Superstition on Zodiac and Firm Performance:
Evidence from China

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Qianfeng Rong

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Abstract

Among the widespread superstitions in China, the "zodiac year" of birth, which occurs once every 12 years, is believed to bring bad luck to one's career, health, or family. In this study I investigate if the zodiac year of a firm's top executives would bring negative impact on the firm's financial performance compared to normal years. I find that ROA, ROE, and Tobin's Q are significantly lower in the zodiac year than those in normal years. However, the firm's stock returns do not seem to reflect the zodiac year's negative impact.

Key words: zodiac year of birth, firm performance, chairman

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Qianfeng Rong

Acknowledgements

1. Introduction

Superstition as an irrational superpower usually hard to be justified in scientific ways; however, it can be explained by the psychology of rational risk aversion. Keinan (2002) indicate that high stress can reduce people's sense of control, which lead people to resort to superstitious thinking. Specifically, similar with firm's top executives, the elite sport players who shoulder the crucial responsibility show apparent superstition during the contests. They always choose to wear the same lucky clothes with the specific number or color, and that is proved to connect with the placebo effect (Domotor et al. 2016). Moreover, Foster and Kokko (2008) demonstrate that superstition is an inevitable feature of adaptive behavior in all organisms, including human beings, which is consistent with the experiments tested by Abbott and Sherratt (2011) and Killeen (1978). They find this instinctive predispositions in many natural creatures and conclude that superstition arises when the periodic life is broken or the public information is incomplete.

Many researchers excavate and analyze the superstition impacts in economics or finance, and mainly referring to the stocks or firm performance. For instance, in Chinese market, Weng and Huang (2017), Ke et al. (2017), and Simmons and Schindler (2002) address the different attitudes from the public to the digit 8 and 4, which are associated with preciousness and death respectively. They find that investors, merchants or customers all favor the digit 8 and avoid the digit 4, which can ascribe to people's preference in lucky numbers. One of the results from Simmons and Schindler (2002) exhibit that about 40% commodities use the digit 8 as the ending of the price. Apparently, in Chinese culture, eight expresses an absolute predominance in many areas comparing with the other nine digits, and the beliefs that are widely accepted by the publics often reflect in people's decision making.

In this paper, I focus on one of the Chinese superstitions as well, namely the Chinese zodiac, and link it to the corporate analysis. I choose the Chinese market since Chinese superstition mostly develops from the ancient philosophy, such as Yin Yang, Eight Diagram tactics, or Five Elements, which intend to explain the comprehensive natural phenomena. Furthermore, Torgler (2007) also emphasize that people from Communist countries even formerly Communist countries show a particularly high degree of superstition after testing 17 countries. Chung et al. (2014) and Brown et al. (2008) indicate that those handed down superstitions are deeply rooted in the public's mind because of the mysticism in ancient Chinese culture. The Chinese astrology is one of the representative ways to divide the world into a relatively structured cycle, which consists of twelve zodiac animals, and each person is considered to have a corresponding zodiac animal depending on the birth. In sequence, the twelve zodiac animals are rat, ox, tiger, rabbit, dragon, snake, horse, goat, monkey, rooster, dog, and pig. Those animals are not the simple symbols. It is meaningful when people choose their partner, job, or face other challenges. Above all, it is thought to bring bad luck during people's zodiac year of birth. As in this year, people are believed to offend the God of Age, called Tai Sui who brings curses. Fisman

et al. (2019) demonstrate that the purchase of the medical, life, or accident insurance in the previous year of people's zodiac year increase significantly.

In general, some researchers have documented the changes in CEOs/Chairmen's corporate and personal behavior when they face their zodiac year. Fisman et al. (2019) test the personal behavior of the chairman himself/herself and the result indicates a siginificant negative impact to the degree of risky investments. In this study, I aim to assess the zodiac year impact on firm performance. While a manager could have an influence on how his/her firm perform via investment decisions (e.g. Fisman et al., 2019), the firm performance may also be subject to external factors such as market demand, investor tastes. These exogenous factors are well out of the manager's control and could be driven by the negative force of the manager's zodiac year. I use accounting-based financial performance measures of ROA, ROE, and Tobin's Q and market-based performance measure of stock return to examine whether the zodiac negativity results in a lower performance of the company led by a manager in his/her zodiac year. If the God of Age imposes a negative impact on the manager in his zodiac year regardless of what he tries to do, I expect to find this impact in firm performance measures.

