



# Do CEO characteristics influence a firm's investment in brand equity? Evidence from Chinese listed firms

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## Abstract

This paper contributes to the upper-echelons theory by extending the investigation of how CEO characteristics, namely gender, age, tenure, education attainment, and duality, influence firms' strategic decisions regarding brand equity investment. We gather 8830 firm-year observations from the Chinese listed firms for the period of 2012 to 2018. We develop several hypotheses and use a probit regression specification to test each hypothesis. The empirical results show that a CEO's tenure and duality have a positive influence. Interestingly, the CEO's age has a negative influence while their gender and education have no significant influence on a firm's propensity to invest in brand equity. It indicates that longer tenures and duality lead CEOs to be confident making them more willing to invest in high-risk projects. It also indicates that older CEO's are risk-averse, while gender does not play a role in the risk-taking appetite of the CEO. The results provide several implications for firms looking to develop influential brands, especially in China.

**Keywords** Brand equity; CEO's characteristics; upper-echelons theory; overconfident

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## Introduction

Researchers recognize that intangible assets lend a critical competitive advantage to a firm, especially in the era of the knowledge economy (Barney 1991). Numerous efforts have been made to confirm the contribution of intangible assets to a firm's performance at both micro (Bontempi and Mairesse 2015; Marrocu et al. 2012; Yang et al. 2018) and macro levels (Corrado et al. 2009; Li and Wu 2018). Compared to this extensive literature, studies on the factors influencing firms' investments in intangible assets are relatively rare (Arrighetti et al. 2014). Most of the existing studies focus on the determinants of a firm's R&D investment (Barker III and Mueller 2002; Wang et al. 2018; Jiang et al. 2020). Apart from R&D, intangible assets also consist of computerized information, brand equity, human capital, and organizational capital (Marrocu et al. 2012), all of which contribute to a firm gaining comparative advantages.

In this study, we focus on a firm's investment in brand equity as it can help firms fully realize the commercial value of innovation (Krasnikov and Jayachandran 2008). Brand equity is a business concept that appeared in the early 1990s and is the value generated by branded goods and services when compared to those without brands. Existing literature regards it as an intangible asset that reflects customers' implicit valuation of the revenue that accrues from a firm's brand name(s) (Corrado and Hao 2014). It implies that investment in brand equity is also a crucial strategic decision for increasing firm performance. As indicated by Corrado and Hao (2014), the direct contribution of brand equity is almost as significant as the direct contribution of private R&D in Japan and high-income Europe. However, relatively little is known about the determinants of investment in brand equity.

Regarding investment in brand equity as an investment in intangible assets, the factors that influence investment decisions can be split into two main categories. One category is related to the resource-based theory consisting of factors such as firm age, firm size, financial constraint, physical resource, and human capital (Del Canto and Gonzalez 1999; Arrighetti et al. 2014; Yang et al. 2018). Another main category is related to behaviour theory, such as CEO characteristics (Barker and Mueller 2002; Hu and Liu 2015; Faccio et al. 2016; Wong and Wang 2018; Hsu et al. 2020) and top management team characteristics (Chen 2014; Li et al. 2016; He et al. 2019). It focuses on the impact of psychological factors and leadership style on a firm's performance.

It should be noted that although both brand equity and R&D are valuable assets, their properties and functions are quite different. Therefore, it should be further studied whether the factors affecting R&D expenditure also influence brand equity investment. This paper suggests that a firm's strategy, such as allocating resources to brand equity, is determined by the characteristics of senior executives, particularly CEOs (Hambrick and Mason 1984; Hambrick 2007). That is, although a firm's strategy is restricted by resources such as financial, physical, and human, it mainly depends on how CEOs allocate these resources. Typical CEO attributes such as age, gender, education, tenure, and duality, play a critical role in shaping firms' strategic decisions (Crossland et al. 2014). These attributes are closely related to the CEO's risk-taking appetite, cognition, knowledge, and power (Farg and Mallin 2017; Galbreath 2018; Furlotti et al. 2019).

