

Article

Founder CEO, CEO Characteristics, and Firm Innovation Efficiency: An Empirical Study of China's GEM-Listed Companies

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Abstract: While it is widely known that founder Chief Executive Officers (CEOs) can influence firm innovation, few studies have comprehensively examined how the founder CEO affects the firm's innovation input, innovation output, and input-to-output conversion rate, and how these effects depend on the founder CEO's demographic, cognitive, and corporate positional characteristics. We analyze the nine-year panel data of China's Growth Enterprise Market (GEM)-listed companies to empirically study the relationship between founder CEO (vs. non-founder CEO), CEO characteristics, and firm innovation efficiency. Our analysis produces four major findings. First, founder CEO firms have a lower innovation input and higher innovation output than non-founder CEO firms. Second, compared with male founder CEOs, female founder CEOs can further reduce innovation input without sacrificing innovation output. Third, founder CEOs with a higher education level can also further reduce innovation input without sacrificing innovation output. Finally, compared with founder CEOs that are not the chairman of the board, the founder CEOs that take dual positions (CEO and chairman) allocate higher innovation input, but the innovation output does not increase. These findings have implications for both research and practice in helping firms achieve sustainable development.

Keywords: founder CEO; CEO characteristics; innovation efficiency



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1. Introduction

In today's highly competitive environment, innovation is critical to the survival and success of enterprises, because the sustainable development of companies ultimately depends on their ability to innovate and differentiate themselves from competitors [1]. As the primary driving force for the growth of enterprises, innovation is considered one of the most important competitive advantages of enterprises [2]. Efficient investment and innovation activities can revitalize corporate funds, obtain higher profit margins, enhance corporate value, and promote economic growth. As corporates' strategic decision makers, a founder's decisions have a significant impact on the enterprise [3]. Start-up companies rarely hire professional Chief Executive Officers (CEOs) due to concerns such as unpredictable development and shortage of funds. Instead, the founder often serves as the CEO. A founder CEO refers to an individual who founds a company and also holds the CEO position of the company. Considering the important influence of founder CEOs on operations, it is imperative to understand how these unique top managers influence enterprise innovation.

Considerable research has been conducted to understand the role of founder CEOs in improving firm performance in general. Founder CEOs are found to have a high level of organizational identity with their company [4]. Founder CEOs tend to exhibit

strong emotional attachment to the company and usually regard the company as their “baby” or “legacy” [5,6]. Hence, founder CEOs are likely to be devoted and work hard to achieve better company performance [7]. It has been consistently found that when the founder serves as CEO, corporate performance (ROA and Tobin Q) is significantly improved [8,9]. The structure of founder identity can further determine how the company makes strategic responses to external adversity, and subsequently firm performance [10]. The impact of founders on start-up firm performance seems to largely depend on founder identity. For example, researchers find that when founders distinguish their founder role and self-concept (self-concept refers to an organic cognitive concept composed of attitudes, emotions, beliefs, and values, which runs through the whole experience and action and organizes the various specific habits, abilities, thoughts, and viewpoints expressed by the individual), i.e., there is incongruent founder identity, enterprise sustainable management declines [11,12]. In this case, founders take their own economic interests into consideration when establishing and operating the enterprise, and will likely make decisions to serve their self-interests. Conversely, when founders align their founder role with self-concept (when there is no incongruence in founder identity), corporate sustainability management will be improved because the founders will make decisions that are conducive to the development of the company.

Since innovation is an important indicator of firm performance, the relationship between founder CEOs and firm innovation has attracted much attention. For instance, Kim and Koo [1] found that founder CEOs are more inclined to innovation than professional CEOs. Kubota and Takehara [13] show that the founder CEOs of family firms tend to increase R&D investment because of their strong entrepreneurial skills [14,15]. Lee, et al. [16] reveal that founder CEOs generate more explorative innovations, and a firm’s innovation would decrease after its founder CEO is replaced by a professional CEO. In general, there is consensus that founder CEOs have a positive impact on firm innovations.

Despite abundant prior research on founder CEOs’ impact on firm innovation, there are still many unanswered questions. Few studies have comprehensively examined how the founder CEO affects the firm’s innovation input, innovation output, and input-to-output conversion rate. There is also a lack of research on how the founder CEOs’ impacts are contingent on their personal characteristics. In this paper, we intend to answer the following two research questions: What is the relationship between the founder CEO and the firm’s innovation efficiency? How is this relationship moderated by CEO’s personal characteristics such as gender, education level, and dual appointment status (serving as CEO and board chairman simultaneously)? Our objective is to identify the direct relationship between founder CEOs and firm innovation efficiency, and then investigate how this relationship is contingent on various founder CEO characteristics.

This paper makes several contributions. First, it expands the relevant research on founder CEO and focuses on the relationship between founder CEO and innovation input and output of public startups. Second, it introduces moderating variables and examines the heterogeneous effects of founder CEO on corporate innovation efficiency at different levels of CEO characteristics. Third, from a practical point of view, it provides suggestions for startup firms regarding how to make appropriate CEO appointments to improve enterprise innovation performance.

2. Theoretical Background

Following the theory-building tradition of management research [17], we blend several theories to serve as the theoretical foundation for this research. Specifically, we draw on three theories to understand founder CEOs’ influences on firm innovation input and output, namely, stewardship theory, risk taking theory, and upper echelons theory. According to stewardship theory, founder CEOs tend to play a steward role for their firms. According to risk taking theory, CEOs’ gender and education level will affect their risk aversiveness. According to upper echelon theory, CEOs’ personal characteristics will have major impacts on firm performance. Together, these theories help to explain why founder CEOs have

heterogeneous effects on firms' innovation input and output. We elaborate on each theory in detail as follows.

2.1. Stewardship Theory

Stewardship theory is a popular theory on firm governance [18]. Different from agency theory, stewardship theory holds that the agent regards themselves as the steward of the organization, whose interests are consistent with the organization, and whose behavior is orderly and serves the collective. If they have to choose between self-serving behavior or organization-serving behavior, they prefer the latter [19]. According to stewardship theory [20], individuals seek higher-level needs through pro-organization behaviors, thus naturally connecting their interests with the organization. When the interests of the steward and the client are inconsistent, the steward pays more attention to cooperation than betrayal [20,21].

Stewardship can be induced by being a founder CEO or having CEO duality (serving as CEO and Chair of the Board of Directors). First, for founder CEOs, the influence of steward factors is more relevant than the influence of agency factors [22]. Demsetz and Lehn [23] believe that founders can add value to the firm by virtue of their professional knowledge and attachment to the firm. Therefore, we use the stewardship theory to explain the influence of the founder CEO on the firm innovation performance. Second, CEO duality embodies the unity of leadership and control, which strengthens the stewardship effect [22]. Based on stewardship theory, Donaldson [19] and Muth and Donaldson [24] argue that the CEO duality is the ideal choice to enhance corporate performance.

2.2. Risk-Taking Theory

Rosenbloom [25] defines risk as the uncertainty of loss. Williams and Heins [26] believe that risk is the loss that the subject may suffer due to the uncertainty of the result, and corporate risk-taking refers to the acceptance of uncertain results in the future. Lumpkin and Dess [27] point out that corporate risk-taking can be used as an indicator of the firm's future development prospects, which means that firms are willing to pay the price in pursuit of high profits. Barger et al. [28] believe that risk-taking reflects managers' orientation when making investment decisions. Risk-taking affects firms' decision making and has an important impact on the firm's performance and survival.

The risk-taking tendency of executives is related to their gender and education. First, Faccio et al. [29] found that females are more inclined to avoid risks than males, and female CEOs will choose to reduce the firm's risk to a level that suits their preferences. Buratti et al. [30] showed that compared with males, females have a lower preference for risky strategies (such as innovative implementation) and a higher tendency to adopt conservative methods. Mao and Zhang [31] show that there is a positive relation between the CEO's risk-taking level and the firm's innovation. Second, CEOs' education level and ability to deal with complex information from outside will affect their willingness to take risks [32]. CEOs are affected by their knowledge reserves, and their perceptions of risk will also be inconsistent. Therefore, the risk-taking theory is applied to explain the moderating effects of CEO gender and education on the relationship between founder CEOs and firm innovation performance.

2.3. Upper Echelons Theory

Upper echelons theory is constructed under the premise of bounded rationality, which refers to the restriction of accessing, processing and using information [33]. Hambrick and Mason [34] believe that CEOs' cognitive foundation and personality traits affect their cognition and perceptions, thereby influencing their strategic choices [33]. In other words, the characteristics of CEOs can affect the strategic actions of the firm and ultimately affect the firm's performance. The differences in firm innovation stem from the differences in CEO's inclination to innovate. For example, CEOs with technical backgrounds are more likely to increase innovation than CEOs with other backgrounds [35]. Education can greatly

influence CEOs' personal values and preferences [34], playing an important role in the choice of innovation strategy [36]. Camelo et al. [37] believe that the higher the education level of the CEO, the higher the innovation level of the firm. Thus, we apply the upper echelons theory to justify that the CEO's education is a key factor that affects the firm's innovation performance.

3. Literature Review and Hypothesis Development

3.1. Founder CEO and Firm Innovation Performance

A founder, by definition an entrepreneur, is an individual in constant pursuit of new knowledge [32]. Generally, the founder has some prior explicit or implicit knowledge on which they base their blueprints, early strategies, and actions—which in turn have lasting consequences on organizational outcomes [3]. Unlike non-founder CEOs, founder CEOs put a lot of devotion into their enterprises. They usually regard their enterprise as a lifelong achievement [38]. When the founder of the company serves as the CEO, the CEO has greater control power throughout the enterprise, and its guiding role is also greater. In terms of stimulating innovation, founders and CEOs play an deciding role [39,40], because they influence innovation by making strategic decisions and allocating resources [41].

The founder CEO is regarded as an entrepreneur [1]. In the management and economics literature, entrepreneurs are the core figures of innovation and entrepreneurship [32]. Schumpeter [42] pointed out that entrepreneurs play an important role in absorbing new knowledge and developing new products. Non-founder CEOs are different from founder CEOs in terms of personal skills, characteristics, firm strategy, and policy formulation and selection [38,43]. Compared with non-founder CEOs, founder CEOs are better at innovation [32] for two main reasons.

