIGI survey questions were:

Please indicate the total number of your firm's employees in your home country. (Include all the employers, temporary staff, but exclude free lancers and occasional workers).

(1) 10 - 19 employees

(2) 20 - 49 employees

(3) 50 - 249 employees

(4) 250 employees and more

Within which of the following ranges does your firm's annual turnover in 2008 fall?

(1) less than 1 million euro

(2) 1-2 million euro

(3) 2-10 million euro

(4) 10-15 million euro

(5) 15-50 million euro

(6) 50-250 million euro

(7) more than 250 million euro

Table-2. Distribution of family firms and family-CEOs across countries.

Firm type	FRA	GER	ITA	SPA	UK
Family firms	1,681	2,409	2,244	2,132	1,285
Nonfamily firms	1,292	526	777	700	782
Total	2,973	2,935	3,021	2,832	2,067
Family CEO	1,443	2,139	2,118	1,829	1,119
Nonfamily CEO	1,530	796	903	1,003	948

Source: Author's elaboration based on EFIGE data. (www.efige.org).

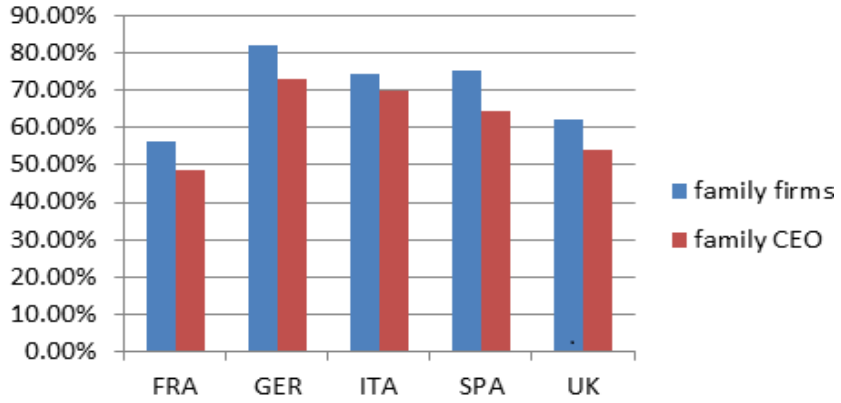

Figure-1. Share of family firms and family CEOs of some EU countries.
Source: Author's elaboration based on EFIGE data. (www.efige.org).

Precise figures are reported in Table 3 and 4. The number of big firms across the surveyed countries was relatively small, with the majority SMEs in terms of both employees and turnover. Here, small firms are defined as having 50 employees or fewer and an annual turnover less than 15 million euros (see Table 5). Figure 2-5, exhibit the distribution of firm size in terms of the number of employees.

Table-3. Distributions of firms by country and size (measured by the number of employees).

Class size	AUT	FRA	GER	HUN	ITA	SPA	UK	Total
Employees (10-49)	286	2,144	1,790	325	2,447	2,280	1,416	10,688
Employees (50-249)	91	607	778	118	429	406	509	2,938
Employees (> 250)	42	208	283	39	141	138	96	947
Total	419	2,959	2,851	482	3,017	2,824	2,021	14,573

Source: Author's elaboration based on EFIGE data. (www.efige.org).