A sample with 8830 firm-year observations between 2012 and 2018 of Chinese listed firms is studied to examine the effects of the above-mentioned CEO

characteristics on a firm's investment in brand equity. Since the upper-echelons theory was proposed by Hambrick and Mason in 1984, numerous efforts have been made to study the influence of the top managers on a firm's decision-making. This paper contributes to the literature on the upper-echelons theory and a firm's strategic decision-making process by extending the investigation to the impact specific attributes have on a firm's branding efforts using Chinese listed firms for the same. First, it improves the academic understanding of the role firms' decision-makers play on the firm's development into influential brands. CEOs are perceived by stakeholders as the principal decision-maker in formulating a firm's innovation strategy (Berger et al. 2008). Surprisingly, research has paid limited attention to the influence a CEO's characteristics have on a firm's branding efforts. Second, identifying the drivers of investment in brand equity is crucial for China's transformation to an innovation-driven country as Chinese brands still lack international competitiveness compared with the rapid growth of the economy. The empirical evidence gives some implications for Chinese firms developing brand equity as well as for firms in other transition economies.

This paper proceeds as follows: Section 2 reviews the literature, illustrates how CEOs' characteristics influence firms' branding efforts, and proposes the theoretical hypothesis. Section 3 presents the variable description and econometric methodology. Section 4 presents empirical evidence on the effect a CEO's characteristics have on investment in brand equity. Section 5 concludes and discusses the main findings.

## Literature review and theoretical hypotheses

According to the upper-echelons theory, organizational outcomes such as strategic choices and performance are influenced by executives' cognition, experience, and risk preferences (Hambrick and Mason 1984). This implies that investment in brand equity, an essential firm-level strategy, depends to some extent on the characteristics of the top management, especially that of CEOs within given resources. CEOs play a central role in designing the composition of the top management team (Zahra and Pearce 1989; You et al. 2020) and in strategic decision-making (Goodstein and Boeker 1991). We choose five visible characteristics of CEOs including gender, age, education, tenure, and the duality of the CEO and controlling shareholders suggested by the upper-echelons theory, and investigate all of them as these characteristics are generally regarded as a measurement of CEOs' cognition and risk preferences (He et al. 2019).

### CEO gender

Existing literature shows mixed results as far as the effect an executive's gender has on the firm's innovative strategy adoption (You et al. 2020). Some of the results suggest that male CEOs positively affect a firm's creative activities, such as R&D and brand equity investment. We know that investments made in marketing and new product designs to build brand equity are risky and costly (Banker et al. 2014). Male CEOs are likely to be overconfident decision-makers and tend to be overly optimistic about earnings in such high-risk projects and thus invest more in them (Bernasek and

Shwiff 2001; Hirshleife et al. 2012). Some research also suggests that female CEOs are more risk-averse, which is confirmed by Faccio et al. (2016) and Zalata et al. (2019) in European companies and US firms, respectively.

It was also found that female CEOs positively affected a firm's innovative outcomes, by primarily investing in brand equity because female directors are more likely to have managerial skills, holding positions related to soft administrative issues like marketing and advertisement (Zelechowski and Bilimoria 2006). Along this line, some research has shown that women usually have superior skills to men in fostering the exchange of ideas and knowledge, resolving conflicts, adapting to changes, and motivating and inspiring others. This expertise could provide firms with diverse viewpoints and different methods to solve problems, thus significantly promoting firms' innovative activities.

