

DOES CEO POPULARITY AFFECT FIRM INNOVATION? EVIDENCE FROM THE DEVELOPING COUNTRY

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Abstract

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The purpose of this study is to provide empirical evidence from Indonesia of the influence of CEO popularity on firm innovation. This study draws on the upper echelons theory to investigate whether CEO popularity affects firm innovation. Upper echelons theory is the idea that top executives view their situations through their own highly personalized lenses (Hambrick & Mason, 1984). We argue that popularity may be positively or negatively related to firm innovation. The approach used in this research is quantitative. To examine the relationship between CEO popularity and firm innovation, this study employs a logistic regression on 378 firm-years observations during 2014–2017 period of Indonesian listed firms. The result of this study shows that CEO popularity is positively related to firm innovation. Our result is robust after mitigating the concern about endogeneity and self-selection bias. Further, we find that the positive relationship between CEO popularity and innovation is more pronounced for firms with a lower level of board independence. Our findings highlight the importance of CEO characteristics on firm behaviour.

Keywords: Upper Echelons Theory, CEO Popularity, Firm Innovation, CEO Characteristics

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1. INTRODUCTION

Innovation has long been regarded as an essential factor in influencing a firm's long-term growth and competitiveness (Porter, 1992; Chemmanur & Tian, 2018). Hills (1994) defines innovation as an idea, practice, or object that is considered new by an individual or other user unit. Suryana (2003) defines innovation, namely, as the ability to apply creativity in order to solve problems and opportunities to improve and enrich life. The company's innovation activities to achieve the company's goal of maximizing profit is inseparable from operational performance, where operational performance is a resource activity that

has an influence on the company in achieving company performance and performance. Innovation capability is an organization's ability to adopt or implement new ideas, processes, and new products (Hurley & Hult, 1998). Martínez-Román et al. (2015) state that the ability to innovate is to generate new ideas and knowledge to take advantage of market opportunities. Meanwhile, the ability of product innovation, according to Wonglimpiyarat (2010), is the ability to bring new knowledge or technology to develop new products. The ability to innovate is absolutely necessary for a business that has many competitors and is prone to saturation. Much research investigates various factors influencing innovation (Aghion et al., 2005, 2013; Lerner et al.,

2011; Bernstein, 2015; Bernstein et al., 2016; Tian & Wang, 2014). Bradley et al. (2017) find a negative relationship between unionization and firm innovation. Seru (2014) examines the effect of conglomerate mergers on innovations and finds that diversifying mergers results in a lower level of acquired firms' innovations than failed targets. Exploiting the deregulation of interstate banking in the U.S., Cornaggia et al. (2015) find a negative relationship between banking competition and innovation for public firms headquartered in deregulated states.

Another stream of research investigates the impact of manager-level characteristics on innovation. Hirshleifer et al. (2012) examine the influence of CEO overconfidence on innovation. They find that CEO overconfidence relates to higher innovation measured by patents and patent citations. In a similar vein, Galasso and Simcoe (2011) find that CEO overconfidence induces higher innovation, especially for more competitive industries. In a recent study, Sunder et al. (2017) examine the relationship between the CEOs' hobby of flying airplanes and a firm's innovation. They argue that the hobby of flying an airplane captures the CEO characteristics of seeking new experiences and risk-taking behavior. They find a positive relationship between pilot CEOs and innovation outcomes, innovation effectiveness, and diversity and originality of patents. In this paper, we extend this line of research by examining the influence of another CEO-level factor, namely CEO popularity, on firm innovation.

In their upper echelons theory, Hambrick and Mason (1984) argue that managers' experiences, values, and personalities influence firm-level actions. We, therefore, argue that CEO popularity may affect a firm's innovation behavior by setting the tone at the top. Duan et al. (2018) argue that CEO publicity may be positively related to the market's expectations, thereby increasing the pressure on CEOs. CEOs may react either positively or negatively to the higher market pressure resulting from higher publicity. CEOs may perceive that higher market pressure means a higher need to act according to shareholder interests. In this case, CEOs may follow the interest of shareholders to focus on long-term growth, competitive advantage, and future survival. Consequently, higher publicity will be positively related to innovation. On the other hand, CEOs may react negatively by lowering innovation if they interpret higher market pressure as a motivation to focus on earnings. In this case, CEOs may protect their credibility by meeting or beating investors' expectations on earnings. Consequently, CEOs with higher publicity may lower expenses related to research and development (R&D) expenses to increase earnings.