First, given that they have established the enterprises, founder CEOs will have stronger motivation to pursue continuous growth of the enterprises and achieve long-term organizational goals [9,44]. Since innovation cannot be accomplished overnight and usually takes a long time to produce the best result, long-term goals and incentive are closely related to innovation [45]. Second, in order to improve the innovation ability of the enterprise, founder CEOs are more willing to take risks [46] because they are well-informed, have experiences in managing the firm, and have a strong ability to deal with uncertainties. For example, prior research finds that founder CEOs of family businesses tend to explore innovative ideas and take the risks associated with them [47]. More importantly, founder CEOs with an adventurous spirit are inclined to hire employees with similar innovative ideas and characteristics, so as to improve the company's innovation performance [9,48].

Enterprises often need to make a large amount of capital investment in innovation projects [49]. Innovation investment is usually defined as the expenditure of financial capital when an enterprise is committed to exploration and innovation of new products [50]. Kim and Koo [1] argue that the positive impact of founder CEOs on innovation is stronger in more competitive industries, and that founder CEOs are more effective at stimulating innovation than professional CEOs. Overall, these findings support the view that the founder CEO plays an important role in facilitating corporate innovation. Given that innovation requires substantial investment, it seems that founder CEOs must increase innovation investment if they want to improve innovation performance. However, we argue that this is not necessarily true.

We apply the stewardship theory to elaborate on our argument. The stewardship theory allows researchers to study the situations in which business managers are motivated to act as stewards in the best interests of their principals [20,51]. It holds that, based on managers' self-discipline, the interests of managers, shareholders, and other stakeholders become consistent. Managers' pursuit of their own dignity, faith, and inner work satisfaction will make them work hard and become qualified stewards [51]. Once managers have stewardship, they are unlikely to undertake opportunistic behaviors. According to the stewardship theory, in the process of managing enterprises, managers will pursue more challenging and responsible work in order to realize their own value and the long-term

development of enterprises [51]. Managers want to be loyal stewards and put organizational goals above self-interest [21,52]. Furthermore, when the CEO is a founder or a member of the founder team, he is more likely to think of himself as a steward and will strive to efficiently manage the company's assets in order to generate more revenue. To this end, founder CEOs are likely to prioritize efficiency on innovation management so that every penny counts. As a result, they may reduce investments on innovation because they try to do more with less. Some empirical evidence in the context of family businesses provides support to this point. For example, Kline and Rosenberg [53] found that family firm owners are reluctant to invest in innovations because the success of innovation projects is uncertain [54]. Meanwhile, Matzler et al. [55] found that family founders' involvement in management and governance had a negative impact on innovation input (R&D intensity) and a positive impact on innovation output (number of patents and patent citations). These findings corroborate our argument that founder CEOs tend to assume the role of steward to improve innovation efficiency.

In addition, considering their professional image, founder CEOs will be more cautious in their investments to avoid overly risky projects, as investment failures are often accompanied by reputational damage [56]. Thus, founder CEOs with foresight are likely to reduce their investments and choose innovation investments wisely. In summary, when it comes to innovation investment decisions, the founder CEO (vs. non-founder CEO) is more like a conscientious steward who tries to minimize innovation costs and maximize innovation outputs so that the company gets the most benefits. Based on the above analysis, we put forward two hypotheses:

Hypothesis 1a (H1a). *Compared with firms with a non-founder CEO, firms with a founder CEO tend to have lower innovation input.*

Hypothesis 1b (H1b). *Compared with firms with anon-founder CEO, firms with a founder CEO tend to have higher innovation output.*

3.2. Founder CEO Characteristics and Firm Innovation

The background and personal characteristics of CEOs determine their acceptance of innovative ideas and implementation of innovative activities [36]. According to previous studies, we take into account three characteristics of the CEO: gender, education, and CEO duality. CEO gender is a demographic feature, whose relationships with risk-taking and enterprise innovation have received considerable attention [57,58]. CEO education is a cognitive attribute that may affect firms' strategic choices [58]. CEO duality is a positional attribute of the CEO within the firm's governance structure that affects all aspects of the board of directors' strategic choices [59].

3.2.1. CEO Gender

Many characteristics distinguish female CEOs from male CEOs, and these characteristics could have different effects on business operations [60,61]. We explain the moderating effect of CEO gender from three aspects.

First, due to different early and continuous socialization, there are inherent differences between females and males, and they have different world views and values. These differences will affect their judgments and behaviors in running firms [62]. Specifically, the similarities and differences between females and males are the result of cultural and social interaction [62]. Expósito et al. [57] believe that gender is a socialized construction that affects management concepts, behaviors, and business decisions. Strohmeier et al. [63] find that firms led by female executives have less breadth and depth of innovation than companies led by male executives. Compared with female entrepreneurs, male entrepreneurs are more inclined to increase R&D investments and file more patent applications [64]. Compared with male-run firms, female-run firms will produce fewer innovative activities, including process innovation and product innovation [65].

Second, innovation requires high-risk long-term investments, and CEOs' risk preference may have a significant impact on investment decisions [66]. Generally, women are more risk-averse and cautious than men [67]. For example, a previous study shows that female executives are more inclined to implement conservative corporate strategies, because female CEOs are more cautious and plan carefully in risky situations, and their participation in organizational decision making tends to reduce risky behaviors of the enterprise [68]. The careful assessment of investment proposals may reduce the amount of investments, but will also increase the chance of making high-quality investments, which help to achieve innovation success and improve decision making efficiency.

Finally, Han et al. [69] find that female CEOs have a more significant promoting effect on the innovation output than male CEOs. Due to gender bias, female CEOs were less likely to be recognized. In order to overcome the gender prejudice, they tend to make more efforts than male CEOs, and are more cautious and comprehensive when making decisions [70]. Moreover, the communication and social skills of female CEOs are advantageous in motivating employees and improving their performance [71]. Thus, female CEOs are able to boost innovation output. Indeed, Altuk et al. [72] found a positive and significant relationship between female CEOs and three types of innovative assets: patents, trademarks, and copyrights.

In summary, given the risk-averse tendency and cautiousness of female CEOs, they are more calculative in weighing the benefits and potential risks of innovation investments, and try to improve innovation efficiency in light of broader value creation strategies, thus achieving lower input and higher output in innovation. Thus, the following hypotheses are proposed:

Hypothesis 2a (H2a). *The negative relationship between the founder CEO and innovation input is stronger when the founder CEO is female than when it is male.*

Hypothesis 2b (H2b). *The positive relationship between the founder CEO and innovation output is stronger when the founder CEO is female than when it is male.*

3.2.2. CEO Education

Education level is a widely used indicator to measure human capital and development capability [73]. The education level of the CEO has often been employed to represent the cognitive ability of the CEO to some extent [34]. Based on the upper echelons theory, CEO education can influence firm innovation activities. Studies have found that a higher CEO education level and longer professional experience are positively correlated with the firm's innovation investment [74]. In the high-tech industry, CEO education level is associated with higher R&D intensity [75,76].

However, we contend that the CEO, as the steward of the enterprise and the risk bearer of the enterprise, will be more conservative in making innovation investments, but more effective in producing innovation outputs. Specifically, more educated CEOs are better at information processing and filtering. For example, Barker and Mueller [77] found that CEOs with higher education have a strong sense of risk. When faced with R&D opportunities, they are more capable of processing relevant information and filtering out risky options. More educated CEOs are more responsive to changes in the external environment, so they are able to seize R&D opportunities and make timely or accurate investments. For example, Yuan and Wen [78] found that the higher the educational level of the CEOs, the higher their sensitivity and responsiveness to the external investment environment, so they will make accurate and high-quality investments that are likely to be successful. Thus, higher education enables CEOs to be more selective in picking innovation investment opportunities. Although the amount of investments may decline, because the investments are carefully selected based on thorough analysis, they are more likely to lead to increased innovation output. Overall, the preceding discussion suggests that CEOs'

higher education does not necessarily correspond to higher innovation input, and it might even improve output efficiency. Thus, the following hypotheses are proposed:

Hypothesis 3a (H3a). *The negative relationship between the founder CEO and innovation investment is stronger when the founder CEO's education is higher.*

Hypothesis 3b (H3b). *The positive relationship between the founder CEO and innovation output is stronger when the founder CEO's education is higher.*

3.2.3. CEO Duality

CEO duality refers to the situation when the board chairman and CEO of an enterprise are held by the same person [79]. It tends to weaken supervision of the board and strengthen the power of the CEO. The stewardship theory [51] posits that the integration of the two positions is conducive to the unity of leadership and to the improvement of management effectiveness. According to steward theory, when the CEO has dual appointments, he is more likely to be a steward of the company, because the board chairman is charged with protecting the interests of shareholders. With CEO duality, the principal and the agent roles are integrated into one person, and the interests of stewarding CEOs and organizational interests become consistent. The combination of the two positions can reduce conflict of interest and improve management efficiency, because the CEO's management plans and strategic proposals are more likely to be approved by the board of directors when he serves as the chairman of the board [20,51].

The relationship between CEO duality and innovation can be understood from two aspects. First, the CEO duality makes CEO more willing to take risks and more likely to invest in drastic innovations that require heavy investments [80]. Second, CEO duality gives the CEO more discretion and autonomy. Li and Yang [59] found that CEO duality increases CEOs' management discretion, because when the CEO is exploring emerging technologies or opportunities, the board will have less resistance and be more willing to approve the CEO's investment proposal. Kao and Chen [81] show that CEO duality reduces the supervision attention of the board and endows CEOs with greater autonomy in decision making, which will enable CEOs to increase investments on innovations [82]. This shows that CEOs' positive influence on enterprise activities will be amplified when the CEO holds dual positions. With stronger top management approval and support, the company is more likely to turn the innovation investment into concrete innovation outputs.