Based on the statements above, we propose the following hypotheses:

**H1a:** Male CEOs have a higher propensity to invest in brand equity than female CEOs.

**H1b:** Male CEOs have a lower propensity to invest in brand equity than female CEOs.

## CEO age

The relationship between a CEO's age and organizational outcomes has received considerable attention (Barker and Mueller 2002; Yim 2013; Andreou et al. 2017; Belenzon et al. 2019; Yeoh and Hooy 2020; Liu and Jiang 2020). Age generally represents one's cognitive abilities, psychological state, risk preference, and values to some extent, which also affects a firm's decision-making process (Serfling 2014). While age and a firm's R&D expenses are closely related, limited research investigates the effect of a CEO's age on the firm's brand equity investment. Psychological literature suggests that age does affect a CEO's risk preferences and risk-taking behaviour, while the direction it might take is uncertain. Some researchers suggest that older executives tend to be more conservative and risk-averse (Hambrick and Mason 1984; Serfling 2014). Older CEOs, having only a few years before retirement, prefer to ensure career safety compared to personal benefits from innovation projects and, thus have a lower tendency to invest in brand equity.

Others argue that younger CEOs may be reluctant to jeopardize future earnings, and therefore avoid risky activities due to career concerns (Petrou and Procopiou 2016; Andreou et al. 2017). It is also suggested that younger CEOs work harder and implement a conservative investment strategy to ensure stable firm performance. If younger CEOs are risk seeking and adopt risky projects with uncertain profit, it may generate losses or even more severe consequences such as bankruptcy, which could lead to a failed career and damage their reputation. Hence, younger CEOs have a lower propensity to invest in brand equity so that they can protect their reputation and gain substantial power to negotiate salary in the future. However, Yim (2013) finds that younger CEOs are unlikely to be fired for poor performance. Therefore, younger CEOs are more risk seeking through, for example, conducting brand strategy, because their career and financial security concerns have a longer time horizon (Barker and Muller 2002).

Based on the statements above, we propose the following hypotheses:

**H2a:** Older CEOs have a lower propensity to invest in brand equity than younger CEOs.

**H2b:** Older CEOs have a higher propensity to invest in brand equity than younger CEOs.

### CEO education attainment

The influence of a CEO's education on a firm's decision-making can be observed in the human capital theory and dynamic capability view (Arrighetti et al. 2014; Gottesman and Morey 2006). Both, a CEO's formal education received before hiring and formal and informal on-the-job training, are a part of the firm's general human capital in a broad sense. The education level, generally used as a proxy for human capital in empirical studies, and a higher education level represents a higher level of human capital. Therefore, CEOs with higher degrees have a higher propensity to invest in brand equity because it represents managerial and innovative capabilities necessary to extend a firm's intangible asset base (Arrighetti et al. 2014; Yang 2018).

When it comes to a CEO's characteristics, a well-educated CEO has a large amount of knowledge and a broad vision so that he/she has better information-processing capabilities. CEOs with higher degrees are more capable of organizing firms' internal and external resources for optimal decision-making. CEOs with higher degrees can recognize the importance of brand equity and tend to allocate resources to it. Besides, there is an illusion of the accuracy of one's knowledge (Slovic et al. 1977), and CEOs usually attribute successful investments to their knowledge and failed investments to bad luck. Such self-attribution bias leads CEOs with higher degrees to be overconfident, which makes CEOs believe that they could deal with any outcome generated by the high-risk projects.

As a result, we hypothesize the following:

**H3:** CEOs with high-degrees have a higher propensity to invest in brand equity than those without.

### CEO tenure

The effect of CEOs' tenure on firms' investment decisions is also under debate. Certain studies support the idea that a longer tenure has a positive impact on the CEO's decision-making regarding innovative activities. Longer tenures allow CEOs to accumulate social capital, knowledge, and power and make use of firms' internal and external information to develop decision-making abilities (Souder et al. 2012; Xie 2014; Kao and Chen 2020). Firms' high-risk investment, such as branding requires accumulating a large amount of knowledge. Consequently, CEOs with longer tenure and better knowledge about the firm are more likely to implement such projects. Meanwhile, CEOs with shorter tenures are focused on earnings to secure their position in the firms and thus execute low-risk projects.

