
Managerial compensation, family firms and firms' innovation: evidence from Indonesia

**Elshabyta Auditya Bintarto and
Mohammad Nasih**

Accounting Department,
Universitas Airlangga,
Jl. Airlangga No. 4–6, Airlangga,
Gubeng, Surabaya,
East Java, 60115, Indonesia
Email: elsha.auditya@gmail.com
Email: mohnasih@feb.unair.ac.id

Imran Haider

Curtin University,
G.P.O. Box U1987, Bentley,
6845, Perth,
Western Australia, Australia
Email: imran.haider@curtin.edu.au

**Iman Harymawan* and
Fajar Kristanto Gautama Putra**

Accounting Department,
Universitas Airlangga,
Jl. Airlangga No. 4–6, Airlangga,
Gubeng, Surabaya,
East Java, 60115, Indonesia
Email: harymawan.iman@feb.unair.ac.id
Email: fajar.kristanto@akuntanindonesia.or.id

*Corresponding author

Abstract: The purpose of this paper is to examine the impact of executive compensation, family firm concentration, and their association to firm innovation (proxied by R&D activities and intangible assets). Research and development intensity levels imply the firm's long-term commitment to the innovation and development of the firm. Management compensation is one of the fundamental incentives to motivate investing in R&D activities and products of innovation. Our sample consists of 988 Indonesian listed companies for the period of 2013–2017. Overall, the results indicate that the managerial compensation is positively related, whereas family firm concentration is negatively related to firms' innovation (proxied by R&D investment and intangible assets). Findings suggest that total compensation given to executives and commissioners motivates them to invest more in their R&D activities and innovation product. We contribute to the literature on

managerial compensation and firm innovation in Indonesian settings. This study provides insight as it uses several proxies and endogeneity tests which confirms the prior studies' result.

Keywords: managerial compensation; family firms; innovation; R&D investment; intangible assets; Indonesia.

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Biographical notes: Elshabyta Auditya Bintarto is a Finance Accounting at Shopee, one of the leading e-commerce start-ups in Indonesia. Previously, she works as an Advisory Associate in Deloitte Southeast Asia. She obtained her Bachelor's degree (2019) in Accounting from Universitas Airlangga. She is also one of the basic financial instructors at the Institute of Indonesia Chartered Accountants. Although most of her time is spent as a practitioner, she has been passionate about writing academic journals, especially in business risk-related topics. To complete her portfolio, she also obtained Certified Risk Associate's (CRA) certification.

Mohammad Nasih is a Professor of Department of Accounting, Faculty of Economics and Business, Universitas Airlangga, Indonesia. Currently, he is a Rector of Universitas Airlangga for period 2015–2020. He obtained his Doctoral degree (2005) in Accounting from Universitas Airlangga in Indonesia, Master degree (1997) in Industry Technology from Institut Teknologi Bandung in Indonesia, Bachelor degree (1991) in Accounting from Universitas Airlangga in Indonesia.

Imran Haider is an Associate Professor from Curtin University, Australia. Currently, he is a full member of Chartered Accountants of Australia and New Zealand.

Iman Harymawan is an Assistant Professor in the Department of Accounting, Faculty of Economics and Business, Universitas Airlangga, Indonesia. He obtained his PhD degree (2016) in Accounting from City University of Hong Kong in Hong Kong, MBA degree (2009) from National Cheng Kung University in Taiwan, and BA degree (2006) in Accounting from Universitas Airlangga in Indonesia. His current research focuses include: corporate governance issues, the accounting impact of political and military connections in business, and financial reporting quality. He currently teaches financial reporting analysis, managerial accounting, and advanced accounting.

Fajar Kristanto Gautama Putra is the Managing Director of Research in the Center for Environmental, Social, and Governance Studies (CESGS), a research centre under Universitas Airlangga. He obtained both his Master's (2021) and Bachelor's degree (2018) in Accounting from Universitas Airlangga in Indonesia. He was also appointed as one of the senior research staff at the Center for Political, Economics, and Business Research (CPEBR). Aside from his regular research activities, he is also entrusted as a financial consultant for several SMEs and holds Certified Risk Associate (CRA) from Indonesia's Capital Market Professional Certification Bodies (LSPPM).

1 Introduction

The importance of innovation for countries is crucial to managing their value-added business process. The presence of innovation can boost the efficiency process and create new demands; therefore, stimulating economic growth. According to WIPO (2020), an international intellectual property agency from the United Nations, Indonesia innovation ranked 85th among 126 countries surveyed. This result implies that Indonesia, even though being the largest economy in Southeast Asia, is behind Thailand, Vietnam, and Malaysia in terms of innovation countries. Such a lower level of innovation skills and knowledge of the Indonesian workforce and the R&D budget allocation could be a reflection of R&D activities by big public listed firms that drive the country's economic growth and development (Alam et al., 2019).

In addition, the family firms have a considerable position in the Indonesia, accounting for 67% of the public listed firms on the stock exchange and the capitalisation of these family firms accounts for 40% of the total market capitalisation (Mulyani et al., 2016). Additional information related is only 30% of these family firms survive their business up to the first generation, and only about 9% move into the third generation. This result implies that most of these family businesses are in the growth phase and there are still many uncertainties to their future prospect. Hence, it is important to investigate the financial decisions in Indonesian family firms, particularly their R&D and innovation intensity, to support their future success.

