

Top Management Team Heterogeneity and Investment Decisions in Family-Owned Firms

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Abstract

This research attempts to extend the literature by analyzing the potential relationship between top management team (TMT) compositional heterogeneity and investment efficiency in family-owned firms in an emerging market. The TMT compositional heterogeneity data used in this study were hand-collected from Taiwanese listed companies between 2009 and 2015. The results indicate that TMT compositional heterogeneity can mitigate inefficient investment in family-owned firms. Specifically, greater heterogeneity within the TMT helps such firms avoid inefficient investments and better address potential threats to their long-term viability. Taiwanese family-owned firms are predominantly small and medium-sized enterprises (SMEs), which exhibit characteristics that differ from those of larger firms commonly studied in U.S. and European contexts. This study therefore extends prior research by examining, for the first time, whether TMT compositional heterogeneity in an emerging market is associated with the relative efficiency of firms' investment strategies.

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1. Introduction

Due to the abundance of contradictory and inconsistent findings, a clear understanding of how family-specific characteristics affect investment decisions remains limited in the literature (Carnes & Ireland, 2013; Calabrò et al., 2019). According to agency theory, family-owned firms are pulled in two opposing directions with respect to investment efficiency. From the opportunism perspective, family-owned firms may make self-interested investment decisions that benefit controlling family members despite potential negative effects on firm performance (Gomez-Mejia et al., 2001; Choi et al., 2015). In contrast, the competitive advantage perspective posits that family-owned firms are more likely to make investment decisions that support the firm's long-term development (James, 1999; Gomez-Mejia et al., 2007; Chrisman & Patel, 2012).

Strategic management research generally suggests that top management team (hereafter, TMT) compositional heterogeneity—defined as the extent to which managers differ in terms of information, competencies, and preferences—enhances managerial decision-making by encouraging more comprehensive information processing and thorough environmental scanning (Finkelstein & Hambrick, 1996; Golden & Zajac, 2001; Jarzabkowski & Searle, 2005; Zhang, 2019). Accordingly, this study examines the potential relationship between TMT compositional heterogeneity and investment decisions in family-owned firms.

Taiwan provides an appropriate context for examining whether TMT compositional heterogeneity in family-owned firms benefits or detracts from investment efficiency. First, compared with developed countries, Taiwanese culture places greater emphasis on conformity rather than individuality (Begley & Tan, 2001), which significantly influences managerial styles (Hugh, 1986). In Taiwan, senior family members in family-owned firms typically lead the company and make most key decisions. Therefore, this study investigates whether greater heterogeneity within TMTs in Taiwanese family-owned firms allows firms to access a broader range of knowledge and perspectives, thereby improving investment decisions. Second, investment efficiency in this study includes efficient investment in fixed assets and R&D (Hsieh et al., 2003). Compared with large multinational corporations such as Dell, HP, Sony, and IBM, most Taiwanese firms are small and medium-sized enterprises (SMEs), which do not fully benefit from economies of scale. Consequently, these firms emphasize the efficiency of their investment expenditures (Tsai & Wang, 2004) and strive to maintain high-quality investment performance. In addition, they often benefit from relatively lower R&D and capital investment requirements. Therefore, this perspective on investment efficiency is particularly appropriate for studying Taiwanese SMEs.

Family-owned businesses tend to seek better opportunities and management strategies when performance outcomes fall below a reference level, such as the firm's average performance in the previous year (Bromiley, 1991; Wiseman & Gomez-Mejia, 1998; Sciascia et al., 2015). Potential performance deterioration may therefore make family-owned firms more willing to engage in aggressive

investment behavior (Chrisman & Patel, 2012). Furthermore, the tradition of transgenerational family control and intrafamily succession (Chua et al., 2003; Chrisman et al., 2010) provides another reason why family firms strive to avoid long-term performance deterioration. Hence, when facing negative aspiration gaps, it is proposed that TMTs characterized by greater compositional heterogeneity in family-owned firms may better manage such challenges through careful stewardship of transgenerational control and the maintenance of a long-term orientation. Accordingly, this study also examines whether TMT compositional heterogeneity in Taiwanese family-owned firms helps avoid inefficient investments that could threaten firm viability.

After controlling for firm characteristics associated with inefficient investment, the empirical results support the premise that TMT compositional heterogeneity in family-owned firms is associated with improvements in investment efficiency. Furthermore, the results indicate that TMT compositional heterogeneity enhances the ability of family-owned firms to prevent inefficient investments when negative aspiration gaps arise. These findings remain robust after accounting for the endogenous sorting of executives into firms, which may otherwise bias the results. In addition, the results are robust to several identification strategies, including alternative measures of investment inefficiency and partition analyses distinguishing between underinvestment and overinvestment.

This study represents an initial step toward extending the existing literature in this area. Previous research has primarily focused on behavioral differences between family and non-family firms (James, 1999; Gomez-Mejia et al., 2001, 2007; Chrisman & Patel, 2012; Choi et al., 2015). However, Zellweger (2017) argues that little insight is gained from a simple dichotomy between family and non-family firms, as such a distinction may overlook the heterogeneity among family firms or oversimplify the definition of family involvement. In fact, compared with non-family firms, family members in family-owned businesses often occupy top managerial positions and dominate TMT composition. Prior studies generally suggest that family-owned firms exhibit weaker financial performance, corporate governance structures, and managerial practices (Bloom et al., 2012; Mullins & Schoar, 2016), particularly in developing countries (Bloom & Van Reenen, 2007; Bloom et al., 2012). Accordingly, this study complements prior research in emerging market contexts by examining whether TMT compositional heterogeneity in family-owned firms improves investment decisions. In addition, Zhang (2019) examined the relationship between TMT compositional homogeneity and financial reporting quality and found that homogeneous backgrounds and long shared working experiences increase the likelihood of financial restatements. In contrast, this study offers an alternative perspective by suggesting that TMT compositional heterogeneity in family-owned firms may lead to better managerial decision-making.

2. Hypotheses Development

2.1 TMTs and Investment Efficiency in Family-Owned Firms

Family-owned firms face two opposing forces regarding investment efficiency, particularly in capital and R&D investments. On the one hand, family owners may possess both the incentives and the control to make investment decisions that serve their own interests, even when such decisions negatively affect firm performance. For example, Gomez-Mejia et al. (2001) find that ownership and control in Spanish family firms are associated with greater managerial entrenchment. Similarly, Choi et al. (2015) report that family ownership in Korean firms is not positively related to innovation investment, although growth opportunities may mitigate this negative relationship.

On the other hand, family-owned firms may reduce managerial opportunism and create competitive advantages. For instance, James (1999) shows that family firms invest more efficiently than non-family firms because family owners aim to pass the business on to future generations. Likewise, Gomez-Mejia et al. (2007) propose the socioemotional wealth perspective, arguing that family-owned firms often adopt long-term strategic decisions in order to preserve family control and dynasty.

Consistent with the competitive advantage perspective (James, 1999; Gomez-Mejia et al., 2007; Chrisman & Patel, 2012), TMT compositional heterogeneity in family-owned firms is expected to be an important factor that promotes efficient investment decisions. A top management team (TMT) with greater compositional heterogeneity possesses more diverse cognitive resources, which increases the potential for more comprehensive and thoughtful decision-making (Bantel & Jackson, 1989; Kellermanns & Floyd, 2005). Accordingly, TMT compositional heterogeneity in family-owned firms can facilitate the integration of diverse knowledge and perspectives, enabling firms to respond more effectively to investment opportunities and challenges.

