CEO Relative Age and Corporate Risk-Taking

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Keywords: relative age effect, risk-taking, CEO, overconfidence

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1. Introduction

Corporate risk-taking plays an important role in improving the efficiency of using assets and the profit opportunities, returns, and firm growth that result (Faccio, Marchica, and Mura, 2011). There is increasing academic discussion of the determinants of corporate risk-taking from the perspectives of institutional factors (Bargeron, Lehn, and Zutter, 2010; Li, Griffin, Yue, and Zhao, 2013; Arif and Lee, 2014; Armstrong, Glaeser, Huang, and Taylor, 2019; Jiang and Chen, 2021) and firm characteristics (Wright, Ferris, Sarin, and Awasthi, 1996; Cheng, 2008; Kini and Williams, 2012; Ciconte III, Knechel, and Mayberry, 2014). In addition, the literature documents that corporate risk-taking is shaped by managerial experiences and traits, including gender (Faccio, Marchica, and Mura, 2016), age (Peltomäki, Sihvonen, Swidler, and Vähämaa, 2021), duality (Li and Tang, 2010), early-life disasters (Bernile, Bhagwat, and Rau, 2017), military experience (Benmelech and Frydman, 2015), and pilot credentials (Cain and McKeon, 2016). Building on studies in the field of education[1], we find that the relative age differences among CEOs generated by the commencement of formal schooling affect CEO overconfidence and managerial decisions regarding corporate risk-taking.

In many countries, primary school admission is determined by a single cutoff date, typically falling on January 1 or September 1. Children born immediately before the cutoff date become the youngest in the class, approximately 20% younger than the oldest, who were born immediately after the cutoff date but in the previous year. Children who are thus "relatively younger" at school entry are at a disadvantage, because they are physically, emotionally, and cognitively less developed than their older peers (Davis, Trimble, and Vincent, 1980; Bickel, Zigmond, and Strayhorn, 1991; Thompson, Barnsley, and Battle, 2004; Helsen, Van Winckel, and Williams, 2005; Peña, 2017). This age-based

[1] Studies in this area show that relatively older children have better grades (Puhani and Weber, 2008), more years of education (Mühlenweg and Puhani, 2010), and greater self-esteem (Thompson, Barnsley, and Battle, 2004). They are also more likely to become high school leaders (Dhuey and Lipscomb, 2008). Furthermore, students' initial maturity differences have long-lasting effects on their higher education opportunities, career performance, and marriages (Bedard and Dhuey, 2006; Fredriksson and Ockert, 2006; Peña, 2017).

performance differential caused by the cutoff date (COD) policy at primary school entry, as noted by Angrist and Keueger (1991) and Bedard and Dhuey (2006), is referred to as the relative age effect (RAE). RAE-related early childhood experiences, as documented in the literature, are associated with self-confidence in childhood (Pajares, 1996; Thompson, Barnsley, and Battle, 2004; Bedard and Dhuey, 2006) and have implications for career outcomes, such as the performance of politicians (Muller and Page, 2016) and fund managers (Bai, Ma, Mullally, and Solomon, 2019). We focus on CEO behavior by exploiting China's unique institutional context.

We validate the positive link between the RAE and overconfidence using a sample of 11,369 respondents surveyed by the 2013 China Health and Retirement Longitudinal Studies (CHARLS)[2]. Following Huang and Luo (2015), we measure an individual's overconfidence using her perception of her health relative to her actual health condition. This finding points to the possible long-lasting consequences of relative age for individuals' self-confidence: an age-based differential in self-confidence in childhood can propagate forward, with greater self-confidence in early life evolving into overconfidence in adulthood.

Building on the external validity test above, we hypothesize that relatively older CEOs, advantaged by their age since childhood, tend to overestimate their managerial ability and thus are overly optimistic about the firm's future performance. Consequently, they tend to make risky, aggressive financial and investment decisions. We construct a representative sample of firms listed in China's A-share market from 2006 to 2018 with information about CEOs' birth months and years. Our findings suggest that compared with firms managed by the relatively youngest CEOs, firms managed by the relatively oldest CEOs have 8.7% higher volatility in their profits and a 7.1% higher stock risk relative to the mean values, all else being equal. The CEO RAE on firm risk-taking manifests itself more strongly if the CEO is a man or is both the chairperson and the CEO. In addition, the CEO RAE is evidenced in corporate financial policies, in that

[2] Details of the external validity test are presented in Section 2.2.

firms led by relatively older CEOs are exposed to higher leverage ratios and lower cash holdings. Furthermore, relatively older CEOs have a lower propensity to engage in more conservative acquisition activities, such as acquisitions paid for with a firm's stock (as opposed to cash payments) and acquisitions made within the same industry (as opposed to cross-industry acquisitions).

The additional results corroborate the hypothesis that overconfidence functions to influence how CEO relative age affects corporate risk-taking. We find that relatively older CEOs exhibit various types of overconfident managerial behavior, including overinvestment, habitual acquisition of the firm's stock, and overestimation of the firm's future earnings. With respect to firm performance and crash risk, there is evidence that all else being equal, firms with relatively older CEOs have lower profitability but a higher price crash risk (approximately a 21% lower ROE and a 13% higher crash risk relative to the mean). This finding reinforces our main conclusion that a relatively older CEO tends to exhibit overconfidence, exposing the firm to greater risk.

We perform a battery of tests to verify the robustness of our results. In addition to alternative measures of outcome variables, we explicitly account for cohort effects and regional heterogeneities in school enrollment requirements, possible disturbances arising from China's Cultural Revolution, "academic redshirting," and issues that may arise from the fact that some CEOs are born around (rather than in) the cutoff months, for example in August or October. Through these robustness checks, we find consistent evidence that the relative age of CEOs is positively associated with corporate risk-taking.

The advantages of studying the persistence of the RAE in the context of the Chinese school system are threefold. First, China has long had a nationwide single cutoff date of September 1 for primary school admission, enabling a clear identification of individuals' relative age without the possibility of a measurement error resulting from the different cutoff dates (such as in the U.S., where the cutoff date for school entry differs by state).[3]

[3] Further details of the consequences of the different cutoff dates, together with the advantages of a sample in the context of the Chinese school system, are discussed in Section 2.1.

Second, ability-differentiated learning groups during the primary grades, which are a feature of school systems in developed countries, substantially interact with relative maturity and thus affect subsequent skill accumulation throughout the educational process (Bedard and Dhuey, 2006). In contrast, Chinese primary schools do not engage in this type of ability-based sorting into groups, thus netting out the influence of this confounding factor. Third, in industrial economies before 1980, there was a great deal of interregional migration, most notably the Great Migration in the U.S. in the middle of the 20th century, which had a significant impact on educational outcomes (Pribesh and Downey, 1999; Baran, Chyn, and Stuart, 2022). In contrast, the impacts of childhood migration confounded with the RAE are limited in China because the *hukou* (domicile registration) system impedes population interregional mobility.[4] In this regard, a sample in the context of the Chinese school system, which lacks the abovementioned disturbances, provides a solid empirical framework to study the impact of the RAE.

This paper contributes to several strands of the literature. First, it adds to the large body of literature examining managerial traits and individual experiences that influence corporate decision-making, such as gender (Huang and Kisgen, 2013), age (Serfling, 2014; Peltomäki, Sihvonen, Swidler, and Vähämaa, 2021), education (Bertrand and Schoar, 2003), personal leverage (Cronqvist, Makhija, and Yonker, 2012), life events such as marriage (Roussanov and Savor, 2014), early-life disasters (Bernile, Bhagwat, and Rau, 2017)), military experience (Malmendier, Tate, and Yan, 2011; Benmelech and Frydman, 2015), and pilot credentials (Cain and McKeon, 2016; Sunder, Sunder, and Zhang, 2017). Our paper provides the first comprehensive evidence that a CEO's relative age at primary school entry, a managerial trait that has been overlooked in the literature, plays a critical role in corporate risk-taking.

Second, our findings suggest that the mechanism of the RAE on corporate risk-taking rests on the positive relation between the CEO's relative age and overconfidence,

[4] China's *hukou* system is a domicile registration system formalized in 1958 with the intention to control labor mobility (Cheng and Selden, 1994; Chan and Zhang, 1999).

complementing the literature on managerial overconfidence and corporate policies (Malmendier and Tate, 2005, 2008; Malmendier, Tate, and Yan, 2011; Ahmed and Duellman, 2013; Chen, Ho, and Yeh, 2020; Chung and Hribar, 2021). To the best of our knowledge, our study provides the first comprehensive evidence of the role of relative age in CEO overconfidence and subsequent managerial decisions regarding corporate risk-taking. As discussed in Section 2.2, our external validity tests using 2013 CHARLS data confirm the generalizability of the positive relationship between relative age and overconfidence, indicating that overconfident behavior induced by the RAE may have broader implications beyond corporate risk-taking.

Third, this paper provides concrete evidence of the salience of the RAE in a new context, directly contributing to the large body of literature on the RAE in disciplines such as school achievement (Angrist and Keueger, 1991; Hauck and Finch Jr, 1993; Bedard and Dhuey, 2006), labor market outcomes (Fredriksson and Ockert, 2006; Peña, 2017), athletic performance (Barnsley, Thompson, and Legault, 1992; Helsen, Van Winckel, and Williams, 2005; Nolan and Howell, 2010), political selection (Muller and Page, 2016), fund manager performance (Bai, Ma, Mullally, and Solomon, 2019), entrepreneurship (Wang, Chen, and Qian, 2018), and career success (Du, Gao, and Levi, 2012; Covington, Swidler, and Yost, 2022).[5] Our findings shed new light on this literature with novel evidence that the RAE is exhibited in the context of CEOs' managerial behavior: CEOs' relative age-based advantages over their school cohorts multiply as they age, resulting in more overconfident behavior in making managerial decisions on corporate risk-taking.

[5] The two papers studying the RAE on the attainment of CEOs' position obtain mixed results, in part because of their lack of rigorous empirical analysis. Specifically, Du, Gao, and Levi (2012) show that a disproportionately small number of CEOs at Standard and Poor (S&P) 500 companies have the youngest relative age, suggesting that the RAE affects attainment of the CEO position. However, they use a small sample of 375 CEOs and simply tabulate their statistics and test the differences in the number of CEOs by birth month. Covington, Swidler, and Yost (2022) re-examine the same research question using a simple statistical analysis, but they find no evidence of the RAE on the attainment of the CEO position or firm performance. In addition to providing a descriptive summary of the relative age of 2,124 CEOs from S&P 1500 companies, they test the RAE on Tobin's Q, ROA, and ROE with cross-sectional data on 187 pairs of firms selected from propensity score matching without controlling for either CEO or firm characteristics.

The remainder of the paper is organized as follows. Section 2 introduces the institutional details of school-entry policies in China. Section 3 describes the data and empirical design. Section 4 discusses the CEO RAE on corporate risk-taking and its underlying mechanism. The additional tests on heterogeneity and additional outcomes of the RAE are presented in Section 5. Section 6 provides a collection of robustness checks. Section 7 concludes.

2. Institutional background and external validity test

2.1. Chinese primary school entrance system

Unlike the U.S., where school admission in most states is determined by a state-wide cutoff date, China has had a single nationwide enrollment cutoff date of September 1 since the 1920s. In 1927, the Education Administration Committee of the Nanjing National Government issued the "School Calendar for the 16th Year of the Republic of China," which stipulated that all primary schools should "start in autumn." The school entrance age was set at six years old in 1928 and changed to seven years old in 1952.[6] Although China implemented educational reforms during the 10-year Cultural Revolution that began in 1966, there were no statutory changes of the cutoff date or required age for primary school enrollment, as the Cultural Revolution mainly targeted students in middle

[6] In 1928, the "Provisional Regulations for Primary Schools" supplemented the entry age by setting the primary school entrance age at six years old. In 1952, the Ministry of Education published the "Provisional Constitution for Primary Schools," which explicitly stipulated that the primary school entrance age would be seven years old. Admittedly, spring enrollment (typically in March) in primary schools, although small in percentage, coexisted with autumn enrollment during the first four years after the founding of the People's Republic of China (1949–1952). However, we do not expect such multiple enrollments to invalidate our analysis, given that only 11 of the CEOs in our sample (born from 1942 to 1946) were likely to be affected. As we show in our robustness tests, the results remain unaffected if the birth cohorts pre-1962 are removed from the sample.

schools or above (Fan, 2020).[7] Since 1986, the "Compulsory Education Law of the People's Republic of China" has explicitly specified six years old as the primary school entrance age and September 1 as the single cutoff date nationwide.[8] Under the Compulsory Education Law, children who reach six years old before September 1 are required to enter primary school, whereas others, even those born in the same calendar year, must wait until the following year. Accordingly, schoolchildren born shortly before September are approximately 20% younger than schoolchildren who were born immediately after the cutoff date but during the previous year.