Innovation and competitive advantage are two of the firm's critical success factors (Harymawan et al., 2021). To manage the firm's innovation and competitive advantage, the firms must be willing to promote their research and development (R&D) activities. Previous research shows that R&D investment benefits firms in several ways. For instance, it is crucial for the firm's future growth and survival (Lee and O'Neill, 2003), increases the firm's innovation (Hall et al., 2013), improves market value of the firm (Hall and Oriani, 2006), drives growth in long-term operating performance (Bhana, 2001), and increases the future returns (Hussain et al., 2018). Similarly, the intangible assets, as a product of the innovation process acquired externally during the R&D investment phase or their capitalised after achieving economic viability, also have several importances to the firm. According to Arrighetti et al. (2014), intangible assets generate resources for the production process and lead to the creation and sale of new or improved products. Further, such intangible assets aid in fostering productivity of the firms (Marrocu et al., 2012) and assist firms to maintain their output and employment decline during financial shocks (Ignacio and Olivella, 2018).

However, the investment in R&D can be costly and associated with risks, such as not always earning the expected outcomes at a given time (Chen et al., 2017; Lin et al., 2011). In addition, where the benefit from R&D investment cannot be received in the short-term, managers always want to prove their abilities and performance in the short run. Particularly, they are even more concerned to achieve short-term performance and growth at the start of their career or tenure in a new firm. Hence, they could be more concerned with achieving their career incentives, such as compensation and reputation, by adopting alternative profitable short-term investments instead of spending on R&D activities. Therefore, the firm's R&D investment decisions are one of the important issues for the management (Barker and Mueller, 2002). Since R&D decisions are made by top-level management, their compensation and incentives play important roles to

motivate management whether to invest in R&D activities. Also, the compensation needs to be aligned in the way that the management act in the best interest of shareholders (Coles et al., 2006). The appropriate compensation and incentives schemes could help the management not only in focusing on short-term results but also for long-term results and growth (Gomez-Mejia et al., 2000).

We use 988 firm year observations for the Indonesian listed firms for the period 2013 to 2017. We investigate both low tech and high tech companies, excluding financial institutions due to the different nature of reporting. Overall, the results indicate that managerial compensation is positively related, whereas, family presence on board is negatively related to firm innovation (proxied by R&D investment and intangible assets). Findings suggest that total compensation given to executives and commissioners motivates them to invest more in their R&D activities and, therefore, producing product of innovation. Additional analysis suggests that family presence on the board weakens the relationship between managerial compensation and firm innovation in which the total compensation gives positive influence to a firm's R&D activities and product of innovation.

This study provides several contributions to the literature and theory. For instance, we show that the compensation incentives are a strong motivation for managers to improve firm innovation. We provide evidence that family ownership on business dominates management incentives in the context of firm innovation. Another implication of this study is the sensitivity of the positive relationship between management compensation and firm innovation. We encourage shareholders to be wise in controlling firm innovation level through compensation amount. In addition, our study is conducted in the unique context of Indonesia, which is different from most studies with similar topics. Finally, we provide suggestions for research academics to consider our results for further research.

This study is continued by several sections. Section 2 discusses the literature review and hypothesis development while Section 3 focuses on the research methodology, including sample and regression model. Section 4 mainly explains the research's primary and additional result. Lastly, Section 5 provides the conclusion and limitation of this study.

2 Literature review and hypothesis development

A firm's innovation is a risky and complex process, which needs significant resources and uncertain outcomes (Holmstrom, 1989). Hence, managers having a risk averse nature are most likely to avoid investment in such long-term uncertain investments (Harymawan et al., 2020a; Mazouz and Zhao, 2019). Agency theory states that agency relationship emerges as the principal employs another party as the agent to give related service and delegates the decision-making process to the agent (Jensen and Meckling, 1976). Management as the agent assigned by the shareholders is expected to take the decisions in the best interest of shareholders (Rossi et al., 2016). However, management could tend to focus on the short-term profit-based projects to maximise their own incentives, rather than maximising the wealth of shareholders in the long run (Gunardi et al., 2017; Rossi et al., 2021). Under the agency conflict, management could avoid investing in R&D since the outcome or benefits do not arise in the short run. Further, the investment in R&D has a risk of being not fruitful, thus, harming the reputation of management and those charged with governance. Prior studies show that R&D activities antecedents arise from

various factors, such as board compensation-related variables (Chan et al., 2020; Chen et al., 2019; Lu et al., 2020) and corporate ownership structure (López Iturriaga and López-Millán, 2017; Ting et al., 2020; Tsao et al., 2019).