In summary, TMTs with greater compositional heterogeneity in family-owned firms may help decision makers avoid excessively risky investment behaviors (e.g., overinvestment) while also preventing insufficient investment (e.g., underinvestment). In doing so, such heterogeneity may alleviate moral hazard problems in investment decision-making. Therefore, the following hypothesis is proposed:

Hypothesis 1: There is a positive association between TMT compositional heterogeneity and investment efficiency in family-owned firms.

2.2 TMTs and Investment Efficiency When Performance Falls Below Aspiration Levels in Family-Owned Firms

When deviations in performance outcomes, relative to a firm's past performance, fall below expectations (Lant et al., 1992), the top management team (TMT) may perceive this situation as a threat to the firm's accumulated resources and long-term viability. Under such circumstances, the TMT may respond by engaging in more efficient investment activities, such as searching for alternative routines, opportunities, or technologies (Bromiley, 1991; Wiseman & Gómez-Mejía, 1998). Therefore, managers' cognitive assessments of appropriate decisions under conditions of uncertainty become a critical issue (Wiseman & Gómez-Mejía, 1998; Chrisman & Patel, 2012).

One important goal of family firms is the continuation of the family dynasty across generations (Chua et al., 2003; Holt et al., 2010). However, when negative aspiration gaps arise—situations in which performance falls below the firm's aspirations—the ability of family owners to maintain guardianship of the firm may be challenged. This concern becomes particularly salient because family firms often preserve positions and assets for future successors (Curasi et al., 2004). In such contexts, TMTs characterized by greater compositional heterogeneity may perceive below-aspiration performance as a significant threat to the family firm and respond by engaging in more efficient investment behavior.

Based on the above arguments, the following hypothesis is proposed:

Hypothesis 2: The positive relationship between TMT compositional heterogeneity and investment efficiency will be stronger when a firm's performance falls below its aspiration level.

3. Research Method

3.1 Sample

The TMT data used in this study are drawn from publicly listed family-owned firms in Taiwan for the period 2009–2015. Financial and investment data are obtained from the TEJ (Taiwan Economic Journal) database. Information on TMT characteristics is manually collected from annual reports available in the Market Observation Post System (MOPS), which is supervised by the Taiwan Stock Exchange. In addition, the sample information is verified through searches of media reports and business magazines.

Following prior studies (Anderson & Reeb, 2003; Silva & Majluf, 2008), a firm is classified as a family firm if the founder or members of the founder's family hold controlling positions, serve on the board of directors, or act as blockholders of the firm. Relevant information is obtained from the TEJ database, company prospectuses, and the Business Groups in Taiwan directory.

Panel A of Table 1 presents the sample selection procedure. Panel B reports the sample distribution by industry, and Panel C reports the sample distribution by year. Overall, the final sample consists of 3,282 firm-year observations representing 508

firms. The industries with the largest proportions of observations are the electronic components industry (approximately 13.28% of the firm-year observations), the semiconductor industry (approximately 10.85%), and the optoelectronics industry (approximately 9.72%).

Tale 1: Sample construction

Panel A: Sample Selection Procedure								
								Observations
Initial samples								5,416
Less: TMTs without sufficient data								(1,648)
Omitted Financial Variables								(215)
Non-Manufacturing Industry								(271)
Family-owned samples								3,282
Panel B: Sample Industries Distribution								
<u>Industries</u>	<u>Firms</u>							<u>Percentage</u>
Electronic Component	436							13.28%
Photoelectric	319							9.72%
Construction	211							6.43%
Semiconductor	356							10.85%
Computer Peripherals	269							8.20%
Electrical Machinery	201							6.12%
Plastics	121							3.69%
Textile	136							4.14%
Other Electronic	142							4.33%
Steel	160							4.88%
Pharmaceuticals	129							3.93%
Chemicals	110							3.35%
Food	91							2.77%
Communication Network	197							6.00%
Electrical Wire and Cable	73							2.22%
Rubber	62							1.89%
Electronic Distributors	114							3.47%
Cement	34							1.04%
Computer Service	54							1.65%
Automobile	32							0.98%
Glass	27							0.82%
Paper	8							0.24%
Total	3,282							100%
Panel C: Sample Year Distribution								
Year	2009	2010	2011	2012	2013	2014	2015	Total
Firms	408	430	458	479	491	508	508	3,282

3.2 Empirical Model

The empirical regression model (1) used in this work is as follows:

$$EFF = a_0 + a_1 TMT_Heterogeneity + a_2 ASP + a_3 TMT_Heterogeneity \times ASP + b_i Control\ Variables + \varepsilon. \quad (1)$$

To examine the forms of dependence, a least square method with cluster-robust standard errors is used (Greene, 1997). That is that all the t-values are estimated based on White (1984) cluster-robust standard errors, which are robust to heteroskedasticity and permit within-cluster correlations (Wooldridge, 2002; Cameron et al., (2011).

This study follows prior studies to capture the overall investment efficiency of firms (Benlemlih & Bitar, 2018; Habib & Hasan, 2017). This investment model calculates results separately for each industry and year. This study also winsorize outliers at the 1% and 99% levels and the estimated model is described as follows:

$$Invest_{i,t} = \alpha + \alpha_1 NEG_{i,t-1} + \alpha_2 \%RevGrowth_{i,t-1} + \alpha_3 NEG * \%RevGrowth_{i,t-1} + \varepsilon_{i,t}. \quad (2)$$

In this study, $Invest_{i,t}$ is the net value of new investment in fixed assets and R&D expenditures. It includes new investments in machinery, equipment, vehicles, land, buildings, and R&D expenditures less the sale of fixed assets and scaled by lagged total assets for firm i in year t . The indicator variable $NEG_{i,t-1}$ takes the value of 1 for negative revenue growth, and 0 otherwise. $\%RevGrowth_{i,t-1}$ is the yearly revenue growth rate for firm i in year $t-1$. The proportion of venture effectiveness depends on deviations from expected investment utilizing a model that predicts venture as an element of development opportunity. In this manner, both under-investment (negative deviations from anticipated venture) and over-investment (positive deviations from anticipated venture) are additionally viewed as wasteful investment (EFF). For ease of interpretation, in this study, negative residuals are multiplied by -1.

In addition, Hsieh et al. (2003) expressed that (1) an interest in R&D gains a working edge return a lot higher than the business cost of capital, and (2) the impact of an interest in R&D on an firm's reasonable worth is around twice that of an interest in fixed resources. The importance of a dollar invested in R&D thus differs from that of a dollar invested in fixed assets. The effects of inefficient investment on fixed assets (EFF_Cap) and R&D (EFF_RD) are further examined.

Same with the practice in previous research, TMTs are defined as the CEO, chairman, CFO, COO (Chief Operating Officer) /President, and the next level of the management hierarchy, such as vice CEO or senior General Manager (Chemmanur & Paeglis, 2005; Chemmanur et al., 2009).