A sample of CEOs from Chinese listed firms is well-suited for studying the long-lasting RAE on individuals' overconfidence in adulthood. First, China's longstanding single nationwide cutoff date of September 1 for primary school entry enables a clear identification of individuals' relative age without the risk of a measurement error resulting from different cutoff dates. Given that cutoff dates for school entry differ by state in the U.S., studies using U.S. data calculate an individual's relative age based on the "assumed" cutoff date, in which case the state of birth (or the state in which an individual received a Social Security number) is assumed to be the state of residence at school entry. To some extent, these studies misclassify the relative age differences caused by frequent interstate migration, particularly the Great Migration of the 1970s. Indeed, according

[7] During the Cultural Revolution (1966–1976), educational reforms were implemented in response to Chairman Mao's decree of May 5, 1966, closing most schools, especially high schools and universities, between 1966 and 1968 (Deng and Treiman, 1997). However, no statutory change was made to the cutoff date or enrollment policies of primary schools at the national level. Although anecdotal evidence points to a possible alternative cutoff date of March 1 in certain regions from 1969 to 1973 (Wang, Chen, and Qian, 2018), the robustness tests discussed in Section 6.2 provide no evidence for it. On January 18, 1978, the Ministry of Education issued a "Pilot Scheme for the Full-time Ten-year Primary and Secondary School Teaching Plan," reinstating the rule that primary schools should only admit students meeting the September 1 cutoff date.

[8] Based on the compulsory education laws, local government educational authorities provide administrative oversight of the implementation of the school entry age rule. Parents of children reaching school age by August 31 of a given year receive a notification letter requesting that they enroll their children in primary school before a specified date. If the child needs to delay their enrollment, their parents or guardians must obtain the approval of education bureaus (at the county level or higher) based on concrete justifications, which typically involve health issues. The Compulsory Education Law, however, allows for flexibility in the school age (but not the cutoff date) such that in regions that lack the conditions for school entry at age six, entry may be deferred until age seven.

to Rosenbloom and Sundstrom (2004), an average of 13.3% to 15.2% of children aged from four to five years old moved from one state to another between 1960 and 1990 (the period covering the majority of birth cohorts in samples of prior studies).[9] Consequently, in studies on the RAE in the context of U.S. school admission, children who made an interstate move before attending primary school may be assigned an incorrect relative age based on the assumed cutoff date in the state where they were born, even though in reality they were subject to a different cutoff date in the state where they were schooled.[10]

Second, the residential and school moves that accompany interstate migration in early life have mixed effects on school performance. For example, moving may be associated with poor academic performance due to a decline in social relationships experienced by students who move (Pribesh and Downey, 1999), but recent evidence shows some notably positive impacts on the educational outcomes of children caused by the Great Migration (Baran, Chyn, and Stuart, 2022). Interregional migration during the same period was also prevalent in developed countries other than the U.S.[11] Therefore, influences associated with interregional migration in one's early life might be confounding factors that affect both the short- and long-term RAE. However, this concern is alleviated in the context of China because the *hukou* system substantially restricts population mobility. Accordingly,

[9] Geographical mobility, in particular, interstate mobility, is a well-known trait of Americans. Aisch, Gebeloff, and Quealy (2014) note that even principal inbound states like Illinois and New York saw a native-born retention rate somewhere between 65% to 80% during 1960-1990, suggesting that at least 20-30% of their native-born population migrated to other states. Among the most popular interstate migration destination, California, with nearly 50% of non-native-born residents in 1960, has a cutoff date for school entry on December 1 which is different from its popular outbound states like Texas, Arizona, New Mexico, Nevada, and Nebraska. For example, some 15-25% of people born in Nevada lived in California during 1960-1990, during which period 12-21% population born in Arizona moved to California.

[10] Consider the example of a child who is born in Texas (where the school cutoff date is September 1) and migrates to California (where the school cutoff date is December 1) before primary school admission. If her birth month were January, she would be assigned a relative age of eight based on the school cutoff in Texas, whereas her actual relative age is 11 according to the cutoff date in California, the state of schooling. Alternatively, if her birth month were October, she would be assigned a high relative age of 11 if she were assumed to have attended school in Texas, even though she is actually among the youngest at school entry in California, with an actual relative age of two.

[11] Taking 1971 as an example, a double-digit migration rate is observed in the United Kingdom (11.8%), Japan (12%), New Zealand (15.3%), and Canada (46.6%) in a five-year interval) (Greenwood, 1997).

the individuals in our sample had limited exposure to the influences of migration in childhood that are confounded with the RAE.

Third, unlike that in advanced industrial economies, primary school education in China relied on a centralized curriculum with uniform nationwide textbooks before 1987, leaving little room for adjustment and flexibility on the part of local authorities and schools. Thus, curriculum-related regional differences in educational outcomes that might be confounded with the RAE are rarer in China than in more industrialized countries. Furthermore, ability-differentiated learning groups (i.e., ability-based sorting into classes) during the primary grades were absent, or at least somewhat limited, in China before 1990. As stressed in Bedard and Dhuey (2006), a skill-based primary-school curriculum, which is common in developed countries such as the U.S., Canada, the U.K., and Australia, interacts with relative maturity and thus affects subsequent skill accumulation throughout the educational process. In this regard, a sample in the context of the Chinese education system provides an ideal platform to study the RAE without the abovementioned disturbances.

2.2. External validity test

To assess the generalizability of the causal relationship between the RAE and overconfidence, we perform an external validity test using a sample of 11,369 respondents from 150 counties in 126 cities surveyed by the 2013 China Health and Retirement Longitudinal Studies (CHARLS).[12] As shown in Table 2, the CHARLS sample is highly comparable to our main sample, considering the similar distribution pattern of birth months. We follow Huang and Luo (2015) and define *Overconfidence* as a dummy variable that equals one if the individual perceives her health, specifically her hypertension condition, as better than it actually is. Panel B of Table 1 indicates that individuals

[12] CHARLS collects a national representative sample of Chinese residents aged over 45. In 2011, the baseline national wave of CHARLS surveyed approximately 10,000 households and 17,500 individuals in 150 Chinese counties and districts. Those individuals are followed up every two years. The details of the sample's construction are presented in Appendix 2.

with a higher relative age are more overconfident about their hypertension condition, as evidenced in the 1.9% higher likelihood of underdiagnosed hypertension among those with the oldest relative age (i.e., those born in September, October, or November) than among those with the youngest relative age (i.e., those born in June, July, or August). We find consistent evidence using alternative measures of relative age, namely the continuous measure (*Relative age*) and the dummy variable (*High relative age*) defined in Equation 1. The results remain unchanged if the county fixed effect is substituted with a city or province fixed effect. We find similar results from the logit analysis: individuals with a higher relative age have a 12.7% higher likelihood of being underdiagnosed with hypertension (column 5) than their peers. A 17.4% higher likelihood of underdiagnosis is observed for those with the oldest relative ages (column 6).

This finding suggests the long-lasting consequences of relative age on individuals' self-confidence: an age-based differential in self-confidence in childhood may propagate and evolve into overconfidence in adulthood. The external validity test confirms the generalizability of the positive relationship between relative age and overconfidence, indicating that overconfident behavior induced by the RAE may have broader implications beyond corporate risk-taking.

Admittedly, one challenge associated with a sample involving a nationwide single school-entrance cutoff date is the need to disentangle the birth-month effect (seasonal effect), if any, from the RAE (Bedard and Dhuey, 2006). It is documented in the literature that the season of birth might be associated with diverse physiological traits, such as birth weight (Currie and Schwandt, 2013). To investigate this possibility, we explicitly examine whether there is a causal relationship between relative age and four birth defect-related indicators using the same sample of 2013 CHARLS data. Whereas a significant RAE on adults' overconfidence is found in Panel B of Table 1, the coefficients on the relative age variables are statistically and economically insignificant in all of the analyses shown in Panel C of Table 1. These results suggest that there is no causal relationship between relative age and an individual's health status in childhood, or likelihood of heart disease or asthma. We perform additional tests with a vector of chronic diseases and disabilities that are strongly correlated with birth defects (unreported for brevity), and the results remain unchanged.[13] In summary, the absence of the RAE on individuals' health conditions alleviates the concern that the birth-month effect is confounded with the RAE.

[Insert Table 1 about Here]

3. Data and sample construction

3.1. Corporate data sources

We compile a sample of companies listed on the main boards of the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange (SZSE). First, we obtain their CEOs' financial information and demographic characteristics from the China Stock Market and Accounting Research (CSMAR) database. Second, we manually collect each CEO's birth month—the key information used to calculate the relative age variables—from one of the following sources: public announcements, news articles, and search engines, such as Google and Baidu.[14]

Given that the median tenure of CEOs in our sample is four years, the sample is further restricted to firms that have at least four years of observations. We further exclude the following observations: 1) firms with foreign-born CEOs, who might not have been subject to China's primary school entrance policies; 2) firms in the financial and real estate industries, due to the uniqueness of their financial structures and regulatory constraints; 3) firms marked as "ST" (Special Treatment) due to irregularities in their

[13] In addition to brain damage/mental retardation and physical disabilities, we apply alternative measures of health conditions, namely a vector of chronic diseases including hypertension, dyslipidemia, diabetes or high blood sugar, cancer or malignant tumor, stroke, kidney disease, and emotional or psychiatric problems. Another measure of childhood health condition is a dummy for individuals who were confined to either their bed or their home for one month or more during childhood. No causal relationship is found between relative age and any of the abovementioned variables.

[14] We have birth month information for 3,922 CEOs, representing approximately 74% of the listed firms' CEOs over that period.

financial statements; and 4) observations with missing CEO information or firm-level data. The final sample consists of 10,049 firm-year observations from 2006 to 2018 that are associated with 2,595 CEOs from 1,011 firms.

3.2. Variables and summary statistics

3.2.1. CEO relative age

Relative age refers to the linear distance in months between an individual's birth month and September, the nationwide cutoff month for primary school entrance across China. As a result, individuals born in August, the last eligible month before the cutoff month, are the youngest members in their primary school class in a given school year, with a relative age equal to one. Those born in September become the oldest when they enter primary school in the following school year, with a highest relative age of 12. Specifically, *Relative age* is calculated as follows:

$$Relative\ age = \begin{cases} Cutoffmonth - Birthmonth, Birthmonth < Cutoffmonth \\ 12 + (Cutoffmonth - Birthmonth), Birthmonth >= Cutoffmonth \end{cases} \tag{1}$$

where $Cutoffmonth$ is September, except when relative age is redefined in placebo tests such that $Cutoffmonth$ is substituted with other calendar months. In addition to the continuous (linear) measure, we apply categorical variables that group CEOs based on their relative age as alternative measures to ensure that our results are robust to the choice of measure. *Oldest relative age* is an indicator that takes a value of one if the CEO's relative age is 10–12, and zero otherwise, and *Medium relative age* is an indicator that takes a value of one if the CEO's relative age is 4–9, and zero otherwise. In an alternative classification, *High relative age* is an indicator that takes a value of one if the CEO's relative age is 7–12, and zero otherwise.

One concern is that an individual with a higher relative age might have a better chance of being hired as a CEO, resulting in a selection bias that could invalidate our inference. If this is the case, individuals with older (younger) relative ages might be over(under)represented in the CEO sample. Another concern is that parents might manipulate their children's birth months to gain entrance to primary school.[15] We find three sources of evidence refuting these two types of strategic behavior. First, Figure 1 shows an overall even distribution of CEO relative age in our sample, with no obviously abnormal mass of CEOs clustered at higher relative ages, as one would expect if there were manipulation of the birth month to obtain school eligibility. Neither is there evidence that individuals with younger relative ages are underrepresented in the CEO sample. For example, the highest relative age of 12 has a density similar to that of the youngest relative ages of 1 and 2, as well as the medium relative ages of 4–6. Second, we perform the standard McCrary test (McCrary, 2008) to explicitly determine the presence of manipulation at the cutoff month.[16] As shown in Figure 2, there is no significant discontinuity in the density observed around the cutoff, and the absolute value of the McCrary test statistic is 0.018, which is insignificantly different from zero. These results indicate that the CEO birth months are unlikely to have been manipulated to move across the cutoff month. Third, we compare the distribution of the birth months in our sample with that in "One-thousandth Population in China," a sample created from the National Population Fertility Sampling Survey, which tabulates the monthly distribution of newborns in China from 1946 to 1981.[17] More than 99% of the CEOs' birth cohorts in our sample fall into this period, making the two samples highly comparable. As shown in Panel B of Table 2, the distribution of birth months in our sample closely follows that in One-thousandth Population in China.[18]

[15] The exogeneity of birth month is somewhat controversial. For example, Bedard and Dhuey (2006) argue that the initial timing of births is arguably exogenous, while Buckles and Hungerman (2013) note that controlling parents may manage birth month to give their child a perceived advantage.

[16] The cutoff month applied in this McCrary test is August instead of September. The rationale is that children born after August 31 are enrolled the following year and should be classified as having the highest relative age.

[17] The National Population Fertility Sampling Survey was conducted by the National Family Planning Commission in 1982.