We examine the issue using 378 firm-years of Indonesia-listed firms during the 2014–2017 period. Indonesia provides a unique setting to test the issue for several reasons. First, Indonesia has a small yet growing capital market. It is expected that Indonesia will be the biggest stock market in Southeast Asia with a \$529 billion valuation (Miller & Nguyen, 2020). Duan et al. (2018) argue that publicity is associated with market expectations. Hence, it is very interesting to see how pressure from that kind of capital market may affect firm behavior. Second,

according to the Global Innovation Index 2021, Indonesia has performed above the upper middle-income country average in two pillars, namely: infrastructure; and market sophistication (World Intellectual Property Organization [WIPO], 2021). Such strong points lead to further innovation development including 11 unicorn start-up firms in 2021, one of the highest in the Southeast Asian region.

We find that CEO popularity is positively related to firm innovation. This result may support the argument that CEOs perceive higher market pressure as pressure to act per the interests of shareholders, such as focusing on long-term growth, competitive advantage, and future survival, thereby increasing firm innovation. This result holds after we include several firm and CEO-level characteristics as control variables. Our results are robust after mitigating the concern of endogeneity by replacing the measure of CEO popularity with the last-year CEO popularity measure. We also mitigate the self-selection bias issue related to the firm-related characteristics that may affect our results using propensity score matching (PSM). In the matched sample using the PSM method, we still find that higher CEO popularity leads to higher innovation. Interestingly, in the sub-sample test, we find that the positive relationship between CEO popularity and innovation is more pronounced for firms with lower board independence levels. This may show that market pressure as a governance mechanism resulting from higher popularity can substitute the monitoring pressure exercised by board independence.

By examining the relationship between CEO popularity and innovation, we provide several contributions. First, we extend previous research on the determinants of firm innovation (Aghion et al., 2005, 2013; Bernstein, 2015; Bernstein et al., 2016; Chemmanur & Tian, 2018; Lerner et al., 2011; Tian & Wang, 2014). We provide additional evidence on the influence of CEO-level characteristics on innovation (Galasso & Simcoe, 2011; Hirshleifer et al., 2012; Sunder et al., 2017). Second, we add to the existing literature related to the effects of CEO characteristics on firm behavior (Ali & Zhang, 2015; Huang et al., 2012; Kim et al., 2016; Kubick & Lockhart, 2017; Malmendier & Tate, 2005). Specifically, we extend the influence of CEO characteristics on firm behavior using the Indonesian setting (Kuncoro et al., 2022; Razak et al., 2020).

Third, we show evidence of the importance of market pressure as an external mechanism for disciplining managers (Fama & Jensen, 1983; Jensen & Ruback, 1983; Gompers et al., 2003; Lel & Miller, 2015). We also present evidence that market pressure resulting from popularity could substitute monitoring mechanisms provided by board independence. In addition, the results of our study provide practical insights for decisions related to manager appointments.

The remainder of this paper is organized as follows. Section 2 shows previous literature related to the determinant factors of firm innovation and the hypotheses development on the relationship between CEO popularity and innovation. In Section 3, we present our sample and research design. The descriptive statistics of our sample and the results of the baseline regression are presented

in Section 4. We also provide the results for sub-sample analyses in that section. Finally, we conclude the paper in Section 5.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

We will provide a brief literature review on the determinants of firm innovation in sub-section 2.1. Sub-section 2.2 shows the hypotheses development related to the influence of CEO popularity on firm innovation. Sub-section 2.3 discusses the role of top management in determining the organization performance. Finally, sub-section 2.4 outlines the hypotheses of this study.

2.1. Upper echelons theory

The performance of an organization is a reflection of the cognitive abilities of the top leadership (Hambrick, 2007; Hambrick & Mason, 1984). Gounopoulos et al. (2021) assume that the background behind management education peak equips CEO with skills in social relations. This becomes a strategy company in improving the company's financial performance. The theory suggests that CEO leadership is influenced by the breadth of knowledge, beliefs, and characteristics (Kaur & Singh, 2018; Saeed & Ziaulhaq, 2019). These characteristics shape and determine the way of thinking in making strategic company decisions (Abatecola & Cristofaro, 2020). These individualized construals of strategic situations arise because of differences among executives in their experiences, values, personalities, and other human factors. Therefore, it is important to study their characteristics because they are important for the performance of companies and their profits (Altarawneh et al., 2020; Chatterjee & Hambrick, 2007). In the current era of information disclosure, popularity influences the choice of strategic decisions and determines company performance. This characteristic is increasingly in the spotlight during the COVID-19 pandemic because of the need to maintain company performance during the pandemic. A popular CEO has better managerial, communication, and knowledge skills and can read market situations quickly. Therefore, their strategic decisions are of high quality and help maintain and improve company performance during a pandemic (Hambrick, 2007; Shahab et al., 2020).