Taken together, when CEOs hold dual positions, they are more autonomous and risk-taking, and have more willingness to increase innovation inputs. They are also more likely to get more innovation output through the innovation input. Thus, the following hypotheses are proposed:

Hypothesis 4a (H4a). *The negative relationship between the founder CEO and innovation input is weaker when the founder CEO holds dual positions than when it does not.*

Hypothesis 4b (H4b). *The positive relationship between the founder CEO and the innovation output is stronger when the founder CEO holds dual positions than when it does not.*

4. Method

4.1. China's GEM Market

China's economy is shifting from factor-driven to innovation-driven [83]. In October 2009, the second board of China's stock market, the Growth Enterprise Market (GEM), was established [84]. The GEM specializes in assisting emerging and innovative companies with high growth, especially high-tech companies, to raise funds and conduct capital operations. Different from the main board market of incumbent listed companies, it is a forward-looking market that focuses on the development prospects and growth potential of start-up companies. The GEM is a listing venue independent of the existing main board,

usually for smaller, faster growing, more entrepreneurial companies that are unable to meet the full listing requirements of the main board [85].

The establishment of the GEM is the result of the market's "boost" effect on high-tech and high-growth innovative businesses [86]. Growth and innovation are the most salient characteristics of the GEM market, and they are also the most important criteria for thousands of start-ups to be selected into the GEM. For GEM enterprises, technology and management innovation are the core driving force of enterprise growth and constitute the main part of core competitiveness. Enterprise growth resulting from innovation motivates GEM enterprises to continue innovating and reaping benefits from the application of innovations. Since all GEM firms are start-ups, their founders often serve as CEOs, and sometimes also as the chairman of the board of directors. Thus, the GEM provides an ideal context to study the role of founder CEOs' in making innovation investment decisions, implementing innovative strategies, and promoting organizational growth.

4.2. Sample and Data

We selected China's GEM-listed companies for empirical research from 2009 to 2017. The data were extracted from the China Stock Market and Accounting Research (CSMAR) database, where the information of founder CEO is compiled through the founder and senior management data. The data were preprocessed as follows. First, listed companies in the financial and insurance industries were excluded, because the degree of R&D in these industries is very low. Second, to avoid the disturbance of abnormal financial situations of the company, we excluded ST and *ST companies (ST refers to the situation in which a company has suffered losses for two consecutive years and has been specially treated. *ST refers to the situation where, in the third year, the company's operations have not improved, and it is still in a state of loss. In addition to the "ST" before the stock name, "*" will be added, which means at risk of delisting) within the observations interval. Third, to avoid the influence of missing values on the results, we eliminated the observations with missing information. In addition, to eliminate the influence of outliers, we carried out winsorization of 1% and 99% for all continuous variables. Finally, we obtained panel data consisting of 718 companies with 3500 observations over nine years. The panel was unbalanced because companies entered the GEM at different times. Of all the observations, 1893 were associated with founder CEOs and 1607 with non-founder CEOs.

4.3. Measures

4.3.1. Dependent Variables

The dependent variable was enterprise innovation performance, which included two aspects: innovation input and innovation output. Innovation input ($RD_{i,t}$) was measured as the ratio of R&D investment to operating revenue [87,88]. The innovation output ($Apply_{i,t+2}$) was measured by the number of patents applied in the year two years after the current year. Since the firm's innovation output takes time to produce, we used the two-year lead value. The logarithm, $\log(Apply_{i,t+1})$, was used in the analysis [89,90].

4.3.2. Independent Variable

The independent variable was founder CEO ($FCEO_{i,t}$). If the CEO of company was a founder in year t , it was coded as 1, otherwise it was coded as 0. It was a time-varying variable because of CEO succession. During the nine years of this study, some firms initially had a founder CEO, and the heir was a professional CEO, while some firms initially had a professional, and the heir was a founder CEO.

4.3.3. Moderating Variables

(1) CEO gender

CEO gender was coded as 1 if the CEO was female, otherwise 0. It was a binary variable that indicated whether the CEO of a company is female.

- (2) CEO education
CEO education was coded numerically from 1 to 5, representing high school or lower, junior college, bachelor's degree, master's degree, and doctor's degree or above, respectively. This was an ordinal variable, with a larger score representing a higher educational level for the CEO.
- (3) CEO duality
CEO duality was coded as 1 if the CEO was also the chairman of the board of directors, otherwise coded as 0. It was a binary variable that identified whether the CEO held dual positions (being both CEO and chairman).

4.3.4. Control Variables

Based on the literature [91–93], we controlled for the effects of return on assets, financial leverage, proportion of independent directors, the enterprise scale, degree of ownership concentration, enterprise growth, enterprise age, operating cash ratio, number of board of directors, board of supervisors and senior officers, and executives gender disparity. In addition, the year fixed effects (FE) and industry fixed effect were controlled. Table 1 lists the variables and their definitions.

Table 1. Description of variables.

Variables	Measurement
Innovation input (RD_t)	The ratio of a firm's R&D investment over operating revenue
Innovation output ($Apply_{t+2}$)	The logarithm of the number of patent applications after adding 1
Founder CEO (FCEO)	If the founder is CEO, coded as 1, otherwise coded as 0
Female CEO (Gender)	If the CEO is female, coded as 1, otherwise coded as 0
CEO education (Education)	The CEO's education level, where 1 represents high school or lower, 2 represents junior college, 3 represents bachelor's degree, 4 represents master's degree, and 5 represents doctoral degree or above
CEO duality (Duality)	If the CEO is also chairman, coded as 1, otherwise 0
Return on assets (ROA)	Net profit/total assets
Financial leverage (FLew)	Ratio of change in common earnings per share/EBITDA rate of change
Independent directors ratio (IDR)	Number of independent directors/total number of board members
The enterprise scale (Size)	Logarithm of total assets
Degree of ownership concentration (Own)	The total number of shares held by the largest shareholder/the total share capital of the company
Enterprise growth (Growth)	The growth rate of operating revenue
Enterprise age (Age)	The number of years since the firm first went public
Fixed assets ratio (FAR)	Fixed assets/total assets
Operating cash ratio (Cashflow)	Cash flow from operating activities/total assets at the end of the period
DJG	Number of board of directors, board of supervisors and senior officers
Executives gender disparity (Ratio)	Male/female ratio executives in a company
Year	Dummy variables for year
Industry	Dummy variables for industry

4.4. Empirical Models

Stata (Stata Statistical Software: Release 15, StataCorp LLC, College Station, TX, USA) was used for data analysis. To verify H1a and H1b, we used Models 1 and 2 to determine the impact of founder CEO on enterprise innovation performance. The R&D input ($RD_{i,t}$) of the enterprise in year t was included in Model 2 to control for its effect on output [16,94]. Firm, year, and industry fixed effects were also included in the model to control for unexplained variance clustered in firm, time, and industry.

$$RD_{i,t} = \beta_0 + \beta_1 FCEO_{i,t} + \sum \text{Control}_{i,t} + \sum \text{Firm}_i + \sum \text{Year}_t + \sum \text{Industry}_i + \varepsilon_{i,t} \quad (1)$$

$$\text{Apply}_{i,t+2} = \beta_0 + \beta_1 FCEO_{i,t} + \beta_2 RD_{i,t} + \sum \text{Control}_{i,t} + \sum \text{Firm}_i + \sum \text{Year}_t + \sum \text{Industry}_i + \varepsilon_{i,t} \quad (2)$$

where i indexes firm and t indexes year $t \in (2009, 2017)$.

To test H2a–H4a and H2b–H4b, Model 3 and Model 4 were estimated, in which $M_{i,t}$ refers to $Gender_{i,t}$, $Education_{i,t}$, and $Duality_{i,t}$, respectively. Note that founder CEO was a time-varying variable, and thus gender, education level, and CEO duality were all time-varying.

$$RD_{i,t} = \beta_0 + \beta_1 FCEO_{i,t} + \beta_2 M_{i,t} + \beta_3 FCEO_{i,t} * M_{i,t} + \sum Controls_{i,t} + \sum Firm_i + \sum Year_t + \sum Industry_i + \varepsilon_{i,t} \quad (3)$$

$$Apply_{i,t+2} = \beta_0 + \beta_1 FCEO_{i,t} + \beta_2 M_{i,t} + \beta_3 FCEO_{i,t} * M_{i,t} + RD_{i,t} + \sum Controls_{i,t} + \sum Firm_i + \sum Year_t + \sum Industry_i + \varepsilon_{i,t} \quad (4)$$

5. Analyses and Results

5.1. Descriptive Statistics

Table 2 shows the descriptive statistics of all the variables. The mean values of innovation input ($RD_{i,t}$) and innovation output ($Apply_{i,t+2}$) are 0.071 and 0.649. It shows that the R&D investment of GEM-listed companies is at a low level, while the patent output is high. Thus, the innovation conversion rate is high. For moderating variables, the mean value of female CEO ($Gender_{i,t}$) is 0.062, indicating that only 6.2% of CEOs in the sample enterprises are female, and most companies have not appointed female CEOs. Regarding the educational level of CEOs, 3.28% of the samples are high school or lower, 10.72% are junior college, 35.31% are undergraduate, 41.73% are master's degree, and 8.96% are doctoral degree or above. The average value of CEO education is 3.427, indicating that most CEOs have a bachelor's degree or above. The mean values of founder CEO ($FCEO_{i,t}$) and duality variables are 0.541 and 0.548, indicating that the combination of founder CEO and dual positions accounts for more than half of the sample companies.

Table 2. Descriptive statistics.