[18] Accordingly, although October is slightly favored, that is simply the result of nationwide demographic patterns rather than strategic behavior by firms in which they intentionally select relatively older CEOs. We perform robustness tests and further discuss this issue in Section 6.3.

[Insert Figure 1 about Here]

[Insert Figure 2 about Here]

Panel A of Table 2 presents the distribution of the birth cohorts of the CEOs in our sample. Birth cohorts from 1960 to 1969 constitute the majority, making up 60%. They are followed by birth cohorts from 1950 to 1959 (20.54%) and 1970 to 1979 (16.53%). The remaining 3% are in the two tails, with 57 CEOs born before 1950 and 20 after 1980.

[Insert Table 2 about Here]

3.2.2. Corporate risk-taking measurement

The primary measures of corporate risk-taking are the volatility of profitability ($\sigma(ROA)$) and the volatility of daily stock return ($\sigma(Stk\_rtn)$) (Coles, Daniel, and Naveen, 2006; Faccio, Marchica, and Mura, 2011; Ferrero-Ferrero, Fernández-Izquierdo, and Muñoz-Torres, 2012; Chen and Zheng, 2014). $\sigma(ROA)$ is the standard deviation of the industry-adjusted profitability over a three-year window.[19] Return on assets (ROA) is calculated as the ratio of earnings before interest and taxes (EBIT) to total assets. $\sigma(Stk\_rtn)$ is the standard deviation of the industry-adjusted daily stock return over a fiscal year. As shown in Panel B of Table 3, the mean value for our two volatility variables ($\sigma(ROA)\%$ and $\sigma(Stk\_rtn)\%$) is 3, which is broadly consistent with that in Bargeron, Lehn, and Zutter (2010); Boubakri, Cosset, and Saffar (2013). Detailed definitions of the variables are presented in Appendix 1.

Following prior studies, we employ various leverage ratios and cash holdings as additional measures for the riskiness of corporate accounting choices (Acharya, Amihud, and Litov, 2011; Ahmed and Duellman, 2013; Beuselinck, Markarian, and Verriest, 2021). The means of *Book leverage, Market leverage*, and *Financial leverage* are 0.44, 0.35, and 1.72, respectively. The mean *Cash_securities / total assets* ratio, defined as the sum of cash and cash equivalents to total assets, is 0.16. Additionally, mergers and acquisitions

[19] As we show in Table I-4 of the Internet Appendix, our results are robust to a four-year window.

(M&A) are essential corporate risk-taking activities. CEOs usually have more decision-making power in M&A activities than in other corporate activities (Jensen, 1986; Graham, Li, and Qiu, 2012), and the characteristics of CEOs, especially those relating to risk preferences, matter a great deal in M&A (Graham, Harvey, and Puri, 2013). For these reasons, we use two acquisition-related variables (Bernile, Bhagwat, and Rau, 2017) to measure corporate risk-taking. *Same-industry acquisitions* take place when the acquirer and target companies are in the same industry. They are less risky than cross-industry acquisitions, which create an unfamiliar market environment and make it more challenging to realize synergies. Moreover, offering only stock in an acquisition (*All-stock acquisition*) reduces the risk of unforeseen problems in valuation, making it a less risky method of payment. *Same-industry acquisitions* and *All-stock acquisition* each account for 10% of the 5,084 M&A activities studied.

3.2.3. CEO overconfidence

Managerial overconfidence is a significant psychological characteristic that affects corporate risk-taking (Malmendier and Tate, 2005; Lin, Hu, and Chen, 2005; Doukas and Petmezas, 2007; Schrand and Zechman, 2012). Moreover, the advantages given to relatively older children in their school cohort may persist into adolescence and adulthood as those children accumulate soft skills and prepare for college (Bedard and Dhuey, 2006). For these reasons, we hypothesize that CEO overconfidence is the mechanism by which CEO relative age affects corporate risk-taking. Overconfident CEOs are inclined to overestimate their ability to generate returns on investment. Thus, they tend to be overly optimistic about their firms' future performance and arguably, they make aggressive, risky financial and investment decisions (Malmendier and Tate, 2008; Faccio, Marchica, and Mura, 2011; Chen, Ho, and Yeh, 2020). We follow prior studies in constructing five proxies of CEO overconfidence. The first variable, *Firm holder*, is a dummy variable equal to one if the number of shares of the firm's stock held by the CEO has not been reduced compared with the end of last year, and zero otherwise, whereas *Firm holder_LT* equals one if the CEO has never reduced her holding of the firm's stock throughout her tenure, and zero otherwise (Malmendier and Tate, 2008; Hirshleifer, Low, and Teoh, 2012; Schrand and Zechman, 2012). Panel A of Table 3 shows that 89% of the CEOs in our sample have not reduced their holdings of the firm's stock during the past year (as indicated by the variable *Firm holder*) and 60% have not reduced their holdings of the firm's stock throughout their tenure (as indicated by the variable *Firm holder_LT*). *Net buyer* equals one if the CEO bought stock in more years than she sold stock during the first three years of her tenure, and zero otherwise (Malmendier and Tate, 2005; Andreou, Doukas, Koursaros, and Louca, 2019). The fourth proxy for overconfidence is *Number of overestimates*, which is calculated as the number of upwardly biased earnings forecasts where the earnings reported are higher than those disclosed in the contemporaneous financial report each year(Lin, Hu, and Chen, 2005).[20] Approximately 15% of the CEOs are *Net buyer*, and the average number of overestimates is 0.18. Finally, as discussed in Ahmed and Duellman (2013) and Hsu, Novoselov, and Wang (2017), overinvestment is a potential consequence of CEO overconfidence. *High CapEx* is a variable indicating whether the firm has capital expenditures above the industry median.

3.2.4. Other variables

Following Callen and Fang (2015), we compute two variables measuring stock price crash risk. *Crash risk 1* (*NCSKEW*) is the negative coefficient of the skewness of firm-specific weekly returns over the fiscal year period, and *Crash risk 2* (*DUVOL*) is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. The mean values of *Crash risk 1* and *Crash risk 2* are -0.28 and -0.31, respectively. We follow prior studies and control for a variety of CEO and firm characteristics that may affect corporate risk-taking (Dong, Wang, and Xie, 2010; Nguyen, 2011; Armstrong and Vashishtha, 2012; Boubakri, Cosset, and Saffar, 2013; Eckbo, 2014; Harjoto, Laksmana, and Yang, 2018; Brisley, Cai, and Nguyen, 2021; Cadman, Campbell, and Johnson, 2021). We account for age, gender, education, tenure, salary, and ownership at the CEO level.

[20] In China, listed companies are required to disclose four financial reports each year: a first-quarter report, a semi-annual report, a third-quarter report, and an annual report.

As shown in Panel A of Table 3, the CEOs in our sample are aged 49 on average. 95% are male; and 57% have at least a master's degree (*Master's degree*). The average tenure is 4.84 years, and 14% of the CEOs also hold a chairperson's title (*Duality*). With an average salary of RMB 0.62 million (*Salary*), the CEOs in our sample retain 0.45% stock ownership (*CEO-share*). Panels B and C show the summary statistics of the firm characteristics. Of the firms in the sample, 79% are state-owned, and the average number of years since their establishment is approximately 16 (*Firm age*). With a mean annual growth rate of sales of 30% (*Sale growth*), the sample firms have an average *ROA* of 3.58% and an average *ROE* of 6.68%. Finally, the sample firms hold total assets of RMB 21.21 billion on average, resulting in a market-to-book ratio of 2.2 and a CapEx-to-total asset ratio of 0.07 (*CapEx*). To alleviate the impact of outliers, all of the accounting variables are winsorized at the top and bottom 1%.

[Insert Table 3 about Here]

3.3. Empirical design

We estimate the baseline regression model using ordinary least squares (OLS) to investigate the effect of CEO relative age on corporate risk-taking:

$$y_{i,t} = \beta_0 + \beta_1 \, Relative \; Age_{i,t} + CEO \; Chars + Firm \; Chars + Year \; FE + Firm \; FE + \epsilon_{i,t} \quad (2)$$

The dependent variable $y_{i,t}$ includes various measures of corporate risk-taking: the volatility of profitability ($\sigma(ROA)$), the volatility of stock return ($\sigma(Stk\_rtn)$), the leverage ratio, and cash holdings. $Relative\ Age_{i,t}$, the key variable defined as the relative age of a CEO serving in firm i at year t, is substituted with the dummy variables *High relative age*, *Oldest relative age*, and *Medium relative age* as robustness checks. We control for a vector of CEO characteristics (*CEO Chars*), including *Age, Male, Master's degree, Tenure, CEO-share, Salary*, and *Duality*. The firm characteristics (*Firm Chars*) include, but are not limited to, *SOE, Firm age, Market-to-book, Book leverage, Total assets,* and

Industry-adjusted ROA. We also control for firm and year fixed effects, and the standard errors are clustered at the industry level. Our main interest is in the coefficient β_1, which captures the impact of the CEO's relative age on corporate risk-taking.

For our acquisition-related measures of risk-taking, we employ an acquisition-level sample and estimate the following OLS regression:

$$\begin{aligned} Acquisition_{k,i,t} = \gamma_0 + \gamma_1\, Relative\ age_{k,i,t} + CEO\ Chars + Firm\ Chars \\ + Year \times Industry\ FE + \epsilon_{k,i,t} \end{aligned} \tag{3}$$

$Acquisition_{k,i,t}$ represents the acquisition-related measures of corporate risk-taking for acquisition event k of firm i in year t, including both *Same-industry acquisition* and *All-stock acquisition*. *Relative age*, $CEO\ Chars$, and $Firm\ Chars$ have the same definitions as in Equation 2. The additional control variables are *Relative size of target*, which is defined as the book value of the acquirer relative to that of the target; *Stock price run-up*, which captures the cumulative stock return of the acquirer over trading days [-250, -30] relative to the acquisition announcement date; and the volatility of daily stock returns over the same period (*Stock price volatility*). Considering the relatively small sample size, the $Year \times Industry$ fixed effect is used instead, and the standard errors are also clustered at the industry level.

To explore the mechanism of the RAE on corporate risk-taking, we examine the relationship between CEOs' relative age and overconfidence. We perform an OLS estimation based on Equation 2 in which the dependent variable is replaced with the five measures of CEO overconfidence: *Firm holder, Firm holder_LT, Net buyer, High CapEx*, and *Number of overestimates*. *Relative age*, $CEO\ Chars$, and $Firm\ Chars$ have the same definitions as in Equation 2.

4. Results

4.1. CEO relative age and firm risk-taking: Volatilities in ROA and stock returns

Table 4 presents our regression estimates for the relation between CEO relative age and firm volatilities for industry-adjusted ROA (columns 1–3) and stock returns (columns 4–6).[21] The coefficient on *High relative age* is 0.215 and is significant at 1% (column 1), indicating that controlling for CEO and firm characteristics, a firm with a relatively older CEO (relative age $\geq$ 7) has a 7% higher volatility in ROA relative to the mean (0.215/3.08). Alternatively, in column 2, an approximately 8.7% higher volatility in ROA relative to the mean (0.268/3.08) is observed in the firms whose CEOs have the oldest relative age (relative age $\geq$ 10) compared with the firms whose CEOs have the youngest relative age (relative age $\leq$ 3). Turning to the continuous measure, *Relative age* has a coefficient of 0.017 (column 3), suggesting that one month of additional relative age is associated with a 0.5% higher volatility in ROA.

Likewise, we find a significant and positive relation between CEO relative age and a firm's equity risk ($\sigma(Stk\_rtn)\%$). For example, compared with the youngest relative age, the oldest (medium) relative age is associated with a 7.1% (5.7%) higher volatility in stock returns relative to the mean (column 5). The results are robust to the different measures of relative age.[22]

[Insert Table 4 about Here]

A potential concern is that China, according to anecdotal evidence, applies cutoff months other than September on occasion. To address this, we perform placebo tests by shifting the cutoff month when defining relative age. Table 5 reports the results from re-estimating Table 4 with redefined relative age variables where the cutoff month

[21] In the interest of brevity, the full results are not reported. The independent variables of each regression are specified in the notes to each table.

[22] The results, particularly those related to the magnitude and significance power of the estimates of the relative age variables, remain highly robust to the inclusion of the year×industry fixed effect.

is substituted with August (Panel A) and October (Panel B). Even under model specifications identical to those in Table 4, the regressions do not indicate a statistically significant RAE at those placebo thresholds. We obtain similar results, i.e., insignificant coefficients on the key variables, by running similar regression analyses replacing the cutoff month with the remaining months (for brevity, these results are not reported). This provides corroborative evidence that a single cutoff date of September 1 for primary school eligibility has long been implemented in China, causing a significant RAE on CEOs' managerial behavior and attitudes toward risk-taking in their careers.