There is some recent research which provides evidence on the relationship between executive compensation and firm innovation. For instance, Chan et al. (2020) examine the relationship between CEO-employee pay gap and firm R&D efficiency. They empirically prove that a wider pay gap reduces employee motivation in improving R&D efficiency consistent with the pay equity theory. Chen et al. (2019) consider US technology industry from 2001 to 2011 as research samples to examine the relationship between R&D capitalisation and R&D overinvestment. Their study examines the role of executive equity-based compensation in the relationship between R&D capitalisation and overinvestment. They find that the aggressive R&D capitalisation leads to R&D overinvestment; however, executive compensation weakens such relationship. Similarly, another study using Chinese public listed firms sample examines the possibility of nonlinear relationship between executive compensation and R&D investment (Lu et al., 2020). Lu et al. (2020) found an inverted-u shape relationship between executive compensation and R&D investment in the Chinese stock market between 2012 and 2015. Further, they conclude that the inverted u-shape relationship exists only in high performance firms. Research suggests that greater levels of short-term compensation can suppress the agency problem to engage in venture capital projects (Wang et al., 2018). This is because managers receiving compensation incentives are now less inclined toward risky short-term profit making projects. Further, Lu et al. (2020) conclude that the inverted u-shape relationship can only be applied in high performance firms. Research shows that the management may trade off firm's long-term value for focusing on short-term earnings, causing the agency problems. This situation is understandable since, expensing the R&D activities is seen as a cost rather than investment (Lee and O'Neill, 2003). Hence, research suggests that firms need to provide incentives to the management to encourage the investment in the firm's long-term investment through R&D activities. Similarly, according to Xue (2007), the compensation-related incentives for management play important roles in investing for the firm's R&D activities in USA high-tech industries. These findings in line with Harymawan et al. (2021) argument where industry's technology level is an essential determinants in predicting corporate innovation behaviour. Research conducted by Chen et al. (2017) in Taiwan found the appropriate incentive schemes linked with management compensation improve the firm's investment in R&D activities. Further, the appropriate compensation and incentives schemes could help the management in not only focusing on short-term results but also for long-term growth (Gomez-Mejia et al., 2000). Previous research conducted using Execucomp database from 1995 to 2011 shows a positive association between CEO stock options compensation and investment for risky projects (Kim et al., 2017). Nevertheless, connecting the dots between management compensation and firm innovation may be tricky, particularly in Indonesia. First, Indonesia is considered one of the countries that have not yet established a stable innovation environment. More than 2,000 business leaders agree that it is challenging for a business to forecast innovation benefits as its uncondusive atmosphere (General Electric, 2018). This condition is worsened by inconsistencies in government intervention on research and innovation policy by continuously reshuffling related ministries (Nugroho, 2021). Although it is not directly connected with firm innovation policy, we believe this situation drives shareholders to be

pessimistic and sceptical with government support in developing industrial innovation. After all, Indonesia's technological readiness is lagged compared to the worldwide median (World Economic Forum, 2018). Aware of this unpromising condition, shareholders may use management compensation to restrict the development of firm innovation, both internally and externally. Summarising the previous literature, the management compensation could be linked in either direction with firm innovation, thus we develop the following non-directional hypothesis.

H1 There is an association between managerial compensation and firm's innovation.

Indonesia provides a unique institutional setting for family firms' study. Recent studies Harymawan et al. (2019, 2020b) show that Indonesian family firms have substantial involvement in diverse businesses. Indonesia law enforcement regarding to ownership control is also considered as weak. This argument was indirectly supported by the World Economic Forum (2019) which stated that Indonesia positioned 68th in conflict interest regulation index. Based on PwC (2018) survey result, 87% of Indonesian family businesses in 2017 were expected to grow over the next two years. These findings confirm that Indonesian family firms play a vital role in the capital market. The majority of the Indonesian family firms plan to have a significant role to improve digital capabilities and feel vulnerable to digital disruption (PwC, 2018). This phenomenon will drive family firms to enhance their R&D activities and to keep up with the digital market innovation.

Studies regarding family firms are not quite new; in fact, this topic has already been part of the discussion for several years. To the best of our knowledge, one of the seminal researches regarding family firms examined its impact on firm profitability (Calder, 1961; Waters and Powell, 1960). Recently, Kubiček and Machek (2020) accumulated 88 family firm studies and showed that innovation is the one of key outputs impacted by family ownership. Similarly, some further research is driven by socio-emotional wealth (SEW) trends where family firms try to pursue the family's affective needs, such as identity, the ability to exercise family influence, and the perpetuation of family dynasty, which *l* can impact the R&D-related decisions (Rousseau et al., 2018; Tsao et al., 2019).

In addition, research suggests that the family firms put substantial concern on the long-term view as they have a greater incentive to preserve the family business heritage compared to non-family firms (Diaz-Moriana et al., 2020). They conducted a study using five in-depth cases comprising 42 semi-structured interviews, 25 participant observations, and several thousand pages of historical data dating from 1916–2017 to draw its conclusion. They found that firm innovation behaviour is closely related to R&D investment and has three innovation patterns which are conserving, persisting, and legacy-building. This process is synchronised with the SEW perspective where sustainability of family influence within the business is a key characteristic of family firms. Such family influence is also supported by Jiang et al. (2020) who found that greater family power proxied by presence of family member(s) on board is associated with more intensive investment compared to the non-family firms. Specifically, in an Indonesian context, family ownership is associated with lower managerial short-term opportunism (Harymawan et al., 2020b).

However, some research suggests that the family firms may discourage risky investment in long-term R&D activities. A recent study by Aiello et al. (2020) compares the productivity of R&D investment in family non-family firms. Their study applies 2007–2009 sample period for European manufacturing firms and finds that, on average,

innovative family firms are about 6% lower compared to innovative non-family firms and family firms have a lower rate of return from R&D investment as compared to non-family ones. This suggests that the family firms are less concerned about their R&D activities and the R&D is not included in their long-term strategy. Using Japanese firms for the sample period 2003 to 2012, Kubota and Takehara (2019) find that the innovation output is higher in non-family firms compared to family firms.

Since there is no resemblance in the prior research that suggests a clear relationship between family firms and a firm's innovation, this study develops a non-directional hypothesis. Therefore, the hypothesis maintained for this study is follows:

H2 There is an association between family firm and firm's innovation.

3 Research methodology

3.1 Data analysis technique

Similar with other studies who examining relationship between variables, we employ quantitative method data analysis. Data analysis techniques used in this study are analysis test by descriptive statistics, Pearson correlation analysis test, and ordinary least square regression.