Variables	N	Mean	sd	Min	Max
RD_t	3500	0.071	0.066	0	0.984
$Apply_{t+2}$	3500	0.649	1.388	0	7.691
FCEO	3500	0.541	0.498	0	1
Gender	3500	0.062	0.242	0	1
Education	3350	3.427	0.921	1	5
Duality	3490	0.548	0.498	0	1
ROA	3500	0.057	0.059	−1.016	0.469
FLev	3500	0.237	0.155	0.004	0.852
IDR	3500	0.380	0.055	0.250	0.600
Size	3500	20.96	0.745	18.68	24.30
Own	3500	0.318	0.126	0.042	0.812
Growth	3500	0.843	21.90	−2.780	1294
Age	3500	12.13	4.938	1	32
FAR	3500	0.247	0.317	−3.567	7.949
Cashflow	3500	1.020	0.918	0	12.45
DJG	3500	17.23	2.810	3	33

Table 3 shows Pearson's correlations. The correlations between ROA and fixed asset ratio (FAR) is 0.724; between operating cash ratio (Cashflow) and executive gender disparity (Ratio) is 0.705; and between founder CEO ($FCEO_{i,t}$) and CEO duality ($Duality_{i,t}$) is 0.535, suggesting possible multicollinearity. However, the variance inflation factor (VIF) values are all below 10, and thus the multicollinearity concern can be alleviated.

Table 3. Correlations between variables.

	RD	Apply	FCEO	Gender	Education	Duality	ROA	FLev	IDR	Size	Own	Growth	Age	FAR	Cashflow	DJG	Ratio
RD	1																
Apply	−0.024	1															
FCEO	0.041 **	−0.008	1														
Gender	−0.004	0.010	0.019	1													
Education	−0.013	−0.024	−0.027	−0.036 **	1												
Duality	−0.033 **	0.037 **	−0.585 ***	−0.006	0.026	1											
ROA	−0.062 ***	0.012	0.103 ***	0.017	−0.017	−0.047 ***	1										
FLev	−0.204 ***	0.015	−0.035 **	−0.009	−0.014	0.004	−0.192 ***	1									
IDR	0.044 ***	−0.014	0.050 ***	0.008	−0.021	−0.083 ***	−0.029 *	−0.020	1								
Size	−0.065 ***	0.077 ***	−0.092 ***	−0.007	−0.009	0.105 ***	−0.168 ***	0.271 ***	−0.052 ***	1							
Own	−0.120 ***	0.043 **	0.012	0.027	−0.025	−0.130 ***	0.073 ***	−0.002	0.082 ***	−0.130 ***	1						
Growth	0.002	−0.008	−0.019	−0.004	−0.009	0.017	−0.001	−0.012	−0.015	−0.013	0.033 *	1					
Age	−0.045 ***	−0.041 **	−0.058 ***	0.008	−0.007	0.047 ***	−0.033 *	0.109 ***	−0.007	0.132 ***	−0.052 ***	0.026	1				
FAR	−0.034 **	0.029 *	0.079 ***	0.022	0.006	0.015	0.724 ***	−0.147 ***	−0.057 ***	−0.040 **	−0.283 ***	−0.006	−0.053 ***	1			
Cashflow	0.099 ***	−0.054 ***	0.019	−0.002	0.024	0.011	−0.028 *	−0.002	0.034 **	0.066 ***	−0.425 ***	−0.004	0.057 ***	0.161 ***	1		
DJG	0.022	0.092 ***	0.035 **	−0.007	−0.003	−0.006	0.035 **	0.105 ***	−0.420 ***	0.220 ***	−0.099 ***	0.000	0.055 ***	0.099 ***	−0.061 ***	1	
Ratio	0.034 **	−0.062 ***	0.060 ***	0.014	0.015	−0.089 ***	0.027	−0.007	0.072 ***	−0.031 *	0.071 ***	0.005	0.027	−0.019	0.705 ***	−0.163 ***	1

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

5.2. Effects of Founder CEO on Innovation Performance

We use the fixed effect estimator for all the regression models, because the Hausman test suggests that the fixed effect model is more suitable than the random effect model. As shown in Table 4, founder CEO ($FCEO_{i,t}$) and innovation input ($RD_{i,t}$) has a significant negative relationship ($\beta = -0.00351$, $p < 0.05$), supporting H1a. Founder CEO ($FCEO_{i,t}$) and innovation output ($Apply_{i,t+2}$) has a significant positive relationship ($\beta = 0.123$, $p < 0.05$), supporting H1b. This suggests that founders severing as CEOs play an important role as stewards, and they tend to reduce innovation input and promote innovation output.

Table 4. Regression results of founder CEO on firm innovation performance.

Variables	Model 1	Model 2
	RD_t	$Apply_{t+2}$
FCEO	−0.00351 * (0.00211)	0.123 * (0.0673)
RD_t		0.251 (0.610)
ROA	−0.159 *** (0.0261)	−1.296 (0.837)
FLev	−0.0283 *** (0.00746)	−0.241 (0.240)
IDR	0.0233 (0.0224)	1.077 (0.714)
Size	−0.0109 *** (0.00208)	−0.0459 (0.0680)
Own	−0.0219 (0.0194)	1.034 * (0.622)
Growth	5.30×10^{-6} (2.99×10^{-5})	-1.90×10^{-5} (0.000951)
Age	0.00118 ** (0.000549)	0.224 (0.153)
FAR	−0.00718 (0.00572)	0.552 *** (0.184)
Cashflow	−0.00399 * (0.00226)	−0.128 * (0.0721)
DJG	0.00201 *** (0.000445)	−0.00308 (0.0143)
Ratio	0.0403 *** (0.0111)	0.476 (0.355)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Constant	0.251 *** (0.0527)	0.507 (2.022)
Observations	3500	3500
R-squared	0.089	0.046

Standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, one-tailed test.

5.3. Moderation Effects of CEO Characteristics

Regression results after adding moderator variables are shown in Table 5. As shown in the first and fourth columns, the interaction term between founder CEO and female CEO has a significant negative relationship with innovation input ($RD_{i,t}$) ($\beta = -0.0106$, $p < 0.05$), supporting H2a, but has no significant relationship with innovation output ($Apply_{i,t+2}$). Therefore, H2b is not verified. This indicates that female founder CEOs make fewer innovation investments without sacrificing innovation output.

Table 5. Influences of founder CEO and CEO characteristics on firm innovation performance.

Variables	Model 3	Model 3	Model 3	Model 4	Model 4	Model 4
	RD _t	RD _t	RD _t	Apply _{t+2}	Apply _{t+2}	Apply _{t+2}
FCEO	−0.00292 (0.00214)	0.00536 (0.00574)	−0.0263 *** (0.00772)	0.121 * (0.0681)	0.154 (0.180)	−0.177 (0.252)
Gender	0.00803 * (0.00422)			−0.0477 (0.134)		
FCEO × Gender	−0.0106 * (0.00563)			0.0408 (0.180)		
Education		0.000909 (0.00111)			−0.0102 (0.0349)	
FCEO × Education		−0.00254 * (0.00153)			−0.00511 (0.040)	
Duality			−0.00435 (0.00368)			−0.0619 (0.118)
FCEO × Duality			0.0155 *** (0.00464)			0.194 (0.152)
RD _t				0.258 (0.611)	0.236 (0.618)	0.161 (0.612)
ROA	−0.157 *** (0.0261)	−0.148 *** (0.0284)	−0.156 *** (0.0261)	−1.303 (0.838)	−0.986 (0.896)	−1.240 (0.838)
FLev	−0.0281 *** (0.00746)	−0.0298 *** (0.00773)	−0.0275 *** (0.00748)	−0.242 (0.240)	−0.155 (0.245)	−0.201 (0.240)
IDR	0.0225 (0.0224)	0.0256 (0.0232)	0.0234 (0.0226)	1.079 (0.715)	0.892 (0.728)	1.106 (0.721)
Size	−0.0108 *** (0.00208)	−0.0108 *** (0.00217)	−0.0108 *** (0.00209)	−0.0462 (0.0680)	−0.0412 (0.0699)	−0.0376 (0.0682)
Own	−0.0222 (0.0194)	−0.0262 (0.0201)	−0.0205 (0.0194)	1.034 * (0.623)	1.332 ** (0.634)	1.129 * (0.624)
Growth	5.31×10^{-6} (2.99×10^{-5})	5.84×10^{-6} (3.01×10^{-5})	5.23×10^{-6} (2.99×10^{-5})	-1.88×10^{-5} (0.000951)	4.93×10^{-6} (0.000945)	-2.52×10^{-5} (0.000950)
Age	0.00116 ** (0.000549)	0.00118 ** (0.000573)	0.00113 ** (0.000550)	0.224 (0.153)	0.219 (0.152)	0.206 (0.155)
FAR	−0.00778 (0.00573)	−0.00957 (0.00645)	−0.00746 (0.00574)	0.555 *** (0.184)	0.494 ** (0.204)	0.526 *** (0.184)
Cashflow	−0.00393 * (0.00226)	−0.00401 * (0.00220)	−0.00381 * (0.00227)	−0.128 * (0.0721)	−0.126 * (0.0722)	−0.133 * (0.0722)
DJG	0.00200 *** (0.000445)	0.00208 *** (0.000460)	0.00212 *** (0.000447)	−0.00304 (0.0143)	−0.00248 (0.0145)	−0.00245 (0.0144)
Ratio	0.0400 *** (0.0111)	0.0406 *** (0.0114)	0.0392 *** (0.0111)	0.476 (0.355)	0.540 (0.358)	0.496 (0.355)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.250 *** (0.0527)	0.228 *** (0.0569)	0.259 *** (0.0529)	0.504 (2.023)	0.709 (2.106)	0.592 (2.037)
Observations	3500	3350	3490	3500	3350	3490
R-squared	0.090	0.090	0.093	0.046	0.049	0.047

Standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, one-tailed test.

As shown in the second and fifth columns, the interaction term between founder CEO and CEO education has a significant negative relationship ($\beta = -0.0025$, $p < 0.05$) with innovation input ($RD_{i,t}$), supporting H3a, but has no significant relationship with innovation output ($Apply_{i,t+2}$). Therefore, H3b is not verified. This indicates that highly educated founder CEOs invest less in innovations, while maintaining the same level of innovation output.

The results of the third and sixth columns show that the interaction term between founder CEO and CEO duality has a significant positive relationship ($\beta = 0.0155$, $p < 0.01$), with innovation input ($RD_{i,t}$), supporting H4a, but has no significant relationship

with innovation output ($\text{Apply}_{i,t+2}$), failing to support H4b. This suggests that when the chairman concurrently serves as CEO, without the supervision of the board of directors, the CEO's discretionary power will increase, and the increase of power will increase the CEO's confidence and increase the innovation input. However, the increased investments do not lead to more patent applications.