Others hold a different opinion. Zajac and Westphal (1996) point out that as CEOs gain power and status in the process of work they lean towards safeguarding their

careers and become risk-averse as their tenure is extended. Therefore, a CEO's with a longer tenure have a lower propensity to invest in brand equity. Hsu et al. (2020) find that both agent and founder CEOs invest less in R&D during the later stages of their tenures. Agent CEOs lose touch with the external environment and resort to using methods that brought them success in the past. Founder CEOs reach the limit of their managerial capability for continued innovation.

Based on the above statement, we propose the following hypotheses:

**H4a:** The longer CEOs' tenure is, the higher the propensity to invest in brand equity.

**H4b:** The longer CEOs' tenure is, the lower the propensity to invest in brand equity.

### ***CEO /controlling shareholder duality***

CEO/controlling shareholder duality refers to the situation where the CEO is also the controlling shareholder, who strategizing organizational structure and other aspects of the firm. Agency theorists argue that such duality weakens the power of the board and loosens the monitoring of the CEO (Hayward and Hambrick 1997). Therefore, CEOs play a dominating role in the firm's decision-making processes, which allows CEOs to defend projects against shareholder interests. In this situation, the duality can limit investments in brand equity if it is against a CEO's preference. However, the approach/inhibition theory of power (Keltner et al. 2003) suggested that such duality enhances CEOs' power making them overconfident and adventurous. Influential individuals focus on the potential rewards of risky behaviour while ignoring potential threats (Anderson and Berdahl 2002). Empirical research also confirms a positive relationship between possessing power and the affinity to take risks in individuals who focus more on the potential payoffs intrinsic to taking risks while focusing less on the inherent potential dangers (Anderson and Galinsky 2006; Li and Tang 2010). Therefore, this duality strengthens a CEO's confidence and triggers the cognitive bias which leads them to ignore the negative consequences of risky choices and to only consider the potential (Magee and Galinsky 2008). For our research, this implies that powerful CEOs will underestimate risks and overestimate potential returns when investing in brand equity, which increases the propensity to invest in such projects.

Based on the above statement, we propose the following hypothesis:

**H5:** The CEO/controlling shareholder duality increases the propensity to invest in brand equity.

## **Data and methods**

### **Data**

This paper uses data from Chinese listed firms from 2012 to 2018. We collect 8830 firm-year observations to investigate the influence a CEO's characteristics have on a firm's investment in brand equity. The sample is pre-treated as follows: we remove (1)

firms that do not undertake brand activities and do not report the annual advertisement expenditures; (2) firms with other missing data; (3) firms in the finance industry; (4) ST/\*ST stock; (5) industries having fewer than five firms in a specific year. Information on companies is obtained from the database China Stock Market & Accounting Research (CSMAR) and WIND database. All the continuous variables were WINSORIZE at 1% and 99% quantiles to eliminate outliers.

**Dependent variable** Measuring brand equity is a challenging task due to the multi-dimensionality of it. It could be summarized as consumers' knowledge, perceptions, and awareness of the products and services produced by a firm. This paper uses expenditure on advertising to measure a firm's investment in brand equity as suggested by Corrado et al. 2009. Although advertising is aimed at gaining market share, it is also necessary for developing new brands and maintaining the value of existing brands. It accounts for a substantial portion of the investments in brand equity. This paper uses 60% of the advertising expenditure as a proxy as Corrado et al. (2009) indicate that only a part of the advertising expenditure is assumed to have long-lasting effects and the remaining proportion is regarded as seasonal, temporary, or public service advertising with relatively short service life. A dummy variable (*Brand*) is constructed to measure a firm's propensity to invest in brand equity. Keeping the industry's average advertising expenditure, from the collected sample, as the boundary, the variable is set to 1 if the firm's advertising expenditure is larger than that of the industry's average or 0 otherwise.

**Independent variable** The independent variables are the five characteristics of a CEO (for firm *i* in year *t*) and are constructed below.