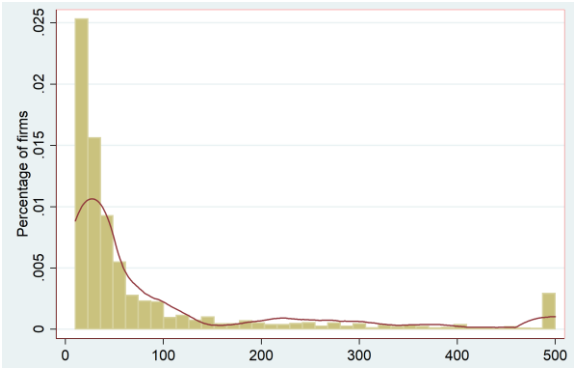

Figure-2. Firm size=No. employees; 2008-Austria

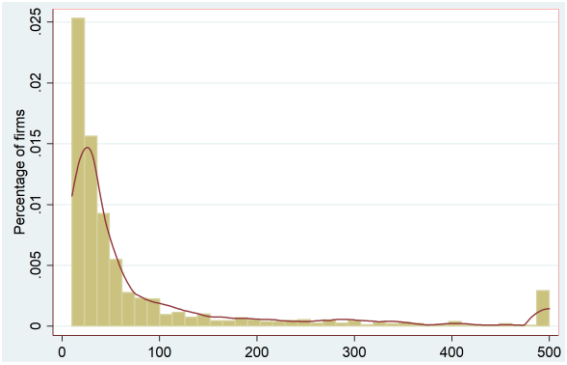

Figure-3. Firm size=No. employees; 2008-France

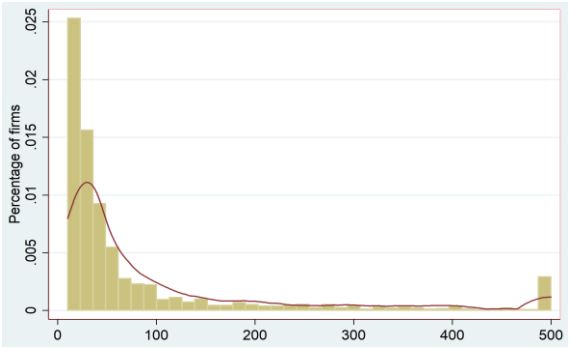

Figure-4. Firm size=No. employees; 2008-Germany

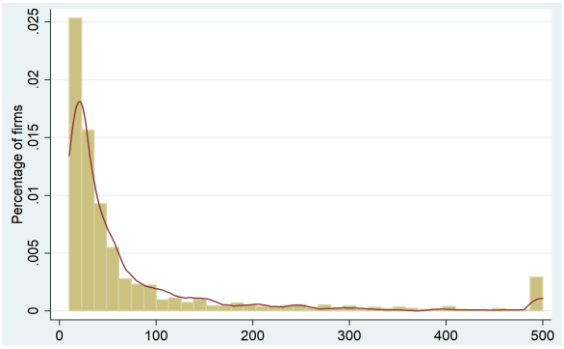

Figure-5. Firm size=No. employees; 2008-UK

Table-4. Distributions of firms by country and size (annual turnover).

Class size	AUT	FRA	GER	HUN	ITA	SPA	UK	Total
Turnover (<15 million)	317	2,475	2,267	442	2,563	2,498	1,815	12,377
Turnover (15-250 million)	96	445	555	44	423	301	198	2,062
Turnover (>250 million)	7	45	43	2	35	33	20	185
Total	420	2,965	2,865	488	3,021	2,832	2,033	14,624

Source: Author's elaboration based on EFIGE data. (www.efige.org).

Table-5. Distribution firms by country and class size matched by two requirements.

Class size	AUT	FRA	GER	HUN	ITA	SPA	UK	Total
Small firms	277	2,108	1,734	323	2,349	2,238	1,398	10,427
Medium firms	52	247	297	15	217	148	105	1,081
Large firms	7	41	41	1	29	29	15	163
Total	336	2,396	2,072	339	2,595	2,415	1,518	11,671

Source: Author's elaboration based on EFIGE data. (www.efige.org).

The relationship between family leadership and innovation is measured using the following econometric model:

$$R\&D_i = \beta_0 + \beta_1 * FamilyCEO + \beta_1 * FamilyCEO * smallfirms + \beta_2 * C_i + S_i + \lambda_i + \varepsilon_i$$

The dependent variable R&D stands for R&D intensity, which is commonly used to indicate innovation inputs. Family CEO is a dummy variable to measure the family leadership; C is a vector of control variables for firm characteristics; λ is a vector of country dummies; S represents the sector effects, and ε is the error term. Table 6 summarizes the contents and definitions of variables in the regression equation in detail.