I firstly collect all the birth information of chairman and CEO in the Chinese non-SOE public companies listed on both Shanghai and Shenzhen Stock Exchange from 2004 to 2018. Then, I extract the dataset that contains the entire birth month and year. Only the combinations of birth month and year are supposed to provide the accurate zodiac year of the chairman/CEO, where the Chinese New Year often happens in January or February of the Gregorian calendar. I also find the corresponding personal characteristics, which are age, education level, and gender. Peltzer et al. (2003) and Fisman et al. (2019) include these personal characteristics as well when they test the personal beliefs. In addition, Torgler (2007) finds that age, gender and education have a strong analytical impact on superstition. Furthermore, all data come from the CSMAR database, including the preliminary items in measuring the proxies of firm performance: ROA, ROE, Tobin's Q, capital expenditure ratio and stock return, as well as the following firm characteristics, namely firm size, leverage, cash ratio, book to market ratio and R&D ratio.

Empirically, I find some intriguing results: (1) ROA, ROE, and Tobin's Q show the significant negative relationship with the chairman's zodiac year and remain robust under different conditions. Tobin's Q as a proxy in measuring the firm's market value shows a reduction of around 15% during the zodiac year. On average, ROA and ROE are 0.35% and 1% lower in that year. (2) The capital expenditure ratio is not statistically significant with the unstable sign of coefficients in most of the tests, but exhibits saliently negative result when the test only extract the valid R&D dataset. (3) The yearly stock return occurs as the worst result. None of the tests exists the acceptable outcomes. Interestingly, I do not find any significant evidence that links firm performance and zodiac year effect for CEOs. Corporate culture in China often sees that chairmen engage in more major strategic decisions such as ultimate mergers or acquisitions, new contracts, or substantial investments, while CEOs concern more

about the short-term operations. Thus, the relationship between CEO behavior and firm performance are relatively insignificant in my examinations, which are consistent with Fisman et al. (2019).

There are some plausible explanations for the discrepancy: Firstly, this study works on more indirect measures comparing with previous papers. The impact on individual investors is relatively arguable, the investors are rarely inclined to dig the personal information of the firm's chairman. Barber et al. (2016), Hedström et al. (2011), and Nagy and Obenberger (1994) find the factors that influence the individual investors in choosing the stocks or funds. The results show that market factor is the most important effect, and the wealth-maximization becomes the second place of their considerations. Whereas the ethical position and managers' private messages appear to give only rough effects. And for those unsophisticated investors, they even observe less evaluating indicators. For capital expenditure ratio, Chung et al. (2003) point that capital expenditure not shows a positive relationship with firm value, as the target of executives is to maximize their own wealth rather than the firm's value. Moreover, the capital expenditure includes all investment opportunities in a firm, Chung et al. (1998) provide that the ratio of capital expenditure is related with whether the firm's investment opportunities are valuable or not. Therefore, the negative relationships between R&D and the Zodiac year mentioned in Fisman et al. (2019) are underrepresented in my test, as the results of capital expenditure ratio and yearly return appear the inconsistent coefficients. Secondly, many related papers emphasize the impact from calendar anomolies, which convert the results by testing different time periods or regions. Especially, the lunar calendar effect apparently influence individual's behavior. For instance, the volatility of stock return on Friday the Thirteenth appears inconsistent results between different time ranges (Dumitriu and Stefanescu, 2019; Lucey, 2000; Yuan et al. 2006; Khaled and Keef, 2011; Liu, 2013; McGuinness and Harris, 2011 and Kim and Park, 1994). Furthermore, there are several technical limitations when I investigate this perceptual topic. For instance, the sample range shrinks distinctly due to the missing birth month, which reduces from more than 200 thousand observations to about 10 thousand observations. I drop them for the sake of precise evaluations but lose some representativeness. Similar confusion also arises in collecting the R&D expenditure data, where I only gain one third of the figures in Fisman et al. (2019).

Overall, there are some contributions based on the tests. As widely believed, back luck comes during a person's zodiac year of birth. According to Fisman et al. (2019), the chairmen incline to avoid some investments or business in that year, and this study confirm that no matter what they try to do, the negative zodiac effect still exists on firm performance. Block and Kramer (2009) and Keinan (2002) indicate that the superstitions can be classified as either cultural or personal. It is reasonable to say that this zodiac superstition is not baseless, as the impacts reflect in both direct and indirect levels, namely whether they are controlled by the chairmen or not. Then, it is evident that the different performance measures exhibit different results. The existence of the negative effect is significantly impact on the firm's value (ROA, ROE and Tobin's Q) rather than the capital expenditure, where the conservative fixed assets are not affected much.

