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The impact of CEO founder and CEO age on new ventures performance: A quantile regression analysis for U.S. IPOs

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ABSTRACT

Using quantile regression, we compare the relationship between CEO founder and CEO age and the performance of new firms in the US. Our empirical evidence shows that issuers led by a CEO founder have a strong positive impact on first-day returns, especially at the intermediate level of underpricing, while underpricing declines as CEO age increases, especially above the 40th percentile, which would not be confirmed by a classical linear regression. This finding suggests that estimating the different quantile effects of a response variable may be more informative than estimating only the average effect of the response variable. In addition, CEO founders exacerbate uncertainty about issuer quality with firm expansion; and in large firms, mature CEOs perform better than young ones in reducing the first trading day return; the mature CEO has a strong negative impact on initial returns only in low-R&D firms, and the CEO founder has a significant positive association with underpricing in R&D-intensive firms.

El impacto del CEO fundador y la edad del CEO en el rendimiento de las nuevas empresas: un análisis de regresión cuantílica de las OPI estadounidenses

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RESUMEN

Comparamos la relación entre el CEO fundador y la edad del CEO con los resultados de las nuevas empresas en EE. UU., aplicando una regresión cuantil. Nuestra evidencia empírica revela que las empresas lideradas por un CEO fundador tienen un fuerte impacto positivo en los rendimientos del primer día, especialmente en el nivel medio de infravaloración; mientras que la infravaloración se reduce a medida que aumenta la edad del CEO, especialmente por encima del percentil 40, algo que la regresión lineal clásica dejaría sin confirmar. Este hallazgo indica que, en comparación con la estimación del efecto medio de la variable de respuesta, la estimación del efecto de los distintos cuantiles de una variable de respuesta puede ser más perspicaz. Además, los consejeros delegados fundadores exacerban la incertidumbre sobre la calidad de los emisores con la expansión de las empresas; y en las grandes empresas, los consejeros delegados maduros obtienen mejores resultados que los jóvenes a la hora de reducir la rentabilidad del primer día de cotización. El consejero delegado maduro tiene un fuerte impacto negativo en la rentabilidad inicial solo en las empresas de baja intensidad de I+D, y el consejero delegado fundador tiene una asociación positiva significativa con la infravaloración en las empresas de intensidad de I+D.

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1. Introduction

Since 2020, the coronavirus severely impacted the global hospitality industry, which has curtailed leisure and business travel. Who would have thought that Airbnb, the earliest ancestor of B&B, would successfully land on the Nasdaq in December 2020, giving a shot in the arm to the B&B industry, which had already been depressed for almost a year. At the end of the first day, Airbnb's shares closed at 112.81 per cent, raising around $3.5 billion and making it the largest IPO in the US market this year. Airbnb's successful listing has made headlines in major news sources for Brian Chesky, the company's CEO, founder, owner and ultimate decision maker. At just 39 years old, Chesky has led his organisation to the highest IPO level on the US stock market during economic slowdown, sparking our interest in investigating whether founder CEO and CEO age are key factors in IPO success.

The aforementioned anecdotes and the influence mechanism of CEO characteristics lead us to wonder whether 'CEO as founder' and 'CEO age' can be introduced as a signalling mechanism of firm value to contain the information asymmetry between firms and investors. Based on the extensive previous studies on the personal characteristics of CEOs, we argue that there are many contrasting characteristics between CEO founders and mature CEOs. For example, founders are risk takers (Nelson, 2003), whereas mature CEOs prefer to be risk averse (Hambrick & Mason, 1984; Jenter & Lewellen, 2015). Furthermore, CEO founders are more radical and courageous (Gao & Jain, 2011; Lee et al., 2017); and conversely, mature CEOs are more conservative (Yim, 2013). CEO founders are more innovative and tend to increase R&D (Lee et al., 2020), while mature CEOs are much less innovative (Yoon et al., 2016). CEO founders value long-term benefits (Schuster et al., 2020), but mature CEOs prefer to focus on steady growth of current performance (Andreou et al., 2017). CEO founders are generally young and inexperienced (Wasserman, 2003), while mature CEOs have rich social experience (Ashto & Lee, 2016). Unlike CEO founders, who tend to be overly optimistic, leading to self-interest and moral hazard (Adams et al., 2009), mature CEOs are more likely to perceive immoral practices, promoting better financial reporting (Huang et al., 2012).

The significant discrepancy in many cases between the CEO founder and the older CEO provides an interesting framework for our research to select 'CEO founder' and 'CEO age', rather than other characteristics, as 'determinants' of firm performance. Notwithstanding the above, studies within the upper echelon theory (Hambrick & Mason, 1984) have focused exclusively on the effect of CEO founder and CEO age on performance. Our research is the first of its kind to derive conclusive evidence on the impact of these two elements in the IPO process, as the different strengths and approaches of the CEO founder and the mature CEO may lead to completely different outcomes in terms of reducing the inherent information asymmetry in the IPO process (Gounopoulos et al., 2017; Chiang et al., 2019) and promoting the launch of new ventures.

In addition, the groundbreaking means, quantile regression, is applied to reconcile the composite body of findings regarding the IPO performance effect of CEO founder and CEO age in the current study. The methodology adopted in this study is productive in identifying the mixture of relationships that may be hidden in data that are unable to fulfil one or more of the assumptions associated with standard OLS regression, as applied in virtually all prior research on corporate governance. Quantile regression aims to calculate the relationship between independent variables at different levels (i.e. quantiles) in the conditional distribution of dependent variables. By using the quantile regression approach, we can develop an overall picture of how our pair of CEO attributes is related to IPO performance at different conditional quantiles. More specifically, by using the quantile regression approach, we could shed light on whether the CEO founder/or CEO age-IPO performance relationship is different for high or low levels of underpricing? Thus, this paper provides a methodological and substantive contribution by proposing quantile regression as an advanced estimation method for the CEO founder-IPO performance relation in the IPO literature.

Based on the above logic on the topic, we need a comprehensive new database to conduct this research. Our data consists of 2,017 US IPO deals collected from the period between 1 January 1998 and 31 December 2017; company prospectuses provide the basis for collecting data on CEO founder and CEO age. Econometrically, we use a two-stage least squares (2SLS) instrumental variable approach and propensity score matching (PSM) to effectively deal with feedback effects arising from self-selection bias. Ultimately, we find that issuers led by CEO founders have a strong positive impact on first-day returns while underpricing contracts as the age of the CEO increases. Moreover, it is worth noting that in the quantile regression results, the presence of a negative significant effect of a mature CEO on the initial return is above the 40th percentile. However, the positive effect of the founder CEO on the first day's return is only significant for issuers with a medium level of underpricing, but has little effect on issuers with a high or low level of underpricing. Below, we examine the moderating effects of firm size, as issuers led by CEO founders increase uncertainty about issuer quality within the range of listed firms. We examine how, in large firms, mature CEOs perform better than young CEOs in reducing first-day market friction. We then examine the conditions under which CEO characteristics contribute as a valuable mechanism for signalling firm quality and find that a mature CEO has a strong negative impact on initial returns only in low R&D firms. Conversely, a founder CEO has a positive and significant association with underpricing when R&D intensity is high.

Our research is related to the work of Daily & Dalton (1992), Anderson & Reeb (2003), Nelson (2003), Wasserman (2003), He (2008), Adams et al. (2009), Fahlenbrach (2009), Gao & Jain (2011), Li & Srinivasan (2011), Block (2012), Souder et al. (2012), Abebe & Alvarado (2013), Lee et al. (2017), Schuster et al. (2020) and Lee et al. (2020), all of which examine the association between founder leadership and firm performance. For the association between CEO age and firm performance, we refer to Vroom & Pahl (1971), Barker & Mueller (2002), Bertrand & Mullainathan (2003), Huang et al. (2012), Yim (2013), Serfling (2014), Yoon et al. (2016), Andreou et al. (2017), Ettore et al. (2017), Bassyouny et al. (2020) and Gupta & Mahakud (2020). We update the previous scholarship by conducting a study that focuses on the importance of CEO founder and CEO age as follows:

1) We unravel the conditions under which these CEO characteristics can be signals of firm quality according to the IPO literature, focusing on pre-IPO expedients such as hiring reputable auditors (Beatty & Ritter, 1986); linking to VCs with a successful IPO track record (Megginson & Weiss, 1991); hiring top-tier underwriters (Loughran & Ritter, 2002); introducing respected managers (Certo, 2003); and building political connections (Gounopoulos et al., 2017);

all factors that reduce the costs of the IPO process. Interestingly, we provide evidence that CEO-founder management is characterised by more risk-taking and less experience. Overoptimism is also an obstacle to firm performance, as it sends a negative signal to external investors. Mature CEOs, on the other hand, who are conservative, cautious, experienced and moral, signal high firm quality and reduce market friction on the trading day. These findings complement those of Nelson (2003), Gao & Jain (2011), Lee et al. (2020), Yim (2013), Serfling (2014) and Ashton & Lee (2016).

2) The current study attempts to resolve this controversy by applying quantile regression as a new advanced estimation method in the corporate governance literature, which may help to reconcile the seemingly contradictory findings of classical linear regression research. More specifically, we compare the relationship between CEO founder and CEO age on the one hand and IPO underpricing on the other hand, which may differ across IPO price quantiles.

2. Literature review

2.1. Studies on CEO founders and performance

The topic of managerial characteristics has received a great deal of attention in the corporate finance and corporate governance literature. Recently, a large body of work has documented the explanatory power of the CEO founder role in corporate decision making (Adams et al., 2009; Li & Srinivasan, 2011; Block, 2012). The relevant research has revealed the negative impact of the CEO founder on performance (e.g., Anderson & Reeb, 2003; Adams et al., 2009) because the founder-CEO is likely to say 'what I say goes'. This approach leads to the opacity of the firm and increases the risks associated with decision making, potentially to the detriment of performance. Wasserman (2003), on the other hand, questions the leadership of the CEO-founder, arguing that founders tend to be younger and have less work experience than professional managers. Using a large sample of US Securities and Exchange Commission firms, Block (2012) shows that founder-managed firms are more receptive to R&D decisions with higher risk and greater uncertainty. In contrast, other scholars suggest that founder-controlled firms have a positive effect on corporate governance and firm development (Jensen, 1993; Ross & Staw, 1993; Fischer & Pollock, 2004). The main reason for this is that firms led by CEO founders have lower agency costs, along with reduced moral hazard and adverse selection problems (Li & Srinivasan, 2011). The important experiences and decisions that founders bring to the table have a lasting impact on the firm (Beckman & Burton 2008), as energetic founders invest more time, energy and value into the firm and are therefore more responsible and loyal to the firm (He, 2008). However, Daily & Dalton (1992), using ROE and ROA to measure the financial performance of firms, find no difference in financial performance between SMEs run by founders and those run by non-founders.