[Insert Table 5 about Here]

4.2. CEO relative age and firm risk-taking: Financial policies

To further understand the impact of the CEO's relative age on her attitude towards risk-taking, we now examine the relation between the RAE and corporate financial policies. In columns 1–6 in Table 6, we find that the coefficients on *High relative age* and *Relative age*are significant and positive, indicating that everything else being equal, a firm with a relatively older CEO is exposed to higher leverage ratios, namely *Book leverage, Market leverage, and Financial leverage*. We also investigate the CEO RAE on a firm's cash holding intensity. Columns 7–8 suggest that CEO relative age is inversely associated with a firm's holdings of cash and short-term securities (*Cash_securities / total assets*). In other words, firms with a relatively older CEO retain lower cash holdings, leading to higher exposure to the risk of a liquidity shortage. Taken together, we find consistent evidence that conditioned on a rich set of CEO and firm characteristics, relatively older CEOs tend to implement riskier corporate financial policies, as reflected in higher leverage ratios and lower cash holdings.

[Insert Table 6 about Here]

4.3. CEO relative age and firm risk-taking: Merger and acquisition activities

CEOs tend to exercise significant decision-making power at the expense of firm shareholders when engaging in acquisitions. Corporate acquisitions are inherently riskier than organic internal growth in that they require a large commitment of time and resources (Jensen, 1986; Bernile, Bhagwat, and Rau, 2017). To further refine the relationship between the CEO RAE and corporate risk-taking, we investigate whether CEOs with higher relative ages prefer riskier acquisition activities.

The sample is restricted to 5,084 M&A announcements by 943 firms from 2006 to 2018. We follow Bernile, Bhagwat, and Rau (2017) and focus on two acquisition characteristics: whether the target and acquirer companies are from the same industry (*Same-industry acquisition*), and whether the acquirer only offers its stock as a contract consideration (*All-stock acquisition*). Acquisitions with such characteristics carry lower risk, and, if our hypothesis holds, are less likely to occur in firms with relatively older CEOs. Additionally, we compute the acquirer's cumulative abnormal return during trading days [-2, +2] around the merger announcement (*Announcement CAR* [-2, +2]), which is inversely associated with investors' expectations of the riskiness of the acquisition.

As shown in Table 7, the coefficients on the two relative age variables are negative and significant in all regressions.[23] The results show that conditioned on a variety of CEO and firm characteristics, acquiring firms with relatively older CEOs exhibit a lower propensity to engage in more conservative acquisition activities, i.e., acquisitions in which the target is from the same industry and all-stock acquisitions. Moreover, the negative RAE on *Announcement CAR* [-2, +2] indicates that acquisitions offered by firms with relatively older CEOs are considered to have a higher risk than those offered by firms with relatively younger CEOs. These results support the hypothesis that CEOs of relatively higher ages exhibit a higher propensity to venture into more diversifying and value-

[23] Because the number of firm-year observations in this subsample is reduced by half, we employ OLS regressions with a year×industry fixed effect instead of year and firm fixed effects. The same set of CEO and firm characteristics are controlled for (see the notes to Table 7). The results are robust to the logistic regressions.

destroying acquisitions than their relatively younger peers.

[Insert Table 7 about Here]

4.4. Mechanism: CEO overconfidence

We hypothesize that the underlying mechanism by which CEO relative age affects corporate risk-taking could be overconfidence. Overconfident CEOs are inclined to overestimate their ability to generate returns on investment. Thus, they tend to be overly optimistic about their firms' future performance and arguably, they make aggressive, risky financial and investment decisions (Malmendier and Tate, 2008; Malmendier, Tate, and Yan, 2011; Chen, Ho, and Yeh, 2020). Accordingly, we explicitly investigate whether CEOs of higher relative age exhibit overconfident behavior.

Table 8 presents the estimates for the relation between CEO relative age and CEO overconfidence. Controlling for the CEO and firm characteristics, significantly positive coefficients on the relative age variables are observed across all of the tests. That is, a CEO of relatively higher age has a higher propensity to hold a firm's stock both in the short term (*Firm holder*, columns 1–2) and in the long term (*Firm holder_LT*, columns 3–4) than her younger peers. In addition, she is 4.9% more likely to habitually acquire the firm's stock (*Net buyer*, columns 5–6) and has a higher incidence of overestimating the firm's future earnings compared with the forecast earnings disclosed in the firm's quarterly financial report (*Number of overestimates*, columns 9–10) than her younger peers. Additionally, the analysis of *High CapEx* in columns 7–8 indicates that firms with a relatively older CEO are 2.2% more likely to be subject to a capital expenditure that is higher than the industry average. These results provide consolidated evidence that, all else being equal, relatively older CEOs have a higher propensity to perform overconfidently when making managerial decisions.

[Insert Table 8 about Here]

5. Further discussion

5.1. Heterogeneity analyses

Next, we investigate the heterogeneity of the effect of CEO relative age on corporate risk-taking. The key variables, *High relative age* and *Oldest relative age*, interact with our dummy variables capturing two CEO characteristics: being male (*Male*), and being the chairperson (*Duality*). We re-estimate Table 4 with these interaction terms included. As shown in Table 9, a firm with a relatively older male CEO experiences greater ROA and stock return volatilities than a firm run by a younger female CEO (columns 1–4). These results indicate that men are more subject to the RAE than women, consistent with Davis, Trimble, and Vincent (1980) and Fredriksson and Ockert (2006). These results are also consistent with the large body of literature finding that men tend to be more risk-seeking than women (Sunden and Surette, 1998; Charness and Gneezy, 2012; Faccio, Marchica, and Mura, 2016).

The other heterogeneity analysis indicates that a firm with the CEO as the chairman (columns 5–8) has more volatile earnings and a higher equity risk. This result aligns with the literature documenting the close connection between CEOs' dual leadership in corporate governance and managerial behavior involving corporate risk-taking (Daily and Dalton, 1994; Finkelstein and D'aveni, 1994; Li and Tang, 2010). In conclusion, we find consistent evidence that the CEO RAE on firm risk-taking manifests more strongly if the CEO is a male or holds the dual roles of chair and CEO.

[Insert Table 9 about Here]

5.2. Performance and crash risk

One natural question is whether a CEO's relative age causes outcomes beyond corporate risk-taking. We further explore how CEO relative age affects firm performance and stock price crash risk to answer this question. Table 10 shows that conditional on CEO and firm characteristics, firms led by relatively older CEOs are associated with a deterioration in performance, as evidenced in a 14.8% lower ROA and a 21.5% lower ROE relative to the mean (columns 1–4). Moreover, columns 5-8 show a significant positive relationship between relative age and crash risk in all four regressions, indicating that firms with relatively older CEOs are exposed to a 12.3%-13.6% higher crash risk relative to the mean values. In summary, with all else being equal, firms with relatively older CEOs have lower profitability but a higher stock price crash risk. These results reinforce our conclusion that a relatively older CEO tends to exhibit overconfident behavior, exposing the firm to higher risk.[24]

[Insert Table 10 about Here]

6. Robustness

6.1. CEO year and place of birth

We now present further evidence of the robustness of our main findings. The foundation of our empirical analysis is that to be admitted to primary school, CEOs were subject to a single statutory cutoff date of September 1 and an entry age of seven years old.[25] Although these rules have been in effect in China since 1928, they were not compulsory until the 1986 passage of the "Compulsory Education Law of the People's Republic of China." Admittedly, the Compulsory Education Law allows for flexibility in some regions (mostly rural regions) to overcome the difficulties of implementing the law on a national scale. For example, the law stipulates that "In regions that lack the conditions for doing so, entry into school may be deferred until seven years of age." To

[24] We show in Table I-5 in the Internet Appendix that CEO relative age does not significantly impact firm value or the CAR around CEO turnover announcements, indicating that investors do not react to CEO relative age. These results are intuitive in the sense that investors, when learning about CEO turnover announcements, tend to pay attention to characteristics such as gender, age, work experience, and educational attainment, not relative age (at least they do not recognize CEO relative age as valuable information).

[25] According to educational law and related documents, the age of school admission was seven years old from 1952 to 1986, a period covering more than 96% of the CEOs' birth years in our sample.

mitigate this noise, we control for the CEO's birth cohort and place of birth to purge any cohort effects and regional heterogeneities from the analysis.

Table I-1 in the Internet Appendix presents the re-estimation of the main results in Table 4, with the inclusion of the CEO birth year fixed effect (columns 1–4). The coefficients on the relative age variables remain highly consistent in terms of their magnitude and significance compared with the main results. Adding a birth-province fixed effect does not affect our main results, as columns 5–8 consistently evidence a significant and positive relationship between the CEO RAE and firm risk.[26] These results reinforce our conclusion that a firm led by a relatively older CEO is exposed to greater equity risk and volatility in profitability than a firm led by a CEO who is relatively younger.

6.2. Potential impact of the Cultural Revolution

Another potential concern with our analysis is that the relation between CEO relative age and corporate risk-taking might be influenced by noise related to the Cultural Revolution, which began in 1966 and lasted for 10 years. As noted in the literature, the Cultural Revolution may have had an explicit impact on teenagers through two events: the "Class Suspension" and "Down to the Countryside" movements (Deng and Treiman, 1997). The Class Suspension movement from 1966 to 1968 primarily occurred in major cities and targeted students in middle schools or above, indicating that only the birth cohorts from 1959 to 1961 could have experienced it. Similarly, only pre-1962 cohorts could have experienced the Down to the Countryside movement, which lasted from 1966 to 1978 and primarily targeted urban youths who were junior or senior high-school graduates (Fan, 2020). It is noted in the literature that individuals who experience depression behave more conservatively in later life (Romer, 1990; Fan, 2020). Although none of these movements directly affected the cutoff date or age requirement for primary school enrollment, they may still influence (most likely, adversely) CEOs who had those

[26] We manually collect information about the birthplaces of the studied CEOs. Only 390 firms disclose the provinces where their CEOs were born. To ensure a reasonable sample size, we do not include the birthplace fixed effect in our main analyses.

experiences during their youth or adolescence with respect to their managerial behavior later in life.

To account for the potential impact of the Class Suspension movement, we re-estimate the main results with the inclusion of *Suspend class*, an indicator capturing whether a CEO is likely to have been exposed to the movement (i.e., birth cohorts 1959–1961). In a similar vein, we control for the potential impact of the Down to the Countryside movement by including *Send down*, an indicator of whether a CEO is likely to have been exposed to this movement (i.e., the birth cohort pre-1962). The results in Panel A of Table I-2 are quantitatively in line with the main results reported in Table 4, suggesting that the Cultural Revolution does not mitigate the CEO RAE on the CEO's attitude toward risk-taking. These results remain robust to an alternative approach that re-estimates the main analysis with a subsample excluding either the birth cohorts of 1959–1961 (*Suspend class*=1) or the pre-1962 cohorts (*Send down*=1) (for brevity, this result is not reported).

Although the cutoff date of primary-school entry was not subjected to a statutory change during the Cultural Revolution, anecdotal evidence indicates that from 1969 to 1973, certain regions had an alternative cutoff date of March 1 (Wang, Chen, and Qian, 2018). This spring cutoff date, if prevalent, would have been applied to the birth cohorts of 1962–1966. To address this concern, we re-estimate the main analysis with the inclusion of *Spring COD*, a dummy variable for CEOs in the 1962 to 1966 birth cohorts. As shown in Panel B of Table I-2, the results remain highly similar to our main results in Table 4. These results remain robust to an alternative approach that re-estimates the main analysis with a subsample excluding the birth cohorts of 1962–1966 (*Spring COD* =1).

6.3. CEOs born around the cutoff month

Another concern involves the possibility of flexibility in the cutoff date, pursuant to which children may still enroll in the current school year if their date of birth is immediately after September 1. It could also be true that alternative cutoff dates in September, rather than September 1(for example, September 15), are applied in certain places. To further purge the noise induced by the flexibility of the cutoff date, we perform robustness tests that replicate the baseline analysis with the inclusion of *Born in September*, an indicator that takes a value of one if the CEO was born in September, and zero otherwise. As shown in columns 1–4 in Panel A, Table I-3, the coefficients on the relative age variables remain materially unchanged compared to the main results. Using an alternative approach, we observe similar results estimated from a subsample excluding CEOs whose birth month is September (columns 5–8).

Arguably, relatively younger children (e.g., those born in August) might be subject to "academic redshirting," in which their parents intentionally postpone their enrollment by one year. In this scenario, the children in the relatively youngest group are among the oldest quartile in terms of absolute age. If this "academic redshirting" is a common practice in our CEO sample, then the number of births in June–August (i.e., those among the youngest quartile in terms of relative age) should be higher than that of the remaining months. However, we do not find such evidence in Panel B of Table 2. We concur with Bedard and Dhuey (2006) and Muller and Page (2016) that the estimated RAE would be *de facto* biased downwards if redshirting were a common practice in the sample, suggesting that the estimates in our study represent the lower bound on the RAE on CEO managerial behavior.