As in most prior studies (Finkelstein & Hambrick, 1996; Golden & Zajac, 2001; Keck & Tushman, 1993), in this study, TMT demographics, such as TMT size, TMT education, and TMT tenure, are used to measure TMT compositional

heterogeneity. First, this study includes the idea that TMT size and a larger management team imply a more diverse TMT. Given the likelihood that TMT size might be associated with firm size, and given that the connection between the two could be nonlinear, TMT size is regressed on the book value of firm assets (BVA), the natural logarithm of the book value of assets ($LNBVA$), the book value squared (where the potential relationship between the two could be nonlinear, BVA^2), and industry dummies (to control for variations in management team size across industries), where the residuals ($XSIZE$) are used as the measure of TMT size as follows:

$$TSIZE_{i,t} = \gamma_0 + \gamma_1 BVA_{i,t} + \gamma_2 LNBVA_{i,t} + \gamma_3 BVA^2_{i,t} + \gamma_4 Industry_{i,t} + \varepsilon. \quad (3)$$

Second, this study includes the percentage of TMT members with an MBA degree to measure the team's knowledge and education (MBA) since a prior study pointed out that members of TMTs employing strategic changes are more likely to hold an MBA degree (Grimm & Smith, 1991). Third, this study includes two indicators regarding TMT tenure. The first indicator is the average tenure of TMT members, where tenure is measured as the average number of years that team members have been working for the firm. A higher average tenure in a firm can show union and shared encounters and in this way may suggest lower exchange costs among members. To avoid a correlation with firm age, in this study, residuals from the regression of $TENURE$ on the natural logarithm of firm age (AGE) are used as the measure of tenure ($XTEN$) as follows:

$$TENURE_{i,t} = \delta_0 + \delta_1 AGE_{i,t} + \varepsilon. \quad (4)$$

The second indicator is tenure heterogeneity ($VART$), which is characterized as the coefficient of the varieties in the tenures of members, which likewise gauges the degree of consistency or heterogeneity in the tenures of supervisory group individuals and their relative significance to the supervisory team.

Table 2 reports the distribution of the TMTs. First, regarding TMT size, the maximum value of TMT Size is 47 members, while the minimum value of TMT Size is 2 members. Approximately 40% of TMTs have less than 5 members, and approximately 75% have fewer than 10 members. Second, regarding TMTs with MBAs, in almost 60% of the firms under consideration, less than 20% of the TMT members have MBA degrees, and the maximum value of the TMTs with MBAs is 0.67. Third, in the case of average TMT tenure, the highest value of average TMT tenure is 29 years, and the lowest value of average TMT tenure is 1 year. Approximately 50% of the sample has served for 5-10 years, and less than 3% of the sample has TMT members with more than 20 years of service. Finally, regarding variance in TMT tenure, approximately 59% have less than 20 years of variance and nearly 19% have greater than 40 years of variance.

Table 2: Distribution of TMTs

TMTs Composition	Min	Max	Distribution	
<i>TMTs Size</i>	2	47	<=5	40.4%
			5-10	34.6%
			10-15	12.5%
			15-20	6.0%
			>20	6.5%
<i>TMTs with MBAs</i>	0	0.67	<=0.1	41.9%
			0.1-0.2	16.8%
			0.2-0.3	15.0%
			0.3-0.4	14.9%
			>0.4	11.4%
<i>Average TMTs Tenure</i>	1	29	<=5	29.9%
			5-10	48.4%
			10-15	15.2%
			15-20	4.4%
			>20	2.1%
<i>Variance TMTs Tenure</i>	0	258.33	<=10	36.5%
			10-20	22.6%
			20-30	10.9%
			30-40	10.6%
			>40	19.4%

Following prior research (Chrisman & Patel, 2012), return on assets (*ROA*) measures firm performance. A persistent edited variable is built to gauge the gaps among desires and performance, which is the discrepancy from historical performance. This reflects the suspicion that there is either a negative error between the company's presentation and its historical performance, or the presentation of contenders has augmented the gap between the two, where leaders are bound to see gaps between current performance and yearnings (Iyer & Miller, 2008). The historical performance gap (Chen, 2008) alludes to the size of execution deficits between periods as estimated by looking at a company's performance at time $t-1$ and its average three-year performance (e.g. $t-2$ to $t-4$). A score of 0 (*ASP*) means that the target is achieved, and a score of 1 (*ASP*) means that the target is not achieved. Based on prior studies (Chemmanur et al., 2009; Benlemlih & Bitar, 2018), this work includes the following control variables: *SIZE* is the natural logarithm of a firm's total assets; financial performance (*ROA*) is defined as operating income divided by total assets; *TANG* is the ratio of property, plant, and equipment to total assets, and *DIVID* is an indicator variable that takes the value of one if the firm paid a dividend, and zero otherwise. *AUDIT* is an indicator variable that takes the value

of one if the company is audited by a big four audit firm, and zero otherwise. *CASH* is the ratio of cash to total assets. *CFOS* is the ratio of operating cash flow to total assets. *SLACK* is the ratio of cash to property, plant, and equipment. *OPER* is the log of receivables to sales plus inventory to COGS multiplied by 360. In addition, *INST* is also included as the percentage of firm shares held by institutional investors. Finally, *Industry Effect* is the categorical variable using the TEJ industry codes. *Year effect* is the categorical variable using sample firm years. Table 3 sums up the meanings of the key factors utilized in this work.

Table 3: Definitions of variables

Variables	Definition
Dependent Variable	
<i>EFF</i>	Total investment efficiency (<i>EFF</i>) is measured as the value of the residuals from the total investment model.
<i>EFF_Cap</i>	Capital investment efficiency (<i>EFF_Cap</i>) is measured as the value of the residuals from the capital investment model.
<i>EFF_RD</i>	R&D investment efficiency (<i>EFF_RD</i>) is measured as the value of the residuals from the R&D investment model.
Independent Variables	
<i>TMT_Heterogeneity</i>	First, TMT size is regressed on the book value of firm assets (<i>BVA</i>), the natural logarithm of the book value of assets (<i>LN BVA</i>), the book value squared (the potential relationship between the two could be nonlinear, <i>BVA2</i>), and industry dummies (to control for variations in management team size across industries, <i>Industry</i>), where the residuals (<i>XSIZE</i>) are used as the measure of TMT size. Second, the percentage of TMT members with an MBA degree is used to measure the team's knowledge and level of education. In this study, the percentage of TMT members with a master's degree is used to measure team knowledge and education (<i>MBA</i>). Finally, this study includes TMT tenure. The first indicator is the average tenure of TMT members, where tenure is measured as the average number of years that team members have been working for their firm. To avoid any correlations with firm age, in this study, residuals from the regression of <i>TENURE</i> on the natural logarithm of firm age (<i>AGE</i>) are used as the measure of tenure (<i>XTEN</i>). The second indicator of TMT structure, therefore, is tenure heterogeneity (<i>VART</i>), defined as the coefficient of the variations in the team members' tenures.
<i>ASP</i>	The historical performance gap refers to the magnitude of performance shortfalls between periods and is measured by comparing a firm's performance in time t-1 and its average three-year performance (e.g. t-2 to t-4). A score of 0 (<i>ASP</i>) means that the target is achieved, and a score of 1 (<i>ASP</i>) means that the target is not achieved.

Control Variables	
<i>SIZE</i>	<i>SIZE</i> is the natural logarithm of a firm's total assets.
<i>ROA</i>	<i>ROA</i> is defined as operating income divided by total assets.
<i>TANG</i>	<i>TANG</i> is the ratio of property, plant, and equipment to total assets.
<i>DIVID</i>	<i>DIVID</i> is an indicator variable that takes the value of one if the firm paid a dividend, and zero otherwise.
<i>AUDIT</i>	<i>AUDIT</i> is an indicator variable that takes the value of one if the company is audited by a big four audit firm, and zero otherwise.
<i>CASH</i>	<i>CASH</i> is the ratio of cash to total assets.
<i>CFOS</i>	<i>CFOS</i> is the ratio of operating cash flow to total assets.
<i>SLACK</i>	<i>SLACK</i> is the ratio of cash to property, plant, and equipment.
<i>OPER</i>	<i>OPER</i> is the log of receivables to sales plus inventory to COGS multiplied by 360.
<i>INST</i>	<i>INST</i> is the percentage of firm shares held by institutional investors.
<i>Year Effect</i>	<i>Year Effect</i> is defined as a categorical variable using sample firm year.
<i>Industry Effect</i>	<i>Industry Effect</i> is defined as a categorical variable using <i>TEJ</i> industry codes.