2.2. Studies on CEO age and performance

Existing empirical research on CEO age tends to focus on risk-taking behaviour (Prendergast & Stole, 1996; Herrmann & Datta, 2010; Yim, 2013). Not surprisingly, older CEOs prefer a quiet life as their energy levels decline (Bertrand & Mullainathan, 2003). Lower levels of physical and mental stamina (Child, 1975) lead them to prioritise both financial and professional security (Hambrick & Mason, 1984), and so older leaders tend to take fewer risks (Vroom & Pahl, 1971). Serfling (2014) also argues that older CEOs tend to be risk-averse and reduce the firm's risk by making smaller risk capital decisions. Huang et al. (2012) also show a positive correlation between CEO age and financial reporting quality. Andreou et al. (2017) use a larger sample of firms from CRSP (the Center for Research in Security Prices) 1995-2013 and confirm that the age of a CEO is negatively correlated with the risk of a stock price crash; that is, younger CEOs have a stronger tendency to exacerbate the risk of a stock price crash in the future. The above arguments show that companies derive economic benefits from older executives. However, there is some evidence that firms led by younger managers are more likely to perform well. For example, Child (1975) shows that the age of senior managers is negatively correlated with the growth rate of the firm. Chevalier & Ellison (1999) also report that portfolios managed by young fund managers outperform those of mature fund managers. Yoon et al. (2016) find that as the average age of TMTs (top management teams) increases, the likelihood of organisational creativity decreases. Others, focusing on the earnings management of older CEOs, argue that the reduced importance of long-term career concerns before retirement may encourage a CEO to manipulate short-term firm performance to the detriment of long-term performance (Dechow & Sloan, 1991; Barker & Mueller, 2002).

2.3. Studies on IPO

The excess return anomaly on the first day of trading has received a lot of attention in IPO studies. In this article, we review some of the work that explains the anomaly discussed by Stoll & Curley (1970), namely that flippers in small companies have achieved good returns in the short run, in other words, the IPO price is lower than the closing price on the first day of trading.

Several theoretical hypotheses have been put forward in the financial community to explain the phenomenon of IPO underpricing. The most widely accepted in the literature explains underpricing through information asymmetry. This theory suggests that when IPO firms go public, they have not yet established a consistent track record, in other words, they are trapped by the liability of the new issuer (Certo, 2003) and thus fail to convey organisational legitimacy. At this point, issuers take on the task of gaining the recognition of investors. To persuade investors to pay more for firms, issuers tend to discount their issue prices, which in turn leads to underpricing (Benveniste & Spindt 1989). Beatty (1989) documents that a highly respected auditor will certify a report that reduces the uncertainty of uninformed investors, so that the issuer will realise less underpricing in the IPO process. Similarly, when an IPO firm is underwritten by a highly rated investment bank, it leaves less money on the table due to the underwriter's positive signal about the quality of the new issue (Carter et al., 1998). Megginson & Weiss (1991) explore another way for issuers to mitigate information asymmetry, namely that a VC with a track record of successful offerings may be a valuable partner, which in turn reduces the motivation of IPO firms to price their firms at a discount. Ann & Chan (2008) propose a new mechanism to reduce issuer uncertainty: obtaining a pre-listing credit rating could provide investors with an objective and easily visible sign of quality. They find that credit ratings, whether high or low, lead to less rather than more underpricing. Gounopoulos et al. (2017) complement the list of pre-IPO strategies by introducing political contributions as a valuable mechanism to

deter initial returns in the first place. In particular, a 10% increase in political investment is associated with a 2.5% decrease in the amount of money left on the table. More recently, Colombo et al. (2019) argue that science-based IPOs that are affiliated with a prestigious university gain legitimacy from their association with a scientific institution, which helps to reduce IPO underpricing relative to those without a prestigious university affiliation.

2.4. Theoretical framework

All of the above studies have been conducted within the framework of the upper echelons theory, which states that strategic and financial management decisions generally vary according to personal background characteristics such as age, value beliefs, and risk preferences (Hambrick & Mason, 1984). Based on the upper echelons theory, a large number of scholars extend these studies by focusing on additional characteristics of top management, such as an overseas background (Giannetti et al., 2015), an academic background (Miller et al., 2015; King et al., 2016; Bai et al., 2020), executive tenure (Fraser & Greene, 2006; Graf-Vlachy et al., 2020), and so on. Moreover, over the last three decades, we have also witnessed a surge in studies investigating whether and to what extent the age of the CEO and the founder of the firm matter for firm performance (Dechow & Sloan, 1991; Daily & Dalton, 1992; Barker & Mueller, 2002; Fan et al., 2012).

In line with this concept, signalling theory suggests that the existence of non-determinacy and information asymmetry often hinders potential investors in distinguishing the legitimacy of the organisation. Passing the rigorous test of higher education, for example, acts as a signal of the willingness and ability of candidates to make firm-specific investments (Spence, 1973; Spence, 2002). In this sense, channels that eliminate inefficiencies in the labour market by matching the skills of jobseekers with potential employers should allow scholars to examine whether uncertainty in hiring can be mitigated by signalling. A large body of related literature contributes to the notion that signalling can eliminate friction in the new stock market by establishing cooperative relationships with well-known individuals and parties, such as top underwriters, high quality auditors, prestigious venture backers, etc. (Beatty, 1989; Carter & Manaster, 1990; Megginson & Weiss, 1991); or by implementing beneficial pre-listing strategies, such as improving the reputation of the board of directors (Certo, 2003); obtaining a credit rating (An & Chan, 2008).

3. Hypothesis development

3.1. The benchmark

Although research continues how a myriad of asymmetry reduction channels affect issuance performance, the literature examining the conditions under which CEO founder and CEO age can be used as a measure to reduce the money left on the table remains an under-researched topic. Supported by a priori evidence of the founder 'dictatorship' phenomenon (Adams et al., 2009), the tendency to seek private interests from the founder's strong power (Anderson & Reeb, 2003), in addition to the lack of experience due to the founder's youth (Wasserman, 2003), will be detrimental to performance. At the same time, due to the strong acceptance of uncertain R&D decisions, founder-controlled firms are more likely to conduct R&D (Block, 2012; Yim, 2013), which in turn creates information asymmetry (Aboody & Lev, 2000; Guo et al., 2006).

Conversely, CEOs tend to adopt more conservative attitudes as they age and as their physical health and energy decline, making it difficult for them to deal with challenging issues (Bertrand & Mullainathan, 2003). More precisely, older people consider financial and occupational security as their primary goals (Hambrick & Mason, 1984; Ashton & Lee, 2016) and are therefore more likely to pursue high quality financial reporting (Huang et al., 2012). According to the previous work, the characteristics of the founder CEO and the mature CEO may be reflected in the level of underpricing, as risk preference and risk aversion may generate the opposite signalling mechanism and thus affect IPO performance. These observations lead to H1 and H2.

***H1**: CEO founder is positively associated with IPO underpricing.*

***H2**: CEO age is negatively associated with IPO underpricing.*

3.2. Conditional firm performance

Previous studies on the effect of founder/CEO age on firm performance typically use OLS, MANOVA, or logit regression, etc., to provide point estimates of the average effect of independent variables at the average sample level (Daily & Dalton, 1992; Barker & Mueller, 2002; Adams et al., 2009; Li & Srinivasan, 2011; Huang et al., 2012; Block, 2012; Yim, 2013; Andreou et al., 2017). However, the effects of the independent variables may differ at different levels of underpricing. To overcome the conditional mean restriction, the current discussion assumes that the relationship between CEO characteristics and IPO underpricing may differ with the money left on the table.

When the IPO underpricing is high, it is concluded that the firm has a large information asymmetry, and in the same way, the uncertainty caused by R&D investment makes investors confused about the market outlook (Guo et al., 2006, Heeley et al., 2007; Hirshleifer et al., 2013). At this point, it is essential for mature CEOs who pursue the concept of occupational safety and financial security to curb the number of innovative but risky R&D paths taken (Hambrick & Mason, 1984; Herrmann & Datta, 2010; Huang et al., 2012). Older CEOs act as signals of lower R&D risks and have more confidence in increasing short-term profits (Hambrick, 2007; Serfling, 2014; Andreou et al., 2017), potentially reducing the large information asymmetry and reducing the information friction between investors and issuers.

Conversely, when underpricing is low, risk-seeking CEO founders dominate because they are not concerned with job security (Block, 2012). Founders who view firms as personal achievements pay more attention to the long-term benefits of taking risks than to the risks themselves (Nelson, 2003; Bartrand & Mullainathan 2003; He, 2008). On the other hand, instead of taking a conservative approach and mitigating risks to contract information asymmetries, firms prefer to adopt radical strategies that generate huge profits from large R&D investments (Yim, 2013).

***H3**: CEO founders serve to increase IPO underpricing for low-underpricing firms, but not for high-underpricing firms.*

***H4**: CEO ages are particularly eective in restricting underpricing for high-underpricing firms, but not for low-underpricing firms.*

3.3. Firm size

In the process of gradually increasing the size of the issuer, the CEO must face the administrative challenge of running a large and complex organisational structure to drive business growth (Murphy & Zabojnik, 2007; Miller et al., 2015). On the other hand, management models based on the founder's appeal (He, 2008) or emphasising innovation in the start-up phase (Block, 2012) are less effective (Wasserman, 2003; Ambos & Birkinshaw, 2010; King et al., 2016). In cases where the founder's skills and abilities are insufficient to effectively lead the organisation (Abebe & Alvarado, 2013), the firm needs to replace that CEO founder with a professional and more experienced CEO to lead the organisation (Boeker et al., 2002). It seems that the entrenchment of the CEO founder is detrimental to subsequent market valuations (Jayaraman et al., 2000; Busenitz et al., 2003; Adams et al., 2009). In this sense, we assume that as firm size increases, the founder is more likely to exhibit poor governance, leading to greater underpricing. Hence, we propose the next hypothesis:

***H5**: Firm size positively moderates the relationship between CEO founders and IPO underpricing.*

According to the above discussion, such an entrepreneurial characteristic of the founders may, by definition, not be as directly applicable to inferring firm quality in a large firm. At the same time, the business and social experience of older individuals, as well as their network of connections, enables them to define the means to reduce market frictions, and may attract the attention of external investors. The increasing complexity of the growing firm - with its increasing overlaps and a more diversified customer base - is likely to attract investors, especially if these advantages are accompanied by well-coordinated communication between technicians and management (Hambrick et al., 2005; Souder et al., 2012). In addition, previous literature suggests that the calmer and more rational approach to problem solving, greater organisational management skills and professional judgement of mature employees (Serfling 2014, Yim, 2013) may tend to support the idea that older CEOs are more valuable to the performance of large firms. For this reason, we derive the final hypothesis:

***H6**: Firm size positively moderates the impact of CEO age on restricting underpricing.*

3.4. "R&D" vs "non-R&D firms"

Our final hypothesis reveals the conditions under which CEO characteristics are a valuable mechanism for signalling firm quality. It is well documented how issuers in technology-intensive industries can signal legitimacy to investors by employing well-trained scientists as CEOs, who are less risk-averse and more likely to pursue pioneering strategies than their non-professional counterparts (Stam & Wennberg, 2009; Xie et al., 2020). Therefore, the survival of knowledge-intensive firms often depends on the appointment of expert CEOs who are more likely to engage in innovative activities due to their understanding of the firm's core technology (Barker & Mueller, 2002). It should be noted, however, that while issuers with founders in the core CEO role are often at the forefront of innovation, we expect that their higher propensity to engage in risk-taking activities (Nelson, 2003) and lower level of expert managerial knowledge (He, 2008; Abebe & Alvarado, 2013) may de facto prove to be an impediment to the listing performance of technology firms.