Another concern is parents' potential manipulation of their child's age to gain school entry. For example, the parents of a child whose date of birth is immediately after the cutoff may have an incentive to fraudulently claim a different date of birth to avoid a year of waiting.[27] If this is true, then the manipulated birth month is most likely to be August, meaning that the number of births in September should decrease discontinuously relative to the number in August. However, we do not observe discontinuity in the sample distribution or total population (Panel B of Table 2) around August and

[27] Again, this is not a common practice, because parents of underage children must pay additional fees and, importantly, must use personal relationships to register their children ahead of schedule.

September.[28] This indicates birth-month manipulation to delay or bring forward CEOs' school admission is relatively rare in our sample.

Nevertheless, we explicitly account for this potential noise and re-estimate the main results in Table 4. The results reported in Panel B in Table I-3 in the Internet Appendix suggest that including an indicator variable set to one for CEOs born in August, September, or October does not mitigate the positive RAE on firms' risk-taking (columns 1–4). Using an alternative approach, we observe robust results estimated from a subsample removing CEOs born in August, September, or October (columns 5–8). This evidence further rules out the possibility that the CEO RAE that we find is affected by parental manipulations of birth month that have a school-attending or "academic redshirting" effect.

6.4. Alternative measures of firms risk-taking

Finally, we examine the robustness of the main findings to alternative measures of the outcome variables in Table 4. Panel A of Table I-4 in the Internet Appendix reports the results with three alternative measures of volatility in ROA: 1) ROA_Diff, the difference between the maximum and minimum industry-adjusted ROA over the three-year overlapping windows ($[t, t+2]$); 2) $\sigma(ROA\_4\ year)\%$, volatility in the ROA calculated the same way as $\sigma(ROA)\%$, except that the event window is extended to a four-year window ($[t, t+3]$); and 3) $\sigma(ROE)\%$, the standard deviation of a firm's industry-adjusted return on equity (ROE) over a three-year window ($[t, t+2]$). The results are consistent with the main results indicating that the firms managed by relatively older CEOs exhibit higher volatility in profitability. Panel B of Table I-4 presents our results with two additional measures of stock return volatility: $\sigma(Stk\_rtn\_M)\%$, the standard deviation of the industry-adjusted daily stock return calculated using the (total) market

[28] A comparison of our sample with the National Population Fertility Sampling Survey shown in Panel B of Table 2 indicates that the birth month distribution in our sample is similar to that of newborns in the total population. Therefore, even if some parents artificially change their child's birth age, that is a minority practice.

capitalization-weighted method over the fiscal year, and $\sigma(Stk\_rtn\_E)\%$ the standard deviation of the industry-adjusted daily stock return calculated using the equal-weighted method over the fiscal year. Again, we find consistent evidence that higher stock return volatility is observed in firms with relatively older CEOs.

7. Conclusion

Using novel data on 2,595 CEOs from 1,011 firms listed in China's A-share market, we investigate how early childhood experiences related to relative age differences at the start of formal schooling affect CEOs' overconfidence and managerial decisions regarding corporate risk-taking. Applying a single cutoff date for primary school enrollment, the education system in China allows children to enroll only after their sixth (or seventh) birthday as of September 1. As a result, children born immediately before the cutoff date are 17% younger than their oldest peers in the same cohort, i.e., those born immediately after the cutoff date. To assess the external validity of our findings, we use a nationally representative survey of the middle-aged population in China and confirm that individuals with a higher relative age tend to be more overconfident in health status.

In the corporate context, we find consolidated evidence that conditioned on a rich set of CEO and firm characteristics, firms managed by CEOs with the oldest relative age experience volatility in profitability that is approximately 8.7% higher and stock risk that is approximately 7.1% higher than the mean values compared with firms managed by CEOs with the youngest relative age. This RAE on risk-taking is more pronounced for male CEOs and CEOs who hold dual positions. In addition, this CEO RAE is evidenced in corporate policies, in that firms led by relatively older CEOs have higher leverage ratios and lower cash holdings than firms that are led by relatively younger CEOs. Furthermore, relatively older CEOs have a lower propensity to engage in more conservative acquisition activities than CEOs who are relatively younger.

We conjecture that CEO overconfidence is the mechanism by which a CEO's relative age affects corporate risk-taking. In support of this hypothesis, we find consistent evidence that relatively older CEOs exhibit overconfident managerial behavior, such as overinvestment, habitual acquisition of the firm's stock, and overestimation of the firm's future earnings. We also investigate the additional corporate outcomes induced by the CEO RAE. The results imply that all else being equal, firms with relatively older CEOs have lower profitability and a higher crash risk than firms with relatively younger CEOs, corroborating our main finding that a relatively older CEO tends to be more overconfident in making corporate policies, rendering the CEO more susceptible to risk-taking.

We conduct a variety of tests to study the robustness of our results. For example, we explicitly account for the cohort effects and regional heterogeneities in school enrollment requirements, possible disturbances arising from the Cultural Revolution, and potential issues concerning CEOs born around cutoff months. Through these robustness checks, we find consistent evidence that CEO relative age is positively associated with corporate risk-taking. We make three contributions to the literature. First, we demonstrate that the CEO's relative age at primary school entry, a managerial trait that is overlooked in prior studies, plays a critical role in corporate risk-taking, contributing new insights to the literature on determinants of corporate decision-making. Second, we provide concrete evidence of the salience of the RAE in the new context of the CEO's attitude toward risk-taking, which adds to debates over the existence of a longstanding RAE. Third, our findings suggest that the mechanism of this effect rests on the positive relation between CEO relative age and overconfidence, which innovatively highlights the role of relative age in CEO overconfidence and subsequent managerial decisions in corporate risk-taking.

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Figure 1 Distribution of Relative Age

Note: Figure 1 shows the relative age distribution in our sample. The X-axis is the numeric value of relative age defined as in Equation 1, and the Y-axis corresponds to density.

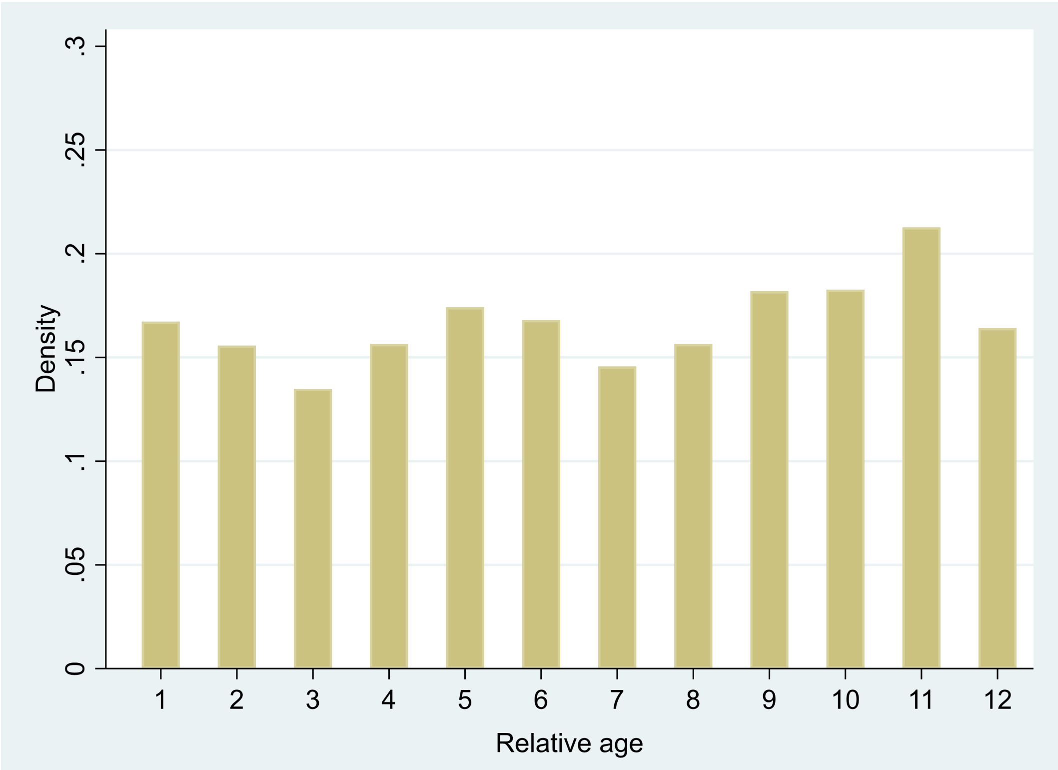

Figure 2 McCrary Density Test

Note: Figure 2 shows the graphical results of the McCrary (2008) density test. The X-axis represents the forcing variable, the number of months to August. The Y-axis corresponds to the density of the forcing variable, with the estimated density and 95% confidence intervals presented. No significant discontinuity in the density of the forcing variable, the number of months to August, is observed around the cutoff point x = 0. The absolute value of the McCrary test statistic is 0.018, which is insignificantly different from zero. These results indicate that the CEOs' birth months are unlikely to have been manipulated to move across the cutoff.

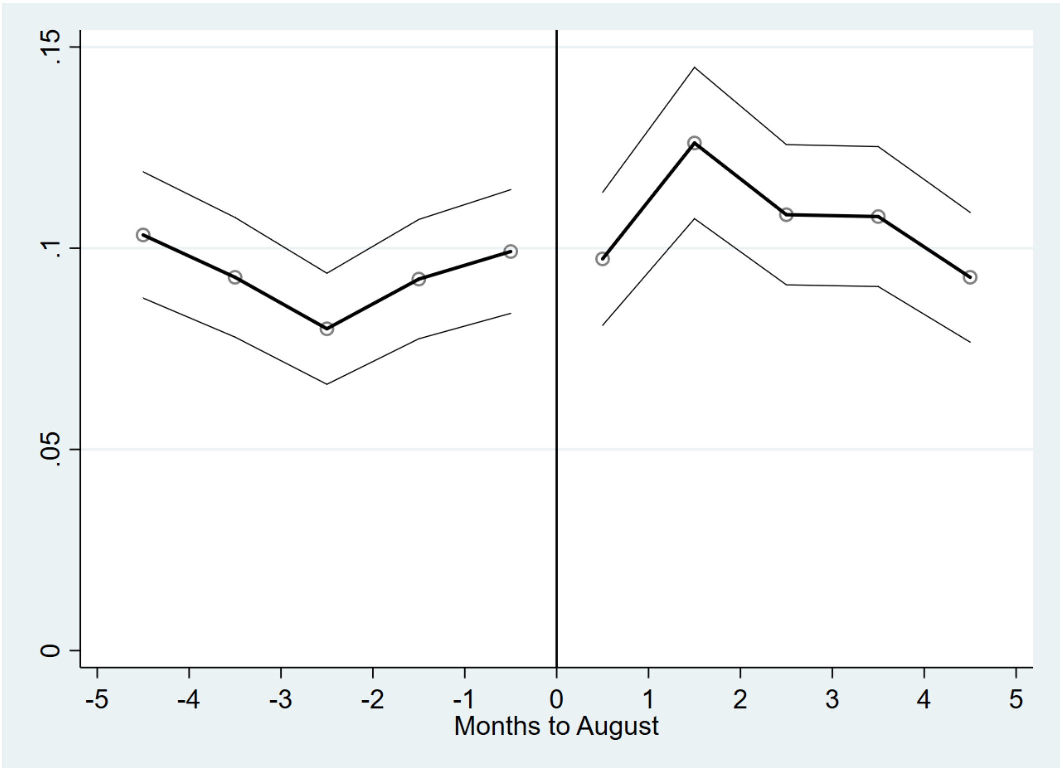

Table 1 External Validity Test of the RAE on Overconfidence

Note: This table reports the results of the external validity test of the RAE on overconfidence using a sample of 11,369 respondents surveyed in Wave 2 of the 2013 China Health and Retirement Longitudinal Studies (CHARLS). Panel A shows a summary of the statistics. We follow Huang and Luo's (2015) approach in measuring an individual's overconfidence about her health. *Overconfidence* is an indicator variable that takes a value of one if the individual meets both of the following two requirements, and zero otherwise: 1) the individual answers "No" to the question "Do you know if you have hypertension?" or "Have you been diagnosed with hypertension?"; and 2) the individual's blood pressure has a minimum systolic reading of 140 or greater or a minimum diastolic reading of 90 or greater. Panel B reports the results of the RAE on overconfidence. The dependent variable, *Overconfidence*, measures whether the individual perceives his or her health as better than it actually is. As defined in Equation 1, *Relative age* is the difference between the CEO's birth month and the cutoff month for primary school entrance. *High relative age* is a dummy variable that equals one if the CEO's relative age is 7–12, and zero otherwise. *Oldest relative age* is a dummy variable that equals one if the CEO's relative age is 10–12, and zero otherwise. *Medium relative age* is a dummy variable that equals one if the CEO's relative age is 4–9, and zero otherwise. Columns 1–3 report the OLS regression estimates with a county fixed effect, and columns 4–6 report the logit model estimates. The covariates controlling for individual characteristics are *Age, Male*, *Married*, *Education*, *Healthy*, *Homeowner*, *Asset*, *Income*, and *Hukou. Married* is a dummy variable that takes a value of one if the individual is married, and zero otherwise. *Education* is an indicator variable that takes a value of one if the individual has a high school degree or above, and zero otherwise. *Healthy* is an indicator variable that takes a value of one if the individual, when asked to evaluate and rate her health status from 1 ("Excellent") to 5 ("Poor"), gives a rating of 1 ("Excellent") or 2 ("Very good"), and zero otherwise. *Homeowner* is a dummy variable that takes a value of one if the individual is a homeowner, and zero otherwise. *Asset* is the sum of the individual's total financial assets and debts (RMB million), and *Income* measures the individual's annual income (RMB 10,000). *Hukou* is a dummy variable that takes a value of one for individuals with urban hukou. Panel C reports the results of the RAE on health status. The dependent variables are given in the column titles. *Childhood health* is an indicator for individuals who, when asked to rate their health status during childhood compared to other children of the same age from 1 ("Much healthier") to 5 ("Much less healthy"), give a rating of 4 or 5 (i.e., below average). *Heart disease* is an indicator for individuals with heart problems such as heart attack and coronary heart disease. *Asthma* is an indicator for individuals with asthma. Individual characteristics are *Age*, *Male*, *Married*, *Education*, *Healthy* (in columns 10–12 only), *Homeowner*, *Asset*, *Income*, and *Hukou.* Definitions of other variables, including *Age* and *Male*, are identical to those used in the main results (see Appendix 1). The details of our sample construction are discussed in Appendix 2. The standard errors are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