5.4. Robustness Tests

5.4.1. Replacing Control Variables

Considering that different control variables will affect the final regression result, ROA was replaced with ROE. Table 6 shows the regression results after the replacement. Model 1 and Model 2 are the founder CEO and results of innovation input and output. Model 3 and Model 4 are the results of innovation input and output after adding moderator variables. According to the results, it can be concluded that H1a, H1b, H2a, H3a, and H4a are valid, while H2b, H3b, and H4b are still not significant. The conclusions above are robust.

Table 6. Replaced control variables.

Variables	Model 1	Model 2	Model 3	Model 3	Model 3	Model 4	Model 4	Model 4
	RD _t	Apply _{t+2}	RD _t	RD _t	RD _t	Apply _{t+2}	Apply _{t+2}	Apply _{t+2}
FCEO	−0.00351 * (0.00213)	0.122 * (0.0673)	−0.00285 (0.00215)	0.00598 (0.00578)	−0.0285 *** (0.00777)	0.121 * (0.0682)	0.152 (0.180)	−0.182 (0.247)
Gender			0.00832 * (0.00424)			−0.0430 (0.134)		
FCEO × Gender			−0.0117 ** (0.00567)			0.0323 (0.180)		
Education				0.00107 (0.00112)			−0.00981 (0.0349)	
FCEO × Education				−0.00272 * (0.00154)			−0.00479 (0.0480)	
Duality					−0.00533 (0.00362)			−0.0740 (0.115)
FCEO × Duality					0.0169 *** (0.00471)			0.202 (0.150)
RD _t		0.361 (0.606)				0.368 (0.607)	0.308 (0.614)	0.299 (0.608)
ROE	−0.00594 (0.00888)	−0.0724 (0.281)	−0.00532 (0.00888)	0.00126 (0.00933)	−0.00462 (0.00887)	−0.0734 (0.281)	0.00963 (0.291)	−0.0585 (0.281)
FLev	−0.0290 *** (0.00756)	−0.250 (0.240)	−0.0289 *** (0.00756)	−0.0304 *** (0.00783)	−0.0283 *** (0.00755)	−0.252 (0.240)	−0.162 (0.245)	−0.243 (0.240)
IDR	0.0162 (0.0226)	1.059 (0.715)	0.0153 (0.0226)	0.0175 (0.0234)	0.0172 (0.0226)	1.061 (0.716)	0.870 (0.729)	1.065 (0.718)
Size	−0.00846 *** (0.00213)	−0.0328 (0.0675)	−0.00838 *** (0.00213)	−0.00853 *** (0.00222)	−0.00849 *** (0.00213)	−0.0329 (0.0675)	−0.0313 (0.0694)	−0.0331 (0.0676)
Own	−0.0493 ** (0.0197)	0.907 (0.623)	−0.0495 ** (0.0197)	−0.0556 *** (0.0203)	−0.0484 ** (0.0196)	1.204 * (0.624)	1.204 * (0.635)	0.914 (0.623)
Growth	5.01×10^{-6} (3.01×10^{-5})	-1.65×10^{-5} (0.000951)	5.07×10^{-6} (3.01×10^{-5})	5.47×10^{-6} (3.03×10^{-5})	4.82×10^{-6} (3.00×10^{-5})	-1.63×10^{-5} (0.000952)	6.97×10^{-6} (0.000945)	-1.86×10^{-5} (0.000951)
Age	0.00513 (0.00484)	0.218 (0.153)	0.00495 (0.00484)	0.00514 (0.00488)	0.00458 (0.00483)	0.218 (0.153)	0.214 (0.152)	0.212 (0.153)
FAR	−0.0324 *** (0.00467)	0.348 ** (0.149)	−0.0328 *** (0.00467)	−0.0371 *** (0.00514)	−0.0326 *** (0.00466)	0.350 ** (0.149)	0.304 * (0.162)	0.344 ** (0.149)
Cashflow	−0.00411 * (0.00228)	−0.130 * (0.0721)	−0.00404 * (0.00228)	−0.00416 * (0.00231)	−0.00394 * (0.00227)	−0.130 * (0.0722)	−0.128 * (0.0722)	−0.128 * (0.0721)
DJG	0.00180 *** (0.000451)	−0.00385 (0.0143)	0.00178 *** (0.000451)	0.00186 *** (0.000465)	0.00192 *** (0.000451)	−0.00382 (0.0143)	−0.00317 (0.0145)	−0.00235 (0.0144)
Ratio	0.0422 *** (0.0112)	0.486 (0.355)	0.0419 *** (0.0112)	0.0426 *** (0.0115)	0.0413 *** (0.0112)	0.486 (0.355)	0.551 (0.358)	0.478 (0.355)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3500	3500	3500	3350	3500	3500	3350	3500
R-squared	0.082	0.045	0.083	0.085	0.086	0.045	0.049	0.046

Standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, one-tailed test.

5.4.2. Alternative Measures of Dependent Variables

We replaced the two dependent variables by using new measures. Specifically, we calculated a new score of the innovation input ($\text{RD}_{i,t}$) based on the ratio of R&D investment to the total assets (vs. total revenue) at the end of the year ($\text{Input}_{i,t}$) [88,95], and a new score of innovation output by counting the patent applications ($\text{Apply}_{i,t+1}$) after one year (vs. after two years). Table 7 shows the regression results after replacement. Ac-

According to the results, only the relationship between FCEO and innovation input becomes insignificant, and all the other relationships are qualitatively the same as our main analysis. Thus, our findings are robust after replacing the dependent variables.

Table 7. Replaced dependent variables.

Variables	Model 1	Model 2	Model 3	Model 3	Model 3	Model 4	Model 4	Model 4
	Input _t	Apply _{t+1}	Input _t	Input _t	Input _t	Apply _{t+1}	Apply _{t+1}	Apply _{t+1}
FCEO	−0.000609 (0.000969)	0.0870 * (0.0674)	−0.00271 (0.00214)	0.00595 ** (0.00263)	−0.0115 *** (0.00367)	0.106 (0.0688)	0.243 (0.182)	−0.0336 (0.118)
Gender			0.00757 * (0.00421)			0.0522 (0.136)		
FCEO × Gender			−0.0104 * (0.00563)			−0.185 (0.181)		
Education				0.000692 (0.000511)			0.0710 ** (0.0353)	
FCEO × Education				−0.00187 *** (0.000702)			−0.0519 (0.0486)	
Duality					−0.00550 (0.00371)			−0.122 (0.120)
FCEO × Duality					0.0165 *** (0.00475)			0.207 (0.153)
Input _t		0.425 (0.614)				3.062 ** (1.344)	3.194 ** (1.361)	3.023 ** (1.346)
ROA	0.0465 *** (0.0120)	−0.167 (0.842)	−0.162 *** (0.0261)	0.0506 *** (0.0130)	−0.161 *** (0.0261)	−0.128 (0.843)	−0.216 (0.904)	−0.0838 (0.844)
FLev	0.00982 *** (0.00345)	−0.15 (0.240)	−0.0272 *** (0.00751)	0.00860 ** (0.00357)	−0.0265 *** (0.00752)	−0.191 (0.242)	−0.139 (0.247)	−0.164 (0.243)
IDR	−0.00187 (0.0103)	−0.497 (0.718)	0.0179 (0.0224)	−0.00295 (0.0107)	0.0191 (0.0226)	−0.595 (0.722)	−0.565 (0.737)	−0.651 (0.730)
Size	−0.0140 *** (0.000976)	0.0806 (0.0677)	−0.00992 *** (0.00213)	−0.0138 *** (0.00102)	−0.00998 *** (0.00213)	0.140 ** (0.0710)	0.132 * (0.0729)	0.145 ** (0.0713)
Own	−0.0207 ** (0.00896)	2.436 *** (0.625)	−0.0316 (0.0195)	−0.0233 ** (0.00928)	−0.0300 (0.0196)	2.477 *** (0.629)	2.511 *** (0.642)	2.554 *** (0.632)
Growth	1.12×10^{-6} (1.37×10^{-5})	0.000782 (0.00096)	4.67×10^{-6} (2.98×10^{-5})	1.29×10^{-6} (1.38×10^{-5})	4.41×10^{-6} (2.98×10^{-5})	0.000780 (0.00096)	0.000815 (0.00096)	0.000774 (0.000962)
Age	0.00380 * (0.00221)	−0.108 (0.153)	0.00570 (0.00481)	0.00382 * (0.00223)	0.00466 (0.00487)	−0.139 (0.155)	−0.132 (0.154)	−0.141 (0.157)
FAR	−0.00416 (0.00264)	0.250 (0.184)	−0.00555 (0.00577)	−0.00549 * (0.00298)	−0.00520 (0.00577)	0.201 (0.186)	0.227 (0.206)	0.186 (0.186)
Cashflow	−0.00120 (0.00104)	−0.0254 (0.0721)	−0.00378 * (0.00226)	−0.000934 (0.00106)	−0.00370 (0.00226)	−0.0209 (0.0729)	−0.0205 (0.0730)	−0.0183 (0.0730)
DJG	0.00088 *** (0.000205)	−0.00119 (0.0143)	0.00187 *** (0.000447)	0.00082 *** (0.000212)	0.00198 *** (0.000449)	−0.00659 (0.0144)	−0.00305 (0.0147)	−0.00632 (0.0145)
Ratio	0.00349 (0.00510)	0.118 (0.353)	0.0402 *** (0.0111)	0.00270 (0.00523)	0.0394 *** (0.0111)	0.115 (0.358)	0.0991 (0.362)	0.102 (0.359)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.283 *** (0.0320)	−1.032 (1.969)	0.208 *** (0.0697)	0.278 *** (0.0328)	0.223 *** (0.0701)	−2.755 (2.277)	−3.024 (2.300)	−2.672 (2.293)
Observations	3500	3500	3500	3350	3490	3500	3350	3490
R-squared	0.119	0.039	0.096	0.117	0.099	0.047	0.048	0.048

Standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, one-tailed test.