4. Empirical Results

4.1 Descriptive Statistics

Table 4 gives illustrative insights to the entirety of the factors included for this research. The means of the absolute value of total inefficiency (*EFF*), the absolute value of capital inefficiency (*EFF_Cap*), and the absolute value of R&D inefficiency (*EFF_RD*) are, respectively, 0.06; 0.04, and 0.02, which suggest that capital inefficiency is higher than R&D inefficiency in Taiwanese family-owned firms. The mean (median) value of the TMTs is very similar to those reported in Table 2. Table 4 also shows the correlations among the variables. Consistent with the prediction, TMT tenure heterogeneity (*VART*) is negatively and significantly correlated with the absolute value of R&D inefficiency (*EFF_RD*) and the absolute value of capital inefficiency (*EFF_Cap*).

Table 4: Descriptive statistics and correlations matrix

Variables	Mean	Med.	Dev	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
V1.EFF	0.06	0.05	0.05	0.80 ^a	0.57 ^a	-0.03	-0.03	-0.03	-0.04 ^a	-0.01	-0.04 ^a	0.16 ^a	-0.02	0.04 ^a	0.07 ^a	0.16 ^a	0.02	0.11 ^a	-0.07 ^a	0.09 ^a
V2.EFF_Cap	0.04	0.03	0.04		-0.03 ^b	-0.02	0.01	-0.02	0.01	-0.03	-0.01	0.11 ^a	0.15 ^a	0.02	0.02	-0.01	0.03	0.07 ^a	-0.08 ^a	0.06 ^a
V3.EFF_RD	0.02	0.02	0.03			-0.02	-0.04 ^b	-0.01	-0.09 ^a	0.02	-0.06 ^a	0.10 ^a	0.24 ^a	0.03	0.09 ^a	0.28 ^a	-0.01	0.08 ^a	-0.01	0.07 ^a
V4.XSIZE	0.21	-0.80	6.18				0.04 ^b	-0.17 ^a	-0.13 ^a	0.01	0.01	0.01	0.09 ^a	0.03 [*]	0.10 ^a	0.01	0.05 ^a	-0.09 ^a	0.01	0.03
V5.MBA	0.15	0.11	0.17					-0.06 ^a	-0.03 ^b	0.02	0.07 ^a	0.01	-0.04 ^a	0.04 ^b	0.15 ^a	0.01	0.05 ^a	-0.03	0.03	0.10 ^a
V6.XTEN	0.50	-0.38	4.24						0.63 ^a	-0.02	-0.14 ^a	0.11 ^a	-0.01	0.05 ^a	-0.06 ^a	0.01	0.07 ^a	0.06 ^a	0.13 ^a	-0.05 ^a
V7.VART	33.80	16.33	47.57							-0.01	-0.08 ^a	0.05 ^a	0.07 ^a	0.04 ^b	-0.12 ^a	-0.04 ^a	0.05 ^a	0.04 ^b	0.09 ^a	-0.04 ^a
V8.ASP	0.58	1.00	0.49								0.03	-0.16 ^a	0.04 ^b	-0.10 ^a	0.03	0.01	0.01	-0.03	0.02	-0.03
V9.SIZE	6.98	6.90	0.59									0.08 ^a	0.08 ^a	0.17 ^a	0.09 ^a	-0.17 ^a	0.08 ^a	-0.10 ^a	-0.19 ^a	0.61 ^a
V10.ROA	0.04	0.04	0.07										-0.18 ^a	0.63 ^a	0.07 ^a	0.22 ^a	0.35 ^a	0.07 ^a	-0.13 ^a	0.26 ^a
V11.TANG	0.28	0.26	0.17											-0.16 ^a	-0.02	-0.33 ^a	0.21 ^a	-0.37 ^a	0.08 ^a	-0.03
V12.DIVID	0.74	1.00	0.44												0.07 ^a	0.12 ^a	0.25 ^a	-0.03	-0.03	0.24 ^a
V13.AUDIT	0.88	1.00	0.33													0.20 ^a	0.11 ^a	-0.05 ^a	-0.01	0.16 ^a
V14.CASH	0.17	0.14	0.13														0.20 ^a	0.20 ^a	-0.01	0.12 ^a
V15.CFOS	0.07	0.08	0.20															-0.12 ^a	0.01	0.17 ^a
V16.SLACK	2.82	0.57	9.67																-0.16 ^a	-0.04 ^b
V17.OPER	1.44	1.47	0.30																	-0.09 ^a
V18.INST	0.12	0.07	0.13																	-

Note: Definitions of variables appear in Table 3. The sample includes 3,282 firm-year observations. This table show Pearson correlations. ^a and ^b represent significance at the 1% and 5% levels using a two-tailed test, respectively.

Table 5 reports the difference tests between the two subsamples, partitioned according to whether the firm is family-owned or non-family-owned. The results reveal several significant between-group differences. Specifically, family-owned firms exhibit lower absolute values of total investment inefficiency (*EFF*) and R&D investment inefficiency (*EFF_RD*), suggesting that family-owned firms experience fewer investment inefficiency problems than non-family-owned firms.

In addition, family-owned firms have longer average TMT tenure and greater variance in TMT tenure compared with non-family-owned firms. This pattern is consistent with the fact that TMTs in family-owned firms often include family members, who typically face lower pressure regarding job security.

Table 5 also shows that family-owned firms have higher fixed assets to total assets (*TANG*) and a higher operating cycle ratio (*OPER*). In contrast, family-owned firms exhibit lower dividend payments (*DIVID*), a lower likelihood of being audited by a Big Four audit firm (*AUDIT*), a lower cash-to-total-assets ratio (*CASH*), lower operating cash flow relative to total assets (*CFOS*), and lower financial slack measured by cash relative to property, plant, and equipment (*SLACK*), compared with non-family-owned firms.

Table 5: Difference between family and non-family firms

<i>Samples</i>	<i>Family-Owned Firms</i>		<i>Non- Family-Owned Firms</i>		<i>Difference Test</i>
	<i>Mean</i>	<i>Std.</i>	<i>Mean</i>	<i>Std.</i>	<i>t-value</i>
<i>EFF</i>	0.061	0.046	0.071	0.053	-5.79***
<i>EFF_Cap</i>	0.036	0.040	0.040	0.039	-0.97
<i>EFF_RD</i>	0.021	0.021	0.031	0.029	-7.95***
<i>XSIZE</i>	0.166	6.655	0.277	5.250	-0.50
<i>MBA</i>	0.146	0.166	0.146	0.164	-0.05
<i>XTEN</i>	0.729	4.509	0.101	3.686	4.33***
<i>VART</i>	39.964	54.782	23.158	28.454	11.55***
<i>ASPI</i>	0.562	0.496	0.603	0.490	-2.26**
<i>SIZE</i>	6.967	0.575	6.997	0.604	-1.39
<i>ROA</i>	0.038	0.071	0.043	0.073	-1.90*
<i>TANG</i>	0.295	0.172	0.245	0.162	8.36***
<i>DIVID</i>	0.713	0.452	0.793	0.405	-5.20***
<i>AUDIT</i>	0.856	0.351	0.919	0.272	-5.75***
<i>CASH</i>	0.157	0.124	0.196	0.131	-8.29***
<i>CFOS</i>	0.068	0.219	0.081	0.175	-1.99***
<i>SLACK</i>	2.501	9.064	3.377	9.766	-2.50**
<i>OPER</i>	1.447	0.304	1.419	0.304	2.53**
<i>INSTI</i>	0.103	0.118	0.137	0.147	-6.90***

Note: Definitions of variables appear in Table 3. The sample includes 3,282 firm-year observations. ***, **, and * represent significance at the 1%, 5%, and 10% levels using a two-tailed test, respectively.