2.2. The determinants of firm innovation

One stream of research examines the influence of firm-level characteristics on innovations (Baysinger et al., 1991; Chemmanur et al., 2014). Related to firm financing decisions, Lerner et al. (2011) find higher patent citations measuring the influential innovation in the years after private equity investments. They also find that there is a higher focus on patents following investment by a professionally managed partnership. Bernstein (2015) examines the influence of the "going public" decision and innovation. Bernstein (2015) finds a decrease that follows initial public offerings (IPO) in the quality of internal innovation. Moreover, Bernstein (2015) finds evidence of skilled investors quitting and lower productivity of the remaining investors following the IPO.

Aghion et al. (2013) examine the effect of institutional ownership on innovation and find a positive relationship between those two. They find that intense product market competition induces a stronger relationship between institutional ownership and innovation, consistent with the career concern hypothesis. Moreover, they find that ownership by dedicated and transient institutions is the one that has a positive relationship with innovation. From the market perspective, Fang et al. (2014) find a negative relationship between liquidity and future innovation. They argue that it stems from a higher takeover susceptibility and a higher presence of passive institutional investors.

Another stream of research investigates the influence of other factors such as financial analysts, labor unions, market conditions, and takeover susceptibility. Seru (2014) explores the relationship between conglomerate mergers and innovations by exploiting a quasi-experiment including both friendly taken-over target firms and target firms with a failed merger. In a difference-in-difference method, Seru (2014) finds that friendly taken-over target firms experience a decrease in their research output novelty after the merger compared to the target firms with a failed merger. Moreover, Seru (2014) finds that the drop (a smaller number and fewer novel innovations) is higher for mergers by diversifying firms with an active capital market. Cornaggia et al. (2015) find a negative relationship between banking competition and innovation for public firms headquartered in deregulating states using the deregulation of interstate banking in the U.S. They find 30.8% fewer patents in states with deregulation during the three years after the law changes than those with restrictions on interstate branching. Separating the sample into corporations and private firms, they also find a higher innovation for private firms with higher dependency on external sources of funds and limited access to local banks.

Furthermore, Bradley et al. (2017) examine the relationship between unionization and firm innovation. Using a regression discontinuity specification, they find a negative relationship between unionization and firm innovation. They argue that the result is a consequence of a decrease in R&D expenses, reduced inventor productivity, and departure of innovators. Interestingly, they also find a decrease of innovation activities by way of activities movement from states that the union elections win. Chemmanur and Tian (2018) find that antitakeover provisions nurture corporate innovation. They find that the effect is stronger for firms with a higher level of information asymmetry, and which face more competitive product markets. Furthermore, they find that firm value is positively related to antitakeover provisions for firms with an intensive and higher quality of innovation.

Similar to our interest, some studies examine the effect of manager-level characteristics on innovation. Hirshleifer et al. (2012) discuss the influence of CEO-level characteristics, namely overconfidence, on innovation. Based on previous studies, Hirshleifer et al. (2012) argue that an overconfident CEO may accept a higher risk, heavily pursue innovative projects, and achieve higher innovation. Consistently, they find that firms managed by an overconfident CEO have higher stock return volatility, invest more in R&D, and have

higher innovation as measured by patents and patent citation counts. In a similar vein, Galasso and Simcoe (2011) argue that an overconfident CEO will engage in higher innovation as they will be rewarded for the new information released about managerial ability. At the same time, an overconfident CEO underestimates the probability of failure. They also argue that the argument will be more pronounced in competitive industries because the reward of innovations is higher in such sectors. They find that appointment of overconfident CEOs is related to a 25% to 35% higher number of citation-weighted patents.

Moreover, they find that the effect is higher for more competitive industries as per their prediction. In a recent study, Sunder et al. (2017) examine the relationship between a CEO's hobby of flying airplanes and a firm's innovation. They argue that the hobby of flying an airplane captures CEO characteristics of seeking new experiences and risk-taking behavior. They find a positive relationship between pilot CEOs and innovation outcomes, innovation effectiveness, and diversity and originality of patents. In this paper, we extend this line of research by examining the influence of another CEO-level factor, namely CEO popularity, on firm innovation. Lee et al. (2020) stated that popular a CEO has better company management abilities, commitment, and work motivation to produce high performance. During the pandemic, the performance of the company was well maintained, and the rights of shareholders were fulfilled. The popularity of the CEO showed a good value on company. Caton et al. (2019) found that firm innovation tends to increase when equity incentives are combined with a friendly board, the negative effects of CEO power on firm innovation are limited to firms with weak CEO equity incentive compensation plans and arms-length boards of directors.