Panel A. Summary statistics of sample of 2013 CHARLS

Variable	N	Mean	Std. Dev.	P25	P75
Overconfidence	11,369	0.14	0.35	0	0
Relative age (in months)	11,369	6.71	3.52	4	10
High relative age	11,369	0.53	0.50	0	1
Oldest relative age	11,369	0.28	0.45	0	1
Medium relative age	11,369	0.48	0.50	0	1
Male	11,369	0.47	0.50	0	1
Age (in years)	11,369	60	9.71	52	67
Married	11,369	0.87	0.34	1	1
Education	11,369	0.11	0.32	0	0
Healthy	11,369	0.16	0.36	0	0
Homeowner	11,369	0.51	0.50	0	1
Income (RMB 10,000)	11,369	1.20	1.77	0.25	1.57
Asset (RMB million)	11,369	0.25	1.02	0.04	0.25
Hukou	11,369	0.20	0.40	0	0
Childhood health	11,369	0.21	0.41	0	0
Heart disease	11,369	0.12	0.32	0	0
Asthma	11,369	0.04	0.19	0	0

Panel B. Relative age and overconfidence

Dependent variable: *Overconfidence*

	OLS with county fixed effect			Logit model		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
High relative age	0.014**			0.125**		
	(0.006)			(0.055)		
Oldest relative age		0.019**			0.170**	
		(0.009)			(0.077)	
Medium relative age		0.014*			0.118*	
		(0.008)			(0.070)	
Relative age			0.002**			0.019**
			(0.001)			(0.008)
Individual characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,369	11,369	11,369	11,369	11,369	11,369
Adjusted R-squared/Pseudo R-square	0.055	0.055	0.055	0.007	0.007	0.007

Panel C. Relative age and health status

	Childhood health			Heart disease			Asthma		
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High relative age	-0.005			0.004			-0.003		
	(0.008)			(0.006)			(0.004)		
Oldest relative age		-0.003			0.001			-0.005	
		(0.011)			(0.009)			(0.006)	
Medium relative age		-0.001			0.007			-0.006	
		(0.01)			(0.008)			(0.005)	
Relative age			-0.0006			0.0003			-0.0005
			(0.001)			(0.001)			(0.0005)
Individual characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,369	11,369	11,369	11,369	11,369	11,369	11,369	11,369	11,369
Adjusted R-squared	0.018	0.018	0.018	0.097	0.097	0.097	0.021	0.021	0.021

Table 2 Sample Distribution by Birth Year and Month

Note: This table shows the distribution of CEO birth cohort (Panel A) and birth month (Panel B).

Panel A. CEO birth cohort distribution

Birth year	Number of CEOs	% of sample
1930–1939	3	0.12
1940–1949	54	2.08
1950–1959	533	20.54
1960–1969	1,556	59.96
1970–1979	429	16.53
1980–1989	20	0.77
Total	2,595	100

Panel B. CEO birth month distribution

Birth month	Our sample		Sample of 2013 CHARLS		One-thousandth Population in China:1946–1981	
	Observations	% of sample	Observations	% of sample	Observations	% of population
	(1)	(2)	(3)	(4)	(5)	(6)
1	203	7.82	947	8.33	61,407	7.99
2	189	7.28	811	7.13	60,969	7.93
3	218	8.4	975	8.58	61,488	8
4	226	8.71	833	7.33	58,789	7.65
5	203	7.82	860	7.56	55,393	7.21
6	175	6.74	796	7	56,304	7.33
7	202	7.78	882	7.76	58,988	7.68
8	217	8.36	1,033	9.09	64,812	8.43
9	213	8.21	998	8.78	70,095	9.12
10	276	10.64	1,168	10.27	76,423	9.94
11	237	9.13	983	8.65	72,901	9.49
12	236	9.09	1,083	9.53	70,961	9.23
Total	2,595	100	11,369	100	768,530	100

Table 3 Summary Statistics

Note: Panel A reports the summary statistics for both the time-invariant and the time-varying CEO characteristics. *Relative Age* (in months) measures the difference between the CEO's birth month and the cutoff month for primary school entrance, i.e., September. *High relative age* is a dummy variable that equals one if the CEO's relative age is 7–12, and zero otherwise. *Oldest relative age* (*Medium relative age*) is a dummy variable that equals one if the CEO's relative age is 10–12 (4–9), and zero otherwise. *Firm holder_LT* is a dummy variable that equals one if the CEO has never reduced her holding of the firm's stock throughout her tenure, and zero otherwise. *Net buyer* is a dummy variable that equals one if the CEO bought stock in more years than she sold stock during the first three years of her tenure, and zero otherwise. *Number of overestimates* measures the number of upwardly biased earnings forecasts, in which the earnings reported are higher than the actual earnings disclosed in the contemporaneous financial report each year. Panel B reports the summary statistics for the corporate outcomes. At the firm level, $\sigma(ROA)\%$ is the standard deviation of the industry-adjusted ROA over three-year windows ($[t, t+2]$). $\sigma(Stk\_rtn)\%$ is the standard deviation of the industry-adjusted daily stock return calculated in the free float-adjusted market capitalization-weighted method over the fiscal year. Panel C reports the summary statistics for the firm characteristics. The definitions of all of the variables are provided in Appendix 1.

Panel A. Summary statistics for CEO characteristics

Time-invariant CEO-characteristics					
Variable	N	Mean	Std. Dev.	P25	P75
Relative age (in months)	2595	6.72	3.48	4	10
High relative age (dummy)	2595	0.52	0.50	0	1
Oldest relative age (dummy)	2595	0.28	0.45	0	1
Medium relative age (dummy)	2595	0.49	0.50	0	1
Male	2595	0.95	0.20	1	1
Master's degree	2595	0.57	0.50	0	1
Time-varying CEO-characteristics					
Variable	N	Mean	Std. Dev.	P25	P75
Age (in years)	10049	49.21	6.08	45	53
Tenure (in years)	10049	4.84	3.64	2	7
CEO-share (%)	10049	0.45	2.94	0	0
Duality	10049	0.14	0.35	0	0
Salary (RMB million)	10049	0.62	0.67	0	0.75
Firm holder	9332	0.89	0.31	1	1
Firm holder_LT	10049	0.60	0.49	0	1
Net buyer	6940	0.15	0.35	0	0
Number of overestimates	4224	0.18	0.49	0	0

Panel B. Summary statistics for corporate outcomes

Variable	N	Mean	Std. Dev.	P25	P75
$\sigma(ROA)\%$	10049	3.08	4.15	0.89	3.54
$\sigma(Stk\_rtn)\%$	10049	3.18	2.09	2.03	3.95
ROA (%)	10049	3.58	6.16	1.02	6.14
ROE (%)	10049	6.68	14.29	2.44	12.45
Industry-adjusted ROA (%)	10049	-2.59	6.15	-5.05	0.50
Industry-adjusted ROE(%)	10049	-2.91	13.82	-7.19	3.20
Book leverage	10049	0.44	0.22	0.27	0.60
Market leverage	10049	0.35	0.21	0.18	0.49
Financial leverage	10049	1.72	1.67	1.02	1.62
Sales growth	10049	0.30	0.97	-0.06	0.33
CapEx	10049	0.07	0.06	0.03	0.10
High CapEx	10049	0.48	0.50	0	1
R&D expenditures (RMB million)	10049	0.05	0.07	0.01	0.07
Net PPE	10049	3.57	3.81	1.48	4.14
Z-Score	10049	135.39	438.55	0	68.26
Cash_securities/total assets ratio	7544	0.16	0.12	0.08	0.21
Crash risk 1 (*NCSKEW*)	9815	-0.28	0.67	-0.65	0.12
Crash risk 2 (*DUVOL*)	9815	-0.31	0.47	-0.63	-0.01
Same-industry acquisition	5084	0.10	0.30	0	0
All-stock acquisition	5084	0.10	0.30	0	0
Announcement CAR [-2, +2]	4357	0.001	0.065	-0.026	0.028

Panel C. Summary statistics for firm characteristics

Variable	N	Mean	Std. Dev.	P25	P75
Total assets (RMB billion)	10049	21.21	84.94	2.08	12.24
Cash/total assets	10049	1.15	4.66	0.02	0.65
Fixed assets/total assets	10049	0.28	0.19	0.13	0.41
Market-to-book	10049	2.20	1.50	1.25	2.55
Firm age (in years)	10049	16.45	5.24	13	20
Largest shareholding ratio	10049	37.21	15.62	24.57	49.18
SOE	10049	0.79	0.41	1	1
Relative size of target	5084	0.056	0.289	0.001	0.025
Stock price run-up	5084	0.31	0.75	-0.10	0.60
Stock price volatility	5084	0.034	0.039	0.024	0.038

Table 4 CEO Relative Age and Firm Risk-taking: Volatilities in ROA and Stock Returns

Note: This table reports the OLS regression estimates of Equation 2, which tests the relation between the CEO's relative age and the firm's volatilities in ROA (columns 1–3) and stock returns (columns 4–6). The CEO characteristics are *Age, Age square, Male, Master's degree, Tenure, CEO-share, Ln (Salary+1)*, and *Duality*; To analyze the $\sigma(ROA)\%$ in columns 1–3, we follow Faccio, Marchica, and Mura (2011) and Boubakri, Cosset, and Saffar (2013) by including a set of firm characteristics containing *Firm age, ROA, log (Total assets), Book leverage, Sale growth, CapEx, Largest shareholding* and *SOE*. To analyze the $\sigma(Stk\_rtn)\%$ in columns 4–6, we follow Coles, Daniel, and Naveen (2006) by including a set of firm characteristics such as *Firm age, log (Total assets), Book leverage, Market-to-Book, CapEx, R&D/total asset ratio, Largest shareholding* and *SOE*. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	$\sigma(ROA)\%$			$\sigma(Stk\_rtn)\%$		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
High relative age	0.215***			0.184***		
	(0.057)			(0.058)		
Oldest relative age		0.268**			0.226***	
		(0.103)			(0.072)	
Medium relative age		0.229			0.18**	
		(0.132)			(0.068)	
Relative age			0.017**			0.027***
			(0.007)			(0.009)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	10,049	10,049
Adjusted R-squared	0.448	0.449	0.449	0.262	0.262	0.262

Table 5 Placebo Tests: Cutoff Month Replaced with August and October

Note: This table reports our placebo tests re-estimating the main results with alternative cutoff months in defining relative age variables. *Relative age* and *High relative age* in columns 1–4 (columns 5–8) are calculated according to Equation 1, in which the cutoff month is replaced with August (October). The dependent variables are given in the column titles. The CEO characteristics and firm characteristics are the same as in the main results reported in Table 4. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$		$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$	
High relative age (cutoff month=M8)	0.028		0.094					
	(0.14)		(0.076)					
Relative age (cutoff month=M8)		0.008		0.011				
		(0.012)		(0.006)				
High relative age (cutoff month=M10)					0.219		0.207	
					(0.142)		(0.119)	
Relative age (cutoff month=M10)						0.021		0.028
						(0.012)		(0.018)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	10,049	10,049	10,049	10,049
Adjusted R-squared	0.448	0.449	0.260	0.259	0.447	0.448	0.264	0.264