Table-6. Summary of contents and definition for each variable.

Variables	Contents and definition
Innovation intensity (R&D) (%)	R&D investment accounting for the annual turnover on average in the last three years (2007-2009)
Family leadership (familyceo)	A dummy variable (=1, if the firm is headed or controlled by family members or the founders)
Firm size	A dummy variable (=1, if the firm is small)
Family leadership in small firms	An interaction term (=1 if family leadership involved in small firms)
Firm age	Three classifications: (1) <6 years; (2)6-20 years;(3) >20years
Investment on production factors (%) (ln_invest)	percentage of the annual turnover accounting for the overall investments in plants, machines, equipment, and ICT represent on average in the last three years (2007-2009)
Number of employees involved in R&D activities (%) (ln_rdempl)	Percentage/number of employees have been involved in R&D activities in 2008
Education level of employees (%) (ln_edulevel)	What is the percentage/number of university graduates in your workforce in your home country?
Export intensity (%) (ln_expintensity)	Percentage the export activities represent annual turnover in 2008
CEO age (ceoage)	CEOs' age is classified into 7 groups
Gender of family CEO	A dummy variable (=1, if the CEO is male)

Source: Author's elaboration based on EFIGE data. (www.efige.org).

4. EMPIRICAL RESULTS AND ANALYSIS

In order to mitigate the heterogeneity of variance, the author takes logarithm to the percentage variables and adopts the white robust standard error. Table 7 reports the estimation results from the econometric analyses in detail. First, we investigate the effect of family leadership in the context of small firms. The results presented in column (1)-indicate that family leadership is positively correlated with R&D intensity, but it is not significant. Small firms significantly conduct more R&D investments than large firms. However, the main explanatory variable - family leadership of small firms - exerts a significant negative impact on a firm's R&D intensity, meaning family leadership in small firms do invest less on R&D activities than their counterparts.

However, the R square of this model is quite low. It implies the first model may be not well-fitted with the population. Thus, we add control variables. The results are presented in column (2), where family leadership now has a significant positive effect on firm's R&D investments; small-sized firms remain the positive effect, and family leadership in small firm displays a significant negative correlation with the firm's R&D investments. For the robust check, we add the sector dummies and country dummies respectively. The results in column (3) and column (4) provide consistent support for the preceding results, where the significance and sign of coefficients of the main independent variables remain the same.

Thus, based on our data and model, we may conclude that family leadership will increase the R&D intensity on average around 0.3 percent compared with nonfamily leadership. It could be explained by the long-term orientation of family leadership and their higher loyalty, commitment, emotional attachment, and devotion to the firm. Meanwhile, small firms in our sample also show that their R&D intensity is average 0.93 percent more than medium and large firms.

This phenomenon may be the result of motivation to survive and grow, aided by a more flexible organizational structure, and simple, fast and efficient decision-making. However, when family CEOs get involved in the operation of small firms, the positive effect of family leadership becomes significantly negative. Family leadership in small family firms invest on average nearly 0.34 persent ~~%~~ less than non-family firms. Such may be explained by limited ability and risk-aversion of family leaders.

Table-7. Regression results.

Variables	Coefficients			
	-1	-2	-3	-4
Familyceo	0.1132	0.2799**	0.3008**	0.3099**
	-0.0878	-0.1184	-0.1214	-0.1236
Small	0. 5051***	0.9576***	0.9203***	0.9159***
	-0.0773	(0 .1051)	-0.1084	-0.1095
Familyceo*small	-0.2518**	-0.3376**	-0.34774**	-0.3385**
	-0.1067	-0.1342	-0.1364	-0.1374
Firm_age	-	-0.1406***	-0.1523***	-0.1641***
	-	-0.0445	-0.044	-0.0448