2.3. Board characteristics

In upper echelons theory, the experience of organizational leaders, the values and personality of a CEO can influence their interpretation, of the situations they will face, and can also influence them in making their choices later. The characteristics of upper management will later produce a strong explanation of the outcomes of an organization. The characteristics of top management have a strategic direction or choice and in the end, they determine the performance of an organization.

This theory shows that the CEO's age, CEO's education, CEO's experience, CEO's social background, CEO's economic condition, and CEO's personal characteristics are determinants of their ability to handle a complex situation and how the CEO will later control the situation in his/her company (Finkelstein & Hambrick, 1996) states that the top management of an organization has a special role and responsibility for the organization they lead, where the characteristics of the top management and how they will deal with it can, of course, affect the organizational outcomes. According to him, the full responsibility for the company's strategy function is the president's director. Upper echelon theory in the context of company outcomes recognizes that different CEO characteristics will affect their decisions on strategy and structure, directly affecting corporate strategy and company performance. The characteristics of

a reliable CEO are CEO who can decide everything decisions in company policy and become an important role for the company in terms of tax avoidance due to the position of a top executive. In CEO characteristics, researchers selected the CEO's financial expertise, CEO age, and CEO tenure tax evasion. According to Custódio and Metzger (2014), a CEO who has experience in financial expertise in a company or a background in finance at work is an active manager who has less cash, more debt, and engages in more repurchase sections. So far, tax avoidance can be seen as an alternative investment opportunity. CEO age judging by how old the CEO works in the company and CEO tenure is viewed by the length of tenure of the CEO within the company (Doho & Santoso, 2020).

2.4. Hypotheses development

Upper echelons theory reveals that individual characteristics of managers such as experiences, values, and personalities affect the direction and action of a firm (Hambrick & Mason, 1984). Previous studies find that CEO-level characters play an important role in firm innovation (Galasso & Simcoe, 2011; Hirshleifer et al., 2012; Sunder et al., 2017). We extend this previous literature by arguing that CEO popularity may affect firm innovation behavior by setting the tone at the top. Duan et al. (2018) argue that CEO publicity may be positively related to the market's expectations. This will then lead to higher pressure on CEOs. In this case, CEOs may behave differently as a reaction to the higher pressure resulting from higher publicity. On one side, the CEO may perceive the higher pressure as a motivating factor for them to act according to the shareholder interests. CEOs, therefore, may follow the interest of shareholders to focus on long-term growth, competitive advantage, and future survival. Uppal (2020) found that the relationship between CEO narcissism and firm performance is curvilinear, meaning that narcissism can positively impact firm performance to a point, but may become counter-productive or ineffective beyond that.

Hence, higher publicity will be positively associated with innovation. On the other side, CEOs may react negatively to the higher market expectation resulting from higher publicity. CEOs perceive that higher earnings should follow the higher pressure. In that case, they may lower innovation-related expenses to protect their credibility by meeting or beating investors' expectations on earnings. In this case, CEOs with higher publicity may be related to lower innovation.

Given those two competing arguments regarding the influence of CEO popularity and innovation, we propose the following alternative hypotheses:

H1a: CEO popularity has a positive impact on firm innovation.

H1b: CEO popularity has a negative impact on firm innovation.

3. RESEARCH METHODOLOGY

We present our sample and research design in this section. Specifically, we discuss our sample in sub-section 3.1. Sub-section 3.2 shows the research design we use to examine the relationship between CEO popularity and firm innovation.

3.1. Sample selection process

We initially collect all Indonesian firms listed on the Indonesian Stock Exchange with available data from the 2014–2017 period. We filter our sample based on several criteria. First, we delete the financial services industry due to its different operating and financial structures. Second, we exclude 78 firms that report their financial statements in a foreign currency to mitigate currency translation risk that may mislead our results. Third, we exclude three delisted firms, namely PT. Bukaka Teknik Utama Tbk (BUKK), PT. Indo Komoditi Korpora (INCF), and PT. Sekar Bumi Tbk (SKBM) (*Perseroan terbatas* (PT) is also known as a limited liability company (LLC) in Indonesia). Fourth, we exclude firm-year observations with missing values to calculate the necessary variables. These procedures result in 378 firm-year observations for our baseline regression. Alternative methods that would be suitable for conducting the research as explanatory methods and descriptive methods to make descriptions, pictures, or paintings in a systematic, factual, and accurate manner regarding the properties, facts, and relationships between the phenomena being investigated. The explanatory method aims to test several hypotheses with a quantitative approach using panel data regression analysis technique with the common effect model approach.