4.2 Results for TMTs and Efficient Investment in Family-Owned Firms

The estimation results for TMT heterogeneity and investment efficiency are presented in Table 6. Panel A reports the results based on the full sample. The findings indicate that TMT size (*XSIZE*) is significantly negatively associated with both the absolute value of total investment inefficiency (*EFF*) and the absolute value of capital investment inefficiency (*EFF_Cap*). Similarly, the average TMT tenure (*XTEN*) is significantly negatively associated with both the absolute value of total investment inefficiency (*EFF*) and the absolute value of capital investment inefficiency (*EFF_Cap*). In addition, TMT tenure heterogeneity (*VART*) is significantly negatively associated with the absolute value of R&D investment inefficiency.

Panel B presents the results for the subsample of family-owned firms. The findings are consistent with those of the full sample. Specifically, both TMT size (*XSIZE*)

and average TMT tenure (*XTEN*) are negatively associated with the absolute value of total investment inefficiency (*EFF*) and capital investment inefficiency (*EFF_Cap*). Moreover, TMT tenure heterogeneity (*VART*) is negatively associated with the absolute value of R&D investment inefficiency.

Panel C reports the results for the subsample of non-family firms. The results indicate that most of the TMT compositional heterogeneity variables are not statistically significant in this subsample. Finally, the results provide no evidence that the presence of TMT members with MBA degrees (*MBA*) is associated with lower levels of investment inefficiency across all three samples.

Table 6: The TMTs compositional heterogeneity and investment inefficiency

<i>Panel A: Full Sample</i>						
	<i>EFF</i>		<i>EFF_Cap</i>		<i>EFF_RD</i>	
<i>Variables</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
<i>Intercept</i>	0.102***	6.94	0.078***	6.24	0.037***	4.88
<i>XSIZE</i>	-0.001***	-2.89	-0.001**	-2.59	-0.001	-1.19
<i>MBA</i>	0.001	0.12	0.003	0.83	-0.004	-1.47
<i>XTEN</i>	-0.001**	-2.51	-0.001*	-1.92	-0.001	-0.25
<i>VART</i>	-0.001	-0.07	0.001	0.85	-0.001*	-1.88
<i>SIZE</i>	-0.010***	-5.19	-0.009***	-5.27	-0.003***	-3.12
<i>ROA</i>	0.148***	9.50	0.062***	11.95	0.035***	4.37
<i>TANG</i>	0.032***	5.18	0.008***	4.39	-0.035***	-11.07
<i>DIVID</i>	-0.003	-1.26	0.001	0.33	-0.001	-1.09
<i>AUDIT</i>	0.003	1.03	-0.003	-0.37	0.002*	1.85
<i>CASH</i>	0.025***	3.17	-0.004	-1.03	0.027***	6.46
<i>CFOS</i>	-0.022***	-4.96	0.001***	5.39	-0.009***	-3.69
<i>SLACK</i>	0.001***	3.48	-0.007***	-2.72	-0.001*	-1.91
<i>OPER</i>	-0.001	-0.08	0.037***	5.26	0.003**	2.16
<i>INST</i>	0.033***	3.99	0.008	0.01	0.008*	1.85
<i>YEAR</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>INDUSTRY</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>N</i>	3,282		3,282		3,282	
<i>Adjusted R²</i>	20.19%		9.54%		30.02%	
<i>F-value (P-value)</i>	24.72 (<0.01)		11.18 (<0.01)		41.21 (<0.01)	

Panel B: Family-Owned Firms						
	<i>EFF</i>		<i>EFF_Cap</i>		<i>EFF_RD</i>	
<i>Variables</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
<i>Intercept</i>	0.114***	6.19	0.085***	5.18	0.047***	6.17
<i>XSIZE</i>	-0.001***	-3.28	-0.001***	-3.40	-0.001	-0.44
<i>MBA</i>	0.006	1.05	0.006	1.09	-0.002	-0.66
<i>XTEN</i>	-0.001**	-2.37	-0.001*	-1.94	0.001	0.29
<i>VART</i>	0.001	0.59	0.001	1.54	-0.001***	-2.68
<i>SIZE</i>	-0.011***	-4.68	-0.011***	-5.13	-0.003***	-2.80
<i>ROA</i>	0.118***	6.20	0.054***	8.35	0.003	0.32
<i>TANG</i>	0.039***	5.29	0.007***	3.24	-0.020***	-6.60
<i>DIVID</i>	-0.002	-0.70	0.003	1.32	-0.001	-0.33
<i>AUDIT</i>	0.005	1.56	-0.007	-0.76	0.001	0.82
<i>CASH</i>	0.005	0.50	-0.010**	-2.16	0.013***	3.13
<i>CFOS</i>	-0.026***	-5.21	0.000***	4.09	-0.007***	-3.53
<i>SLACK</i>	0.001***	2.81	-0.002	-0.65	-0.001*	-1.85
<i>OPER</i>	-0.003	-0.84	0.049***	5.02	-0.003*	-1.96
<i>INST</i>	0.032***	2.90	0.085***	5.18	0.001	0.29
<i>YEAR</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>INDUSTRY</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>N</i>	2,079		2,079		2,079	
<i>Adjusted R²</i>	13.95%		8.97%		20.04%	
<i>F-value (P-value)</i>	10.63 (<0.01)		7.02 (<0.01)		15.88 (<0.01)	
Panel C: Non-Family-Owned Firms						
	<i>EFF</i>		<i>EFF_Cap</i>		<i>EFF_RD</i>	
<i>Variables</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
<i>Intercept</i>	0.096***	3.88	0.066***	3.35	0.034**	2.21
<i>XSIZE</i>	-0.001	-1.62	0.001	0.97	-0.001***	-3.43
<i>MBA</i>	-0.005	-0.52	0.002	0.22	-0.006	-1.06
<i>XTEN</i>	-0.001	-1.48	-0.001	-0.59	-0.001	-1.33
<i>VART</i>	-0.001	-0.62	-0.001	-0.96	0.001	0.40
<i>SIZE</i>	-0.008**	-2.48	-0.005*	-1.88	-0.004***	-2.02
<i>ROA</i>	0.203***	7.25	0.075***	8.24	0.095***	5.52
<i>TANG</i>	0.026**	2.26	0.008***	2.54	-0.055***	-7.72
<i>DIVID</i>	-0.007	-1.45	-0.006	-1.33	-0.004	-1.45
<i>AUDIT</i>	-0.001	-0.02	0.006	0.54	0.008**	2.33
<i>CASH</i>	0.042***	3.10	0.011	1.60	0.032***	3.84

<i>CFOS</i>	-0.011	-1.17	0.001***	3.24	-0.011*	-1.95
<i>SLACK</i>	0.000	0.79	-0.011***	-2.90	-0.001**	-2.47
<i>OPER</i>	0.004	0.86	0.021**	2.03	0.011***	3.75
<i>INST</i>	0.026**	1.98	0.011	0.17	0.011	1.36
<i>YEAR</i>	YES		YES		YES	
<i>INDUSTRY</i>	YES		YES		YES	
<i>N</i>	1,203		1,203		1,203	
<i>Adjusted R²</i>	30.24%		13.68%		41.60%	
<i>F-value (P-value)</i>	16.32 (<0.01)		6.77 (<0.01)		26.18 (<0.01)	

Note: Definitions of variables appear in Table 3. All the t-values were estimated based on White (1984) cluster-robust standard errors, which are robust to heteroskedasticity and permit within-cluster correlations (e.g., within firm). ***, ** and * represent significance at the 1%, 5%, and 10% levels using a two-tailed test, respectively.