The regression models used in this study are:

- Regressions for the first hypothesis

$$\begin{aligned} RND = & \beta_0 + \beta_1 COMP_{i,t} + \beta_2 BSIZE_{i,t} + \beta_3 CEOTEN_{i,t} + \beta_4 CEOOWN_{i,t} \\ & + \beta_5 FSIZE_{i,t} + \beta_6 FAGE_{i,t} + \beta_7 LEV_{i,t} + \beta_8 OCF_{i,t} + \beta_9 MTB_{i,t} \\ & + \beta_{10} YEAR_{i,t} + \beta_{11} INDUSTRY_{i,t} + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} INT = & \beta_0 + \beta_1 COMP_{i,t} + \beta_2 BSIZE_{i,t} + \beta_3 CEOTEN_{i,t} + \beta_4 CEOOWN_{i,t} \\ & + \beta_5 FSIZE_{i,t} + \beta_6 FAGE_{i,t} + \beta_7 LEV_{i,t} + \beta_8 OCF_{i,t} + \beta_9 MTB_{i,t} \\ & + \beta_{10} YEAR_{i,t} + \beta_{11} INDUSTRY_{i,t} + \varepsilon_{i,t} \end{aligned}$$

- Regression model for the second hypothesis

$$\begin{aligned} RND = & \beta_0 + \beta_1 FF_{i,t} + \beta_2 BSIZE_{i,t} + \beta_3 CEOTEN_{i,t} + \beta_4 CEOOWN_{i,t} \\ & + \beta_5 FSIZE_{i,t} + \beta_6 FAGE_{i,t} + \beta_7 LEV_{i,t} + \beta_8 OCF_{i,t} + \beta_9 MTB_{i,t} \\ & + \beta_{10} YEAR_{i,t} + \beta_{11} INDUSTRY_{i,t} + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} INT = & \beta_0 + \beta_1 FF_{i,t} + \beta_2 BSIZE_{i,t} + \beta_3 CEOTEN_{i,t} + \beta_4 CEOOWN_{i,t} \\ & + \beta_5 FSIZE_{i,t} + \beta_6 FAGE_{i,t} + \beta_7 LEV_{i,t} + \beta_8 OCF_{i,t} + \beta_9 MTB_{i,t} \\ & + \beta_{10} YEAR_{i,t} + \beta_{11} INDUSTRY_{i,t} + \varepsilon_{i,t} \end{aligned}$$

3.2 Sample and data source

Our sample consists of all of the listed companies on the Indonesia Stock Exchange from 2013 to 2017. The data gathered for this study are obtained from the firms' annual reports from the official website of the Indonesia Stock Exchange, OSIRIS database, and ESGI

dataset. This study examines all companies except banking industries due to the different nature of the annual report. According to sampling criteria, this study uses 988 firms as the total observations of this study.

Table 1 Sample selection criteria

<i>Selection criteria</i>	<i>INT model</i>	<i>RND model</i>
Indonesian listed firms 2013–2017	3,288	3,288
SIC 6	(1,208)	(1,208)
COMP missing	(676)	(676)
FF missing	(73)	(73)
CONTROL missing	(343)	(343)
RND missing		(4)
Final observation	988	984

Table 2 Variables measurement

<i>Variable</i>		<i>Proxy</i>	<i>Data source</i>
Management compensation	<i>COMP</i>	The logarithm of total cash compensation paid to management.	Firm's annual report
Family firms	<i>FF</i>	Using binary variables. 1 if firms have two or more family members in the directors and commissioner position and/or more than 5% firm's shares ownership or 0 otherwise.	Firm's annual report
R&D intensity	<i>RND</i>	$RND = \frac{R \& D \ EXPENSE}{SALES}$	Firm's annual report
Intangibles asset	<i>INT</i>	$INT = \log (INTANGIBLES \ ASSET + AMORTISATION)$	Firm's annual report
Board size	<i>BSIZE</i>	Total people seated as firm's board.	ESGI dataset
CEO tenure	<i>CEOTEN</i>	A number of years of CEO has been in positioned for their position.	ESGI dataset
CEO ownership	<i>CEOOWN</i>	Using binary variables. Given 1 point if the CEO has more than 5% of the firm's shares. If the CEO has no or less than 5% shares of the firm will be given point 0.	ESGI dataset
Firm size	<i>FSIZE</i>	$FIRM_SIZE = \log (TOTAL \ ASSET)$	OSIRIS
Firm age	<i>FAGE</i>	Difference year between incorporation date and observation year.	OSIRIS
Firm leverage	<i>LEV</i>	$LEVERAGE = \frac{TOTAL \ DEBT}{TOTAL \ ASSET}$	OSIRIS
Operating cash flow	<i>OCF</i>	$OCF = NET \ INCOME + NON-CASH \ EXPENSES + INCREASE \ IN \ WORKING \ CAPITAL$	OSIRIS
Market to book ratio	<i>MTB</i>	$MTB = \frac{MARKET \ CAPITALISATION}{TOTAL \ EQUITY}$	OSIRIS and firm's annual report

3.3 *Operational definition variable and variables measurement*

The dependent variable used in this research is firm's innovation project. This study measures firms' innovation consistent with Xue (2007), as a firms' R&D intensity is measured as the amount invested by the firms to develop their R&D activities internally. Intangibles asset as a proxy of innovation measures the amount of money invested by the firms to acquire their innovation through purchasing or R&D expense. In Indonesia, the allocation and disclosure of the R&D investment are regulated by Indonesian Statement of Financial Accounting Standards (PSAK) 19, replacing previous regulation, which was PSAK 20. The regulation states that the R&D investment can be categorised into two components. The first component is the research phase and the second phase is the development. The fund disbursed for the research phase must be considered as an expense in the related year. In addition, if the assets developed through research phase can give future economic benefits it can be capitalised as an asset. Therefore, the amount of intangibles assets is also applied as an additional measure of a firm's innovation. The detailed definition of all variables used in this study is available in Table 2.