Table-7. (continued).

ln_invest	-	0.3173***	0.3248***	0.3344***
	-	(0.0308)	(0.0310)	(0.0311)
ln_rdempl	-	0.3812***	0.3730***	0.3588***
	-	(0.0376)	(0.0370)	(0.0376)
ln_edulevel	-	0. 03047	0.0194	0.0274
	-	(0.0362)	(0.0368)	(0.0375)
ln_expintensity	-	0.0629***	0.0484**	0.0482**
	-	(0.0228)	(0.0235)	(0.0243)
Male	-	-0.1025	-0.0829	-0.0884
	-	(0.1244)	(0.1227)	(0.1252)
ceoage	-	0.0349	0.0258	0.0191
	-	(0.0273)	(0.0273)	(0.0278)
observations	1,812	1,036	1,036	1,036
R2	0.0279	0.2591	0.2775	0.2818
Sector dummies	No	No	Yes	Yes
Country dummies	No	No	No	Yes

*** Means the estimated coefficients are significant at the 1% level.
** Means the estimated coefficients are significant at the 5% level.
* Means the estimated coefficients are significant at the 10% level.

With respect to the control variable, investment on production factors (investments in plants, machines, equipment, and ICT), the percentage of employees involved in R&D activities and export intensity are significantly and positively correlated with a firm's R&D intensity. The age of a family firm also has a significant negative effect on R&D intensity, perhaps because older individuals are more apt to adhere to "tried and true" business practices. The percentage of employees who are university graduates, and the age of a CEO also show a correlations with R&D intensity. Male CEOs tend to have a negative impact on firm innovation, but these correlations are not significant across different models.

5. DISCUSSION

The ubiquity of family-led small firms, the significance of firm innovation and insufficient academic focus on the subject were the inspirations for this study. The relationship of family leadership of small firms and their R&D intensity was investigated using the EFIGE dataset. The empirical analysis based on the econometric model revealed a significant disparity between family-led and non-family-led small firms. Our findings demonstrated that innovation investment behavior is both complex and multifaceted with respect to family leadership and firm size. On the one hand, family CEOs are more likely to invest more in innovation activities than non-family CEOs in our sample; on the other hand, family leaders in small firms do invest less in R&D activities. It seems that higher loyalty, emotional attachments, full commitment to the firm's growth, the desire to create a lasting legacy for their progeny and to build on their "socio-emotional[3]" wealth (Gómez-Mejía *et al.*, 2007) motivate them to invest more in

[3] Acoording to Gómez-Mejía, Haynes, Núñez-Nickel, Jacobson and Moyano-Fuentes, (2007).

innovation activities. However, in the context of small firms, family leaders are reluctant to innovate when their personal wealth is substantially the same as their equity in the business (Sciascia *et al.*, 2015).

Any perceived limitations of this study may be due to the data. According to the classification standards and the distribution of firms in our sample, a vast majority were small, possibly resulting in sample bias. Also, the choice of main indicators may have drawbacks. For example R&D intensity can reflect innovation inputs, but not innovation outputs or the motivations for the innovation. There may also exist omitted variable bias and an endogenous problem. Finally, this study examines the impact of family CEOs on firms mainly from the intermediate perspective. Future research should perhaps focus more on the micro-factors which impact family leader's innovation investment decisions, such as the personality and style of family-CEOs, and how they cultivate and select their successors.

Funding: The research contained in this paper has been carried out partly under a supervised graduate-student research project of Shanghai International Studies University (Project No. 41000753) for which the author expresses his gratitude .
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

REFERENCES

Anderson, R.C., A. Duru and D.M. Reeb, 2012. Investment policy in family controlled firms. Journal of Banking & Finance, 36(6): 1744-1758.Available at: https://doi.org/10.1016/j.jbankfin.2012.01.018.