Table 7 presents the empirical results for Hypothesis 2. Panel A reports the results for the full sample. The regression results show that the coefficient for $MBA \times ASP$ is negative and significant, and the coefficient for $VART \times ASP$ is also negative and significant with respect to total investment inefficiency and capital investment inefficiency. These results suggest that when firms face potential threats to their family wealth due to below-aspiration performance, TMT members with MBA degrees (*MBA*) and greater TMT tenure heterogeneity (*VART*) are more likely to recognize such performance shortfalls and respond by reducing inefficient capital investment.

Panel B reports the results for the subsample of family-owned firms. To test Hypothesis 2, the interaction terms between TMT compositional heterogeneity and aspiration levels ($TMT\ heterogeneity \times ASP$) are examined. The regression results indicate that the coefficient for $MBA \times ASP$ is negative and statistically significant. Similarly, the coefficient for $VART \times ASP$ is negative and significant for both total investment inefficiency and capital investment inefficiency. These findings suggest that when family-owned firms face potential threats to family wealth, TMT members with MBA degrees and greater tenure heterogeneity are more sensitive to below-aspiration performance and therefore help reduce inefficient capital investment.

In contrast, larger TMT size (*XSIZE*) and longer average TMT tenure (*XTEN*) in family-owned firms remain significantly negatively associated with the absolute value of capital investment inefficiency (*EFF_Cap*). However, the interaction effects for these two variables are not statistically significant, indicating that the moderating effects are not supported. Specifically, the coefficients for $XSIZE \times ASP$ and $XTEN \times ASP$ are insignificant.

Finally, Panel C reports the results for the subsample of non-family firms. The results indicate that the interaction terms between TMT compositional heterogeneity and aspiration levels are not statistically significant in this subsample.

Table 7: TMT heterogeneity, aspiration, and investment inefficiency

<i>Panel A: Full Sample</i>						
<i>Variables</i>	<i>EFF</i>		<i>EFF_Cap</i>		<i>EFF_RD</i>	
	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
<i>Intercept</i>	0.103***	6.95	0.065***	5.17	0.038***	4.91
<i>XSIZE</i>	-0.001*	-1.79	-0.001***	-2.08	0.001	0.13
<i>MBA</i>	0.009	1.14	0.017***	2.60	-0.008**	-2.03
<i>XTEN</i>	-0.001	-1.39	-0.001	-1.32	0.001	-0.40
<i>VART</i>	0.001	0.96	0.001*	1.94	-0.001	-1.18
<i>XSIZE</i> × <i>ASP</i>	-0.001	-0.30	0.001	0.43	-0.001	-1.24
<i>MBA</i> × <i>ASP</i>	-0.015	-1.59	-0.022***	-2.67	0.007	1.36
<i>XTEN</i> × <i>ASP</i>	-0.001	-0.57	-0.001	-0.73	0.001	0.22
<i>VART</i> × <i>ASP</i>	-0.001	-1.51	-0.001*	-1.69	-0.001	-0.18
<i>ASP</i>	0.007***	2.92	0.006***	2.68	0.001	0.96
<i>SIZE</i>	-0.010***	-5.50	-0.007***	-4.46	-0.003***	-3.18
<i>ROA</i>	0.148***	9.33	0.102***	7.62	0.040***	4.80
<i>TANG</i>	0.031***	4.99	0.065***	12.58	-0.035***	-10.95
<i>DIVID</i>	-0.003	-1.19	-0.001	-0.67	-0.001	-1.13
<i>AUDIT</i>	0.002	0.92	0.001	0.02	0.002	1.72
<i>CASH</i>	0.023***	2.90	-0.008	-1.24	0.027***	6.43
<i>CFOS</i>	-0.021***	-4.66	-0.011***	-2.86	-0.009***	-3.67
<i>SLACK</i>	0.001***	3.38	0.001***	5.00	-0.001*	-1.89
<i>OPER</i>	0.001	-0.06	-0.003	-1.37	0.003***	2.08
<i>INST</i>	0.036***	4.27	0.028***	4.01	0.008*	1.86
<i>YEAR</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>INDUSTRY</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>N</i>	3,282		3,282		3,282	
<i>Adjusted R²</i>	20.48%		12.05%		30.064%	
<i>F-value (P-value)</i>	19.37 (<0.01)		10.77 (<0.01)		31.65 (<0.01)	
<i>Panel B: Family-Owned Firms</i>						
<i>Variables</i>	<i>EFF</i>		<i>EFF_Cap</i>		<i>EFF_RD</i>	
	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
<i>Intercept</i>	0.117***	6.25	0.071***	4.26	0.048***	6.24
<i>XSIZE</i>	-0.001***	-2.07	-0.001**	-2.08	-0.001	-0.07
<i>MBA</i>	0.020***	2.19	0.022***	2.79	-0.003	-0.87
<i>XTEN</i>	-0.001	-1.43	-0.001*	-1.72	0.001	0.64
<i>VART</i>	0.001*	1.77	0.001***	2.80	-0.001*	-1.85

<i>XSIZE</i> × <i>ASP</i>	-0.001	-0.30	-0.001	-0.27	-0.001	-0.37
<i>MBA</i> × <i>ASP</i>	-0.027**	-2.30	-0.027***	-2.64	0.002	0.42
<i>XTEN</i> × <i>ASP</i>	-0.001	-0.48	-0.001	-0.17	-0.001	-0.73
<i>VART</i> × <i>ASP</i>	-0.001**	-2.02	-0.001**	-2.16	-0.001	-0.10
<i>ASP</i>	0.010***	3.22	0.009***	3.13	0.001	0.42
<i>SIZE</i>	-0.012***	-4.99	-0.009***	-4.46	-0.003***	-2.80
<i>ROA</i>	0.117***	6.05	0.107***	6.25	0.005	0.58
<i>TANG</i>	0.037***	5.10	0.056***	8.62	-0.019***	-6.43
<i>DIVID</i>	-0.002	-0.57	-0.001	-0.48	-0.001	-0.36
<i>AUDIT</i>	0.004	1.44	0.003	1.18	0.001	0.71
<i>CASH</i>	0.002	0.21	-0.015*	-1.65	0.013***	3.08
<i>CFOS</i>	-0.026***	-5.16	-0.017***	-3.75	-0.007***	-3.50
<i>SLACK</i>	0.000***	2.67	0.001***	3.69	-0.001*	-1.89
<i>OPER</i>	-0.003	-0.89	0.001	0.15	-0.003**	-2.11
<i>INST</i>	0.035***	3.10	0.037***	3.78	0.001	0.19
<i>YEAR</i>	YES		YES		YES	
<i>INDUSTRY</i>	YES		YES		YES	
<i>N</i>	2,079		2,079		2,079	
<i>Adjusted R²</i>	14.36%		11.39%		19.84%	
<i>F-value (P-value)</i>	8.58 (<0.01)		6.81 (<0.01)		12.18 (<0.01)	
Panel C: Non-Family-Owned Firms						
<i>Variables</i>	<i>EFF</i>		<i>EFF_Cap</i>		<i>EFF_RD</i>	
	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
<i>Intercept</i>	0.101***	4.03	0.058***	2.94	0.037**	2.41
<i>XSIZE</i>	-0.001**	-2.24	-0.001	-0.06	-0.001***	-3.32
<i>MBA</i>	-0.013	-0.91	0.008	0.72	-0.020**	-2.22
<i>XTEN</i>	0.001	0.05	0.001	0.25	-0.001	-0.52
<i>VART</i>	-0.001	-1.16	-0.001	-1.09	-0.001	-0.10
<i>XSIZE</i> × <i>ASP</i>	0.001	1.48	0.001	0.63	0.001	1.51
<i>MBA</i> × <i>ASP</i>	0.011	0.65	-0.011	-0.84	0.021*	1.96
<i>XTEN</i> × <i>ASP</i>	-0.001	-1.19	-0.001	-0.93	-0.001	-0.41
<i>VART</i> × <i>ASP</i>	0.001	0.89	0.001	0.63	0.001	0.37
<i>ASP</i>	-0.001	-0.30	-0.001	-0.05	-0.001	-0.18
<i>SIZE</i>	-0.009***	-2.71	-0.004	-1.42	-0.005**	-2.24
<i>ROA</i>	0.204***	7.17	0.091***	4.06	0.104***	5.94
<i>TANG</i>	0.025***	2.16	0.081***	8.79	-0.055***	-7.59