5.4.3. Combining Three Moderations

Considering that individual moderators and interaction terms may be related to each other and their covariance may change the final results, we put female CEO (Gender_{*i,t*}), CEO education (Education_{*i,t*}), CEO duality (Duality_{*i,t*}), and their interaction terms with founder CEO (FCEO_{*i,t*}) in the same model. As the results in Table 8 show, H2a, H3a, and H4a are still supported, while H2b, H3b, and H4b are still not significant. These findings are consistent with the results of each separate moderation test in our main analysis. Thus, our findings about the moderation effects are robust.

Table 8. Three moderations included in the same model.

Variables	Column 1	Column 2
	RD _t	Apply _{t+2}
FCEO	−0.0195 ** (0.00968)	−0.0771 (0.304)
Gender	0.00769 * (0.00433)	−0.0727 (0.136)
FCEO × Gender	−0.0116 ** (0.00583)	0.0112 (0.183)
Education	0.00120 (0.00112)	−0.00793 (0.0350)
FCEO × Education	−0.00291 * (0.00153)	−0.0083 (0.0481)
Duality	−0.00685 * (0.00382)	−0.0246 (0.120)
FCEO × Duality	0.0178 *** (0.00490)	0.163 (0.154)
RD _t		0.153 (0.620)
ROA	−0.150 *** (0.0285)	−0.888 (0.898)
FLev	−0.0279 *** (0.00779)	−0.121 (0.245)
IDR	0.0201 (0.0234)	0.942 (0.736)
Size	−0.00983 *** (0.00223)	−0.0325 (0.0702)
Own	−0.0345 * (0.0203)	1.422 ** (0.636)
Growth	5.02×10^{-6} (3.01×10^{-5})	1.48×10^{-6} (0.000944)
Age	0.00439 (0.00492)	0.197 (0.154)
FAR	−0.00765 (0.00652)	0.459 ** (0.205)
Cashflow	−0.00360 (0.00230)	−0.130 * (0.0723)
DJG	0.00204 *** (0.000464)	−0.00193 (0.0146)
Ratio	0.0392 *** (0.0114)	0.557 (0.359)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Constant	0.193 *** (0.0675)	0.716 (2.120)
Observations	3340	3340
R-squared	0.102	0.050

Standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, one-tailed test.

6. Discussion

Based on an analysis of the nine-year panel data of China's GEM-listed companies, we find that firms with a founder CEO have a lower innovation input but higher innovation output than firms with a non-founder CEO. Our moderation analysis further shows that compared with founder CEOs who are male or have lower education, founder CEOs who are female or have higher education can reduce innovation input without sacrificing innovation output. In contrast, compared with founder CEOs who are not the chairman of the board, founder CEOs who take dual positions (CEO and chairman) tend to make higher innovation input, but cannot increase the innovation output.

6.1. Implications for Research

These findings contribute to entrepreneurship research in two respects. First, it expands the research on founder CEOs by investigating how the presence of founder CEOs influences firms' innovation input and output. Most previous research on founder CEOs examines their impact on general organizational outcomes, and few studies have examined their role in innovation management [10]. Our findings about founder CEOs' reduction on innovation input suggest that founder CEOs are likely to act as stewards for the firms, so that their financial resources are efficiently utilized. Interestingly, we find that, for this sample of China's GEM companies, innovation input has no significant influence on the subsequent years' innovation output. This provides additional support to the stewardship of founder CEOs: if they predict that innovation input cannot be turned into output, they might intentionally cut down the investments on innovation to avoid unnecessary expenses. These findings corroborate the existing literature that founder CEOs strive to serve the best interests of the organization because their self-interests are aligned with the organizational interests [55,88].

Second, we illustrate the heterogeneous effects of founder CEOs on corporate innovation performance at different levels of CEO characteristics. Specifically, we have shown how gender, education, and CEO duality can moderate the way founder CEOs influence innovation input and output. Compared with their counterparts, founder CEOs who are female and have higher levels of education are able to maintain the same level of innovation output with lower innovation inputs, suggesting that they are more efficient in managing innovations. These findings provide nuanced knowledge regarding the advantageous roles played by founder CEOs who are female and have higher education. However, we also find that when founder CEOs are also the board chairman, their efficiency level declines because they tend to make more innovation investments without increasing innovation output. Thus, consistent with the CEO duality literature, this research suggests that the roles of CEO and chairman need to be separated to prevent opportunism and improve efficiency [81].

6.2. Implications for Practice

This research has implications for entrepreneurship practice, particularly in terms of executive appointment. It suggests that for high-tech, high-growth innovative firms, the appointment of a founder CEO will likely help them achieve high innovation efficiency characterized by low innovation input and high innovation output. It also suggests that the role of CEO characteristics should be cautiously taken into consideration when appointing founder CEOs.

Gender discrimination against women on the job market has long been a problem. On average, in organizations, the number of male employees is higher than that of female employees [96], and senior managers are mainly male [97]. It is also more difficult for female employees to get promoted or enter the top management team [98,99]. In light of the findings of this research, it suggests that female founder CEOs at least outperform their male peers in the area of innovation management. Therefore, for enterprises with limited resources, especially start-ups or small and medium-sized enterprises, appointing a female founder CEO may be a wise choice if they try to develop competitive advantages on innovation efficiency.

In addition, this research confirms that the education level of founder CEOs cannot lead to more innovation output. While founder CEOs with higher education can reduce innovation input, they are not able to improve innovation output. This suggests that when firms appoint CEOs, education level should not be the only key factor. In addition to the level of education, other important factors need to be considered, such as the ability to assess and deal with risks in the internal and external environment of the enterprise. While it seems like commonsense to focus on candidates' overall leadership competence when hiring CEOs, it is important not to let education become a biased criterion that prevents the appointment of capable CEOs with a lower education level. This is particularly meaningful

for small start-ups in China which are often founded by entrepreneurs whose education levels are low.

Furthermore, when the founder CEOs serve as the chairman, they tend to increase innovation input without increasing innovation output. This suggests that the centralization of power in one person can lead to poor R&D investment decisions and low efficiency. Therefore, firms should encourage the separation of CEO and chairman roles to strengthen the supervisory role of the board of directors, improve the transparency of CEO decision making, and eventually improve innovation performance of the firms.

Finally, the findings of our paper call for attention to the conversion rate of the innovation process—that is, how many units of innovation output can be generated by one unit of innovation input—as well as the influencing factors of the conversion rate [88]. Not only GEM-listed firms in China, but most international small- and medium-sized companies are operating under resource constraints, and they cannot increase investments in innovation to form a competitive advantage. Therefore, the concepts of conversion rate and efficient innovation are particularly important [100] because firms need to work efficiently to continuously improve their efficiency. Understanding the factors that facilitate or hinder the transformation of innovation input into innovation output will help to improve competitive advantage brought by innovation. Through this research, we show that the founder CEO's personal characteristics play an important role in determining the efficient transformation of innovation input into innovation output.

6.3. Limitations and Future Research

This research has some limitations that could create opportunities for future research. First, our sample is limited to China's GEM-listed enterprises, most of which are start-ups. Future research should expand the sample scope to include more firms who compete on innovation. Our findings also need to be validated in other countries where market environments and intellectual property policies are different from China. Second, we only examined the moderating role of three CEO characteristics: gender, education, and duality. Founder CEOs' impact on innovation performance could depend on many other factors. We encourage researchers to identify other salient CEO characteristics that could affect how founder CEOs influence firm innovation performance. Third, we have studied the lag effect of founder CEO on enterprise innovation, but the older the firm gets, the more likely the founder CEO will be replaced, and their R&D decisions may change. When firms grow older, their innovative initiatives can become more strategic. In these situations, R&D investments' time span may also grow, so the output can be observed in the long run. Future research should expand the observation periods of sample enterprises to examine such temporal effects.

7. Conclusions

In summary, this research shows that founder CEOs play an important role in influencing firm innovation. Founder CEOs can efficiently use less innovation input to generate more innovation output. Moreover, founder CEOs' influence is moderated by their gender, education, and CEO duality. This paper provides insights on how founder CEOs affect firms' innovation input and output, as well as the heterogeneity of their effects. The findings are of great significance to management theory and practice, especially in the context of fast-developing economies driven by innovation.