The remainder of the paper is organized as follows. Section I reviews the pioneering papers and other evidence relating to superstition in the finance area. Section II presents the hypotheses and expectations. Section III describes the data and the methodology. Section IV provides descriptive statistics, results and the robustness checks. Section VI concludes.

2. Literature review

Presumably, superstition is generally driven by individuals' psychologies and judgments. Comparing to religiosity or belief, it is relatively difficult to provide a standard behavior via the impact of superstition. However, there are some widely held points that superstitions frequently influence individuals' behavior, and many scientific fields also pay considerable attention to them. Hirshleifer et al. (2018) address that superstition is a mistaken theory in investment decisions, but the tendency is still strong in many cultures. For example, the manifestations of unlucky numbers in stock code: number 13 in Western countries and number 4 in Asian countries.

The zodiac year effect is apparently a crucial superstitious belief in China. People believe that they would face frustrations when they meet their zodiac year of birth, which happens once in every twelve-year cycle. The traditional explanation is the mystery about the God of Age who haunts people in this year. Thus, people always become more cautious during this year. The combination between the zodiac year and finance in empirical research presents some controversial results due to the disparate research orientations.

2.1 Zodiac and behavior

Fisman et al. (2019) demonstrate that the zodiac year of a chairman's birth influences his/her decisions. They assume that the risk-taking for an individual or a firm decline in the zodiac year of birth. This assumption inspires me as well, since the psychology of risk avoidance often appears, especially under the superstition. Then, they find that risky investments, which they use R&D and acquisitions as the proxies, are significantly lower in the chairman's zodiac year. Meanwhile, the insurance purchases present a significant positive relationship with the zodiac year of birth.

Some papers related to the difference of personality in each zodiac animal show the multiple results in whether the birth determines the firm or market performance. Meisami (2013) and Phoeng and Swinkels (2016) assume that people in the same zodiac year represent the corresponding traits, which impact the investment decisions directly. Focusing on Hongkong Stock Exchange, the result shows that the market return in Rat, Snake, or Rooster years fluctuate more than other years, but these variations are not strong enough to be the evidence of their hypotheses. The researches above recommend that either shareholders or management in a corporation are not attentive to the managers' zodiac animals as they assume. But Chen (2018) provides evidence that the CEOs born in dragon years, which are considered as auspicious zodiac years, are positively associated with firm value. This case can be explained by the studies which they find that the leaders with positive psychological traits, such as hope, optimism, resiliency, tend to have a positive and strong effect on firm performance (Peterson et al., 2009).

2.2 Superstition and stock market

Several empirical examinations are focusing on the performance of the stock market. Rodriguez and Kolb (1987) reveal the relationship between the superstition and U.S. security market performance in early times and indicate that the mean return for Friday the Thirteenth is significantly lower than the remaining Fridays. The sample of their research is from 1962 to 1985, with 39 Friday the Thirteenth and 1141 normal Fridays, which is about 3% experimental observations. However, this study only reports the t-statistic values of the difference but does not show any regression models, which only demonstrates a fundamental hypothesis that the market can be affected by this superstition. Recently, Dumitriu and Stefanescu, (2019) publish a similar report to investigate the volatility of stock price suffered by Friday the Thirteenth but stratify into three periods separately, namely 1990-1999, 2000-2007, and 2008-2019. The authors conclude that three subsamples occur different price volatilities, where the second time range shows more consistent results than others. The other two subsamples cannot prove that the returns on Friday the Thirteenth are lower than the trading days before or after them. Combining with Rodriguez and Kolb (1987), they think the results may be affected by some calendar anomalies which present seasonality. Coincidentally, Lucey (2000) examine the stock returns of Friday the Thirteenth as well, but extend the sample to 19 international countries. However, the results not reveal a perfect lower returns on Friday the Thirteenth among all countries, which some of the them show higher returns on that day. Thus, the author conclude a philosophy of the anomalies that only the existence of the anomalies can overturn the paradigm.