Conversely, non-tech-intensive industries place higher demands on CEOs to deal with the available resources in the most effective way and to overcome the obstacles created by the complex organisational structure (King et al., 2016). We expect that the importance of coordinating better communication between departments and establishing network connections with a more diverse range of customers on the part of mature CEOs (Hambrick et al., 2005; Souder et al., 2012) would be particularly valued in non-tech-intensive firms.

***H7**: The positive relation between a CEO founder and IPO underpricing is more salient for tech firms.*

***H8**: The negative relation between a CEOs age and IPO underpricing is more salient for non-tech firms.*

4. Data sources and samples

We use a dataset from the Securities Data Company (SDC) database to collect complete IPO transactions based on US stock exchanges between 1 January 1998 and 31 December 2017. We take 1998 as the starting point of the sample to combine the dotcom bubble period from 1998 to 2001. Subsequently, our sample also covers the effects of the subprime mortgage crisis (2008-2009) that hit the US economy, where IPO activity shows a significant decline.

Building on existing work (Loughran & Ritter, 2002; Ritter & Welch, 2002; Ljungqvist & Wilhelm, 2003 and Lowry & Schwert, 2004), we reject IPOs involving REITs, closed-end funds, royalty trusts and IPOs with issue prices below $5 that do not provide information on their financing returns. The rest of the sample is enriched with information from Compustat and CRSP, which provide us with accounting variables and after-market performance, respectively. We end up with a final sample of 2017 US IPOs. The data on CEO age and CEO founder were collected manually from the Securities and Exchange Commission (SEC) and the Electronic Data Gathering Analysis and Retrieval System (EDGAR).

5. Methodology

5.1. Quantile regression

Traditional least squares regression provides a single and incomplete summary of the average influence of independent variables at the sample average level (Mosteller & Tukey, 1977). However, the function of the explanatory variables is quite different at different levels of response variable power. To provide a more comprehensive picture of how to compute the conditional quantile of response variables in a linear model, Koenker & Bassett (1978) consider quantile regression to be both the inevitable and ideal choice. In recent years, quantile regression has been gradually applied to the empirical study of firm performance (Elsayed, 2007; Ramdani & Witteloostuijn, 2010; Conyon & He, 2017). Table 1 presents the comparative summary between classical linear regression and quantile regression based on previous major quantile regression studies (Koenker & Bassett, 1978; Koenker & Hallock, 2001).

Following Koenker & Bassett (1978), quantiles of conditional distribution expressed as functions of explanatory variables can be given as follows:

$$yi = x'i\beta\theta + \mu\theta i \qquad \theta\epsilon(0,1) \tag{1}$$

$$Quant\,\theta(yi|xi) = x'i\beta\theta \tag{2}$$

Table 1. Classical linear regression vs quantile regression

	Classical linear regression	Quantile regression
Modelling basics	Using the conditional mean of the dependent variable	Using conditional quantile of the dependent variable
Modelling thought	Using the connection function to describe the relationship between the independent variable and dependent variable	Data-driven
Model	$E(y\|x) = \mu y\|x = \alpha + x'i\beta$	$Q\theta(yi\|xi) = \alpha(\theta) + x'i\beta(\theta)$ with $\theta \epsilon (0,1)$
Algorithm	The sum of squared residuals	Weighted least absolute deviation
presupposition	Independence, normality, homovariance	Independence
Testing type	Parameter test	Nonparametric tests
information	Describes the average information	Various percentage information of the distribution
Outlier	The effect cannot be considered	The effect can be considered
Heteroscedasticity	Big impact	Small impact
image	One curve	A cluster of curves

Where *yi* is the response variable; *xi* is a combined vector of independent variables; $\beta\theta$ is the parameter vector; μ is the matrix of error term; and θ denotes the θth quantile. By increasing θ from 0 to 1, all conditional distributions of *yi* given that the *xi* conditions are presented, and expressed as $Quant\theta(yi|xi)$, *equal to* $x'i\beta\theta$. Therefore, we could identify the influence of covariates at different positions in the conditional distribution of response variables by quantile regression. The OLS function, incidentally, written as $E(y|x) = \mu y|x = \alpha + x'i\beta$. $\mu y|x$ refers to the average of y for a given value *of x,* estimating the conditional mean.

The parameter $\beta\theta$ of the θth quantile can be estimated by minimizing the weighted sum of absolute value errors, as shown in equation (3):

$$\min_{\beta} \left\{ \sum_{yi \geq x'i\beta\theta} \theta|yi - x'i\beta| + \sum_{yi<x'i\beta} (1-\theta)|yi - x'i\beta| \right\} \quad (3)$$

It is often calculated by linear programming (Hao & Naiman, 2007) due to the objective function in quantile regression with absolute value and is non-differentiable. In the distribution of the explained variable y, the proportion θ is less than the quantile function $Q(\theta)$, while the part of (1-θ) is greater than the quantile function $Q(\theta)$, so the whole distribution of y is divided into two parts by θ. For any $0 < \theta < 1$, defines the check function. If $\theta = 0.5$, it is called *median regression*, which is a special condition of the quantile regression. In the progress of the current experiment of investigating the effect of CEO characteristic on the first-day return, we are allowed to obtain the influence direction, and the size and trend of the CEO founder and CEO age in varying locations of conditional distribution according to the β value at the different quantile θ.

5.2. Variables

Following a large stream of important IPO studies (Aggarwal et al., 2002; Ritter & Welch, 2002; Liu & Ritter, 2011; Nielsson & Wójcik, 2016; Li et al., 2019; Gao et al., 2020), we estimate the following OLS model to examine hypotheses 1 and 2:

$$\begin{aligned} Underpricing = {} & \beta 0 + \beta 1 \times (CEO\ founder\ or\ CEO\ age) \\ & + \beta 2 \times firm\text{-}specific\ characteristics \\ & + \beta 3 \times IPO\ characteristics + \varepsilon \end{aligned} \quad (4)$$

We use *underpricing* to estimate the first listing day performance of IPO issuers. This measures the amount of money left on the table at the first place (Nielsson & Wójcik, 2016; Gao et al., 2020) and it is given by:

$$\text{Underpricing}_{,t} = \frac{P_{i,1} - P_{i,0}}{P_{i,0}} \quad (5)$$

$P_{i,0}$ is the IPO offer price as it emerges in the prospectus of firm 'i'. $P_{i,1}$ represents the IPO's closing price at the end of the first trading day of the firm. 'i.' $\beta 1$ captures the effect of the CEO founder and CEO age on IPO pricing. If the CEO incurs higher (smaller) underpricing, then we estimate $\beta 1$ to be positive (negative). The letter 'ε' at end of the regression models stands for the error term.

As for the independent variables measured in this paper, we use a) the 'CEO founder' as a dummy variable, is coded as 1, otherwise 0 from the question 'Does the CEO of your firm also serve as the founder?'; b) the "CEO age" variable is the age of the CEO to this day.

Moreover, the additional control variables we choose in our analyses are commonly guided by a particular relationship in our research and IPO studies. First, we consider several Firm-specific characteristics, namely *IPO Proceeds*, *Board size*, *Firm Age, EPS (Earnings per share) and, Leverage*. IPO proceeds are measured as the issuers' size as we suspect that larger IPO firms that have better prospects and operations lead to a reduction in initial returns (Beatty & Ritter, 1986). Additionally, we that consider more effective communication between executives on small boards can lower, rather than increase, underpricing (Chancharat et al., 2012 and Bertoni et al., 2014). Earnings per share (EPS) is a dummy variable that obtains prospective issuers gains in the year before issuance. A positive accounting return tends to constrain underpricing (Gounopoulos et al., 2017). In terms of IPO characteristics, we control *Dotcom period, Financial Crisis, Overhang, VC (Venture-Capital backing), Underwriter and Auditor.* Specifically, as a reputable independent third party, the VC, Underwriter and Auditor build a bridge for disseminating information that is visible to potential investors, and thereby contribute to a successful listing (Beatty, 1989; Carter & Manaster, 1990; Megginson & Weiss, 1991). The above variables used in our analysis are also defined in the Appendix.

Furthermore, to examine the moderation effect of assets as a proxy for issuer size, on the relation between CEO founder/CEO age and the amount of money left on the table, we put in place the following regression Model 3. As explained above in hypotheses 5 and 6, larger companies not only boost standardized and institutionalized management but also increase performance gains or firm prospects (Beatty & Ritter, 1986; Li, 2010; Serfling, 2014; Ashton & Lee, 2016), thus increasing the probability of the CEO founder entrenchment that should account for the excessive initial returns in the first place, and reduce the deterrent of mature CEOs against excess uncertainty.

$$\begin{aligned} Underpricing = {} & \beta 0 + \beta 1 \times (CEO\ founder\ or\ CEO\ age) \\ & + \beta 2 \times Assets * (CEO\ founder\ or\ CEO\ age) \\ & + \beta 3 \times firm\ -\ specific\ characteristics \\ & + \beta 4 \times IPO\ characteristics + \varepsilon \end{aligned} \quad (6)$$

Where *Assets ∗ (CEO founder or CEO age)* stand for the interaction between firm size and the CEO characteristics on underpricing, other controls for IPO characteristics and firm-specific characteristics were measured as stated above in Model (6).

5.3. Endogeneity control

Our study still can't ignore the potential endogeneity between first trading day performance and CEO characteristics. If the decision of IPO firms to hire their CEOs with a particular background is influenced by unobserved issuer-specific characteristics (e.g., a firm's strategic and managerial challenges) that also affect IPO pricing, then self-selection bias and feedback effects may undermine the validity of our results.

First, we employ a two-stage least squares model in which the CEO founder variable is instrumented by the presence of CEO founders in the same three-digit Standard Industrial Classification (SIC) code, following Heckman (1979) who states that endogenous selection is a problem like the omitted variable problem and suggests a two-stage method as a remedy. We adopt this technique because imitative behaviour is common among firms seeking social legitimacy (Deephouse & Carter, 2005) and is particularly important for new ventures (Bertoni et al., 2014).