<i>DIVID</i>	-0.007	-1.52	-0.003	-0.70	-0.004	-1.48
<i>AUDIT</i>	0.001	0.07	-0.007*	-1.68	0.008**	2.32
<i>CASH</i>	0.041***	3.01	0.004	0.40	0.033***	3.87
<i>CFOS</i>	-0.006	-0.7	0.005	0.72	-0.011*	-1.96
<i>SLACK</i>	0.001	0.63	0.001***	2.99	-0.001***	-2.58
<i>OPER</i>	0.005	1.00	-0.007*	-1.91	0.012***	3.87
<i>INST</i>	0.028**	2.17	0.015	1.44	0.012	1.46
<i>YEAR</i>	YES		YES		YES	
<i>INDUSTRY</i>	YES		YES		YES	
<i>N</i>	1,203		1,203		1,203	
<i>Adjusted R²</i>	30.56%		16.14%		41.73%	
<i>F-value (P-value)</i>	12.76 (<0.01)		6.14 (<0.01)		20.13 (<0.01)	

Note: Definitions of variables appear in Table 3. All the t-values were estimated based on White (1984) cluster-robust standard errors, which are robust to heteroskedasticity and permit within-cluster correlations (e.g., within firm). ***, ** and * represent significance at the 1%, 5%, and 10% levels using a two-tailed test, respectively.

Overall, the findings support Hypothesis 1 and indicate that larger TMT size (*XSIZE*) and longer TMT tenure (*XTEN*) in family-owned firms help alleviate agency problems in capital investment decision-making. In addition, TMT tenure heterogeneity (*VART*) helps family-owned firms reduce inefficiencies in R&D investment. The results also support Hypothesis 2, showing that when TMT members in family-owned firms possess MBA degrees (*MBA*) and exhibit greater tenure heterogeneity (*VART*), they are more responsive to negative aspiration gaps. This heightened awareness encourages more careful planning, including the prudent management of family control and the maintenance of a long-term orientation, thereby helping to avoid inefficient capital investment.

Two different theoretical frameworks explain the relationship between family ownership and investment strategy. Under agency theory, family-owned firms may possess both the incentives and the power to pursue managerial entrenchment through inefficient investment decisions. Both Gomez-Mejia et al. (2001) and Choi et al. (2015) provide evidence supporting this negative association between family ownership and investment efficiency. In contrast, the results for Hypothesis 1 are consistent with the competitive advantage perspective (James, 1999; Gomez-Mejia et al., 2007; Chrisman & Patel, 2012) and complement prior accounting research on managerial demographics (Francis et al., 2015; McGuire et al., 2012; Zhang, 2019). These findings suggest that family-owned firms can enhance investment efficiency when their top management teams possess appropriate structural characteristics. A distinguishing feature of this study is that, unlike many prior studies (James, 1999; Gomez-Mejia et al., 2007; Chrisman & Patel, 2012), which rely primarily on a simple family versus non-family firm dichotomy to examine differences in

investment behavior, this study moves beyond such a binary classification. Instead, it provides evidence that TMT compositional heterogeneity within family-owned firms plays an important role in promoting efficient investment decisions relative to non-family-owned firms. More broadly, this study compares the heterogeneity of TMT structures—particularly with respect to tenure, education, and team size—between family-owned and non-family-owned firms.

Prior research suggests that family-owned firms often seek to pass the business on to future generations, particularly in U.S. and European contexts (James, 1999; Gomez-Mejia et al., 2007). Consistent with this perspective and the findings of Hypothesis 2, the present study provides evidence that family-owned firms in the Taiwanese emerging market context improve the quality and diversity of their top management teams in order to reduce inefficient investments when faced with negative aspiration gaps.

4.3 The Sample Selection Concern

A primary challenge in this study is that the composition of top management in family-owned firms is an endogenous choice, determined by the board of directors based on the strategic needs of the firm. To address potential endogeneity concerns, two complementary approaches are employed.

The Heckman two-stage procedure is used to mitigate concerns that sample selection may be driving the cross-sectional results. Following Heckman (1979), a two-step estimation method incorporating the inverse Mills ratio is applied to account for potential selection bias. In the first stage, a Probit model is estimated to predict the likelihood of a firm being family-owned (versus non-family-owned) using fundamental financial variables as explanatory variables, including the control variables from the main regression. The estimated parameters from this stage are then used to calculate the inverse Mills ratio, which is included as an additional regressor in the OLS estimation (Greene, 1997). Table 8 shows that after accounting for sample selection, the results remain consistent with the main findings, indicating that the primary conclusions are robust.

Table 8: Sample selection consideration

<i>Variables</i>	<i>EFF</i>		<i>EFF_Cap</i>		<i>EFF_RD</i>	
	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
<i>Intercept</i>	0.043	1.07	0.056**	2.19	-0.006	-0.26
<i>XSIZE</i>	-0.001**	-2.29	-0.001**	-2.14	-0.001	-0.40
<i>MBA</i>	0.019**	2.19	0.022***	2.80	-0.004	-1.14
<i>XTEN</i>	-0.001	-1.56	-0.001*	-1.78	0.001	0.29
<i>VART</i>	0.001*	1.71	0.001***	2.83	-0.001	-1.60
<i>XSIZE</i> × <i>ASP</i>	-0.001	-0.37	-0.001	-0.29	-0.001	-0.49
<i>MBA</i> × <i>ASP</i>	-0.026**	-2.36	-0.027***	-2.66	0.002	0.59
<i>XTEN</i> × <i>ASP</i>	-0.001	-0.45	0.001	-0.17	-0.001	-0.62
<i>VART</i> × <i>ASP</i>	-0.001*	-1.92	-0.001***	-2.17	-0.001	-0.01
<i>ASP</i>	0.009***	3.01	0.009***	3.11	0.001	0.05
<i>SIZE</i>	-0.006	-1.54	-0.008***	-3.25	0.001	0.47
<i>ROA</i>	0.195***	4.55	0.123***	4.60	0.062**	2.39
<i>TANG</i>	0.089**	3.80	0.066**	4.46	0.019	1.32
<i>DIVID</i>	-0.024**	-2.41	-0.006	-0.90	-0.017***	-2.81
<i>AUDIT</i>	-0.003	-0.55	0.002	0.49	-0.005	-1.28
<i>CASH</i>	-0.002	-0.13	-0.016*	-1.69	0.010	1.02
<i>CFOS</i>	-0.027***	-3.18	-0.017***	-3.65	-0.008	-1.44
<i>SLACK</i>	0.000	0.93	0.001***	3.05	0.001***	-3.79
<i>OPER</i>	0.007	0.97	0.003	0.59	0.004	0.98
<i>INST</i>	-0.026	-0.89	0.025	1.37	-0.044**	-2.53
<i>Invers Mill</i>	0.099***	2.65	0.020	0.78	0.074***	3.39
<i>YEAR</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>INDUSTRY</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>N</i>	2,079		2,079		2,079	
<i>Adjusted R²</i>	14.45%		10.98%		20.97%	

Note: Definitions of variables appear in Table 3. ***, ** and * represent significance at the 1%, 5%, and 10% levels using a two-tailed test, respectively.