The calendar anomaly that many papers mentioned, combines the abnormal stock market with calendars, such as weekend effect, January effect, turn-of-the-month effect, or lunar effect. Yuan et al. (2006) examine the daily returns and cumulative returns before and after the new moon or the full moon from 1973 to 2001 through 48 countries. Later, Khaled and Keef (2011) re-examine this effect from 1988 to 2008 through 62 countries. Similarly, they establish two 7-day event windows separately and provide that the mean return during the full moon period is signficantly lower than the new moon event. These two between-country examinations confirm the anomalous behavior under the lunar effects. In Chinese market, Liu, (2013) and McGuinness and Harris, (2011) emphasize the relationship between the stock market and the Chinese lunar calendar, which named the Chinese Farmer's Calendar, and the zodiac year defines along with it. The properties written in the Chinese Farmer's Calendar interiorize the public, which provides a strong evidence to explain stock volatility by the lunar calendar. Moreover, Ke et al. (2017) emphasize that during festival dates, such as the period of Chinese New Year and the "ghost month" in the lunar calendar, superstition presents a more prevalent role in decision-making. They add several dummy variables that represent each important date or period and test them based on weekly frequency. Their results show that investors are more likely to become superstitious before or during these special dates, but pay less attention to it after the festivals; especially, they are more inclined to avoid the inauspicious number 4. But the conclusions above all present the regionally-based

phenomena, where the results are not acceptable in some samples. However, they still provide strong evidence that the investors' mood are related to the calendar superstitions.

The numerical preference also occupies a vital position in superstitious studies. Weng and Huang (2017) and Ke et al. (2017) provide evidence in the Taiwan security market where investors usually present irrational preference for lucky listing codes during selecting the stocks. The lucky numbered shares are traded at a premium compared to those with regular or unlucky numbers. This idea manifestes in Chinese A-shares as well (mostly held by Chinese) that the stock prices are more than twice as likely to end in 8 than 4, where 8 sounds like "rich" and 4 sounds like "death" in Chinese. It is interesting to note that the preference for 8 in B-shares (mostly held by foreigners) is not apparent (Brown and Mitchell, 2008). Chung et al. (2014) examine whether superstition is deeply rooted in the mind of the Chinese public by testing the returns in US commodity trading. They find that on unlucky days, Chinese customers buy only half of the US exports compared to lucky days. Moreover, the housing market in North American, where congregates a large proportion of immigrants, is affected by Chinese superstition. For example, people also prefer number 8 and obviate number 4 to the ending figure of the address number, which is consistent with the stock market (Huang, Hill, and Fortin, 2014).

Besides the traditional firm stocks, Robiyanto et al. (2015) calculate the annual metals return of gold, silver and platinum from 1900 to 2013, and link the return volatility with each Chinese zodiac year. Comparing to the superstition of Five Elements, zodiac cycle shows more statistically significant impacts. For example, year of the Snake, Goat, Dragon and Rat consecutively present negative effects on gold; year of the Monkey shows lower return on silver; year of the Rooster negatively influence the platinum return.

2.3 Investor, CEO or chairman's behavior and stock, firm performance

Many papers demonstrate the volatilities of people's behavior under the zodiac superstition with some indirect indicators. Xiang et al. (2018) propose to use the number of Taoist temples and corporate philanthropy to test whether the zodiac compatibility can fix the agency problem between the chairman and CEO. This paper suggests that the attitudes to charitable donations exist similarity if they were born in one zodiac year, which means this positive and affirmative donating action can improve the cooperation between the chairman and CEO. Guo et al. (2018), Agarwal et al. (2014) and Lev et al. (2010) confirm the positive relationship between donation and firm reputation, sales growth, future profit, and fund risk as well. Especially, the advanced donations of hedge fund managers provided by Agarwal et al. (2014) present a significant effect in lowering the risk.

Comparing with the behavior of CEO or chairman, investors' psychology is more traceable. Baker and Wurgler (2006) and Schmeling (2009) exhibit that investor sentiment affects the stock price in the U.S market and shows a highly subjective influence. Concretely, the sentiment of investors shows negative effect on stock returns, especially those stocks that are difficult to arbitrage or value. Yu and

Li, (2012) and those papers above also indicate that investor's behavioral biases can affect not only individual stock prices but also the aggregate market price. Notably, the proxies and control variables the authors mentioned are quite comprehensive; for example, they include the max, delta, and many indexes of the returns. In my research, I only employ the yearly return of each firm, which may exist some anchoring or objective bias.