3.2. Baseline model

To test the relationship between CEO popularity and firm innovation, we use the following logistic regression:

$$INNOVATION_{i,t} = \beta_0 + \beta_1 POPULARCEO_{i,t} + \beta_2 CONTROLS_{i,t} + \varepsilon_{i,t} \quad (1)$$

where, *INNOVATION* is our firm innovation measure. We create a dummy variable coded “1” if a firm’s R&D expense is higher than 0 (zero) rupiahs, and it remains at “0” otherwise. CEO popularity is measured by *POPULARCEO* as measured using the Google Trends search volume index. Specifically, we search for the full name of the CEO and the company name or code in Google Trends (www.google.com/trends). We measure *POPULARCEO* as the average weekly search volume index as in Duan et al. (2018).

We include several control variables following previous literature on the determinant factors of firm innovation (Hirshleifer et al., 2012; Chemmanur et al., 2014; Chemmanur & Tian, 2018). Specifically, we use firm size as measured by the natural logarithm of total assets (*SIZE*), profitability as measured by return on assets (*ROA*), and leverage as measured by the ratio of total liabilities on total

assets (*LEVERAGE*). We also include a dummy variable coded “1” if a firm was a state-owned enterprise (SOE), and “0” otherwise (*BUMN*) to measure firm type. A dummy variable was coded “1” if the firm is audited by the Big Four audit firms, and “0” otherwise (*BIG4*). It is included because Francis and Yu (2009) find a relationship between *BIG4* and earnings management. This, therefore, may affect the relationship between CEO popularity and firm innovation, especially if the CEO perceives market pressure resulting from higher popularity as a motivation to inflate earnings. Serfling (2014) finds that CEO age is negatively related to risk-taking behavior. We, therefore, include CEO age (*CEOAGE*), as measured by the absolute value of the CEO’s age, as a control variable because innovation and risk influence each other. As Galasso and Simcoe (2011) find that industry type plays a vital role in innovation behavior, we control the impact of industry type by including industry fixed effect. In addition, we also include the year-fixed effect to mitigate the influence of yearly economic and market fluctuation on the firms’ innovation. We winsorized all the continuous variables at the 1st and 99th percentiles to account for outliers. The detailed definitions of all the variables are presented in Appendix.

4. RESULTS

This section discusses our empirical findings. The descriptive statistical characteristics of our sample are presented in sub-section 4.1. We show the baseline regression results on the relationship between CEO popularity and firm innovation in sub-section 4.2. We mitigate the concern of firm self-selection bias related to the firm characteristics in influencing our results in sub-section 4.3. We perform an additional test and discuss the result in sub-section 4.4.

4.1. Descriptive statistics

Table 1 shows our sample statistical characteristics. It shows that the average *INNOVATION* is 0.212. This indicates that 21.2% of our sample records non-zero R&D expenses. Related to our variable of interest, Table 1 shows that the average (median) of our CEO popularity, *POPULARCEO*, is 0.362 (0.357). For control variables, the mean (median) size (*SIZE*) of our sample is 14.94 (14.89). The mean value of profitability (*ROA*) is 4.6%, while the median value for *ROA* is 4%. We find that *BIG4* audit firms audit 49.7% of our sample; 5.3% of our sample is state-owned enterprises (*BUMN*). Table 1 reveals that the average CEO age (*CEOAGE*) of our sample is 55.23 years old, while the most senior (oldest) CEO is 78 (33) years old. The mean and median of *LEVERAGE* are 17.9% and 18.1%, respectively.

Table 1. Descriptive statistics

Variable	N	Mean	SD	Min	P25	Median	P75	Max
<i>INNOVATION</i>	378	0.212	0.409	0.000	0.000	0.000	0.000	1.000
<i>POPULARCEO</i>	378	0.362	0.250	0.000	0.178	0.357	0.533	0.890
<i>SIZE</i>	378	14.95	1.660	10.84	13.65	14.89	16.09	19.28
<i>ROA</i>	378	0.046	0.082	-0.300	0.010	0.040	0.080	0.410
<i>CEOAGE</i>	378	55.23	9.221	33.00	50.00	54.00	62.00	78.00
<i>BUMN</i>	378	0.053	0.224	0.000	0.000	0.000	0.000	1.000
<i>BIG4</i>	378	0.497	0.501	0.000	0.000	0.000	1.000	1.000
<i>LEVERAGE</i>	378	0.179	0.151	0.000	0.029	0.181	0.285	0.571

Note: This table reports the descriptive statistics for the sample of 378 firm-year observations for the period 2014–2017. The Appendix provides a detailed description of the variables.