Table 6 CEO Relative Age and Firm Risk-taking: Leverage Ratios and Cash Holdings

Note: This table reports our regression estimates based on Equation 2, which tests the relation between a CEO's relative age and the firm's financial policies. The dependent variables are given in the column titles. The CEO characteristics are *Age, Age square, Male, Master's degree, Tenure, CEO-share, Ln (Salary+1),* and *Duality*. For the regressions in columns 1–6, we follow Coles, Daniel, and Naveen (2006) by including a set of firm characteristics containing *Firm age, log (Total assets), Market-to-Book, Industry-adjusted ROA, Net PPE, Z-Score, R&D/total asset ratio,* and *SOE*. For the regressions in columns 7–8, the firm characteristics are *Firm age, log (Total assets), Market-to-Book, Book leverage, Industry-adjusted ROA, CapEx, R&D/total asset ratio, Largest shareholding,* and *SOE*. The variables *Cash_securities/total assets* have missing observations because some firms failed to disclose their cash holdings and securities in 2006, 2016, 2017, and 2018. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	Book leverage (%)		*Market leverage (%)*		*Financial leverage (%)*		*Cash_securities/total assets*	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High relative age	0.865**		0.885***		7.873*		-0.006**	
	(0.333)		(0.291)		(4.698)		(0.003)	
Relative age		0.080*		0.069**		0.596*		-0.001**
		(0.045)		(0.032)		(0.308)		(0.000)
CEO characteristics controls	Yes	Yes			Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes			Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes			Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes			Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	10,049	10,049	7,544	7,544
Adjusted R-squared	0.715	0.715	0.845	0.843	0.303	0.291	0.579	0.579

Table 7 CEO Relative Age and Firm Risk-taking: Merger and Acquisition Activities

Note: This table reports our OLS regression estimates based on Equation 3, testing the relation between the CEO's relative age and the firm's acquisition characteristics based on 5,084 merger and acquisition announcements by 943 firms. The dependent variables are given in the column titles. The CEO characteristics are *Age, Age square, Male, Master's degree, Tenure, CEO-share, Ln (Salary+1),* and *Duality*. We follow Bernile, Bhagwat, and Rau (2017) by including a set of firm characteristics containing *log (Total assets), Market-to-Book, Book leverage, Cash/total assets ratio*, *Relative size of target, Stock price run-up, Stock price volatility, All-stock acquisition* (in columns 5-6 only), *Largest shareholding* and *SOE*. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	Same-industry acquisition		*All-stock acquisition*		*Announcement CAR* [-2, +2]	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
High relative age	-0.016*		-0.018***		-0.008***	
	(0.009)		(0.004)		(0.002)	
Relative age		-0.003**		-0.003**		-0.001***
		(0.001)		(0.001)		(0.000)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes
Year × Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,084	5,084	5,084	5,084	4,357	4,357
Adjusted R-squared	0.106	0.105	0.201	0.200	0.098	0.096

Table 8 Mechanisms: CEO Overconfidence

Note: This table reports our OLS regression estimates based on Equation 2, which tests the relation between the CEO's relative age and the CEO's overconfidence. The dependent variables are given in the column titles. Columns 1–2 are estimates based on a subsample of 9,332 firm-year observations covering 1,011 firms whose CEOs had not reduced their holdings of the firm's stock compared with the end of last year. Columns 5–6 are the estimates from a subsample of 6,940 firm-year observations covering 868 firms whose CEOs had bought stock in more years than they sold stock during the first three years of their tenure. Columns 9 and 10 report the estimates from a subsample of 4,224 firm-year observations covering 897 firms that had disclosed their earnings forecasts in their quarterly financial reports. The CEO characteristics are *Age, Age square, Male, Master's degree, Tenure, CEO-share, Ln (Salary+1),* and *Duality*. The firm characteristics are *Firm age, log (Total assets), Market-to-Book, Cash/total assets ratio, CapEx, R&D/total asset ratio, Largest shareholding,* and *SOE*. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	Firm holder		*Firm holder_LT*		*Net buyer*		*High CAPEX*		*Number of overestimates*	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High relative age	0.014**		0.03**		0.049***		0.022*		0.018*	
	(0.006)		(0.012)		(0.015)		(0.012)		(0.01)	
Relative age		0.002**		0.004**		0.008***		0.003*		0.003**
		(0.001)		(0.002)		(0.002)		(0.002)		(0.001)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,332	9,332	10,049	10,049	6,940	6,940	10,049	10,049	4,224	4,224
Adjusted R-squared	0.099	0.099	0.631	0.631	0.828	0.828	0.387	0.388	0.125	0.124

Table 9 Heterogeneities: By the CEO's Characteristics

Note: This table shows the heterogeneity in the RAE on corporate risk-taking by the CEO's characteristics. The dependent variables are given in the column titles. The CEO's characteristics and the firm's characteristics are identical to those in the main results reported in Table 4. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	$\sigma(ROA)\%$	$\sigma(Stk\_rtn)\%$	$\sigma(ROA)\%$	$\sigma(Stk\_rtn)\%$	$\sigma(ROA)\%$	$\sigma(Stk\_rtn)\%$	$\sigma(ROA)\%$	$\sigma(Stk\_rtn)\%$
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High relative age×Male	0.184**	0.187***						
	(0.073)	(0.057)						
Oldest relative age×Male			0.200**	0.228***				
			(0.094)	(0.077)				
High relative age×Duality					0.276**	0.373***		
					(0.128)	(0.096)		
Oldest relative age×Duality							0.341*	0.606***
							(0.178)	(0.147)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	10,049	10,049	10,049	10,049
Adjusted R-squared	0.449	0.262	0.450	0.262	0.448	0.262	0.450	0.262

Table 10 Performance and Crash Risk

Note: This table shows the impact of the CEO's relative age on firms' profitability (columns 1–4) and the stock price crash risk (columns 5–8). The dependent variables are given in the column titles. The CEO characteristics are *Age*, *Age square*, *Male*, *Master's degree*, *Tenure*, *CEO-share, Ln (Salary+1)*, and *Duality*. The firm characteristics in columns 1–4 are *Firm age, log (Total assets), Book leverage, Market-to-Book, CapEx, Sales growth, R&D/total asset ratio, Largest shareholding,* and *SOE*. The firm characteristics in columns 5–8 are *Firm age*, *log (Total assets)*, *Book leverage*, *Market-to-Book*, *CapEx, Sales growth, Industry-adjusted ROA*, *Largest shareholding*, and *SOE*. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	ROA (%)		*ROE (%)*		*Crash risk 1 (NCSKEW)*		*Crash risk 2 (DUVOL)*	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High relative age	-0.530***		-1.437**		0.038**		0.03***	
	(0.093)		(0.572)		(0.014)		(0.009)	
Relative age		-0.068**		-0.176***		0.006***		0.004**
		(0.023)		(0.053)		(0.001)		(0.001)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	9,815	9,815	9,815	9,815
Adjusted R-squared	0.428	0.428	0.284	0.284	0.098	0.098	0.098	0.098

Appendix 1. Definitions of variables

Variable	**Definition**
CEO Characteristics	
Relative age	Difference between the CEO's birth month and the cutoff month for primary school entrance, i.e., September.
High relative age	Dummy variable that equals one if the CEO's relative age is 7–12, and zero otherwise.
Oldest relative age	Dummy variable that equals one if the CEO's relative age is 10-12, and zero otherwise.
Medium relative age	Dummy variable that equals one if the CEO's relative age is 4-9, and zero otherwise.
Male	Dummy variable that equals one if the CEO is a male, and zero otherwise.
Master's degree	Dummy variable that equals one if the CEO has a master's degree or above, and zero otherwise.
Age (in years)	CEO's age (in years) in year t.
Tenure (in years)	Number of years a person served as CEO in a given firm.
CEO-share (%)	Percentage ownership of the CEO at year's end.
Duality	Dummy variable that equals one if the CEO is the chairman of the board, and zero otherwise.
Salary (RMB million)	Total value of cash payment the CEO received in year t (in RMB millions).
Firm holder	Dummy variable that equals one if the number of shares of the firm's stock held by the CEO is not reduced compared with the end of last year, and zero otherwise.
Firm holder_LT	Dummy variable that equals one if the CEO has not reduced her holding of the firm's stock during her tenure, and zero otherwise.
Net buyer	Dummy variable that equals one if the CEO bought stock in more years than they sold during the first three years of their tenure, and zero otherwise.
Number of overestimates	Number of upwardly biased earnings forecasts where the earnings reported are higher than those disclosed in the contemporaneous financial report each year.
Corporate Outcomes	
$\sigma(ROA)\%$	Standard deviation of the industry-adjusted ROA over three-year overlapping windows ($[t, t+2]$), $$\sigma(ROA) = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(E_{i,j,t} - \frac{1}{T}E_{i,j,t})^2} \mid T = 3;$$

	where $E_{i,j,t} = \frac{EBIT_{i,j,t}}{A_{i,j,t}} - \frac{1}{N_{j,t}} \sum_{k=1}^{N_{j,t}} \frac{EBIT_{k,j,t}}{A_{k,j,t}}$, $N_{j,t}$ indexes the firms within industry j and year t, and $EBIT_{i,j,t}$ is defined as the earnings before interest and taxes in year t, $A_{i,j,t}$ is equal to the total assets.
$\sigma(Stk\_rtn)$	Standard deviation of the industry-adjusted daily stock return calculated in free float-adjusted market capitalization weighted method over the fiscal year.
ROA	Return on assets, which equals the ratio of earnings before interest and taxes (EBIT) to total assets.
ROE	Return on equity, which equals the ratio of earnings before interest and taxes (EBIT) to equity.
Industry-adjusted ROA	Industry-adjusted return on assets, which equals the ratio of earnings before interest and taxes (EBIT) to total assets.
Industry-adjusted ROE	Industry-adjusted return on equity, which equals the ratio of earnings before interest and taxes (EBIT) to equity.
Book leverage	Ratio of total book debt to book value of total assets.
Market leverage	Ratio of total book debt to market value of total assets.
Financial leverage	Ratio of EBIT to earnings before tax (EBT).
Sales growth	Annual growth of total sales.
CapEx	Ratio of capital expenditure to total assets.
High CapEx	Dummy variable that equals one if the capital expenditures deflated by total assets is greater than the median level of that result for the firm's industry in a given year, and zero otherwise.
R&D (RMB million)	Expenditure on research and development in a given year (in million RMB).
Net PPE	Investment in property, plant, and equipment scaled by total assets.
Z-Score	Measure of bankruptcy risk from Altman (1968).
Cash_securities/total assets	Ratio of the sum of cash and cash equivalents to total assets.
Crash risk 1 (NCSKEW)	Negative coefficient of skewness of firm-specific weekly returns over the fiscal year.
Crash risk 2 (DUVOL)	Log of the ratio of the standard deviations of down-week to up-week firm-specific returns.
Same-industry acquisition	Dummy variable that takes a value of one if the acquirer and the target company are in the same industry, and zero otherwise.
All-stock acquisition	Dummy variable that takes a value of one if the acquirer offers only its own stock as contract consideration, and zero otherwise.
Announcement CAR [-2, +2]	Acquirer's cumulative abnormal return during trading days [–2, +2] around the merger announcement based on the market model.
Firm Characteristics	
Total assets (RMB billion)	Book value of total assets (in billion RMB).
Cash/total assets	Sum of cash and cash equivalents scaled by book value of total assets.

Fixed assets/total assets	Ratio of fixed assets to book value of total assets.
Market-to-book	Ratio of the market value of total assets to the book value of total assets.
Firm age (in years)	Number of years since the firm's establishment.
Largest shareholding ratio	Shareholding ratio of the firm's largest shareholder.
SOE	Dummy variable that is equal to one if the firm is state-owned, and zero otherwise.
Relative size of target	Book value of the acquirer to that of the target.
Stock price run-up	Cumulative stock return of the acquirer over trading days [-250, -30] relative to the acquisition announcement date.
Stock price volatility	Standard deviation of daily stock returns over trading days [-250,-30] relative to the acquisition announcement date.
Individual Characteristics (Sample of 2013 CHARLS)	
Overconfidence	Dummy variable that is equal to one if the individual meets both of the following two requirements, and zero otherwise: 1) the individual answers "No" to the question "Do you know if you have hypertension" or "Have you been diagnosed with hypertension"; and 2) The individual's blood pressure has a minimum systolic reading of 140 or greater or a minimum diastolic reading of 90 or greater.
Married	Dummy variable that is equal to one if the individual is married, and zero otherwise.
Education	Dummy variable that is equal to one if the individual has a high school degree or above, and zero otherwise.
Healthy	Dummy variable that is equal to one if the individual, when asked to evaluate and rate his or her health status from 1 ("Excellent") to 5 ("Poor"), gives a rating of 1 ("Excellent") or 2 ("Very good"), and zero otherwise.
Homeowner	Dummy variable that is equal to one if the individual is a homeowner, and zero otherwise.
Income	Individual's annual income (RMB 10,000).
Asset	Sum of the individual's total financial assets and debts (RMB million)
Hukou	Dummy variable that is equal to one if the individual has an urban hukou, and zero otherwise.
Childhood health	Dummy variable that is equal to one if the individual, when asked to compare his or her health status during childhood to that of other children of the same age from 1 ("Much healthier") to 5 ("Much less healthy"), gives a rating of 4 or 5 (i.e., below average), and zero otherwise.
Heart attack	Dummy variable that is equal to one if the individual has heart problems such as heart attack and coronary a heart disease, or zero otherwise.
Asthma	Dummy variable that is equal to one if the individual has asthma, and zero otherwise.