Ashwin, A., R.T. Krishnan and R. George, 2015. Family firms in India: Family involvement, innovation and agency and stewardship behaviors. Asia Pacific Journal of Management, 32(4): 869-900.Available at: https://doi.org/10.1007/s10490-015-9440-1.

Basco, R. and A. Calabrò, 2016. Open innovation search strategies in family and non-family SMEs: Evidence from a natural resource-based cluster in Chile. Latin American Academy of Administration Academy, 29(3): 279-302.Available at: https://doi.org/10.1108/arla-07-2015-0188.

Bennedsen, M., F.P. Gonzalez and D. Wolfenzon, 2010. The governance of family firms. Corporate Governance: A Synthesis of Theory, Research, and Practice: 371-389.

Block, J.H., 2012. R&D investments in family and founder firms: An agency perspective. Journal of Business Venturing, 27(2): 248-265.Available at: https://doi.org/10.1016/j.jbusvent.2010.09.003.

Bottazzi, G. and A. Secchi, 2003. Common properties and sectoral specificities in the dynamics of US manufacturing companies. Review of Industrial Organization, 23(3-4): 217-232.Available at: https://doi.org/10.1023/b:reio.0000031366.28559.c1.

Broekaert, W., P. Andries and K. Debackere, 2016. Innovation processes in family firms: The relevance of organizational flexibility. Small Business Economics, 47(3): 771-785.Available at: https://doi.org/10.1007/s11187-016-9760-7.

Chang, S.C., W.Y. Wu and Y.J. Wong, 2010. Family control and stock market reactions to innovation announcements. British Journal of Management, 21(1): 152-170.Available at: https://doi.org/10.1111/j.1467-8551.2008.00618.x.

Chen, H.-L. and W.-T. Hsu, 2009. Family ownership, board independence, and R&D investment. Family Business Review, 22(4): 347-362.Available at: https://doi.org/10.1177/0894486509341062.

Choi, Y.R., S.A. Zahra, T. Yoshikawa and B.H. Han, 2015. Family ownership and R&D investment: The role of growth opportunities and business group membership. Journal of Business Research, 68(5): 1053-1061.Available at: https://doi.org/10.1016/j.jbusres.2014.10.007.

Chrisman, J.J. and P.C. Patel, 2012. Variations in R&D investments of family and nonfamily firms: Behavioral agency and myopic loss aversion perspectives. Academy of Management Journal, 55(4): 976-997.Available at: https://doi.org/10.5465/amj.2011.0211.

Chu, W., 2009. The influence of family ownership on SME performance: Evidence from public firms in Taiwan. Small Business Economics, 33(3): 353-373.Available at: https://doi.org/10.1007/s11187-009-9178-6.

Craig, J. and C. Dibrell, 2006. The natural environment, innovation, and firm performance: A comparative study. Family Business Review, 19(4): 275-288.Available at: https://doi.org/10.1111/j.1741-6248.2006.00075.x.

Cruz, C.C., L.R. Gómez-Mejia and M. Becerra, 2010. Perceptions of benevolence and the design of agency contracts: CEO-TMT relationships in family firms. Academy of Management Journal, 53(1): 69-89.Available at: https://doi.org/10.5465/amj.2010.48036975.

Cucculelli, M., I. Le Breton-Miller and D. Miller, 2016. Product innovation, firm renewal and family governance. Journal of Family Business Strategy, 7(2): 90-104.Available at: https://doi.org/10.1016/j.jfbs.2016.02.001.

De Massis, A., F. Frattini and U. Lichtenthaler, 2013. Research on technological innovation in family firms: Present debates and future directions. Family Business Review, 26(1): 10-31.Available at: https://doi.org/10.1177/0894486512466258.

De Massis, A., J. Kotlar, J.H. Chua and J.J. Chrisman, 2014. Ability and willingness as sufficiency conditions for family-oriented particularistic behavior: Implications for theory and empirical studies. Journal of Small Business Management, 52(2): 344-364.Available at: https://doi.org/10.1111/jsbm.12102.