Second, we apply a propensity score-based weighting and regression technique to solve the concern that company observable characteristics may interfere with the effect of age on IPO underpricing (Yim, 2013; Serfling, 2014). This paper divides the CEO age into two groups, young CEOs (≤50-years-old) and old CEOs (>50-years-old), then reweights the observed value of the two groups of CEO samples to duplicate 'ideal' compared specimens with comparable covariate distributions that differ on age. The propensity score, p(X), is defined as the predicted probability of receiving treatment given the pre-treatment characteristics of X, and is normally estimated as a logit model with the independent variable X. I report the mature CEOs as the 'treatment'. 'Treated' and 'control' groups, which are weighted by 1/p(X) and 1/(1-p(X)), respectively. Clearly, in the treatment group, the observations with characteristics leading to a high probability of treatment p(X) were weighted downward, and equally, in the control group, the observations with characteristics leading to a low probability of treatment were weighted downward. This process balances the differences in covariates between the 'young' and 'old' CEO groups.

6. Descriptive statistics

Table 2 presents descriptive statistics for our sample data. Our first examination shows that the average age of the CEO among the potential issuers is 50.14 years. In less than half of the issuers (33%), the CEO is also the founder. The evidence also shows that more than half of the issuing firms establish links with reputable underwriters (61%) and accounting firms (55%) to reduce issuer-specific uncertainty (Beatty, 1989; Carter & Manaster, 1990). About 40 per cent of issuers use a venture capitalist, an independent third party who can act as an information bridge between a company and outside investors, to reduce information asymmetry (Megginson & Weiss, 1991). Subsequently, the firms in our sample have been in business for an average of 15.6 years, with a median of 8 years. The average board size consists of 6.9 directors and the median is 7. However, the average market leverage ratio is about 1.33 and the median is 0.89. The average overhang is about 3.61, with a median of 2.95.

Table 2. Descriptive statistics

	N	Mean	Median	SD	Skew.	Kurt.	Jarque-Bera
Panel A. CEO characteristics							
CEO age	2017	50.14	50.00	8.54	0.07	2.77	5.83[b]
CEO founder	630	0.33	0.00	0.47	0.72	1.52	339.6[a]
Panel B. Firm Characteristics							
Ln proceeds	2017	4.28	4.30	1.08	0.05	4.67	232.5[a]
Board size	2017	6.86	7.00	2.40	1.32	10.77	5660[a]
Firm age	2017	15.64	8.00	22.40	3.15	14.53	15000[a]
EPS	2017	0.45	0.00	0.50	0.22	1.05	336.4[a]
Leverage	2017	1.33	0.89	2.82	17.68	424.02	1.5e+0.7[a]
Panel C. IPO Characteristics							
Dotcom Period	585	0.29	0.00	0.45	0.93	1.86	397.8[a]
Overhang	2017	3.61	2.95	3.75	8.93	142.01	1.7e+0.6[a]
Financial Crisis	173	0.09	0.00	0.28	2.96	9.75	6775[a]
Underwriter	1231	0.61	1.00	0.49	-0.46	1.21	339.8[a]
VC	933	0.46	0.00	0.49	0.15	1.02	336.3[a]
Auditor	1099	0.55	1.00	0.49	-0.18	1.03	336.2[a]

This table shows the CEO characteristics (including CEO age and CEO founder) corporate characteristics and IPO characteristics in our sample. IPO features include, dot.com period, venture capital backed IPOs, the presence of a repeatable underwriter and auditor, overhang, and the years of the financial crisis. In the firm-specific characteristics, we include capital raised, board size, firm age, Earnings Per share and leverage. The sample consists of 2,017 IPOs announced from 1st of January, 1998 to the 31st of December, 2017. IPO data were collected from the Securities Data Company (SDC) Database. Accounting data were retrieved from CRSP and Compustat Databases. Lastly, the CEOs characteristics were hands collected from the Securities and Exchange Commission (SEC). Note: J-B statistic is the test value of Jarque-bera normality. The superscript a, b and c indicate that the test values are statistically significant at 1%, 5% and 10% levels respectively.

We can also see that the mean and median of some variables are different. Furthermore, the skewness coefficient is only close to zero for all variables except CEO age and Ln revenue, which means that the variables are asymmetrically distributed. The kurtosis values of most variables are greater than 3, indicating that there is a high value in the sample. In addition, the Jarque-Bera normality test for CEO age and other variables indicates that we can reject the null hypothesis that the data are normally distributed at the 5 per cent and 1 per cent levels, respectively. This means that directly estimating the correlation between CEO characteristics and underpricing using the OLS method may lead to biased conclusions; therefore, the quantile regression method, which is not easily affected by outliers or non-normal distribution of variables, is preferred.

A Pearson correlation matrix of our variables is presented in Table 3, which shows an initial correlation between all the independent variables used in our regression models. Although the correlation matrix shows no sign of multicollinearity, we perform a multicollinearity test including all relevant interaction terms. Since the statistics for our variance inflation factor (VIF) of all variables are below the index used in the field (10 for VIF; 30 for the conditional index), our results prove that the models are free from multicollinearity problems. Furthermore, our suspicion of potential self-selection bias is confirmed as the Durbin-Wu-Hausman test rejects the hypothesis of no endogeneity and justifies the use of the two-stage instrumental variable method and the propensity score matching method.

Table 3. Correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 CEO founder	1													
2 CEO age	-0.172***	1												
3 Ln proceeds	-0.080***	0.056**	1											
4 Board size	-0.094***	0.111***	0.094***	1										
5 Firm age	-0.164***	0.185***	0.207***	0.103***	1									
6 EPS	-0.074***	0.136***	0.170***	0.030	0.251***	1								
7 Leverage	0.057**	-0.010	-0.079***	-0.002	-0.061***	-0.143***	1							
8 Dotcom Period	0.123***	-0.238***	-0.163***	-0.102***	-0.089***	-0.116***	0.005	1						
9 Overhang	0.066***	-0.101***	-0.010	0.042*	-0.070***	-0.044*	-0.036	0.103***	1					
10 Financial crisis	-0.030	0.017	0.093***	0.024	0.044*	0.069***	0.013	-0.193***	-0.049**	1				
11 Underwriter	-0.000	-0.050**	0.394***	0.052**	0.070***	0.045**	-0.046**	-0.117***	0.087***	0.123***	1			
12 VC	0.196***	-0.231***	-0.181***	0.029	-0.273***	-0.398***	0.080***	0.091***	0.080***	-0.003	0.037	1		
13 Auditor	-0.218***	0.141***	0.149***	-0.023	0.204***	0.262***	-0.059***	-0.108***	-0.047**	0.001	-0.008	-0.661***	1	
14 Assets	-0.054**	0.075***	0.166***	0.034	0.163***	0.051**	-0.022	-0.019	0.030	-0.020	0.055**	-0.088***	0.043*	1

The table reports pairwise correlations for the variables included in our analysis. The results refer to a sample of new equity issues that floated the US stock exchanges from 1st t of January, 1998 to the 31st of December, 2,017. IPO data were collected from the Securities Data Company (SDC) Database. Accounting data were retrieved from CRSP and Compustat Databases. Lastly, the CEOs characteristics were hands collected from the Securities and Exchange Commission (SEC).

7. Analysis of results

7.1. Effect of CEO founder and CEO age on underpricing

Table 4A presents the OLS regression estimates. This study first examines the effect of CEO founder and CEO age on the first day return of a sample IPO, as hypothesised in hypotheses 1 and 2. The OLS results show that the CEO founder coefficient is positive and statistically significant at the 5 per cent level. We then correct for endogeneity in our two-stage instrumental variable model and present a positive and statistically significant result at the 5 per cent level, indicating that the CEO founder increases the amount of money left on the table on the day of the IPO. In contrast, Table 4B shows a negative coefficient in column 1, implying that the older the CEO, the more likely it is that the level of underpricing decreases at the 1 per cent significant level. Column 2 shows the first stage regression, the fitted values of which form the propensity score. Column 3 shows the regression results on the weighted, pruned sample: the 'old CEO' treatment variable shows that mature CEOs have a stronger tendency to minimise underpricing and confirms that the result is not confounded by the distributional differences in the observed covariates between firms with older and younger CEOs. Therefore, we find strong evidence to accept Hypotheses 1 and 2, in other words, they shed light on how issuer-specific IPO uncertainty tends to be lower in firms led by mature CEOs, which is consistent with previous research. This finding suggests that older individuals adopt strategies that are conservative and safe; therefore, they may be advantageous in subsequent market valuations (Serfling, 2014; Ashton & Lee, 2016; Andreou et al., 2017).

Unlike older CEOs, CEO founders are more likely to increase initial returns than their counterparts, supporting the research of Wasserman (2003), Block (2012) and Yim (2013), who find that founder-managed firms are more likely to make R&D decisions and face higher levels of risk and uncertainty, leading to higher underpricing. Our evidence confirms and extends the upper echelons theory, according to which top managers with different characteristic variables have different knowledge and skills, which may help or hinder performance gains or firm prospects (Hambrick & Mason, 1984; Slater & Dixon-Fowler, 2009; Manner, 2010; Richard et al., 2019, Bassyouny et al., 2020). In the same vein, the statistical significance of our findings confirms that firms led by mature CEOs and CEO founders create uncertainty for issuers up to and through the IPO, both negatively and positively, in line with signalling theory research (Spence, 1973; Certo, 2003; Morris et al., 2017).

We also control for other IPO characteristics and firm-specific characteristics as key factors that may lead to underpricing. The main findings are that, ln proceeds, board size and firm age are negatively and significantly associated with underpricing, while the dotcom period, overhang and finan-

Table 4A. Effect of CEO founders on underpricing

	OLS	2SLS
CEO founder	**0.058****	**0.304****
	(0.025)	**(0.159)**
Ln proceeds	-0.045***	-0.036***
	(0.012)	(0.012)
Board size	-0.005	-0.000
	(0.003)	(0.005)
Firm Age	-0.001**	-0.000
	(0.000)	(0.001)
EPS	-0.042**	-0.048*
	(0.021)	(0.026)
Leverage	-0.001	-0.000
	(0.002)	(0.004)
Dotcom Period	0.352***	0.330***
	(0.035)	(0.028)
Overhang	0.020***	0.017***
	(0.006)	(0.003)
Financial Crisis	0.007	0.012
	(0.034)	(0.040)
Underwriter	0.097***	0.097***
	(0.025)	(0.025)
VC	0.142***	0.131***
	(0.032)	(0.033)
Auditor	0.011	0.040
	(0.031)	(0.036)
% of CEO founder in the industry		0.752***
		0.103
Constant	-0.201***	-0.279***
	(0.062)	(0.094)
Adj. R2	0.175	0.129

Table 4A shows the results of cross-sectional OLS regression analysis and 2SLS analysis on the impact of CEO founder on Underpricing. The list of instruments used and the definition of control variables are provided in the Appendix. CEO founder variable was manually collected from the Securities and Exchange Commission (SEC), Electronic Data Gathering Analysis and Retrieval System (EDGAR). All regressions control the fixed effect of the year, and their coefficients are suppressed. 10%, 5% and 1% respectively.