The Spearman and Pearson correlation matrices for our variables are presented in Table 2. The Spearman correlation is given above the diagonal, while the Pearson correlation is shown below

the diagonal. It shows that there is no indication of multicollinearity being a problem for estimating the test model.

Table 2. Correlation matrix

Variable	1	2	3	4	5	6	7	8
1. INNOVATION		0.173*	0.092	-0.022	-0.121	0.109*	0.016	-0.082
2. POPULARCEO	0.173*		0.171*	0.092	-0.132*	0.169*	0.148*	0.019
3. SIZE	0.079	0.154*		0.040	0.001	0.255*	0.519*	0.219*
4. ROA	0.006	0.033	0.070		-0.056	0.017	0.162*	-0.154*
5. CEOAGE	-0.110*	-0.159*	0.039	-0.037		0.061	-0.058	0.123*
6. BUMN	0.109*	0.154*	0.247*	0.003	0.049		-0.093	0.092
7. BIG4	0.016	0.133*	0.522*	0.138*	-0.052	-0.093		-0.085
8. LEVERAGE	-0.089	0.023	0.203*	-0.152*	0.135*	0.091	-0.076	

Note: This table reports the correlation matrix for the sample of 378 firm-year observations for the period of 2014-2017. The Spearman correlation is presented above the diagonal, while the Pearson correlation is presented below the diagonal. The Appendix provides a detailed description of the variables. * Indicates a statistical significance at the 5-percent level.

4.2. Baseline results

We initially regress our CEO popularity measure (*POPULARCEO*) on the firm innovation measure (*INNOVATION*) without any additional control variables and present the result in column 1 of Table 3. Using logistic regression specification, we find that CEO popularity is positively related to firm innovation (1.703) and significant at the 1% level. The same result is generated when we include both industry and year-fixed effects in our baseline model. As shown in column 2 of Table 3, we find that *POPULARCEO* is positively (1.927) related to *INNOVATION* at the 1% significance level.

We present the more comprehensive results in column 3 of Table 3. It shows that after including all control variables and both fixed effects, we find that *POPULARCEO* is positively (1.627) related to *INNOVATION* at the 5% significance level. This may

indicate that the pressure resulting from being popular may motivate CEOs to conduct more innovation. The result, therefore, supports our argument that CEOs may perceive the higher pressure resulting from higher publicity as a motivating factor for them to behave in the shareholder's interests. In that case, CEOs may follow the interest of shareholders to focus on long-term growth, competitive advantage, and future survival. Hence, higher publicity is positively associated with innovation.

Related to control variables, we find that probability of disbursing money to R&D expense is higher for firms with a larger size and lower for firms with older CEOs and audited by the *BIG4*. Overall the results for the control variables are consistent with previous studies (Chemmanur et al., 2014; Chemmanur & Tian, 2018).

Table 3. Main results: CEO popularity and innovation

Variable	INNOVATION		
	1	2	3
<i>POPULARCEO_i</i>	1.703*** (0.514)	1.927*** (0.616)	1.627** (0.660)
<i>SIZE_i</i>			0.223** (0.112)
<i>ROA_i</i>			-1.071 (1.644)
<i>CEOAGE_i</i>			-0.050*** (0.018)
<i>BUMN_i</i>			0.640 (0.698)
<i>BIG4_i</i>			-0.907** (0.389)
<i>LEVERAGE_i</i>			-1.628 (1.097)
Constant	-1.983 (0.251)***	-1.405 (0.531)***	-0.777 (1.936)
Year fixed-effect	No	Yes	Yes
Industry fixed-effect	No	Yes	Yes
Pseudo R-square	0.0290	0.1530	0.1986
N	378	378	378

Note: This table shows the logit regression results for the impact of CEO popularity on innovation. Column 1 shows the results when no control variables and fixed effects are included in the model. Column 2 shows the results when we include industry and year-fixed effects. Column 3 shows the results when all control variables are included in the estimation. We winsorize continuous variables at the 1% and 99% levels. We present the standard errors in parentheses. We provide definitions of the variables in the Appendix. *, **, and ***, indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

4.3. Self-selection bias

To mitigate the concern of firm self-selection bias related to the firm characteristics influencing our results, we perform two checks. First, we use a lead-lag approach to mitigate reverse causality (Lim et al.,

2018). We set our independent variables into lagged variables by one year. The result is presented in Table 4. It shows that we still find a positive and significant relationship between CEO popularity and firm innovation, supporting our baseline result.