Gallo, M.Á., J. Tàpies and K. Cappuyns, 2004. Comparison of family and nonfamily business: Financial logic and personal preferences. Family Business Review, 17(4): 303-318.Available at: https://doi.org/10.1111/j.1741-6248.2004.00020.x.

Gomez-Mejia, L.R., C. Cruz, P. Berrone and J. De Castro, 2011. The bind that ties: Socioemotional wealth preservation in family firms. Academy of Management Annals, 5(1): 653-707.Available at: https://doi.org/10.5465/19416520.2011.593320.

Gómez-Mejía, L.R., K.T. Haynes, M. Núñez-Nickel, K.J. Jacobson and J. Moyano-Fuentes, 2007. Socioemotional wealth and business risks in family-controlled firms: Evidence from Spanish olive oil mills. Administrative Science Quarterly, 52(1): 106-137.Available at: https://doi.org/10.2189/asqu.52.1.106.

Gomez-Mejia, L.R., M. Larraza-Kintana and M. Makri, 2003. The determinants of executive compensation in family-controlled public corporations. Academy of Management Journal, 46(2): 226-237.Available at: https://doi.org/10.5465/30040616.

Gomez-Mejia, L.R., M. Marianna and L.K. Martin, 2010. Diversification decisions in family-controlled firms. Journal of Management Studies, 47(2): 223-252.Available at: https://doi.org/10.1111/j.1467-6486.2009.00889.x.

Habbershon, T.G. and M.L. Williams, 1999. A resource-based framework for assessing the strategic advantages of family firms. Family Business Review, 12(1): 1-25.Available at: https://doi.org/10.1111/j.1741-6248.1999.00001.x.

Hambrick, D.C. and S. Finkelstein, 1987. Managerial discretion: A bridge between polar views of organizational outcomes. Research in Organizational Behavior.

Kim, H., K. Heechun and M.L. Peggy, 2008. Ownership structure and the relationship between financial slack and R&D investments: Evidence from Korean firms. Organization Science, 19(3): 404-418.Available at: https://doi.org/10.1287/orsc.1080.0360.

Lazzarotti, V. and L. Pellegrini, 2015. An explorative study on family firms and open innovation breadth: Do non–family managers make the difference? European Journal of International Management, 9(2): 179-200.Available at: https://doi.org/10.1504/ejim.2015.067854.

Lim, E.N., M.H. Lubatkin and R.M. Wiseman, 2010. A family firm variant of the behavioral agency theory. Strategic Entrepreneurship Journal, 4(3): 197-211.Available at: https://doi.org/10.1002/sej.91.

Llach, J. and M. Nordqvist, 2010. Innovation in family and non-family businesses: A resource perspective. International Journal of Entrepreneurial Venturing, 2(3-4): 381-399.Available at: https://doi.org/10.1504/ijev.2010.037119.

Lodh, S., M. Nandy and J. Chen, 2014. Innovation and family ownership: Empirical evidence from India. Corporate Governance: An International Review, 22(1): 4-23.Available at: https://doi.org/10.1111/corg.12034.

Matzler, K., V. Veider, J. Hautz and C. Stadler, 2015. The impact of family ownership, management, and governance on innovation. Journal of Product Innovation Management, 32(3): 319-333.Available at: https://doi.org/10.1111/jpim.12202.

Memili, E., J.J. Chrisman and J.H. Chua, 2011. Transaction costs and outsourcing decisions in small-and medium-sized family firms. Family Business Review, 24(1): 47-61.Available at: https://doi.org/10.1177/0894486510396706.

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

Miller, D., J. Lee, S. Chang and I. Le Breton-Miller, 2009. Filling the institutional void: The social behavior and performance of family vs non-family technology firms in emerging markets. Journal of International Business Studies, 40(5): 802-817.Available at: https://doi.org/10.1057/jibs.2009.11.