Table 4B. Effect of CEO age on underpricing

Y: underpricing	OLS	PSM	
		Old 1 stage	Under Weighted
CEO age	**-0.005*** **		
	(0.002)		
Old CEO			**-0.078*** **
			(0.025)
LN proceeds	-0.044***	0.060	-0.065***
	(0.011)	(0.050)	(0.013)
BOARD SIZE	-0.004	0.075***	-0.004
	(0.003)	(0.021)	(0.004)
Firm Age	-0.001**	0.013***	-0.001
	(0.000)	(0.003)	(0.001)
EPS	-0.039*	0.003	-0.063**
	(0.021)	(0.105)	(0.027)
Leverage	-0.001	0.001	0.000
	(0.003)	(0.016)	(0.004)
Dotcom Period	0.339***	-0.872***	0.329***
	(0.032)	(0.109)	(0.028)
Overhang	0.017***	-0.026**	0.009***
	(0.005)	(0.013)	(0.002)
Financial Crisis	0.003	-0.239	0.012
	(0.034)	(0.170)	(0.044)
Underwriter	0.086***	-0.354***	0.008
	(0.025)	(0.108)	(0.028)
VC	0.114***	-0.678***	0.095***
	(0.039)	(0.133)	(0.034)
Auditor	-0.030	-0.098	-0.010
	(0.035)	(0.126)	(0.032)
Constant	0.137	0.119	-0.174***
	(0.127)	(0.282)	(0.070)
Adj. R2	0.169	0.078	0.093

This table shows the results of cross-sectional OLS regression analysis and PSM (Propensity score matching) analysis on the impact of CEO age on Underpricing. Table 4B shows OLS and PSM regression results. In column 1 the dependent variable equals the age of CEOs on the listing day, which is an unweighted baseline regression. In PSM analysis, we consider treatment to be having an old CEO (age range >=50), and control to be having a young CEO (age range <50). Column 2 presents the regression whose fitting values constitute the propensity score (first stage). Column 3 runs regressions on the matched sample after weighting via the inverse propensity score. The CEO age variable was hands collected from the Securities and Exchange Commission (SEC), Electronic Data Gathering Analysis and Retrieval System (EDGAR). All regressions control the fixed effect of the year, and their coefficients are suppressed. 10%, 5% and 1% respectively.

cial crisis are positively associated with first-day return. Interestingly, underwriter and venture capital have significantly positive coefficients on underpricing, in line with the findings of Loughran & Ritter (2004) and Lowry & Murphy (2007), while underpricing tends to be lower for firms that appoint prestigious auditors, suggesting that information asymmetry about IPO firms with prestigious auditors is on average quite low (e.g., Beatty, 1989).

7.2. Quantile regression models of the CEO founder and CEO age on underpricing

Since OLS only captures the central trend of the distribution, quantile regression is used to gain a deeper understanding of the impact of CEO founder and CEO age on underpricing. The other results in Table 5 - for the 20th, 40th, 60th and 80th quantiles - clearly indicate that the effects vary according to the quantile level. First, the CEO founder coefficients are positive and statistically significant at the median quantile (40th and 60th) and insignificant at the 20th and 80th quantiles. Strikingly, the significance is greater at the 40th percentile than at the 60th percentile. This implies that the CEO founder has a much larger positive impact on the first-day return for firms with a medium level of undervaluation, but not for firms with a high or low level of undervaluation. Meanwhile, at the 40th, 60th and 80th percentiles, we find a negative and statistically significant relationship between CEO age and initial return. Below the 40th percentile, we find that the coefficients of CEO age are not statistically significant. This suggests that older CEOs negatively affect underpricing for firms in the higher and median quantile, but not for firms in the lower quantile.

Table 5. Quantile regression models of the CEO characteristics on Underpricing

Y: underpricing	Quantile regression			
	Q0.20	Q0.40	Q0.60	Q0.80
CEO founder	**0.008**	**0.035*** **	**0.034***	**0.031**
	(0.005)	(0.013)	(0.021)	(0.033)
CEO age	**-0.000**	**-0.002*** **	**-0.002*** **	**-0.004*** **
	(0.000)	(0.001)	(0.001)	(0.002)
Ln proceeds	-0.012**	-0.01***	-0.020***	-0.027*
	(0.003)	(0.007)	(0.010)	(0.017)
Board size	0.003	0.00 0	-0.003	-0.007
	(0.001)	(0.002)	(0.004)	(0.006)
Firm Age	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.001)
EPS	0.030**	.019**	0.032**	-0.017
	(0.006)	(0.013)	(0.021)	(0.033)
Leverage	0.001	0.000	0.002	0.000
	(0.001)	(0.002)	(0.003)	(0.005)
Dotcom Period	0.033***	0.026***	0.108***	0.354***
	(0.006)	(0.014)	(0.022)	(0.035)
Overhang	0.002	0.004***	0.016***	0.039***
	(0.001)	(0.002)	(0.003)	(0.004)
Financial Crisis	-0.001	-0.011	-0.005	0.012
	(0.009)	(0.021)	(0.034)	(0.053)
Underwriter	0.020**	0.007	0.027	0.021
	(0.006)	(0.013)	(0.021)	(0.034)
VC	0.022	0.024***	0.078***	0.13***
	(0.008)	(0.016)	(0.027)	(0.042)
Auditor	0.001	0.001	0.001	0.001
	(0.007)	(0.015)	(0.025)	(0.040)
Constant	-0.164***	-0.053*	0.009	0.11

This table shows the results from the quantile regression method for the 20^{th}, 40^{th}, 60^{th}, 80^{th} quantiles. The table displays the estimated coefficients vary upon the quantile levels. Unlike OLS regression that primarily based on the mean, may be interfered by extreme values, quantile regression model depends on the generalisation based on the median method for different stages of regression.

This trend can be seen more clearly if we estimate separate quantile regressions for the quantiles, , ranging from 5 to 95 per cent. Figures 1(a) and 1(b) show the CEO founder and CEO age, respectively, with the horizontal X-axis representing the quantile and the vertical Y-axis representing the quantile regression coefficient of the CEO characteristic variables. That is, the Y scale is the value of the estimated coefficient at a given quantile on the X scale, so the solid line in the shape region represents the coecient estimates of , and the shaded region derives the corresponding 95 per cent confidence intervals. Note that the dotted line in the middle shows the standard OLS coefficient of the conditional mean eect, and the top and bottom non-continuous dashes are 5 per cent confidence bands. The overall situation is like the previous description.

In general, the coefficients of each quantile in Figure 1(a) are lower than the OLS regression estimate. The quantile regression estimates of CEO founder on underpricing are positive and significant in the median quantile, but not significant in the lower and upper quantiles, from which we can see the board band at the ends of the confidence interval. The

results unravel the interesting finding that founder-led firms increase the level of underpricing, especially for firms with mediocre initial returns, but there is little evidence that such a signalling mechanism can operate when the underpricing rate is high or low. First, we speculate that CEO founders may ignore the interference of security (Block, 2012) when the underpricing level is low, making them more willing to pursue the long-term benefits of risky projects. The insignificant statistic in the distribution of high and low underpricing, due to the lack of scope for CEO founders in both low and high information asymmetry environments - here is probably the clue - is because the firm has achieved performance success (low underpricing) and is growing rapidly. Thus, a variety of managerial capabilities are essential to deal with increasingly complex managerial tasks (Murphy & Zabojnik, 2007; Miller et al., 2015), while the founders lack the necessary managerial skills (Souder et al., 2012; Abebe & Alvarado, 2013). Therefore, the poor performance (high underpricing) requires the firm to bring in new managers to reverse the potential failure (Finkelstein & Hambrick, 1996; Boeker & Wiltbank, 2005). The results partially support hypothesis 3.

Figure 1. Evolution of Spanish corporate governance index and its subindices

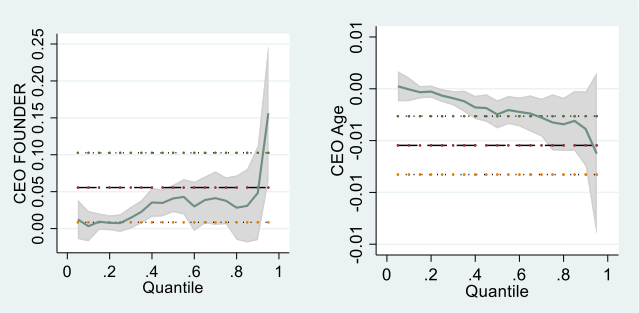

Figure 1 represents the coefficient of CEO founder and CEO age to present a whole picture of the estimation and their trends., ranging (5% - 95%). Figure 1 (a) and (b) show the CEO founder and CEO age, respectively, with the horizontal X-axis representing the quantile, and the vertical Y-axis representing the quantile regression coefficient of CEO characteristic variables. The solid line in the shape area represents coecient estimates of the , and the shaded area infers its corresponding 95% confidence intervals. The dotted line in the middle shows the standard OLS coefficient of the conditional mean eect, and the top and bottom non-continuous dashes are 5% confidence bands.

CEO age, shown in Figure 1(b), shows that the coefficients are above the OLS regression estimate at each quantile level. The coefficient increases as the underpricing quantile increases, but is only significant at the 40 per cent, 60 per cent and 80 per cent quantiles. As a signalling mechanism, the age of the CEO has a significant negative impact on the first trading day return, as noted above, and this inhibition weakens as the age of the CEO increases, but the effect is quantitatively stronger at higher quantiles than at lower ones. Thus, Hypothesis 4 is confirmed. Quantile regression helps us to explore the effect of CEO age on different levels of underpricing, which can't be achieved by classical regression, and provides some grounds for the conjecture that CEO age shows heterogeneity of signalling effect when the level of underpricing changes. Our results confirm that mature CEOs with a more conservative approach and less R&D strategy act as a strong signal of firm quality when the issuer faces high information asymmetry. However, the benefits associated with relying on mature executives to signal issuer quality would be comparatively marginal when firms operate in a low-risk environment. Lower frictions in new equity markets and better reporting quality may reduce other investors' attention to mature CEOs.