Table 4. CEO popularity and innovation – Lag variables

Variable	INNOVATION
POPULARCEO _{t-1}	1.335* (0.761)
SIZE _t	0.225* (0.131)
ROA _t	-1.948 (-1.948)
CEOAGE _t	-0.061*** (0.022)
BUMN _t	0.591 (0.815)
BIG4 _t	-0.803* (0.449)
LEVERAGE _t	-1.829 (1.280)
Constant	0.261 (2.220)
Year fixed-effect	Yes
Industry fixed-effect	Yes
Pseudo R-square	0.2142
N	278

Note: This table shows the logit regression results for the impact of CEO popularity on innovation. We use a lagged CEO popularity measure in this table. We winsorize continuous variables at the 1% and 99% levels. We present the standard errors in parentheses. We provide definitions of the variables in the Appendix. *, **, and ***, indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Second, we employ the PSM method (Rosenbaum & Rubin, 1983). In doing so, we create a dummy variable based on the yearly median of the CEO popularity measure as the cut-off value. We then create a dummy variable coded “1” for firms in the above-median group (treatment group) and “0” otherwise (control group). We estimate the probability of being assigned to the treatment or

control group using a logit regression with all the control variables and year and industry fixed effects as in our baseline regression. We then use specifications within a caliper of 0.01 without a replacement to create a matching sample – this specification results in 111 propensity score-matched pairs (that is, 222 firm-year observations).

Table 5. Propensity score matching regression

Panel A: Descriptive statistics for the matched sample			
Variable	Treatment firms	Control firms	T-test
<i>Dependent variables</i>			
INNOVATION	0.261	0.153	1.996**
<i>Control variables</i>			
SIZE	14.95	14.93	0.080
ROA	0.044	0.052	-0.640
CEOAGE	55.27	55.28	-0.010
BUMN	0.009	0.009	0.000
BIG4	0.577	0.523	0.810
LEVERAGE	0.181	0.177	0.200
Panel B: PSM regression analysis			
Variable	INNOVATION		
POPULARCEO _t	2.013** (0.897)		
SIZE _t	0.221 (0.161)		
ROA _t	-2.018 (2.296)		
CEOAGE _t	-0.040 (0.026)		
BUMN _t	18.30 (1.591)		
BIG4 _t	-0.856* (0.519)		
LEVERAGE _t	-2.858* (1.467)		
Constant	-0.774 (2.792)		
Year fixed-effect	Yes		
Industry fixed-effect	Yes		
Pseudo R-square	0.2469		
N	222		

We present the characteristics of both treatment and control groups in Panel A of Table 5. It shows that the firm characteristics of treatment and control groups are not statistically different for all variables, except for *INNOVATION*. To be specific,

we find that the *INNOVATION* of the treatment group is higher than those of the control group. This may indicate that firms with higher CEO popularity have a higher possibility to engage in R&D activities which supports our baseline regression result.

To test that finding, we re-perform our baseline regression using the matched sample. Panel B of Table 5 shows the result. It shows that *POPULARCEO* is positively (2.013) related to *INNOVATION* and significant at the 5% level. Therefore, the self-selection bias check results in supporting our baseline finding that CEO popularity induces higher firm innovation.

4.4. Additional test

There is mixed evidence on the influence of board independence on earning management (Klein, 2002; Park & Shin, 2004; Davidson et al., 2005; Chen et al., 2015). We run an additional test to see whether board independence influences the relationship between CEO popularity. Duan et al. (2018) argue that CEO publicity may be positively related to the market's expectations, indicating that popular CEOs receive higher market pressure. So far, we find that CEO popularity is positively related to firm innovation. This may support the argument that higher popularity is related to a higher disciplining mechanism provided by the market to the CEO. Hence, if the market pressure stemming from

popularity provides a governance mechanism to the CEO, we expect that the positive relationship will be stronger for firms with lower governance mechanisms.

To test the above argument, we consider board independence, *BOARDS*, as measured by the proportion of independent boards to the total board members on the relationship between *POPULARCEO* and *INNOVATION*. To do so, we create two dummy variables based on the yearly median value of *BOARDS*. We create *HBOARDS* for firms with *BOARDS* above the annual median value and *LBOARDS* for those with *BOARDS* below or the same as the yearly median. We then interact with those two dummies with the *POPULARCEO*. Table 6 presents the results. We find that *POPULARCEO* is positively related to *INNOVATION* for both *HBOARDS* and *LBOARDS*. However, we only find a significant relationship for the *LBOARDS* group. As per our expectation, this may indicate that market pressure resulting from higher popularity acts as a governance mechanism that can substitute the monitoring pressure exercised by board independence.