Miller, D., S. Lloyd and L.B.-M. Isabelle, 2003. Lost in time: Intergenerational succession, change, and failure in family business. Journal of Business Venturing, 18.(4): 513-531.Available at: https://doi.org/10.1016/s0883-9026(03)00058-2.

Morck, R., A. Shleifer and R.W. Vishny, 1998. Management ownership and market valuation: An empirical analysis. Journal of Financial Economics, 20: 293-315.Available at: https://doi.org/10.1016/0304-405x(88)90048-7.

Morck, R., D.A. Stangeland and B. Yeung, 2002. Inherited wealth, corporation control and economic growth: The Canadian disease?. Concentrated corporate ownership. Chicago, IL: University of Chicago Press.

Morck, R., D. Wolfenzon and B. Yeung, 2005. Corporate governance, economic entrenchment, and growth. Journal of Economic Literature, 43(3): 655-720.Available at: https://doi.org/10.1257/002205105774431252.

Munari, F., O. Raffaele and S. Maurizio, 2010. The effects of owner identity and external governance systems on R&D investments: A study of Western European firms. Research Policy, 39(8): 1093-1104.Available at: https://doi.org/10.1016/j.respol.2010.05.004.

Naldi, L., M. Nordqvist, K. Sjöberg and J. Wiklund, 2007. Entrepreneurial orientation, risk taking, and performance in family firms. Family Business Review, 20(1): 33-47.Available at: https://doi.org/10.1111/j.1741-6248.2007.00082.x.

Salvato, C. and K. Moores, 2010. Research on accounting in family firms: Past accomplishments and future challenges. Family Business Review, 23(3): 193-215.Available at: https://doi.org/10.1177/0894486510375069.

Sanchez, R. and J.T. Mahoney, 1996. Modularity, flexibility, and knowledge management in product and organization design. Strategic Management Journal, 17(S2): 63-76.Available at: https://doi.org/10.1002/smj.4250171107.

Schulze, W.S., M.H. Lubatkin and R.N. Dino, 2003. Toward a theory of agency and altruism in family firms. Journal of Business Venturing, 18(4): 473-490.Available at: https://doi.org/10.1016/s0883-9026(03)00054-5.

Schulze, W.S., M.H. Lubatkin, R.N. Dino and A.K. Buchholtz, 2001. Agency relationships in family firms: Theory and evidence. Organization Science, 12(2): 99-116.Available at: https://doi.org/10.1287/orsc.12.2.99.10114.

Sciascia, S., M. Nordqvist, P. Mazzola and A. De Massis, 2015. Family ownership and R&D intensity in small-and medium-sized firms. Journal of Product Innovation Management, 32(3): 349-360.Available at: https://doi.org/10.1111/jpim.12204.

Shi, C., 2003. On the trade-off between the future benefits and riskiness of R&D: A bondholders' perspective. Journal of Accounting and Economics, 35(2): 227-254.Available at: https://doi.org/10.1016/s0165-4101(03)00020-x.

Sirmon, D.G. and M.A. Hitt, 2003. Managing resources: Linking unique resources, management, and wealth creation in family firms. Entrepreneurship Theory and Practice, 27(4): 339-358.Available at: https://doi.org/10.1111/1540-8520.t01-1-00013.

Steeger, J.H. and M. Hoffmann, 2016. Innovation and family firms: Ability and willingness and German SMEs. Journal of Family Business Management, 6(3): 251-269.Available at: https://doi.org/10.1108/jfbm-09-2015-0036.

Steijvers, T. and W. Voordeckers, 2009. Private family ownership and the agency costs of debt. Family Business Review, 22(4): 333-346.Available at: https://doi.org/10.1177/0894486509338291.

Tsao, S.-M. and W.-H. Lien, 2013. Family management and internationalization: The impact on firm performance and innovation. Management International Review, 53(2): 189-213.Available at: https://doi.org/10.1007/s11575-011-0125-9.