CEO gender (*ceogender*): a dummy variable, which is set to 1 for male and 0 for female;

CEO age (*ceoage*): the age of the CEO;

CEO education attainment (*ceoedu*): a dummy variable, which is set to 1 for those with Master's or Ph.D. degrees, or 0 otherwise;

CEO tenure (*ceotenure*): a dummy variable, which is set to 1 for tenures longer than the median of all the CEO's tenure within the sample, or 0 otherwise;

CEO and controlling shareholder duality (*ceoduality*): a dummy variable, which is set to 1 for CEOs who are shareholders concurrently, or 0 otherwise.

**Control variable** Several firm-level control variables are included in the empirical model to account for alternative determinants of a firm's propensity to invest in brand equity.

Human capital (*hc*) which is measured by the accrued payroll divided by the total sales (in percentage). It positively influences a firm's decision to invest in brand equity (Arrighetti et al. 2014).

R&D (*rd*) which is measured by the expenditure on R&D divided by the total sales (in percentage). A firm investing more in R&D is also likely to invest in brand equities and deliver value and benefits to its customers.

Free cash flow (*cash*) which is divided by the total assets (in percentage). The firm's free cash flow affects a firm's investment behaviour.

Firm profit (*profit*) which is measured by the net sales margin. It is reasonable to believe that higher profits lead to higher investment in brand equity.

Firm size (*firmsize*) which is measured by the firm's total assets divided by the average assets of the firms from the same industry from the sample (in percentage) to eliminate industry factors. The tendency to invest in intangible assets increases with a firm's size.

Firm's ownership (*ownership*) is a dummy variable which is set to 1 for state-owned firms, or 0 otherwise.

This paper also includes debt-to-assets ratio (*doa*) and firm age (*firmage*).

## Econometric Method

Due to the dichotomous nature of the dependent variable, the following probit regression specification is used to test the hypothesis.

$$Prob(Y) = \Phi\left(\text{ceogender, ceoage, ceoedu, ceotenure, ceoduality, hc, rd, cash, profit, firmsize, ownership, doa, firmage, industry, year, province}\right), \sim N(0, \sigma^2) \quad (1)$$

where  $Y$  stands for the dependent variable *Brand*, measuring the propensity to invest in brand equity of firm  $i$  in period  $t$ ;  $Brand = 1$  represents a high propensity to invest. In this equation, the industry, year, and province fixed effects are controlled to alleviate the influence of the unobservable factors, such as industry-wide technology and local economic shocks. Equation (1) uses maximum likelihood (ML) estimation. Stata 15.0 is used for the estimation. Equation (1) allows us to estimate the probability of a firm carrying out brand equity investment as a function of the factors it controls.

## Empirical results

### Descriptive statistics and correlation analysis

Table 1 summarizes descriptive statistics for the main variables. As shown in Table 1, the mean propensity to invest in brand equity is 0.198, which indicates insufficient awareness regarding brand development across industries in China as only 19.8% of the sampled firms have a propensity to invest in brand equity. The gender of CEOs is predominantly male as the mean of *ceogender* is 0.94, which indicates that 94% of the CEOs in our sample are male. CEO age ranges from 32 to 65 years old in the sample. The mean of CEO age is approximately 49 years old. The mean of *ceoedu* is 0.434 which indicates that 43.4% of the CEOs in our sample have Master's or Ph.D. degrees. The mean of *ceotenure* is 0.439 indicating that 43.9% of CEOs have tenures longer than the median tenure of the sample. The mean of *ceoduality* is 0.148 which indicates that approximately 14.8% of the firms from our sample have a controlling shareholder who is also the CEO. Other control variables are in a reasonable range without outliers.



Table 2 summarizes Pearson correlation among the variables and provides a glimpse into the relationship between a CEO's characteristics and the propensity to invest in brand equity. As shown in Table 2, the CEO's characteristics such as being male, older, highly educated, or having a longer tenure and duality are positively related to the propensity to invest in brand equity when considering pairwise correlation. The correlation matrix also shows that there is no multicollinearity problem as the largest correlation coefficient, which is between human capital and R&D is 0.573. Usually, if the correlation coefficients are below 0.85 it can be concluded that the independent variables do not influence the estimation.