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References

- Kim, J.S.; Koo, K.K.J. Are Founder CEOs Effective Innovators? *Asia-Pac. J. Financ. Stud.* **2018**, *47*, 426–448. [\[CrossRef\]](#)
- Cardinal, L.B. Technological Innovation in the Pharmaceutical Industry: The Use of Organizational Control in Managing Research and Development. *Organ. Sci.* **2001**, *12*, 19–36. [\[CrossRef\]](#)
- Overmeyer, N. Founder Cognitions and New Venture Outcomes. *Acad. Manag. Proc.* **2020**, *2020*, 15096–15102. [\[CrossRef\]](#)
- Ashforth, B.E.; Mael, F. Social Identity Theory and the Organization. *Acad. Manag. Rev.* **1989**, *14*, 20–39. [\[CrossRef\]](#)
- Cardon, M.S.; Zietsma, C.; Saporito, P.; Matherne, B.P.; Davis, C. A tale of passion: New insights into entrepreneurship from a parenthood metaphor. *J. Bus. Ventur.* **2005**, *20*, 23–45. [\[CrossRef\]](#)
- Lee, J.M.; Yoon, D.; Boivie, S. Founder CEO Succession: The Role of CEO Organizational Identification. *Acad. Manag. J.* **2020**, *63*, 224–245. [\[CrossRef\]](#)
- Jayaraman, N.; Khorana, A.; Nelling, E.; Covin, J. CEO founder status and firm financial performance. *Strateg. Manag. J.* **2000**, *21*, 1215–1224. [\[CrossRef\]](#)
- Adams, R.; Almeida, H.; Ferreira, D. Understanding the relationship between founder-CEOs and firm performance. *J. Empir. Financ.* **2009**, *16*, 136–150. [\[CrossRef\]](#)
- Villalonga, B.; Amit, R. How do family ownership, control and management affect firm value? *J. Financ. Econ.* **2006**, *80*, 385–417. [\[CrossRef\]](#)
- Powell, E.E.; Baker, T. It's what you make of it: Founder identity and enacting strategic responses to adversity. *Acad. Manag. J.* **2014**, *57*, 1406–1433. [\[CrossRef\]](#)
- Musona, J.; Puumalainen, K.; Vuorio, A. Sustainable Entrepreneurship at the Bottom of the Pyramid: An Identity-Based Perspective. *Sustainability* **2021**, *13*, 812–849. [\[CrossRef\]](#)
- Wagenschwanz, A.; Belz, F.M. The Effect of Founder Identity Work on the Perception and Management of Sustainability. *Acad. Manag. Annu. Meet. Proc.* **2018**, *2018*, 11517. [\[CrossRef\]](#)
- Kubota, K.; Takehara, H. Firm-level innovation by Japanese family firms: Empirical analysis using multidimensional innovation measures. *Pac.-Basin Financ. J.* **2019**, *57*, 101030–101073. [\[CrossRef\]](#)
- Block, J.; Miller, D.; Jaskiewicz, P.; Spiegel, F. Economic and technological importance of innovations in large family and founder firms: An analysis of patent data. *Fam. Bus. Rev.* **2013**, *26*, 180–199. [\[CrossRef\]](#)
- Block, J.H. R&D investments in family and founder firms: An agency perspective. *J. Bus. Ventur.* **2012**, *27*, 248–265. [\[CrossRef\]](#)
- Lee, J.M.; Kim, J.; Bae, J. Founder CEOs and innovation: Evidence from CEO sudden deaths in public firms. *Res. Policy* **2020**, *49*, 103862–103876. [\[CrossRef\]](#)
- Okhuysen, G.; Bonardi, J.P. The challenges of building theory by combining lenses. *Acad. Manag. Rev.* **2011**, *36*, 6–11. [\[CrossRef\]](#)
- Madison, K.; Holt, D.T.; Kellermanns, F.W.; Ranft, A.L. Viewing family firm behavior and governance through the lens of agency and stewardship theories. *Fam. Bus. Rev.* **2016**, *29*, 65–93. [\[CrossRef\]](#)
- Donaldson, L. The ethereal hand: Organizational economics and management theory. *Acad. Manag. Rev.* **1990**, *15*, 369–381. [\[CrossRef\]](#)
- Davis, J.H.; Schoorman, F.D.; Donaldson, L. Toward a Stewardship Theory of Management. *Acad. Manag. Rev.* **1997**, *22*, 20–47. [\[CrossRef\]](#)
- Chrisman, J.J. Stewardship Theory: Realism, Relevance, and Family Firm Governance. *Entrep. Theory Pract.* **2019**, *43*, 1051–1066. [\[CrossRef\]](#)
- Tao, Q.; Shen, F.; Shao, Y.; Li, G. Steward Effects of Target Founder-CEO in Takeovers. *Emerg. Mark. Financ. Trade* **2018**, *54*, 2117–2135. [\[CrossRef\]](#)
- Demsetz, H.; Lehn, K. The structure of corporate ownership: Causes and consequences. *J. Political Econ.* **1985**, *93*, 1155–1177. [\[CrossRef\]](#)
- Muth, M.; Donaldson, L. Stewardship theory and board structure: A contingency approach. *Corp. Gov. Int. Rev.* **1998**, *6*, 5–28. [\[CrossRef\]](#)
- Rosenbloom, J.S. *A Case Study in Risk Management*; Meredith Corp.: Des Moines, IA, USA, 1972.
- Williams, C.A.; Heins, R.M. *Risk Management and Insurance*; Mc Graw-Hill Companies: New York, NY, USA, 1985.
- Lumpkin, G.T.; Dess, G.G. Clarifying the entrepreneurial orientation construct and linking it to performance. *Acad. Manag. Rev.* **1996**, *21*, 135–172. [\[CrossRef\]](#)
- Bargeron, L.L.; Lehn, K.M.; Zutter, C.J. Sarbanes-Oxley and corporate risk-taking. *J. Account. Econ.* **2010**, *49*, 34–52. [\[CrossRef\]](#)
- Faccio, M.; Marchica, M.-T.; Mura, R. CEO gender, corporate risk-taking, and the efficiency of capital allocation. *J. Corp. Financ.* **2016**, *39*, 193–209. [\[CrossRef\]](#)

30. Buratti, A.; Cesaroni, F.M.; Sentuti, A. Does gender matter in strategies adopted to face the economic crisis? A comparison between men and women entrepreneurs. In *Entrepreneurship-Development Tendencies and Empirical Approach*; IntechOpen: London, UK, 2017; pp. 393–412.
31. Mao, C.X.; Zhang, C. Managerial risk-taking incentive and firm innovation: Evidence from FAS 123R. *J. Financ. Quant. Anal.* **2018**, *53*, 867–898. [[CrossRef](#)]
32. Lee, W.S.; Moon, J. Determinants of CEO strategic risk-taking in the airline industry. *Tour. Manag. Perspect.* **2016**, *18*, 111–117. [[CrossRef](#)]
33. Hambrick, D.C. Upper echelons theory: An update. *Acad. Manag. Rev.* **2007**, *32*, 334–343. [[CrossRef](#)]
34. Hambrick, D.C.; Mason, P.A. Upper echelons: The organization as a reflection of its top managers. *Acad. Manag. Rev.* **1984**, *9*, 193–206. [[CrossRef](#)]
35. Daellenbach, U.S.; McCarthy, A.M.; Schoenecker, T.S. Commitment to innovation: The impact of top management team characteristics. *R&D Manag.* **1999**, *29*, 199–208. [[CrossRef](#)]
36. Lin, C.; Lin, P.; Song, F.M.; Li, C. Managerial incentives, CEO characteristics and corporate innovation in China's private sector. *J. Comp. Econ.* **2011**, *39*, 176–190. [[CrossRef](#)]
37. Camelo, C.; Fernández-Alles, M.; Hernández, A.B. Strategic consensus, top management teams, and innovation performance. *Int. J. Manpow.* **2010**, *31*, 678–695. [[CrossRef](#)]
38. Fahlenbrach, R. Founder-CEOs, investment decisions, and stock market performance. *J. Financ. Quant. Anal.* **2009**, *44*, 439–466. [[CrossRef](#)]
39. Elenkov, D.S.; Manev, I.M. Top Management Leadership and Influence on Innovation: The Role of Sociocultural Context. *J. Manag.* **2005**, *31*, 381–402. [[CrossRef](#)]
40. Mumford, M.; Licuanan, B. Leading for innovation: Conclusions, issues, and directions. *Leadersh. Q.* **2004**, *15*, 163–171. [[CrossRef](#)]
41. Storey, J. *Leadership in Organizations*; John Wiley & Sons, Inc.: Hoboken, NJ, USA, 2013.
42. Schumpeter, J.A. *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*; Transaction Publishers: Piscataway, NJ, USA, 1934.
43. Wasserman, N. *The Founder's Dilemmas: Anticipating and Avoiding the Pitfalls that Can Sink a Startup*; Princeton University Press: Princeton, NJ, USA, 2012.
44. Miller, D.; Breton-Miller, I.L.; Lester, R.H. Family and Lone Founder Ownership and Strategic Behaviour: Social Context, Identity, and Institutional Logics. *J. Manag. Stud.* **2011**, *48*, 1–25. [[CrossRef](#)]
45. Lerner, J.; Wulf, J. Innovation and Incentives: Evidence from Corporate R&D. *Soc. Sci. Electron. Publ.* **2007**, *89*, 634–644. [[CrossRef](#)]
46. Cirillo, A.; Pennacchio, L.; Carillo, M.R.; Romano, M. The antecedents of entrepreneurial risk-taking in private family firms: CEO seasons and contingency factors. *Small Bus. Econ.* **2019**, *56*, 1–20. [[CrossRef](#)]
47. Zahra, S.A. Entrepreneurial Risk Taking in Family Firms. *Fam. Bus. Rev.* **2010**, *18*, 23–40. [[CrossRef](#)]
48. Steen, E. Organizational Beliefs and Managerial Vision. *J. Law. Econ. Organ.* **2005**, *21*, 256–283. [[CrossRef](#)]
49. Shafi, K. Are Founder-CEOs Better Innovators? Social Science Research Network. 2014. Available online: <https://ssrn.com/abstract=2408171> (accessed on 21 April 2021).
50. Cooper, R.G.; Kleinschmidt, E.G. New Products: What Separates Winners from Losers? *J. Prod. Innov. Manag.* **1987**, *4*, 169–184. [[CrossRef](#)]
51. Donaldson, L.; Davis, J.H. Stewardship Theory or Agency Theory: CEO Governance and Shareholder Returns. *Aust. J. Manag.* **1991**, *16*, 49–64. [[CrossRef](#)]
52. Schillemans, T.; Bjurström, K.H. Trust and verification: Balancing agency and stewardship theory in the governance of agencies. *Int. Public Manag. J.* **2019**, *23*, 650–676. [[CrossRef](#)]
53. Kline, S.J.; Rosenberg, N. An overview of innovation. In *The Positive Sum Strategy: Harnessing Technology for Economic Growth*; Landau, R., Rosenberg, N., Eds.; National Academy Press: Washington, DC, USA, 1986; Volume 14, pp. 275–305.
54. Chrisman, J.J.; Patel, P.C. Variations in R&D investments of family and nonfamily firms: Behavioral agency and myopic loss aversion perspectives. *Acad. Manag. J.* **2012**, *55*, 976–997. [[CrossRef](#)]
55. Matzler, K.; Veider, V.; Hautz, J.; Stadler, C. The Impact of Family Ownership, Management, and Governance on Innovation. *J. Prod. Innov. Manag.* **2015**, *32*, 319–333. [[CrossRef](#)]
56. Kirkwood, J.; Gray, B. From entrepreneur to mayor: Assessing the impact of the founder's changing reputation on Hubbard Foods Ltd. *Australas. Mark. J.* **2009**, *17*, 115–124. [[CrossRef](#)]
57. Expósito, A.; Sanchis-Llopis, A.; Sanchis-Llopis, A.J. CEO gender and SMEs innovativeness: Evidence for Spanish businesses. *Int. Entrep. Manag. J.* **2021**. [[CrossRef](#)]
58. You, Y.; Srinivasan, S.; Pauwels, K.; Joshi, A. How CEO/CMO characteristics affect innovation and stock returns: Findings and future directions. *J. Acad. Mark. Sci.* **2020**, *48*, 1229–1253. [[CrossRef](#)]
59. Li, M.; Yang, J. Effects of CEO duality and tenure on innovation. *J. Strategy Manag.* **2019**, *12*, 536–552. [[CrossRef](#)]
60. Schmitt, D.P.; Long, A.E.; McPhearson, A.; O'Brien, K.; Remmert, B.; Shah, S.H. Personality and gender differences in global perspective. *Int. J. Psychol.* **2016**, *52* (Suppl. S1), 45–56. [[CrossRef](#)]
61. Snaebjornsson, I.M.; Edvardsson, R.I. Gender, Nationality and Leadership Style: A Literature Review. *Int. J. Bus. Manag.* **2013**, *8*, 89–103. [[CrossRef](#)]