4.4 Additional Tests

In this study, additional tests are also conducted to assess the model validity. First, this study follows Biddle et al. (2009) by identifying industry year combinations at the industry level using the following regression:

$$Invest_{i,t} = \beta_0 + \beta_1 RevGrowth_{i,t-1} + \varepsilon, \quad (5)$$

where $Invest_{i,t}$ is the average investment of the considerable number of firms in every industry-year group, and $RevGrowth_{i,t-1}$, an intermediary for venture opportunities, is the average sales development for all organizations in every industry and the earlier year group. Table 9 indicates that the coefficients of TMT size (*XSIZE*) and average TMT tenure (*XTEN*) have the predicted negative sign and are significant. In addition, the coefficients for *MBA*×*ASP* and *VART*×*ASP* are negative regarding investment inefficiency. Therefore, the above results are consistent with prior findings.

Table 9: Alternative measures of investment inefficiency

<i>Variables</i>	<i>EFF</i>		<i>EFF_Cap</i>		<i>EFF_RD</i>	
	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
<i>Intercept</i>	0.120***	6.51	0.071***	4.26	0.052***	6.73
<i>XSIZE</i>	-0.001*	-1.75	-0.001*	-1.75	0.001	0.03
<i>MBA</i>	0.021**	2.33	0.023***	2.90	-0.003	-0.75
<i>XTEN</i>	-0.001*	-1.91	-0.001**	-2.17	0.001	0.42
<i>VART</i>	0.001*	1.88	0.001***	2.93	-0.001*	-1.88
<i>XSIZE</i> × <i>ASP</i>	-0.001	-0.67	-0.001	-0.59	-0.001	-0.55
<i>MBA</i> × <i>ASP</i>	-0.025**	-2.20	-0.026***	-2.56	0.002	0.40
<i>XTEN</i> × <i>ASP</i>	-0.001	-0.11	0.000	0.14	-0.001	-0.54
<i>VART</i> × <i>ASP</i>	-0.001**	-2.27	-0.001**	-2.42	-0.001	-0.08
<i>ASP</i>	0.011***	3.70	0.010***	3.52	0.001	0.79
<i>SIZE</i>	-0.012***	-5.25	-0.010***	-4.56	-0.003***	-3.18
<i>ROA</i>	0.117***	6.09	0.107***	6.22	0.007	0.85
<i>TANG</i>	0.039***	5.33	0.059***	9.02	-0.020***	-6.72
<i>DIVID</i>	-0.002	-0.80	-0.001	-0.60	-0.001	-0.80
<i>AUDIT</i>	0.004	1.28	0.003	1.14	0.001	0.47
<i>CASH</i>	0.003	0.31	-0.013	-1.40	0.012***	2.84
<i>CFOS</i>	-0.025***	-4.98	-0.017***	-3.64	-0.008***	-3.59
<i>SLACK</i>	0.001***	3.09	0.001***	3.97	-0.001	-1.50
<i>OPER</i>	-0.003	-0.92	0.001	0.22	-0.003**	-2.23
<i>INST</i>	0.001***	3.18	0.001***	3.78	0.000	0.34
<i>YEAR</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>INDUSTRY</i>	<i>YES</i>		<i>YES</i>		<i>YES</i>	
<i>N</i>	2,079		2,079		2,079	
<i>Adjusted R²</i>	15.30%		12.01%		20.48%	
<i>F-value</i>	9.16		7.17		12.63	
<i>(P-value)</i>	(<0.01)		(<0.01)		(<0.01)	

Note: Definitions of variables appear in Table 3. All the t-values were estimated based on White (1984) cluster-robust standard errors, which are robust to heteroskedasticity and permit within-cluster correlations (e.g., within firm). ***, ** and * represent significance at the 1%, 5%, and 10% levels using a two-tailed test, respectively.

In addition, investment efficiency can be classified into two overinvestment and underinvestment dimensions, and inferences can be drawn as to how TMTs affect both overinvestment and underinvestment (Biddle et al., 2009). Thus, in this study, the association between TMT compositional heterogeneity and over- or underinvestment inefficiency is further tested. Untable shows the estimation results. The empirical results also support the premise that larger TMT size (*XSIZE*) will help firms improve both under- and over-investment inefficiency problems. Longer TMT tenure (*XTEN*) will also reduce the under-investment problem. As before, the moderating effect of the coefficients for *MBA* × *ASP* and *VART* × *ASP* are all negative regarding under-investment inefficiency. Overall, most of the findings are consistent with prior findings.

5. Conclusions

Most prior studies on this topic rely on an artificial dichotomy, examining differences in investment behavior between family and non-family firms primarily in U.S. or European contexts, which are dominated by very large firms. In contrast, most Taiwanese family-owned firms are small- and medium-sized enterprises (SMEs), making them clearly distinct from their U.S. and European counterparts. Accordingly, this study extends previous research by providing the first evidence that top management team (TMT) compositional heterogeneity in emerging market firms is positively associated with investment efficiency, consistent with the competitive advantage literature (James, 1999; Gomez-Mejia et al., 2007; Chrisman & Patel, 2012). Moreover, this study evaluates investment performance using efficiency in R&D and capital expenditures, which is particularly relevant for emerging market firms.

More specifically, the findings support the premise that larger TMT size and longer TMT tenure in family-owned firms signal higher future investment efficiency, aligning with the competitive advantage perspective within agency theory. Larger TMTs provide a broader range of perspectives for evaluating investment problems, while longer-tenured TMT members possess deeper knowledge of the firm's resources and operations, enabling more informed investment assessments. Interestingly, when TMT members have an MBA degree and higher tenure heterogeneity, they may also have a greater tendency to engage in inefficient investments. This is consistent with the overconfidence argument, which suggests that highly educated TMT members may feel overconfident due to their enhanced cognitive abilities, accumulated knowledge, and broader networks.

Consistent with prior evidence from U.S. and European family firms, which often aim to transfer the firm to successors, the findings indicate that in Taiwanese family-owned firms, TMTs with MBA degrees and greater tenure heterogeneity are more likely to recognize below-aspiration level performance and act to prevent inefficient investments that could threaten the firm's long-term viability.

This study has several important limitations. First, maximizing investment returns often depends on the development of organizational culture and managerial

capabilities to oversee processes related to innovation (Calantone et al., 2002). Most prior studies on firm investment capacities rely on survey data to investigate this issue. In contrast, this study uses archival data, so future research could benefit from richer, more detailed data on the cognitive and psychological characteristics of top managers. Second, this research focuses on the relationship between TMT compositional heterogeneity and investment decisions. However, there is limited understanding of how the overall structure of TMT human capital interacts with these associations. Exploring the broader implications of TMT structure for managerial human capital remains an important avenue for future research.

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