The first interested (independent) variable used in this study is the total amount of compensation received by directors and commissioners of the firm. Directors and commissioner compensation are the total benefits given to the firm's directors and commissioners. The value of benefits given is measured by the cash amount, including the total salary and other gross honorarium given by the firm.

The second interested (independent) variable used in this research is family firm. Family firm is determined by the existence of family members in the directors and commissioners position. If a firm has two or more family members in the directors and commissioners position, it is considered as a family firm. The measurement uses a binary variable which is equal to 1 for family firms and 0 for non-family firms.

4 **Results and discussion**

4.1 *Descriptive statistic*

The descriptive statistic describes the further description of variables used in this study. Descriptive statistics of variables used in this research have been Winsorised, as shown in Table 3. According to the descriptive statistics below, the table shows the minimum and maximum value of each variable, also with the mean and median value. Based on Table 3, we document several vital insights. First, some Indonesian listed firms have higher R&D expenses than total current sales. Even one observation has R&D expenses 30 times from total sales. In a similar vein, our sample shows their average RND expenses more than 50% of their sales. These figures confirm that Indonesia is one of the settings where innovation activities are one of business prioritisation. Another critical insight that can be concluded from descriptive statistics is the mean value of a family firm, which shows that 35.5% of our sample is categorised as a family firm. In other words, the dominance of family business in the Indonesian listed firm is substantial, thus its suitable context for family firms' studies.

Table 3 Descriptive statistics

	<i>Mean</i>	<i>Median</i>	<i>Minimum</i>	<i>Maximum</i>
INT	13.361	19.248	0.000	27.940
RND	0.518	0.000	0.000	30.082
COMP	23.243	23.340	20.413	26.204
FF	0.355	0.000	0.000	1.000
BSIZE	9.522	9.000	4.000	20.000
CEOTEN	8.330	5.000	0.000	42.000
CEOOWN	0.056	0.000	0.000	1.000
FSIZE	21.922	21.920	17.739	25.307
FAGE	35.073	34.000	8.000	117.000
LEV	1.257	0.871	-6.663	11.430
OCF	0.081	0.061	-0.363	0.711
MTB	0.004	0.001	-0.003	0.077

4.2 *Pearson correlation test*

Table 4 presents the Pearson correlation matrix for the key variables used for analysis. The binary analysis indicates that the COMP has a positive correlation with RND ($p = 0.001$) and INT ($p = 0.000$) at 1% level of significance, while FF has a negative and significant relationship only to INT ($p = -0.000$) at 1% level of significance. Similarly, BSIZE has a statistically significant and positive relationship with INT and RND, which implies that large firms tend to have more investment in R&D. Further, INT has a negative correlation with CEOTEN, CEOOWN and positive correlation with FSIZE. Overall, we do not find any multi-collinearity issue in our variables.

4.3 *Independent two-sample t-tests*

Tables 5 and 6 present variables used in this research based on firms that have R&D activities and product of innovation. Table 5 shows that the firms having more R&D activities results in higher management compensation compared to firms having fewer R&D activities (23.711 and 23.193). This result is also confirmed in firm size, firm age and market to book ratio. Conversely, we document different results in a CEO tenure context wherein for a firm having high R&D activities, the CEO tenure will be significantly lower. The other variables show no significant relationship with R&D activities.

Having a similar result with Table 5, in Table 6, the firms having more product of innovation tend to have more management compensation and R&D activities. Other documented positive relationships are product of innovation with board size, firm size, firm age and market to book ratio. We also document negative relationship between product of innovation with CEO tenure. The similarities of results of Tables 5 and 6 imply that R&D activities and product of innovation portray their connectedness in measuring firm innovation.

Table 4 Pearson correlation test

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
INT [1]	1.000											
RND [2]	0.055* (0.081)	1.000										
COMP [3]	0.315*** (0.000)	0.103*** (0.001)	1.000									
FF [4]	-0.140*** (0.000)	-0.042 (0.182)	0.034 (0.288)	1.000								
BFSIZE [5]	0.222*** (0.000)	0.095*** (0.003)	0.591*** (0.000)	0.026 (0.406)	1.000							
CEOTEN [6]	-0.145*** (0.000)	-0.024 (0.458)	-0.085*** (0.007)	0.199*** (0.000)	-0.131*** (0.000)	1.000						
CEOOWN [7]	-0.105*** (0.001)	-0.022 (0.490)	-0.102*** (0.001)	0.156*** (0.000)	-0.125*** (0.000)	0.217*** (0.000)	1.000					
FSIZE [8]	0.378*** (0.000)	0.063** (0.046)	0.684*** (0.000)	-0.056* (0.079)	0.597*** (0.000)	-0.172*** (0.000)	-0.138*** (0.000)	1.000				
FAGE [9]	-0.011 (0.720)	0.183*** (0.000)	0.114*** (0.000)	0.006 (0.842)	0.231*** (0.000)	0.150*** (0.000)	-0.050 (0.113)	0.044 (0.161)	1.000			
LEV [10]	-0.050 (0.116)	-0.002 (0.944)	0.042 (0.180)	0.042 (0.188)	0.013 (0.685)	-0.024 (0.446)	-0.009 (0.779)	0.048 (0.133)	0.035 (0.263)	1.000		
OCF [11]	-0.024 (0.444)	0.047 (0.140)	0.011 (0.729)	-0.021 (0.506)	0.016 (0.617)	-0.051 (0.107)	-0.040 (0.204)	-0.067** (0.033)	0.050 (0.113)	-0.006 (0.839)	1.000	
MTB [12]	-0.078** (0.013)	0.212*** (0.000)	-0.081** (0.010)	0.003 (0.933)	-0.033 (0.303)	-0.041 (0.192)	0.035 (0.264)	-0.178*** (0.000)	0.061* (0.055)	0.231*** (0.000)	0.377*** (0.000)	1.000

Note: *p < 0.1, **p < 0.05, ***p < 0.01.