## Regression analysis

Table 3 presents the empirical results of testing the hypotheses proposed in section 2. All the models are probit regressions and reported in the form of marginal effects. Model 1 includes the CEO's gender and other control variables. Male CEOs seem to be more confident than female CEOs since the coefficient is positive. However, the influence of gender is statistically insignificant. The empirical result accepts neither H1a nor H1b. As shown in Table 1, 94% of the CEOs in the sample are male while female CEOs account for a relatively small proportion in China. Such a fact may lead that female CEOs cannot make full use of their inherent capabilities in Chinese firms, as most firms hire the male CEOs. Furthermore, it still hasn't reached a consensus whether female are more risk-averse than male. Faccio et al. (2016) and Zalata et al. (2019) find that female CEOs are more risk-averse in European and American markets, while Farag and Mallin (2017) find that female CEOs are not more risk-averse compared to their male counterparts in China. Our result proves the opinion of Farag and Mallin (2017) in some extent. There is no significant difference in the risk appetite

**Table 1** Descriptive Statistics

Variable	Obs	Mean	Std Dev	Min	Max
<i>Brand</i>	8830	0.198	0.398	0	1
<i>ceogender</i>	8830	0.940	0.237	0	1
<i>ceoage</i>	8830	49.411	6.424	32	65
<i>ceoedu</i>	8830	0.435	0.496	0	1
<i>ceotenure</i>	8830	0.439	0.496	0	1
<i>ceoduality</i>	8830	0.148	0.355	0	1
<i>hc (%)</i>	8830	14.448	8.870	1.636	48.276
<i>rd (%)</i>	8830	4.420	4.253	0.021	25
<i>doa (%)</i>	8830	39.266	19.709	5.365	86.010
<i>profit (%)</i>	8830	8.305	13.041	-57.84	45.281
<i>cash (%)</i>	8830	-0.733	7.825	-26.831	17.061
<i>firmsize</i>	8830	0.957	1.291	0.044	7.892
<i>ownership</i>	8830	0.302	0.459	0	1
<i>firmage</i>	8830	18.497	5.222	8	35

Data source: calculated by authors based on WIND and CSMAR database.

Table 2 Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) <i>Brand</i>	1.000													
(2) <i>ceogender</i>	0.019	1.000												
(3) <i>ceoge</i>	0.029	0.034	1.000											
(4) <i>ceedu</i>	0.031	-0.005	-0.022	1.000										
(5) <i>ceotenure</i>	0.068	-0.001	0.158	0.066	1.000									
(6) <i>ceoduality</i>	0.002	0.023	0.131	0.050	0.103	1.000								
(7) <i>hc (%)</i>	-0.058	-0.011	0.021	0.066	-0.001	0.087	1.000							
(8) <i>rd (%)</i>	-0.068	0.010	-0.031	0.105	0.021	0.153	0.573	1.000						
(9) <i>doa (%)</i>	0.118	0.026	0.034	-0.012	-0.006	-0.127	-0.260	-0.328	1.000					
(10) <i>profit (%)</i>	0.032	-0.005	0.007	0.000	-0.028	0.074	0.000	0.110	-0.375	1.000				
(11) <i>cash (%)</i>	0.072	0.004	0.018	0.003	0.105	-0.049	-0.032	-0.035	0.138	0.057	1.000			
(12) <i>firmsize</i>	0.356	0.036	0.094	0.034	0.036	-0.081	-0.192	-0.145	0.348	-0.010	0.070	1.000		
(13) <i>ownership</i>	0.085	0.052	0.114	-0.003	-0.056	-0.274	-0.080	-0.213	0.334	-0.128	0.064	0.260	1.000	
(14) <i>firmage</i>	0.050	-0.008	0.077	-0.012	0.058	-0.111	-0.054	-0.142	0.164	-0.062	0.078	0.089	0.198	1.000

Data source: calculated by authors based on WIND and CSMAR database.

of male and female CEOs, which proves that the effect of the CEO's gender is statistically insignificant.