Table 6. The influence of board independence

Variable	INNOVATION
<i>HBOARDS</i> * <i>POPULARCEO</i> ,	0.861 (0.834)
<i>LBOARDS</i> * <i>POPULARCEO</i> ,	2.000*** (0.698)
Constant	-0.573 (1.936)
Control variables	Yes
Year fixed-effect	Yes
Industry fixed-effect	Yes
Pseudo R-square	0.2052
N	378

Note: This table shows the logit regression results of the influence of board independence on the relationship between CEO popularity and innovation. We sort firms into two groups based on the yearly median value of the board independence measure. We create dummy variables for those groups. We then interact those two dummies with *POPULARCEO* and regress them to the innovation measure. We winsorize continuous variables at the 1% and 99% levels. We present the standard errors in parentheses. We provide definitions of variables in the Appendix. *, **, and ***, indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

5. CONCLUSION

Based on the upper echelons theory, CEO characteristics such as experiences, values, and personalities, may influence the direction and action of a firm (Hambrick & Mason, 1984). It is supported by previous studies that examine CEO-level characteristics of firm innovation (Galasso & Simcoe, 2011; Hirshleifer et al., 2012; Sunder et al., 2017). We provide additional evidence for that line of research by examining the relationship between CEO popularity and firm innovation in Indonesia. Indonesia is chosen because Indonesia has a small yet growing capital market. Hence, it is very interesting to see how pressure from that kind of capital market may affect firm behavior. In addition, Indonesia possesses strong points to support innovation, namely infrastructure and market (WIPO, 2021), which facilitates the development of unicorn start-up firms in the country.

To test the issue, we use 378 firm-year of Indonesia-listed firms during the 2014-2017 period. Overall, we find that CEO popularity is positively related to firm innovation. This result is robust to mitigate the concern of firm self-selection bias associated with the firm characteristics. The results,

therefore, support our argument that CEOs may perceive the higher pressure resulting from higher publicity as a motivating factor for them to behave following the shareholder interests. In that case, CEOs may follow the interest of shareholders to focus on long-term growth, competitive advantage, and future survival. Hence, higher publicity is positively associated with innovation.

Further, we extend our test by examining the influence of board independence on the relationship between CEO popularity. As popularity is related to higher market pressure, we expect that the positive relationship will be stronger for firms with lower governance mechanisms. This indicates that governance mechanisms resulting from higher popularity can substitute the monitoring pressure exercised by board independence. In our sub-sample test, as per our expectation, we find that the positive relationship between CEO popularity and innovation is more pronounced for firms with lower board independence levels. Overall, our study highlights the influence of CEO characteristics on firm behavior.

This study supports the development of the upper echelons by proving that popularity affects firm innovation. There are some limitations

in this study. For example, 1) we exclude the financial services industry due to their different operating and financial structures; 2) we exclude 78 firms that report their financial statements in a foreign currency to mitigate currency translation risk that may mislead our results; 3) the observation period of this research is short, which is only four years. Further studies need to examine other CEO

characteristics that can influence firm innovation, such as millennial age, competence, personality and crisis leadership, gender, and political connections. This research can also be replicated by selecting a research sample of banking companies and a longer observation time to cover better and more comprehensive data and information.

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APPENDIX

Table A.1. Variable definitions

<i>Variable</i>	<i>Definition</i>
$INNOVATION_{it}$	A dummy variable coded 1 if a firm's R&D expense was higher than 0, and 0 otherwise.
$POPULARCEO_{it}$	Measured using the Google Trends search volume index. Specifically, we searched for the full name of the CEO and the company name or code in Google Trends (www.google.com/trends). We measured <i>POPULARCEO</i> as the average weekly search volume index as in Duan et al. (2018).
$BIG4_{it}$	The type of audit firm in year t took the value 1 if the firm was audited by a Big Four auditor and 0 otherwise.
$BUMN_{it}$	Indonesian state-owned enterprises in year t took the value of 1 if the firms were Indonesian state-owned enterprises and 0 otherwise.
$BOARDS_{it}$	The proportion of independent boards to the total board members of firm i in year t .
$CEOAGE_{it}$	The absolute value of the CEO's age of firm i in year t .
$LEVERAGE_{it}$	The ratio of total liabilities on total assets of firm i in year t .
ROA_{it}	The ratio of the pre-tax income on total assets of firm i in year t .
$SIZE_{it}$	The natural logarithm of total assets of firm i in year t .