Table 5 Firms characteristics based on firm's R&D activities

	<i>Firms having R&D activities exceed median</i>	<i>Firms having R&D activities below median</i>	<i>Coef</i>	<i>t-value</i>
INT	18.755	12.753	6.002***	5.312
COMP	23.711	23.193	0.518***	3.885
BSIZE	10.644	9.426	1.217***	3.496
CEOTEN	6.136	8.609	-2.473***	-2.617
CEOOWN	0.049	0.057	-0.009	-0.357
FSIZE	22.206	21.890	0.316*	1.849
FAGE	38.515	34.662	3.853**	2.042
LEV	0.860	1.189	-0.329	-0.881
OCF	0.124	0.094	0.029	0.752
MTB	0.007	0.004	0.003*	1.951

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6 Firms characteristics based on firm's product of innovation

	<i>Firms having product of innovation exceed median</i>	<i>Firms having product of innovation below median</i>	<i>Coef</i>	<i>t-value</i>
RND	7.242	0.001	7.241***	13.213
COMP	23.711	23.193	0.518***	3.885
BSIZE	10.644	9.426	1.217***	3.496
CEOTEN	6.136	8.609	-2.473***	-2.617
CEOOWN	0.049	0.057	-0.009	-0.357
FSIZE	22.206	21.890	0.316*	1.849
FAGE	38.515	34.662	3.853**	2.042
LEV	0.860	1.189	-0.329	-0.881
OCF	0.124	0.094	0.029	0.752
MTB	0.007	0.004	0.003*	1.951

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.4 Multivariate analysis

Table 7 presents the regression results for the relationship between managerial compensation, family firms and firm innovation. Both the first and second columns show that management compensation has significant and positive relationship with firms' innovation as the COMP coefficient in the RND model is 0.147 ($t = 2.69$) and in the INT model is 0.943 ($t = 2.34$). These values confirm that our first hypothesis is accepted. We also found significant and negative relationship between family firms with firm innovation, specifically COMP in the RND model with coefficient -0.367 ($t = -1.93$) and in the INT model with coefficient -2.130 ($t = -3.04$). Thus, we can conclude that our second hypothesis is accepted.

This result ratifies that management compensation is a stakeholders' strategy to realign the management interest, particularly in the context of enhancing firms'

innovation level. This is done as stakeholders' main priority is the long-term sustainability of the firm, not solely on achieving high performance but sacrificing future possibilities. This perspective is surely different with management, as their position may not be as long as the return of the firm's innovation realised and improving firm performance in general.

Table 7 Regression analysis result

	(1)	(2)	(3)	(4)
	RND	INT	RND	INT
COMP	0.147*** (2.69)	0.943** (2.34)		
FF			-0.367* (-1.93)	-2.130*** (-3.04)
BSIZE	-0.013 (-0.48)	0.020 (0.13)	0.009 (0.33)	0.157 (1.11)
CEOTEN	-0.015 (-1.04)	-0.062 (-1.55)	-0.012 (-0.86)	-0.042 (-1.05)
CEOOWN	0.262 (0.91)	-2.384* (-1.80)	0.371 (1.19)	-1.749 (-1.33)
FSIZE	0.188** (2.04)	1.607*** (4.62)	0.243*** (2.64)	1.966*** (6.87)
FAGE	0.019*** (2.83)	0.009 (0.50)	0.018*** (2.82)	0.006 (0.33)
LEV	-0.130*** (-3.25)	-0.582*** (-4.05)	-0.126*** (-3.18)	-0.557*** (-3.82)
OCF	0.045 (0.07)	-1.697 (-0.72)	0.213 (0.35)	-0.641 (-0.27)
MTB	93.237** (2.40)	18.759 (0.78)	92.637** (2.41)	15.463 (0.64)
Industry FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
_cons	-8.112*** (-3.33)	-37.527*** (-4.97)	-6.028*** (-2.82)	-24.295*** (-4.16)
<i>F</i>	1.492	20.840	1.409	21.029
Adjusted <i>R</i> ²	0.114	0.194	0.115	0.197
<i>N</i>	984	988	984	988

Notes: *t* statistics in parentheses.

t* > 1.646, *t* > 1.962, ****t* > 2.581, of significance level 10%, 5%, and 1%.

As for the family firms, the innovation activity tends to be hindered as it is less favourable. Harymawan et al. (2020b) argue that, to some extent, family businesses are more risk averse and sceptical in deciding R&D investment. This behaviour is due to substantial connectedness the family as stakeholders and its business; therefore, they take

excessive precautions toward any possibilities of losses, including innovation costs. Family firms are aware that not all innovation activities are able to enhance firm's performance. They tend to select riskless strategies to ensure the business sustainability.