7.3. Interaction of issuer size with CEO founder and CEO age

We then continue our studies by investigating whether the effect of the founder's age and the CEO's age on initial returns is moderated by the issuer's size. Other scholars also provide evidence and underline the research on the adjustment function of firm size, showing that the founder's personal charm and innovation orientation in the start-up phase boost the performance growth of small firms (He, 2008; Block, 2012). However, this type of CEO is detrimental to market valuations in the case of large and institutionalised management due to the expansion of firm size. Therefore, it is imperative to replace the founder CEO with a professional CEO (Boeker et al., 2002; Busenitz et al., 2003; Wasserman, 2003; Adams et al., 2009; Ambos & Birkinshaw, 2010; King et al., 2016). The current research, therefore, tests the premise that issuers with founders in the core CEO role are detrimental to corporate governance and increase uncertainty about issuer quality within the range of listed firms. Model 1 in Table 6 reports the estimated results of the interaction effects of CEO characteristics and IPO performance. The interaction between firm size and the dichotomous CEO founder is positive and signicant (0.003, with p<0.01), indicating that the marginal effect

Table 6. Interaction of firm size with board characteristics

Y: underpricing	Model 1	Model 2	Model 3	Model 4
			Small	Large
CEO age		-0.005***		
		(0.002)		
CEO founder	0.056**		0.034	0.0073**
	(0.025)		(0.032)	(0.035)
LN Proceeds	-0.04***	-0.038***	-0.150***	-0.002
	(0.011)	(0.010)	(0.025)	(0.012)
Board size	-0.005	-0.004	-0.010	0.002
	(0.003)	(0.003)	(0.007)	(0.003)
Firm Age	-0.001*	-0.001*	-0.002*	0.000
	(0.000)	(0.000)	(0.001)	(0.000)
EPS	-0.042**	-0.043**	-0.038	-0.033
	(0.021)	(0.020)	(0.036)	(0.026)
Leverage	-0.001	-0.001	0.002	-0.076**
	(0.002)	(0.002)	(0.002)	(0.037)
Dotcom Period	0.353***	0.331***	0.451***	0.169**
	(0.035)	(0.032)	(0.041)	(0.066)
Overhang	0.021***	0.017***	0.024**	0.014**
	(0.006)	(0.005)	(0.010)	(0.006)
Financial Crisis	0.006	-0.003	0.048	-0.007
	(0.034)	(0.034)	(0.070)	(0.022)
Underwriter	0.097***	0.092***	0.130***	0.025
	(0.006)	(0.025)	(0.036)	(0.027)
VC	0.145***	0.116***	0.072	0.207***
	(0.031)	(0.038)	(0.050)	(0.046)
Auditor	0.006	-0.022	0.007	0.005
	(0.030)	(0.034)	(0.049)	(0.028)
CEO Age*Assets		**-0.002*** **		
		(0.000)		
CEO founder*Assets	**0.003*** **			
	(0.000)			
Constant	-0.181***	0.159	-.576***	0.066
	(0.062)	(0.127)	(0.109)	(0.077)
Adj. R2	0.176	0.178	0.228	0.118

This table shows the if CEO characteristics (including CEO age and CEO founder) impact on Underpricing mitigated by the issuers size. In Model 1 and Model 2, we introduce the interact variable: assets, and the results show that the same direction mitigation. We split the sample into two types: small firm and large firm in Model 3-6.

of a CEO founder on the first-day return is higher for large firms. Hypothesis 5 is confirmed.

Drawing on the previous discussion of the moderating effect of CEO age on initial returns, we suggest a possible direction for the moderating effect of firm size: investors may particularly value an individual's combination of work experience, social experience, and network contacts as an effective mechanism to reduce market frictions in large firm launches (Serfling, 2014; Yim, 2013). In Model 2 of Table 6, we analyse the moderating effect of firm size on the effect of CEO age on IPO performance on the day of listing. The interactive term between firm size and CEO age is negative and significant (-0.002, with $p<0.01$). Moreover, increasing firm size strengthens the negative correlation between CEO age and underpricing; in other words, as the firm expands rapidly, investors view positively the presence of a mature CEO who can use accumulated skills and connections to better regulate the corporate governance costs arising from increasing firm complexity.

7.4. "R&D" vs "non-R&D firms"

Finally, we examine how issuers belonging to knowledge-intensive industries tend to employ highly educated CEOs with extensive expertise. These CEOs exhibit better first-day performance as they signal the firm's ability to undertake innovative projects by fully exploiting the firm's core technology (Barker & Mueller, 2002). However, non-technology firms tend to have better prospects when CEOs have the necessary managerial skills to effectively manage the existing resources (Souder et al., 2012; King et al., 2016). In this section, we test the hypothesis that the negative relationship between CEO founder age and IPO pricing will be more pronounced for non-technology firms, while the positive relationship between CEO founder and IPO pricing will be more pronounced for technology firms. To test our hypothesis, we split the sample into high and low R&D firms and regress CEO characteristics on underpricing.

The results are presented in Table 7. Models 1 and 2 show IPO firms with founders in the key CEO position in high vs. low R&D intensity environments, and models 3 and 4 show the same details for CEO age. Our results show that the CEO founder variable is positively significant (at the 5% level) with underpricing when R&D intensity is high but has no significant effect in non-R&D industries. On the other hand, CEO age increases the initial return on the IPO day (at the 5% significance level) only in non-technology industries. The result that CEO founders in intensive industries do indeed impose a discount on the first trading day performance is in line with previous work (Block, 2012; Abebe & Alvarado, 2013) in many cases, confirming that a founder's ongoing management - characterised by a higher propensity for risky projects and a lower level of expertise - are factors that reduce listing performance. Meanwhile, our finding that increasing CEO age reduces initial returns in non-intensive industries is also consistent with previous studies (Hambrick et al., 2005; Souder et al., 2012; King et al., 2016; Andreou et al., 2017). These authors highlight the importance of mature CEOs' experience in professional management, such as the ability to focus on standardisation, efficiency, coordinating relationships with different departments and different customers, and demonstrating effective cash management strategies.

Table 7. "R&D vs non-R&D firms"

	Underpricing		Underpricing	
	R&D firms	Non-R&D firms	R&D firms	Non-R&D firms
VARIABLES	(1)	(2)	(3)	(4)
CEO founder	**0.115****	**0.007**		
	(0.050)	**(0.025)**		
CEO age			**-0.006**	**-0.003****
			(0.004)	**(0.001)**
LN Proceeds	-0.052*	-0.030***	-0.057**	-0.028***
	(0.028)	(0.010)	(0.027)	(0.009)
Board size	-0.003	-0.004	-0.006	-0.002
	(0.009)	(0.003)	(0.008)	(0.003)
Firm Age	-0.003*	0.000	-0.003**	0.000
	(0.001)	(0.000)	(0.001)	(0.000)
EPS	-0.121***	0.014	-0.135***	0.018
	(0.045)	(0.022)	(0.047)	(0.032)
Leverage	-0.001	0.001	-0.026	0.001
	(0.023)	(0.002)	(0.024)	(0.045)
Dotcom Period	0.487***	0.200***	0.489***	0.175***
	(0.057)	(0.042)	(0.055)	(0.079)
Overhang	0.047***	0.011**	0.035***	0.010***
	(0.013)	(0.004)	(0.011)	(0.064)
Financial Crisis	0.046	-0.011	0.051	-0.021
	(0.094)	(0.020)	(0.065)	(0.004)
Underwriter	0.132**	0.06***	0.114**	0.061***
	(0.056)	(0.021)	(0.077)	(0.028)
VC	0.132**	0.129***	0.091	0.113***
	(0.067)	(0.033)	(0.034)	(0.035)
Auditor	0.054	-0.019	-0.010	-0.029
	(0.063)	(0.029)	(0.068)	(0.027)
Constant	-0.379**	-0.092*	0.121	0.096
	(0.153)	(0.054)	(0.325)	(0.092)
Observations	652	1,255	652	1,255
R-squared	0.210	0.109	0.210	0.109

We split the samples, namely "R&D companies and non-R&D companies". This table investigate whether the CEO founder and CEO age have an impact on the enterprise with R&D/non-R&D.

8. Conclusion

Our application of quantile regression in the context of the relationship between CEO founder/CEO age and IPO performance on the trading day revealed that the positive effect of a CEO founder on the first-day return is significant only for issuers with an intermediate level of underpricing; the presence of the negative significant effect of CEO age on the initial return is above the 40th percentile. It is precisely this subtle conditional relationship that quantile regression can help us uncover the hidden relationship between CEO characteristics and IPO performance depending on the issuer's performance level, providing a novel tool to realise complex conclusions from the literature.

In addition, issuers led by CEO founders increase uncertainty about issuer quality within the range of listing firms, but for large firms, old CEOs perform better than young CEOs in reducing first-day market friction; the mature CEO has a strong negative impact on initial returns only in low-R&D firms, and a CEO founder has a significant positive association with underpricing in high-R&D firms. Overall, our results provide some interesting preliminary evidence on this highly important but relatively under-researched topic in the IPO literature.

We'll discuss the limitations of our work and suggest avenues for future work. First, one of the constraints of our research is that listed firms represent a window on small

firms and start-ups, which tend to have a limited historical record and thus information asymmetries are particularly high. Future research could extend the findings to firms with different life cycles or different ex-ante uncertainty conditions. Second, future studies could examine the determinants of IPO performance in other countries with different managerial backgrounds, with the aim of obtaining broader insights given the current study's focus on the US context.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

References

Abebe, M., & Anthony Alvarado, D. (2013). Founder-CEO status and firm performance: an exploratory study of alternative perspectives. *Journal of Strategy and Management*, 6(4), 343-357. https://doi.org/10.1108/JSMA-03-2013-0014

Aboody, D., & B. Lev, (2000). "Information Asymmetry, R&D, and Insider Gains", *Journal of Finance*, 55: 2747–2766.

Adams, R., Almeida, H., & Ferreira, D. (2009). Understanding the relationship between founder– CEOs and firm performance. *Journal of Empirical Finance,* 16(1), 136-150. https://doi.org/10.1016/j.jempfin.2008.05.002

Aggarwal, R. K., Krigman, L., & Womack, K. L. (2002). Strategic IPO underpricing, information momentum, and lockup expiration selling. *Journal of Financial Economics,* 66(1), 105-137. https://doi.org/10.1016/S0304-405X(02)00152-6

Ambos, T. C., & Birkinshaw, J. (2010). How do new ventures evolve? An inductive study of archetype changes in science-based ventures. *Organization Science,* 21(6), 1125-1140. https://doi.org/10.1287/orsc.1090.0504

An, H., & Chan, K. (2008). Credit ratings and IPO pricing. *Journal of Corporate Finance,* 14(5), 584-595. https://doi.org/10.1016/j.jcorpfin.2008.09.010

Anderson, R. C., & Reeb, D. M. (2003). Foundingfamily ownership and firm performance: evidence from the S&P 500. *The Journal of Finance,* 58(3), 1301-1328. https://doi.org/10.1111/1540-6261.00567

Andreou, P. C., Louca, C., & Petrou, A. P. (2017). CEO Age and Stock Price Crash Risk. *Review of Finance,* 21(3), 1287–1325. https://doi.org/10.1093/rof/rfw056

Ashton, M. C., & Lee, K. (2016). Age trends in HEXACO-PI-R self-reports. *Journal of Research in Personality*, 64, 102–111. https://doi.org/10.1016/j.jrp.2016.08.008

Bai, X., Tsang, E. W. K., & Xia, W. (2020). Domestic versus foreign listing: Does a CEO's educational experience matter? *Journal of Business Venturing*, 35(1), 105906. https://doi.org/10.1016/j.jbusvent.2018.10.004

Barker, V. L., & Mueller, G. C. (2002). CEO Characteristics and Firm R&D Spending. *Management Science,* 48(6), 782-801. https://www.jstor.org/stable/822629

Bassyouny, H., Abdelfattah, T., & Tao, L. (2020). Beyond narrative disclosure tone: the upper echelons theory perspective. *International Review of Financial Analysis,* 70, 101499. https://doi.org/10.1016/j.irfa.2020.101499

Beatty, R.P. (1989). Auditor reputation and the pricing of initial public offerings. *Accounting Review*, 64(4), 693-709.