62. Fischer, E.M.; Reuber, A.R.; Dyke, L.S. A theoretical overview and extension of research on sex, gender, and entrepreneurship. *J. Bus. Ventur.* **1993**, *8*, 151–168. [[CrossRef](#)]
63. Strohmeier, R.; Tonoyan, V.; Jennings, J.E. Jacks-(and Jills)-of-all-trades: On whether, how and why gender influences firm innovativeness. *J. Bus. Ventur.* **2017**, *32*, 498–518. [[CrossRef](#)]
64. Marvel, M.R.; Lee, I.H.; Wolfe, M.T. Entrepreneur gender and firm innovation activity: A multilevel perspective. *IEEE Trans. Eng. Manag.* **2015**, *62*, 558–567. [[CrossRef](#)]
65. Strohmeier, R.; Tonoyan, V. Bridging the gender gap in employment growth: On the role of innovativeness and occupational segregation. *Int. J. Entrep. Innov.* **2005**, *6*, 259–273. [[CrossRef](#)]
66. Gang, W.; Holmes, R.M., Jr.; Oh, I.S.; Zhu, W. Do CEOs matter to firm strategic actions and firm performance? A meta-analytic investigation based on upper echelons theory. *Pers. Psychol.* **2016**, *69*, 775–862. [[CrossRef](#)]
67. Eckel, C.C.; Grossman, P.J. Men, Women and Risk Aversion: Experimental Evidence. *Handb. Exp. Econ. Results* **2008**, *1*, 1061–1073. [[CrossRef](#)]
68. Huang, J.; Kisgen, D.J. Gender and corporate finance: Are male executives overconfident relative to female executives? *J. Financ. Econ.* **2013**, *108*, 822–839. [[CrossRef](#)]
69. Han, S.; Cui, W.; Chen, J.; Fu, Y. Female CEOs and corporate innovation behaviors—Research on the regulating effect of gender culture. *Sustainability* **2019**, *11*, 682–704. [[CrossRef](#)]
70. Bear, J.B.; Cushman, L.; London, M.; Sherman, G.D. Performance feedback, power retention, and the gender gap in leadership. *Leadersh. Q.* **2017**, *28*, 721–740. [[CrossRef](#)]
71. Eagly, A.H. Female Leadership Advantage and Disadvantage: Resolving the Contradictions. *Psychol. Women Q.* **2010**, *31*, 1–12. [[CrossRef](#)]
72. Altuk, E.; Kablan, A.; Oca, M. Copyright, Patent, and Trademark: Are Females More Likely to Invest in These Strategic Assets? In *Handbook of Research on Strategic Fit and Design in Business Ecosystems*; IGI Global: Hershey, PA, USA, 2020; pp. 570–592.
73. Chen, L.W.; Roberts, P.W. Founders and the Social Performance of B Corporations. *Acad. Manag. Annu. Meet. Proc.* **2013**, *2013*, 13103–13109. [[CrossRef](#)]
74. Mo, J.; Minshall, T.; Mortara, L. Understanding the human side of openness: The fit between open innovation modes and CEO characteristics. *RD Manag.* **2017**, *47*, 727–740. [[CrossRef](#)]
75. Cheng, Z.; Barker, V.L. The Effects of CEO Career Horizon, Power and Education on R&D Spending: Software Industry Evidence. *Acad. Manag. Annu. Meet. Proc.* **2014**, *2014*, 17392. [[CrossRef](#)]
76. Koellinger, P. Why are some entrepreneurs more innovative than others? *Small Bus. Econ.* **2008**, *31*, 21–37. [[CrossRef](#)]
77. Barker, V.L.; Mueller, G.C. CEO Characteristics and Firm R&D Spending. *Manag. Sci.* **2002**, *48*, 782–801. [[CrossRef](#)]
78. Yuan, R.; Wen, W. Managerial foreign experience and corporate innovation. *J. Corp. Financ.* **2018**, *48*, 752–770. [[CrossRef](#)]
79. Krause, R.; Semadeni, M.; Cannella, A.A. CEO Duality: A Review and Research Agenda. *J. Manag.* **2014**, *40*, 256–286. [[CrossRef](#)]
80. Jiatao, L.I.; Tang, R. CEO Hubris and Firm Risk Taking in China: The Moderating Role of Managerial Discretion. *Acad. Manag. J.* **2010**, *53*, 45–68. [[CrossRef](#)]
81. Kao, L.; Chen, A. CEO characteristics and R&D expenditure of IPOs in emerging markets: Evidence from Taiwan. *Asia Pac. Manag. Rev.* **2020**, *25*, 189–197. [[CrossRef](#)]
82. Tuggle, C.S.; Sirmon, D.G.; Reutzel, C.R.; Bierman, L. Commanding board of director attention: Investigating how organizational performance and CEO duality affect board members’ attention to monitoring. *Strateg. Manag. J.* **2010**, *31*, 946–968. [[CrossRef](#)]
83. Li, P. The outlook for China’s innovation-driven development beyond COVID-19. *Cult. Sci.* **2021**, *3*, 232–244. [[CrossRef](#)]
84. Tan, H. The Research on the Measurement of Inefficiency Investment Degree of China’s GEM Listed Companies. *Asian J. Soc. Sci. Stud.* **2016**, *2*, 130–140. [[CrossRef](#)]
85. Cheung, W.; Liu, K. A Comparison of China’s Main Board and Growth Enterprise Market Board—Market Microstructure Approach. *Rev. Pac. Basin Financ. Mark. Policies* **2014**, *17*, 2248–2747. [[CrossRef](#)]
86. Liu, M.; Wang, J. Development, Problems and Suggestions for China’s GEM. In *The Chinese Stock Market*; Cheng, S., Li, Z., Eds.; Palgrave Macmillan: London, UK, 2015; Volume I, pp. 368–413.
87. Chen, H.-L.; Hsu, W.-T. Family Ownership, Board Independence, and R&D Investment. *Fam. Bus. Rev.* **2009**, *22*, 347–362. [[CrossRef](#)]
88. Duran, P.; Kammerlander, N.; Van Essen, M.; Zellweger, T. Doing more with less: Innovation input and output in family firms. *Acad. Manag. J.* **2016**, *59*, 1224–1264. [[CrossRef](#)]
89. Chen, Y.; Podolski, E.J.; Veeraraghavan, M. Does managerial ability facilitate corporate innovative success? *J. Empir. Financ.* **2015**, *34*, 313–326. [[CrossRef](#)]
90. Lee, J.M.; Kim, J.; Bae, J. Founder CEOs and Innovation: Evidence from S&P 500 Firms. Social Science Research Network. 2016. Available online: <https://ssrn.com/abstract=2733456> (accessed on 22 April 2021).
91. Bostan, I.; Mian, G.M. Inventor Chief Executive Officers and Firm Innovation. *Int. Rev. Financ.* **2019**, *19*, 247–286. [[CrossRef](#)]
92. Krause, R.; Semadeni, M. Apprentice, Departure, and Demotion: An Examination of the Three Types of CEO–Board Chair Separation. *Acad. Manag. J.* **2013**, *56*, 805–826. [[CrossRef](#)]
93. Sheikh, S. The impact of market competition on the relation between CEO power and firm innovation. *J. Multinat. Financ. Manag.* **2018**, *44*, 36–50. [[CrossRef](#)]
94. Xu, N.; Tian, H.; Cai, J. Non-founder CEOs, R&D investment and output. *Nankai Bus. Rev. Int.* **2019**, *11*, 143–169. [[CrossRef](#)]

95. Wu, S.; Levitas, E.; Priem, R.L. CEO tenure and company invention under differing levels of technological dynamism. *Acad. Manag. J.* **2005**, *48*, 859–873. [[CrossRef](#)]
96. Bosak, J.; Sczesny, S. Gender Bias in Leader Selection? Evidence from a Hiring Simulation Study. *Sex Roles* **2011**, *65*, 234–242. [[CrossRef](#)]
97. You, J.H. *Bridging the Gender Gap: Factors Enabling Female Directors to Affect the Appointment of Female CEOs*; University of Illinois at Urbana-Champaign: Champaign and Urbana, IL, USA, 2016.
98. Powell, G.N. Six ways of seeing the elephant: The intersection of sex, gender, and leadership. *Gend. Manag. Int. J.* **2012**, *27*, 119–141. [[CrossRef](#)]
99. Smith, P.; Caputi, P.; Crittenden, N. A maze of metaphors around glass ceilings. *Gend. Manag.* **2012**, *27*, 436–448. [[CrossRef](#)]
100. Verona, G. A resource-based view of product development. *Acad. Manag. Rev.* **1999**, *24*, 132–142. [[CrossRef](#)]