Table 8 Regression with interaction

	(1)	(2)
	<i>RND</i>	<i>INT</i>
COMP	0.300*** (3.63)	1.553*** (3.68)
FF	10.241*** (3.15)	38.280*** (3.17)
COMP_FF	-0.457*** (-3.24)	-1.743*** (-3.37)
BSIZE	0.004 (0.16)	0.097 (0.67)
CEOTEN	-0.011 (-0.79)	-0.040 (-1.00)
CEOOWN	0.362 (1.14)	-1.782 (-1.37)
FSIZE	0.176** (2.00)	1.540*** (4.53)
FAGE	0.017*** (2.68)	-0.000 (-0.01)
LEV	-0.119*** (-3.11)	-0.525*** (-3.59)
OCF	0.047 (0.08)	-1.655 (-0.71)
MTB	90.334** (2.37)	5.828 (0.25)
Industry FE	Included	Included
Year FE	Included	Included
_cons	-11.460*** (-3.78)	-50.237*** (-6.37)
<i>F</i>	1.333	22.386
Adjusted <i>R</i> ²	0.122	0.210
<i>N</i>	984	988

Notes: *t* statistics in parentheses.

t* > 1.646, *t* > 1.962, ****t* > 2.581, in significance level 10%, 5%, and 1%.

4.5 Additional analysis

Table 8 presents the outcomes of regression analysis with the presence of family business as the interaction variable. We use the following regression equations:

$$\begin{aligned}
 RND = & \beta_0 + \beta_1 COMP_{i,t} + \beta_2 FF_{i,t} + \beta_3 COMP_{i,t} * FF_{i,t} + \beta_4 BSIZE_{i,t} \\
 & + \beta_5 CEOTEN_{i,t} + \beta_6 CEOOWN_{i,t} + \beta_7 FSIZE_{i,t} + \beta_8 FAGE_{i,t} \\
 & + \beta_9 LEV_{i,t} + \beta_{10} OCF_{i,t} + \beta_{11} MTB_{i,t} + \beta_{12} YEAR_{i,t} \\
 & + \beta_{13} INDUSTRY_{i,t} + \varepsilon_{i,t}
 \end{aligned}$$

$$\begin{aligned}
 INT = & \beta_0 + \beta_1 COMP_{i,t} + \beta_2 FF_{i,t} + \beta_3 COMP_{i,t} * FF_{i,t} + \beta_4 BSIZE_{i,t} \\
 & + \beta_5 CEOTEN_{i,t} + \beta_6 CEOOWN_{i,t} + \beta_7 FSIZE_{i,t} + \beta_8 FAGE_{i,t} \\
 & + \beta_9 LEV_{i,t} + \beta_{10} OCF_{i,t} + \beta_{11} MTB_{i,t} + \beta_{12} YEAR_{i,t} \\
 & + \beta_{13} INDUSTRY_{i,t} + \varepsilon_{i,t}
 \end{aligned}$$

The purpose of this interaction is to test the relationship of management compensation to the firm's R&D activities and product of innovation in family firms. The result of the test

is provided in Table 8 where we document a significant and negative coefficient of interaction between management compensation and family firm variable, both in the RND (coef. = -0.457, $t = -3.24$) and INT (coef. = -1.743, $t = -3.37$) model.

Table 9 Regression with lagged management compensation

	(1)	(2)	(3)	(4)
	<i>INT</i>	<i>RND</i>	<i>INT</i>	<i>RND</i>
LAG_COMP	0.602 (1.42)	0.175** (2.58)	1.070** (2.37)	0.377*** (3.37)
FF		27.040* (1.90)	12.546*** (2.76)	
LAG_COMP_FF		-1.255** (-2.06)	-0.566*** (-2.84)	
BSIZE	0.073 (0.40)	-0.023 (-0.64)	0.142 (0.80)	0.005 (0.13)
CEOTEN	-0.107** (-2.21)	-0.029* (-1.75)	-0.089* (-1.85)	-0.024 (-1.50)
CEOOWN	-3.184** (-2.02)	0.435 (1.17)	-2.512 (-1.62)	0.626 (1.55)
FSIZE	1.626*** (4.15)	0.312*** (2.61)	1.561*** (4.06)	0.290** (2.53)
FAGE	0.016 (0.75)	0.025*** (3.03)	0.008 (0.35)	0.022*** (2.89)
LEV	-0.658*** (-3.53)	-0.174*** (-2.99)	-0.614*** (-3.19)	-0.159*** (-2.87)
OCF	0.294 (0.10)	0.466 (0.45)	0.320 (0.11)	0.438 (0.44)
MTB	8.853 (0.36)	123.688** (2.58)	-1.682 (-0.07)	120.245** (2.57)
Industry FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
_cons	-29.466*** (-3.18)	-12.393*** (-3.79)	-39.169*** (-4.01)	-16.762*** (-3.88)
<i>F</i>	18.655	1.266	18.885	1.152
Adjusted <i>R</i> ²	0.218	0.178	0.228	0.190
<i>N</i>	659	656	659	656

Notes: *t* statistics in parentheses.

* $t > 1.646$, ** $t > 1.962$, *** $t > 2.581$, in significance level 10%, 5%, and 1%.

Table 8 implies that in positive relationship between management compensation and firms' innovation is weaken in family firm. This result due to the incentives that family firm's shareholder provide is not to increase the firms' innovation level, but rather on other strategies that costless and riskless that preferred by the family. This result also

confirm that management compensation is used to realign the management interest, however in family firm context, the desired aim is not enhancing innovation level. This argument is also supported by the COMP coefficient, which is positive and statistically significant; thus, in the non-family business context, the management compensation amount is used as a tool to enhance firm innovation level by shareholders. To be concluded, management incentive is one of the alternatives used by shareholders to minimise interest misalignment (Makri et al., 2006; Xue, 2007). At the same time, firm innovation is more likely determined by the characteristics and interests of business owners.