Beckman, C. M., & Burton, M. D. (2008). Founding the future Path dependence in the evolution of top management teams from founding to IPO. *Organization Science,* 19(1), 3-24. https://www.jstor.org/stable/25146160

Benveniste, L. M., & Spindt, P. A. (1989). How Investment Bankers Determine the Offer Price and Allocation of New Issues. *Journal of Financial Economics,* 24 (2), 343–361. https://doi.org/10.1016/0304-405X(89)90051-2

Bertoni, F., Meoli, M., & Vismara, S. (2014). Board independence, ownership structure and the valuation of IPOs in continental Europe. *Corporate Governance: An International Review, 22*(2), 116-131. https://doi.org/10.1111/corg.12051

Bertrand, M., & Mullainathan, S. (2003). Enjoying the Quiet Life? Corporate Governance and Managerial Preferences. *Journal of Political Economy,* 111(5), 1043. https://doi.org/10.1086/376950

Beatty, R., & Ritter, J. (1986). Investment banking, reputation, and the underpricing of initial public offerings, *Journal of Financial Economics*, 15, 213-232. https://doi.org/10.1016/0304-405X(86)90055-3

Bhagat, S., Bolton, B. J., & Subramanian, A. (2010). Bhagat, Sanjai and Bolton, Brian J. and Subramanian, Ajay, CEO Education, CEO Turnover, and Firm Performance. Available at SSRN: https://ssrn.com/abstract=1670219 or https://dx.doi.org/10.2139/ssrn.1670219

Block, J. H. (2012). R&D investments in family and founder firms: An agency perspective. *Journal of Business Venturing,* 27(2), 248-265. https://doi.org/10.1016/j.jbusvent.2010.09.003

Boeker, W., & Karichalil, R. (2002). Entrepreneurial transitions: factors influencing founder departure. *Academy of Management Journal,* 45(3), 818—826https://www.jstor.org/stable/3069314

Boeker, W., & Wiltbank, R. (2005). New Venture Evolution and Managerial Capabilities. Organization Science, 16(2), 123–133. http://www.jstor.org/stable/25145955

Briscoe, F., Chin, M. K., & Hambrick, D. C. (2014). CEO Ideology as an Element of the Corporate Opportunity Structure for Social Activists. *The Academy of Management Journal,* 57(6), 1786–1809. http://www.jstor.org/stable/43589330

Busenitz, L. W., West, G. P., Shepherd, D., Nelson, T., Chandler, G. N., & Zacharakis, A. (2003). Entrepreneurship Research in Emergence: Past Trends and Future Directions. *Journal of Management*, 29(3), 285-308. https://doi.org/10.1016/S0149-2063/_03/_00013-8

Carter, R., & Manaster, S. (1990). Initial public offerings and underwriter reputation. *The Journal of Finance, 45*(4), 1045-1067. https://doi.org/10.1111/j.1540-6261.1990.tb02426.x

Carter, B., F. Dark, and R. Singh, (1998). Underwriter reputation, initial returns, and the long run performance of IPO stocks, *Journal of Finance*, 53, 285-311.

Certo, S. T. (2003). Influencing initial public offering investors with prestige: Signaling with board structures. *Academy of Management Review*, 28(3), 432-446. https://doi.org/10.5465/amr.2003.10196754

Chancharat, N., Krishnamurti, C., & Tian, G. (2012). Board structure and survival of new economy IPO firms. *Corporate Governance: An International Review,* 20(2), 144–163.

https://doi.org/10.1111/j.1467-8683.2011.00906.x

Chevalier, J., & Ellison, G. (1999). Are Some Mutual Fund Managers Better than Others? Cross-Sectional Patterns in Behavior and Performance. *The Journal of Finance*, 54(3), 875–899. http://www.jstor.org/stable/222428

Chiang, Y. M., Lowry, M., & Qian, Y. (2019). The information advantage of underwriters in IPOs. *Management Science,* 65(12), 5721-5740. https://doi.org/10.1287/mnsc.2018.3126

Child, J. (1975). Managerial and Organizational Factors Associated with Company Performance–Part Ii. a Contingency Analysis. *Journal of Management Studies,* 12(1), 12–27. https://doi.org/10.1111/j.1467-6486.1975.tb00884.x

Colombo, M. G., Meoli, M., & Vismara, S. (2019). Signaling in science-based IPOs: The combined effect of affiliation with prestigious universities, underwriters, and venture capitalists. *Journal of Business Venturing*, 34(1), 141-177. https://doi.org/10.1016/j.jbusvent.2018.04.009

Conyon, M. J., & He, L. (2017). Firm performance and boardroom gender diversity: a quantile regression approach. *Journal of Business Research,* 79, 198-211. https://doi.org/10.1016/j.jbusres.2017.02.006

Daily, C. M., & Dalton, D. R. (1992). Financial performance of founder-managed versus professionally managed small corporations. *Journal of Small Business Management,* 30(2), 25–34.

Dechow, P. M., & Sloan, R. G. (1991). Executive incentives and the horizon problem. *Journal of Accounting & Economics,* 14(1), 51–89.

Deephouse, D., & Carter, S. (2005). An examination of differences between organizational legitimacy and organizational reputation. *Journal of Management Studies,* 42(2), 329–360. https://doi.org/10.1111/j.1467-6486.2005.00499.x

Elsayed, K. (2007). Does CEO duality really affect corporate performance? *Corporate Governance,* 15(6), 1203-1214. https://doi.org/10.1111/j.1467-8683.2007.00641.x

Ettore Croci, Alfonso del Giudice, & Håkan Jankensgård. (2017). CEO Age, Risk Incentives, and Hedging Strategy. *Financial Management*, 46(3), 687–716.

Fahlenbrach, R. (2009). Founder-CEOs, investment decisions, and stock market performance. *Journal of financial and Quantitative Analysis*, 44(2), 439-466.

Fan, J., Wong, T. J. , & Zhang, T. (2012). Founder succession and accounting properties. *Contemporary Accounting Research*, 29(1), 238-311.

Fraser, S., & Greene, F. J. (2006). The effects of experience on entrepreneurial optimism and uncertainty. *Economica*, *73*(290), 169-192. https://doi.org/10.1111/j.1468-0335.2006.00488.x

Gao, S., Brockman, P., Meng, Q., & Yan, X. (2020). Differences of opinion, institutional bids, and IPO underpricing. *Journal of Corporate Finance,* 60, 101540. https://doi.org/10.1016/j.jcorpfin.2019.101540

Gao, N., & Jain, B. A. (2011). Founder CEO management and the long-run investment performance of IPO firms. *Journal of Banking & Finance,* 35(7), 1669-1682. https://doi.org/10.1016/j.jbankfin.2010.11.008

Giannetti, M., Liao, G., & Yu, X. (2015). The brain gain of corporate boards: evidence from china. *Journal of Finance,* 70(4), 1629–1682. https://doi.org/10.1111/jofi.12198

Gounopoulos, D., Kallias, A., Kallias, K., & Tzeremes, P. G. (2017). Political money contributions of U.S. IPOs. *Journal of Corporate Finance,* 43, 19– 38. https://doi.org/10.1016/j.jcorpfin.2016.12.011

Graf-Vlachy, L., Bundy, J., & Hambrick, D. C. (2020). Effects of an Advancing Tenure on CEO Cognitive Complexity. *Organization Science,* 31(4), 936–959. https://doi.org/10.1287/orsc.2019.1336

Guo, R. J., Lev, B., & Shi, C. (2006). Explaining the short- and long-term IPO anomalies in the US by R&D. *Journal of Business Finance & Accounting,* 33(3-4), 580–586.

Finkelstein, S., & Hambrick, D.C. (1996). Strategic leadership: top executives and their effects on organizations. *Cincinnati, OH: South-Western College Pub.

Gupta, N., & Mahakud, J. (2020). CEO characteristics and bank performance: Evidence from India. *Managerial Auditing Journal*, 35(8), 1057-1093. https://doi.org/10.1108/MAJ-03-2019-2224

Hambrick, D. C. (2007). The field of management's devotion to theory: too much of a good thing?. *Academy of Management Journal*, 50(6), 1346-1352.

Hao, L., & Naiman, D. Q. (2007). Quantile Regression. London, UK: Sage.

Hambrick, D. C., & Mason, P. A. (1984). Upper Echelons: The Organization as a Reflection of Its Top Managers. The Academy of Management Review, 9(2), 193–206. https://doi.org/10.2307/258434

Hambrick, D. C., Finkelstein, S., & Mooney, A. C. (2005). Executive Job Demands: New Insights for Explaining Strategic Decisions and Leader Behaviors. The Academy of Management Review, 30(3), 472–491. http://www.jstor.org/stable/20159139

Hirshleifer, D., Hsu, P. H., & Li, D. (2013). Innovative efficiency and stock returns. *Journal of Financial Economics,* 107(3), 632-654. https://doi.org/10.1016/j.jfineco.2012.09.011

He, L. (2008). Do founders matter? A study of executive compensation, governance structure and firm performance. *Journal of Business Venturing,* 23(3), 257-279. https://doi.org/10.1016/j.jbusvent.2007.02.001

Heckman, J. J. (1979). Sample Selection Bias as a Specification Error. Econometrica, 47(1), 153–161. https://doi.org/10.2307/1912352

Heeley, M. B., Matusik, S. F., & Jain, N. (2007). Innovation, Appropriability, and the Underpricing of Initial Public Offerings. The Academy of Management Journal, 50(1), 209–225. http://www.jstor.org/stable/20159848

Herrmann, P., & Datta, D. K. (2010). CEO Experiences: Effects on the Choice of FDI Entry Mode. *Journal of Management Studies,* 43(4), 755-778. https://doi.org/10.1111/j.1467-6486.2006.00610.x

Huang, H. W., Rose-Green, E., & Lee, C. C. (2012). CEO age and financial reporting quality. *Accounting Horizons,* 26(4), 725-740. https://doi.org/10.2308/acch-50268

Jayaraman, N., Khorana, A., & F, E. N. (2000). Research notes and commentaries CEO founder status and firm financial performance. *Strategic Management Journal,* 21(12), 1215-1224. https://doi.org/10.1002/1097-0266(200012)21:12%3C1215::AID-SMJ146>3.0.CO;2-0

Jensen, M. C. (1993). The modern industrial revolution, exit, and the failure of internal control systems. *The Journal of Finance*, 48(3), 831-880.

Jenter, D., & Lewellen, K. (2015). CEO preferences and acquisitions. *The Journal of Finance*, 70(6), 2813-2852.