Model 2 includes the CEO age and other control variables. Different from Liu and Jiang's (2020) result that CEO age has no obvious impact on firm performance, this study finds that older CEOs are less likely to invest in brand equity since the coefficient is significantly negative ( $p < 0.1$ ). On average, a one percent increase in CEOs' age is associated with a 0.011 percent decrease in the probability of investing in brand equity. This result accepts H2a and rejects H2b. The result agrees with the opinion of

**Table 3** Marginal effects of CEO' characteristics on investment propensity of brand equity

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<i>ceogender</i>	0.0245 (0.0162)					0.0231 (0.0162)
<i>ceoage</i>		-0.0011* (0.0006)				-0.0021*** (0.0006)
<i>ceoedu</i>			0.0128 (0.0079)			0.0083 (0.0077)
<i>ceotenure</i>				0.0413*** (0.0078)		0.0427*** (0.0080)
<i>ceoduality</i>					0.0346*** (0.0111)	0.0331*** (0.0113)
<i>hc (%)</i>	0.0004 (0.0006)	0.0004 (0.0006)	0.0003 (0.0006)	0.0003 (0.0006)	0.0004 (0.0006)	0.0004 (0.0006)
<i>rd (%)</i>	0.0001 (0.0013)	0.0001 (0.0013)	0.0000 (0.0013)	-0.0001 (0.0013)	-0.0002 (0.0013)	-0.0005 (0.0013)
<i>firmsize</i>	0.0809*** (0.0036)	0.0815*** (0.0036)	0.0806*** (0.0036)	0.0810*** (0.0036)	0.0798*** (0.0035)	0.0803*** (0.0035)
<i>ownership</i>	-0.0047 (0.0100)	-0.0026 (0.0100)	-0.0041 (0.0100)	0.0030 (0.0102)	-0.0004 (0.0100)	0.0084 (0.0102)
<i>firmage</i>	0.0004 (0.0008)	0.0004 (0.0008)	0.0004 (0.0008)	0.0005 (0.0008)	0.0000 (0.0008)	0.0002 (0.0008)
<i>doa (%)</i>	0.0006** (0.0003)	0.0006** (0.0003)	0.0007** (0.0003)	0.0006** (0.0003)	0.0007*** (0.0003)	0.0007** (0.0003)
<i>profit (%)</i>	0.0011*** (0.0004)	0.0011*** (0.0004)	0.0011*** (0.0004)	0.0010*** (0.0004)	0.0012*** (0.0004)	0.0012*** (0.0004)
<i>cash (%)</i>	0.0020*** (0.0005)	0.0020*** (0.0005)	0.0020*** (0.0005)	0.0021*** (0.0005)	0.0017*** (0.0005)	0.0018*** (0.0005)
<i>Industry</i>	✓	✓	✓	✓	✓	✓
<i>Year</i>	✓	✓	✓	✓	✓	✓
<i>Province</i>	✓	✓	✓	✓	✓	✓
Observations	8,830	8,830	8,830	8,830	8,830	8,830

Note: Robust standard errors corrected for clustering at the firm level are reported in parentheses. \*\*\*denotes level of significance at 1%, \*\* at 5%, \* at 10%. Data source: calculated by authors based on WIND and CSMAR database.

Hambrick and Mason (1984) and Serfling (2014) that older executives tend to be more conservative and risk-averse. Thus, older CEOs have a lower tendency to invest in brand equity. Although both Liu and Jiang's (2020) work and this study are conducted with Chinese listed firms, Liu and Jiang et al. (2020) find no significant impact of the CEO's age on firm performance. It is probably because the CEO's age does not directly affect firm performance, but has an indirect effect on brand equity investment. This potential effect should be considered in future studies.