Appendix 2. Sample construction

1. The full sample (N=10,049):

We compile a sample of companies listed on the main board of the Shanghai and Shenzhen stock exchanges between 2006 and 2018.[29] First, we obtain the financial information and demographic characteristics of the CEOs from the China Stock Market and Accounting Research (CSMAR). Second, we manually collect each CEO's birth month and place of birth from one of the following sources: public announcements, news articles, and search engines such as Google and Baidu. In doing so, we collect information on the birth months of 3,922 CEOs, accounting for approximately 74% of the total number of CEOs over that period. Unfortunately, the CEOs' places of birth are rarely disclosed in the abovementioned sources, with this information available for only 936 CEOs. To ensure a reasonable sample size, we do not include this information in the full sample due to the high percentage of missing observations. Instead, we account for the impact of place of birth in the robustness tests shown in Table A1.

The initial sample includes more than 14,200 firm-year observations involving 1,665 firms. Given that the median tenure of the CEOs in our sample is four years, we restrict the sample to firms with at least four years of observations. We further exclude the following observations: 1) firms with foreign-born CEOs, because they may not have attended primary school in China and thus are not affected by China's primary school entrance policies[30] ; 2) firms in the financial and real estate industries (industry code J or K) due to the uniqueness of their financial structures and the different regulatory constraints to which they are subject; 3) firms marked as "ST" (Special Treatment) due to irregularities in their financial statements; and 4) observations with missing CEO information or firm-level data. The final sample consists of 10,049 firm-year observations from 2006 to 2018, covering 2,595 CEOs from 1,011 firms. To alleviate the impact of

[29] Firms listed on the ChiNext market, a newly established Growth Enterprise Board in China, or the Small and Medium Enterprise (SME) board are not included in the initial sample.

[30] There are seven foreign CEOs in our sample.

outliers, all of the accounting variables are winsorized at the top and bottom 1%.

2. The merger and acquisition sample (N=5,084):

Created from the full sample, the merger and acquisition sample used in the analysis reported in Table 7 consists of 5,084 merger and acquisition announcements by 943 firms from 2006 to 2018.

3. Sample of 2013 CHARLS (N=11,369):

The results of the external validity test reported in Table 1 are based on a sample of the 2013 China Health and Retirement Longitudinal Studies (CHARLS) Wave 2. CHARLS collects a national representative sample of Chinese residents aged over 45. Conducted in 2011, the baseline national wave of CHARLS surveyed approximately 10,000 households and 17,500 individuals in 150 counties/districts in China. The individuals are followed up every two years. The final sample with all of the variables non-missing for the external validity test includes 11,369 individuals from 150 counties in 126 cities. The distribution of the birth months exhibits a pattern similar to that of our sample. To alleviate the impact of outliers, *Assets*, and *Income* are winsorized at the top and bottom 1%.

CEO Relative Age and Corporate Risk-Taking

Internet Appendix

(Not Intended for Publication)

Internet Appendix

Table I-1. Robustness: Controlling for CEO Birth Year and Birth Place

Note: This table shows robustness tests in which the CEO birth cohort and birthplace are controlled for. The dependent variables are given in the column titles. Columns 1–4 report the results from re-estimating Table 4 with the CEO birth cohort fixed effect included. Columns 5–8 are our estimates based on a subsample of 2,648 firm-year observations covering 429 firms whose CEO birth provinces are disclosed, with both the birth cohort and the birth province fixed effects included. The CEO characteristics and firm characteristics are the same as those in the main results reported in Table 4. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	CEO Birth Cohort Fixed Effect				CEO Birth Cohort and Birth Province Fixed Effect			
	$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$		$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$	
Samples/Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High relative age	0.214***		0.18***		0.473**		0.463**	
	(0.073)		(0.052)		(0.199)		(0.214)	
Relative age		0.016**		0.027***		0.064**		0.057*
		(0.007)		(0.008)		(0.026)		(0.032)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth cohort fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth province fixed effect	No	No	No	No	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	2,648	2,648	2,648	2,648
Adjusted R-squared	0.450	0.451	0.261	0.261	0.462	0.341	0.341	0.341

Table I-2. Robustness: Possible Influence of the Cultural Revolution

Note: Panel A shows robustness tests accounting for the possible influence of the Class Suspension and Down to the Countryside movements. CEOs who were born from 1959 to 1961 and before 1962 are likely to have been exposed to the Class Suspension movement and the Down to the Countryside movement, respectively. *Suspend class* is a dummy variable for the birth cohorts of 1959–1961. *Send down* is a dummy variable for the birth cohorts pre-1962. Panel B reports our robustness tests accounting for the possible influence of spring admission, which is reported to have taken place between 1969 and 1973. The reported spring admission, if true, would have been applied to the birth cohorts of 1962–1966. *Spring COD* is a dummy variable for the birth cohorts of 1962–1966. The dependent variables are given in the column titles. CEO characteristics and firm characteristics are the same as those in the main results reported in Table 4. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

Panel A. Possible influence of the Class Suspension and Down to the Countryside movements

	$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$		$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High relative age	0.214***		0.181***		0.216***		0.182***	
	(0.058)		(0.054)		(0.056)		(0.055)	
Relative age		0.017**		0.027***		0.017**		0.027***
		(0.007)		(0.008)		(0.008)		(0.009)
Suspend class	0.017	0.009	0.11	0.106				
	(0.089)	(0.089)	(0.064)	(0.063)				
Send down					-0.084	-0.091	0.125	0.12
					(0.131)	(0.132)	(0.081)	(0.079)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	10,049	10,049	10,049	10,049
Adjusted R-squared	0.448	0.449	0.262	0.262	0.448	0.449	0.262	0.262

Panel B. Possible influence of spring admission

Variables	$\sigma(ROA)\%$ (1)	$\sigma(ROA)\%$ (2)	$\sigma(Stk\_rtn)\%$ (3)	$\sigma(Stk\_rtn)\%$ (4)
High relative age	0.216***		0.183***	
	(0.056)		(0.055)	
Relative age		0.017**		0.027***
		(0.007)		(0.009)
Spring COD	0.136	0.133	-0.011	-0.014
	(0.089)	(0.087)	(0.046)	(0.046)
CEO characteristics controls	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049
Adjusted R-squared	0.450	0.449	0.262	0.262

Table I-3. Robustness: CEOs Born around the Cutoff Month

Panel A. Accounting for the noise induced by CEOs born in September

Note: This table shows our robustness tests that account for the noise induced by the CEOs who were born in September. Columns 1–4 report the results from re-estimating Table 4 with an additional control variable: Born in September takes a value of one if the CEO was born in September, and zero otherwise. Columns 5–8 report the estimate results from re-estimating Table 4 with a subsample removing the CEOs who were born in September. The dependent variables are given in the column titles. The CEO characteristics and firm characteristics are the same as those in the main results reported in Table 4. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	Full sample				Subsample: removing CEOs born in September			
	$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$		$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$	
Samples/Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High relative age	0.258***		0.218***		0.246***		0.208**	
	(0.068)		(0.067)		(0.068)		(0.075)	
Relative age		0.028***		0.039**		0.026***		0.037**
		(0.009)		(0.013)		(0.009)		(0.016)
Born in September	-0.295	-0.271	-0.237*	-0.125				
	(0.209)	(0.191)	(0.125)	(0.085)				
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	9,262	9,262	9,262	9,262
Adjusted R-squared	0.448	0.448	0.269	0.269	0.458	0.458	0.276	0.276

Panel B. Accounting for the noise induced by CEOs born in August, September, or October

Note: The dependent variables are given in the column titles. Columns 1–4 report the results from re-estimating Table 4 with an additional control variable, *M8_M9_M10*, a dummy variable that takes a value of one if the CEO was born in August, September, or October, and zero otherwise. Columns 5–8 report the estimates from re-estimating Table 4 with a subsample removing the CEOs who were born in August, September, or October. The CEO characteristics and firm characteristics are the same as those in the main results reported in Table 4. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	Full sample				Subsample: removing CEOs born in M8, M9, or M10			
	$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$		$\sigma(ROA)\%$		$\sigma(Stk\_rtn)\%$	
Samples/Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High relative age	0.25***		0.215***		0.343**		0.153***	
	(0.067)		(0.063)		(0.12)		(0.045)	
Relative age		0.023***		0.034***		0.051**		0.03**
		(0.008)		(0.011)		(0.02)		(0.011)
M8_M9_ M10	-0.173	-0.182	-0.111	-0.088				
	(0.13)	(0.13)	(0.073)	(0.069)				
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	7,326	7,326	7,326	7,326
Adjusted R-squared	0.448	0.449	0.269	0.269	0.449	0.449	0.3	0.3

Table I-4. Robustness: Alternative Measures of outcome Variables

Notes: Panel A reports pur robustness tests re-estimating the main results with the dependent variable $\sigma(ROA)\%$ replaced with three alternative measures: ROA_Diff in columns 1-3 is the difference between the maximum and minimum industry-adjusted ROA over a three-year window ([*t*,*t+2*]); $\sigma(ROA\_4\ year)$ in columns 4-6 is the standard deviation of the industry-adjusted ROA over a four-year window ([*t*,*t+3*]); and $\sigma(ROE)\%$ in columns 7-9 is the standard deviation of a firm's industry-adjusted return on equity (ROE) over three-year overlapping windows ([*t*,*t+2*]). Panel B reports our robustness tests re-estimating the main results with the dependent variable $\sigma(Stk\_rtn)\%$ replaced with two alternative measures: $\sigma(Stk\_rtn\_M)\%$ in columns 1-3 is the standard deviation of the industry-adjusted daily stock return calculated using the (total) market capitalization weighted method over the fiscal year; and $\sigma(Stk\_rtn\_E)\%$ in columns 4-6 is the standard deviation of the industry-adjusted daily stock return calculated using the equal-weighted method over the fiscal year. The CEO characteristics and firm characteristics in Panel A and B are identical to those in the main results reported in Table 4. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

Panel A. Alternative measures of volatilities of ROA

	ROA_Diff			$\sigma(ROA\_4\ year)\%$			$\sigma(ROE)\%$		
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High relative age	0.409***			0.467**			0.621**		
	(0.102)			(0.220)			(0.246)		
Oldest relative age		0.463**			0.647**			1.019***	
		(0.167)			(0.299)			(0.287)	
Medium relative age		0.449*			0.058			0.135	
		(0.240)			(0.365)			(0.144)	
Relative age			0.029**			0.05*			0.076***
			(0.013)			(0.027)			(0.024)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	8,555	8,555	8,555	10,049	10,049	10,049
Adjusted R-squared	0.447	0.447	0.447	0.493	0.493	0.493	0.478	0.478	0.478

Panel B. Alternative measures of volatilities of stock return

	$\sigma(Stk\_rtn\_M)\%$			$\sigma(Stk\_rtn\_E)\%$		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
High relative age	0.218***			0.216***		
	(0.058)			(0.055)		
Oldest relative age		0.278***			0.285***	
		(0.075)			(0.072)	
Medium relative age		0.221***			0.235***	
		(0.072)			(0.071)	
Relative age			0.031***			0.032***
			(0.009)			(0.009)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,049	10,049	10,049	10,049	10,049	10,049
Adjusted R-squared	0.108	0.108	0.108	0.115	0.115	0.115

Table I-5. The Impact of CEO Relative Age on Firm Value and Cumulative Abnormal Return Around CEO Turnover Announcements

Note: This table shows the overall impact of CEO relative age on firm value (columns 1-2) and the cumulative abnormal return around CEO turnover announcements (columns 3-6). The CEO characteristics are *Age, Age square, Male, Master's degree, Tenure, CEO-share, Ln (Salary+1),* and *Duality*; The firm characteristics are *Firm age, log (Total assets), Market-to-Book* (columns 3-6 only), *Book leverage, CapEx, Sales growth, Industry-adjusted ROA, Largest shareholding,* and *SOE*. The standard errors are clustered at the industry level and are reported in parentheses. ***, **, and, * denote significance at the 1%, 5%, and 10% probability levels, respectively.

	Tobin's Q		*CEO turnover CAR*		*CEO turnover CAR* [-2, +2]	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
High relative age	0.06		0.003		0.004	
	(0.034)		(0.002)		(0.004)	
Relative age		0.008		0.000		0.001
		(0.005)		(0.000)		(0.000)
CEO characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	No	No	No	No
Year Fixed Effect	Yes	Yes	No	No	No	No
Year×Industry Fixed Effect	No	No	Yes	Yes	Yes	Yes
Observations	10,049	10,049	1,523	1,552	1,569	1,569
Adjusted R-squared	0.684	0.689	-0.022	-0.018	0.005	0.005