King, T., Srivastav, A., & Williams, J. (2016). What's in an education? Implications of CEO education for bank performance. *Journal of Corporate Finance*, 37, 287-308.

https://doi.org/10.1016/j.jcorpfin.2016.01.003
Koenker, R., & Bassett, G. (1978). Regression Quantiles. *Econometrica*, 46(1), 33–50. https://doi.org/10.2307/1913643
Koenker, R., & Hallock, K. F. (2001). Quantile Regression. The Journal of Economic Perspectives, 15(4), 143–156. http://www.jstor.org/stable/2696522
Lee, J. M., Hwang, B. H., & Chen, H. (2017). Are founder CEOs more overconfident than professional CEOs? Evidence from S&P 1500 companies. *Strategic Management Journal,* 38(3), 751-769. https://doi.org/10.1002/smj.2519
Lee, J. M., Kim, J., & Bae, J. (2020). Founder CEOs and Innovation: Evidence from CEO Sudden Deaths in Public Firms. *Research Policy,* 49(1), 103862. https://doi.org/10.1016/j.respol.2019.103862
Li, F. (2010). The information content of forward-looking statements in corporate filings—A naïve Bayesian machine learning approach. *Journal of Accounting Research,* 48(5), 1049–1102. https://doi.org/10.1111/j.1475-679X.2010.00382.x
Li, F., & Srinivasan, S. (2011). Corporate governance when founders are directors. *Journal of Financial Economics,* 102(2), 454-469. https://doi.org/10.1016/j.jfineco.2010.11.006
Li, X., Wang, S. S., & Wang, X. (2019). Trust and IPO underpricing. *Journal of Corporate Finance,* 56, 224-248. https://doi.org/10.1016/j.jcorpfin.2019.02.006
Liu X., & Ritter, J. R. (2011). Local underwriter oligopolies and IPO underpricing. *Journal of Financial Economics.*102(3), 579-601.
Ljungqvist, A., & Wilhelm, W. J. (2003). IPO Pricing in the Dot-Com Bubble. The Journal of Finance, 58(2), 723–752. http://www.jstor.org/stable/3094556
Loughran, T., & Ritter, J. (2002). Why don't issuers get upset about leaving money on the table of IPOs? *Review of Financial Studies,* 15, 413-443. https://doi.org/10.1093/rfs/15.2.413
Loughran, T., & Ritter, J. (2004). Why Has IPO Underpricing Changed over Time? *Financial Management*, 33(3), 5–37. http://www.jstor.org/stable/3666262
Lowry, M., & Schwert, G. W. (2004). Is the IPO pricing process efficient? *Journal of Financial Economics,* 71(1), 3-26. https://doi.org/10.1016/S0304-405X(03)00205-8
Lowry, M., & Murphy, K. (2007). Executive stock options and IPO underpricing. *Journal of Financial Economics,* 85(1), 39–65. https://doi.org/10.1016/j.jfineco.2006.05.006
Manner, M. (2010). The impact of CEO characteristics on corporate social performance. *Journal of Business Ethics*, 93(1), 53-72.
Masulis, R. W., & Mobbs, S. (2014). Independent director incentives: where do talented directors spend their limited time and energy? *Journal of Financial Economics,* 111(2), 406-429. https://doi.org/10.1016/j.jfineco.2013.10.011
Miller, D., Xu, X., & Mehrotra, V. (2015). When is human capital a valuable resource? The performance effects of IVY league selection among celebrated CEOs. *Strategic Management Journal*, 36(6), 930–944. http://www.jstor.org/stable/43897813
Mosteller, F., & Tukey, J. W. (1977). Data analysis and regression. A second course in statistics. Addison-Wesley Series in Behavioral Science: Quantitative Methods. London, UK: Pearson.
Murphy, K. J., & Zabojnik, J. (2007). Managerial Capital and the Market for CEOs. Available at SSRN: https://ssrn.com/abstract=984376 or https://dx.doi.org/10.2139/ssrn.984376
Megginson, W. L., & Weiss, K. A. (1991). Venture Capitalist Certification in Initial Public Offerings. *The Journal of Finance*, 46(3), 879–903. https://doi.org/10.2307/2328547
Morris, S. S., Alvarez, S. A., Barney, J. B., & Molloy, J. C. (2017). Firm-specific human capital investments as a signal of general value: Revisiting assumptions about human capital and how it is managed. *Strategic Management Journal,* 38(4), 912-919. https://doi.org/10.1002/smj.2521
Nahata, R. (2019). Success is good but failure is not so bad either: serial entrepreneurs and venture capital contracting. *Journal of Corporate Finance,* 58, 624-649. https://doi.org/10.1016/j.jcorpfin.2019.07.006
Nanda, R., Samila, S., & Sorenson, O. (2020). The persistent effect of initial success: Evidence from venture capital. *Journal of Financial Economics,*137(1), 231-248. https://doi.org/10.1016/j.jfineco.2020.01.004.
Nelson T. (2003). The persistence of founder influence management, ownership, and performance effects at initial public offering. *Strategic Management Journal,* 24(8), 707-724. https://doi.org/10.1002/smj.328
Nielsson, U., & Wójcik, D. (2016). Proximity and IPO underpricing. *Journal of Corporate Finance,* 38, 92-105. https://doi.org/10.1016/j.jcorpfin.2016.03.012
Pollock, F. T. G. (2004). Effects of social capital and power on surviving transformational change: the case of initial public offerings. *The Academy of Management Journal,* 47(4), 463-481. https://doi.org/10.5465/20159597
Prendergast, C., & Stole, L. (1996). Impetuous Youngsters and Jaded Old-Timers: Acquiring a Reputation for Learning. Journal of Political Economy, 104(6), 1105–1134. http://www.jstor.org/stable/2138935
Ramdani, D., & Witteloostuijn, A. (2010). The impact of board independence and CEO duality on firm performance: a quantile regression analysis for Indonesia, Malaysia, South Korea and Thailand. *British Journal of Management,* 21(3), 607-627. https://doi.org/10.1111/j.1467-8551.2010.00708.x
Richard, O. C., Wu, J., Markoczy, L. A., & Chung, Y. (2019). Top management team demographicfaultline strength and strategic change: What role does environmental dynamism play?. *Strategic Management Journal*, 40(6), 987-1009.
Ritter, J. R., & Welch, I. (2002). A Review of IPO Activity, Pricing, and Allocations. The Journal of Finance, 57(4), 1795–1828. http://www.jstor.org/stable/3094524
Ross, J., & Staw, B. M. (1993). Organizational escalation and exit: lessons from the shoreham nuclear power plant. *Academy of Management Journal,* 36(4), 701-732. https://doi.org/10.5465/256756
Schuster, C. L., Nicolai, A. T., & Covin, J. G. (2020). Are Founder-Led firms less susceptible to managerial myopia? *Entrepreneurship Theory and Practice,* 44(3), 391-421. https://doi.org/10.1177/1042258718806627
Serfling, M. A. (2014). CEO age and the riskiness of corporate policies. *Journal of Corporate Finance,* 25, 251–273. https://doi.org/10.1016/j.jcorpfin.2013.12.013
Slater, D. J., & Dixon-Fowler, H. R. (2009). CEO International Assignment Experience and Corporate Social Performance. *Journal of Business Ethics*, 89(3), 473-489.
Souder, D., Simsek, Z., & Johnson, S. G. (2012). The differing effects of agent and founder CEOs on the firm's market

expansion. *Strategic Management Journal,* 33(1), 23-41. https://doi.org/10.1002/smj.944

Spence, M. (1973). Job Market Signaling. *The Quarterly Journal of Economics*, 87(3), 355–374. https://doi.org/10.2307/1882010

Spence, M. (2002). Signaling in Retrospect and the Informational Structure of Markets. *The American Economic Review*, 92(3), 434–459. http://www.jstor.org/stable/3083350

Stam, E., & Wennberg, K. (2009). The roles of R&D in new firm growth. *Small Business Economics*, 33, 77–89. https://doi.org/10.1007/s11187-009-9183-9

Stoll, H. R., & Curley, A. J. (1970). Small Business and the New Issues Market for Equities. *The Journal of Financial and Quantitative Analysis*, 5(3), 309–322. https://doi.org/10.2307/2329998

Vroom, V. H., & Pahl, B. (1971). Relationship between age and risk taking among managers. *Journal of Applied Psychology*, 55(5), 399–405. https://doi.org/10.1037/h0031776

Xie, X.-Y., Feng, W., & Hu, Q. (2020). Does new venture team power hierarchy enhance or impair new venture performance? A contingency perspective. *Journal of business venturing,* 35(6), 106059. https://doi.org/10.1016/j.jbusvent.2020.106059

Wasserman, N. (2003). Founder-CEO Succession and the Paradox of Entrepreneurial Success. *Organization Science*, 14(2), 149–172. http://www.jstor.org/stable/4135157

Yim, S. (2013). The acquisitiveness of youth: CEO age and acquisition behavior. *Journal of Financial Economics,* 108(1), 250-273https://doi.org/10.1016/j.jfineco.2012.11.003

Yoon, W., Kim, S. J., & Song, J. (2016). Top management team characteristics and organizational creativity. *Review of Managerial Science*, 10(4), 757–779. https://doi.org/10.1007/s11846-015-0175-7

Zhang, L. (2019). Founders matter! Serial entrepreneurs and venture capital syndicate formation. *Entrepreneurship Theory and Practice,* 43(5), 974-998. https://doi.org/10.1177/1042258718758641

Appendix

Appendix. Definition of variables

Panel A. Dependent variable(s)	
Underpricing	The underpricing level is equal to (p1-p0) / P0, Where P0 is the initial IPO price and P1 is the closing price on the first day of listing.
Panel B. CEOs Characteristics	
CEO founders	Dummy variable: 1 for the founder serving as CEO, 0 otherwise.
CEO ages	The age of CEOs in the listing day
Panel C. IPOs Characteristics	
Underwriter	Dummy variable: 1 for most prestigious underwriters, 0 otherwise. Prestige rankings are from Jay Ritter's underwriter database.
VC	Dummy variable: 1 for venture backed firms, 0 otherwise.
Overhang	The ratio of the number of shares reserved by pre-IPO shareholders to total equity issued at the time of the offering.
Dotcom period	Dummy variable: 1 for dotcom period from 1995 to 2001, otherwise 0.
Financial crisis	Dummy variable: 1 for the years of the last financial crisis in the USA (2007-2009), otherwise 0.
Ln Proceeds	Alternative variable to company size.
Board size	Total number of directors on the board.
Technology firm	Dummy variable: 1 for IPO firms with SIC codes 3571, 3572, 3575, 3577, 3578 (computer hardware), 3661, 3663, 3669 (communications equipment), 3671, 3672, 3674, 3675, 3677, 3678, 3679 (electronics), 3812 (navigation equipment), 3823, 3825, 3826, 3827, 3829 (measuring and controlling devices), 3841, 3845 (medical instruments), 4812, 4813 (telephone equipment), 4899 (communications services), and 7371, 7372, 7373, 7374, 7375, 7378, and 7379 (software), otherwise 0.
Auditor	Dummy variable: 1 for big four auditors, 0 otherwise.
Panel D. Firm Characteristics	
Firm age	Company age refers to the time from the establishment of the enterprise to the first day of offering
EPS	The net profit of the enterprise or the net loss of the enterprise each share by each common shareholder.
Leverage	The ratio of long-term liabilities to equity at the end of the year.