Table 10 Regression with matched samples

	(1)	(2)	(3)	(4)
	<i>INT</i>	<i>RND</i>	<i>INT</i>	<i>RND</i>
COMP	0.846* (1.73)	0.152** (1.97)		
FF			-2.039** (-2.24)	-0.505 (-1.44)
BSIZE	0.075 (0.42)	0.006 (0.15)	0.366* (1.94)	-0.013 (-0.35)
CEOTEN	-0.103* (-1.76)	-0.052*** (-3.30)	0.009 (0.16)	-0.001 (-0.02)
CEOOWN	-1.945 (-0.85)	0.345 (0.99)	-3.488** (-2.42)	0.243 (0.87)
FSIZE	1.777*** (3.81)	0.288** (2.40)	1.555*** (3.85)	0.117 (0.91)
FAGE	0.009 (0.42)	0.016** (2.56)	-0.023 (-0.79)	0.013* (1.65)
LEV	-0.632*** (-3.74)	-0.232*** (-3.57)	-0.332 (-1.54)	-0.176*** (-2.62)
OCF	-0.420 (-0.12)	-2.078* (-1.79)	-5.975* (-1.68)	0.767 (1.14)
MTB	19.046 (0.38)	198.797*** (2.60)	31.073 (0.69)	18.809 (1.09)
Industry FE	Included	Included	Included	Included
Year FE	Included	Included	Included	Included
_cons	-38.620*** (-3.30)	-10.379*** (-2.91)	-16.777** (-2.02)	-2.176 (-0.86)
<i>F</i>	10.166	1.219	12.422	0.790
Pseudo <i>R</i> ²	0.158	0.178	0.183	0.017
<i>N</i>	587	587	530	530

Notes: *t* statistics in parentheses.

t* > 1.647, *t* > 1.962, ****t* > 2.581, in significance level 10%, 5%, and 1%.

Specifically, for COMP, we interested to examine further due to amount of prior year management compensation. We develop LAG_COMP which represent of management compensation of the prior year. We argue, regardless of the time, provide higher compensation to management can help shareholders to realign the management interest. Thus, the firms' innovation can become a priority for management. Table 9 provide the regression analysis using LAG_COMP as our interested variables. The result of lagged management compensation and its interaction with family firm regression is shown in Table 9. It shows our conjecture is confirmed where prior year of management compensation will not only relate to firm's innovation in the respective year, but also in the current year.

4.6 Robustness test

We are aware that our result is prone to several statistical weaknesses, one of which is the endogeneity issue. Business research is one study strands needs to incorporate the notion that the independent variable is unlikely to be randomly distributed across firms (Reeb et al., 2012). We employ propensity score matching (PSM) approach to address the correlation between the treatment variables and observable variables of our result. We match our samples based on the variables' controls, which include BSIZE, CEOTEN, CEOOWN, FSIZE, FAGE, LEV, OCF, and MTB. Table 10 provides the regression result using matched sample and from it we can conclude that our analysis is not exposed to causality issue as it shows alike result with previous results excluded for relationship between FF and firm's innovation.

5 Conclusions and limitation

This study aims to examine the relationship between management compensation and family firm with firm innovation using non-financial Indonesian listed firms from 2013 to 2017. This study found that management compensation is positively related with a firm's R&D activities and product of innovation. We also documented that family firms have lower firm innovation compared to non-family firms. Additionally, this study confirms that, in the context of family firm, the positive relationship between management compensation with firm innovation is weak and this applies both in current and lagged management compensation. Lastly, our results are robust as they show an alike result in the PSM regression model.

This study provides several contributions to the literature and theory. Our first contribution lies in the main result of this study, where compensation incentives are an effective driver for managers to put more significant concern on enhancing firm innovation, both internally and externally. On the other side, the existence of family firms is proven to have a detrimental effect on firm innovation which confirms conservatism traits of family business dominating SEW traits. Our additional result also provides essential insight where management compensation is one of the tools to realign the managers with shareholders' interest. Therefore, in context of family corporate, management compensation is used as a strategy to realise conservatism of family business, in the form of a lower level of firm innovation. In other words, high

management compensation does not merely result in a high level of innovation; it also depends on the shareholders' interest.

Our second contribution is also derived from the result of additional analysis. Our result confirms that management compensation does not inhibit long-term consequences in making innovation internally. Thus, shareholders need to maintain the compensation level to ensure both innovation generation processes are run smoothly. Another implication that is possibly driven from this result is that controlling innovation activities that proxied research and expense expenditure through compensation level is easier than innovation by procurement, at least in the short-term. Shareholders should be aware of this relationship sensitivity as the changing level of compensation incentives is not automatically followed by a lower level of intangible assets.

Our last contribution based on the setting of this study. We add to the literature on managerial compensation and firm innovation, particularly in an Indonesian setting, which is different than other regulatory settings. For instance, Indonesia follows a more principle-based approach with greater flexibility for financial reporting as compared to the US. In addition, Indonesia has lower litigation risk and low quality of corporate governance. These unique contexts provide a greater freedom to managers for decisions related to innovation-related projects. Finally, we provide suggestions for research academics to consider our results for further research.

Similar to other studies, this study also possesses several weaknesses that, hopefully, future research can address. First is lack of comprehensive evidence to classify whether a business is a family firm or not. This is due to that, in an Indonesian setting, the family utilises pyramid ownership structure to control their various businesses. Therefore, future studies are encouraged to trace every ownership chain structure to identify its ultimate owner. The second limitation is in this study is in only using surname of management to decide the possibilities of family firms. Unfortunately, there is no guarantee that all family members have identical last names. Therefore, this method is possibly inaccurate in determining the family firm variable. Lastly, only few firms disclose their R&D expenses in the annual report, which results in a limited number of research samples.

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