Model 3 includes CEO's education attainment and other control variables. The results show that there is a positive effect of CEO's education on the propensity to invest in brand equity while the effect is statistically insignificant. The empirical result indicated that hypothesis H3 cannot be accepted. This result is unexpected. Previous studies have verified that a higher CEO education level always means higher capacity and confidence, which positively affects the firm's R&D both in China (Wen and Hu 2009; Jiang and Liu 2020) and other countries (Barker and Muller 2002; Harymawan et al. 2020). However, the empirical result indicates that CEOs with a higher degree still pay little attention to brand equity in China. A possible explanation is that Chinese CEOs are motivated to use their capacities in R&D rather than on a broad range of intangibles driven by the national strategy of innovation-driven development.

Model 4 includes the CEO's tenure and other control variables. The result shows that CEOs with longer tenures are more likely to invest in brand equity since the coefficient is positive and significant ( $p < 0.01$ ). On average, if the CEO's tenure is longer than the median in our sample, there is a higher probability (0.0413) of investing in brand equity than those with shorter tenures. This result accepts hypothesis H4a and rejects H4b. It indicates that a longer tenure allows CEOs to accumulate social capital, knowledge, and power in China. On the one hand, the accumulated social capital and knowledge are conducive to CEOs' decision-making to use the firms' internal and external resources optimally. On the other hand, the accumulated power makes CEOs overconfident which increases their tendency to adopt risky strategies (Souder et al. 2012; Xie 2014; Kao and Chen 2020).

Model 5 includes CEO duality and other control variables. The results show that if CEOs are also the controlling shareholder, there is a higher probability (0.0346) of the firm investing in brand equity and the coefficient is positive and significant ( $p < 0.01$ ) supporting the same. The results confirm Huang et al. (2017)'s finding that CEO duality positively influences innovation outcomes in Chinese firms. The duality means CEOs are powerful and have a greater say in firms' strategic decisions. Meanwhile, CEOs who are also shareholders more likely to be confident and take more risks. That is, when such CEOs make a risky investment, they face fewer obstacles from the board. The result accepts hypothesis H5.

Model 6 includes all of the CEO's characteristics and control variables. The results are qualitatively identical to those obtained when each explanatory variable is introduced alone. The results are robust. Among the control variables, human capital investment intensity, firm size, firm ownership, firm age, debt to asset ratio, sales margins, and free cash flow have a positive effect on a firms' decision to invest in brand equity. In contrast, investment in R&D has a negative effect on firms' investment in brand equity. It should be pointed out that the effect of human capital investment, R&D investment, firm age, and firm ownership is statistically insignificant.

As the dependent and independent variables in Equation (1) are of the same period, potential endogeneity issues may exist resulting from reverse causality. In the problem studied in this paper, the reverse causality cannot be an issue. That is, the CEO can influence a firm's investment, while it is almost impossible to hire or fire the CEO due to the brand equity investment. If it exists, it is a rare incident. Therefore, endogeneity was not a problem in this study.

## Conclusions

The results provide several important implications for firms hoping to develop influential brands. First, it is recommended to not change CEOs frequently and to endow them with certain powers, especially for firms that have separate ownership and control. CEOs with longer tenures have better knowledge of the firm and can make full use of the available resources, while a CEO with power tends to be confident and executes high-risk projects. Second, it is better to hire a younger CEO as older CEOs are more likely to be risk-averse. Third, CEOs still do not completely recognize the importance of brand equity in China. Therefore, it is necessary to hire CEOs with a background in marketing and sales.

As with all studies, ours has its limitations. First, the CEO's characteristics should be investigated in detail, such as the influence CEOs with marketing or technical experience have on the firm's propensity to invest in brand equity and whether the influence of the CEO tenure is moderated by gender. All of these questions should be investigated further. Second, although advertising expenses account for a large portion of the investment in brand equity, a more accurate measurement should be used in the future.

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## Compliance with ethical standards

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