In addition, Block and Kramer (2009) randomly choose forty-four students in Taiwan university and let them select the products in stores. Then they organize these commodities into different attributes. The result indicates that human purchase likelihood and satisfaction are strongly driven by superstitious beliefs, especially concerning the lucky numbers, colors. However, customers who do not care about the superstitions not follow these rules.

2.4 Summary

The superstition measured in prior papers are concentrated on numbers and calendars. Except for the papers which investigate the pure zodiac symbolic traits, others all show the negative behavior facing the inauspicious times or numbers, and most of them are statistically significant.

The essence of focusing on superstition is to follow the human nature that people often draw on advantages and avoid disadvantages. The risk-averse psychology drives investors or firm managers to change their decision makings. Mowen and Jadlow (2010) propose that one of the similarities between investors and gamblers is the superstitious belief, which means this superpower provides a considerable basis during uncertain transactions. Fisman et al. (2019) support this trait by supplying a negative relationship between risky investments and the chairmen's zodiac year of birth. Meanwhile, many papers study the association between risk-taking and firm performance. They conclude that risk-taking is positively related with performance and can influence the future firm performance as well. This relationship can be identified under many conditions, such as high internal R&D investment and low information turbulence. The proxies to measure firm performance are concentrate on ROA, ROE, ROS, Tobin's Q and productivity, while they all use R&D represents the risk-taking (Artz et al., 2010; Belderbos et al., 2004; Bromiley, 1991; Hung and Chou, 2013; Pratono, 2018). Emerging from the results reported above, it is predictive that the corresponding firm performance will be lower in the zodiac year.

3. Hypotheses

Since the preceding research mentioned, an unlucky date or number often reflects a negative impact on stock return or firm performance. Meanwhile, investors or firm's chairmen are viable to enhance the profits or avoid the risks by adjusting their attitudes. In the study from Fisman et al. (2019), superstition on zodiac year suggests a negative impact on the chairman's direct behavior. However, it

is believed that the God of Age would bring bad luck to someone during his/her zodiac year regardless of how much effort that person tries to avoid such negativity. Despite stock price are driven by firm fundamentals, it is also affected by other factors including superstitious beliefs (Ke et al, 2017; Rodriguez and Kolb, 1987). If investors, for some reason, are aware of the firm manager's zodiac effect they may try to avoid investing in this company; hence, the company's stock price will fall. Even if investors are not aware of the zodiac effect, an invisible negativity force may drive stock price lower in the zodiac year. Therefore, I have the first hypothesis as follows:

H1: The firm's stock return is lower in the chairman's zodiac year than in non-zodiac years.

Chen (2018) provide a positive growth in firm performance when the year is regarded as an auspicious year. Moreover, the chairman as a decision maker in the firm is expected to be more cautious and afraid during his/her zodiac year of birth, which should impact negatively on the firm performance. Fisman et al (2019) show that Chinese chairmen reduces the firm's merger and acquisition activities and increases their personal insurance due to the zodiac effect. Therefore, I conjecture that firm performance to be negatively affected by either more conservative behaviour of the manager or by an invisible demand decline in the firm's products, which is stated formally as the second hypothesis below:

H2: The accounting-based firm performance is poorer in the chairman's zodiac year than in the non-zodiac years.

4. Data and Methodology

My sample includes all the Chinese public firms listed on Shanghai and Shenzhen Stock Exchange from 2004 to 2018. The main zodiac year and other personal characteristics are acquired from CSMAR since this database covers enough information about the Chinese entrepreneurs. Meanwhile, the corresponding stock returns and other proxies for firm performance are obtained from CSMAR as well to keep the consistency. The measures of all variables are basing on yearly data. The independent variable, chairman's zodiac year, only employs the source which indicates both birth year and month in the database since the Chinese lunar calendar always starts from January or February in the Gregorian calendar. I follow the standard mentioned in Fisman et al. (2019) that defines the person born in January as the previous zodiac animal and assigns the person born in February to the current zodiac animal. Furthermore, I exclude all SOE firms in the main tests because CEOs or chairmen do not control the ultimate decisions in state-owned enterprises. Thus, the final firm-year observations are approximately 8000 varying according to the diverse criteria, with about 1200 non-SOE firms in 15 years.

To address the influence of superstition at the firm level, I use several firm characteristics to estimate firm performance. I use ROA_t to measure the firm total profitability and it is defined as the operational income in end of year t to total assets in end of year t; ROE_t is the ratio of net income in end of year t to shareholders' equity in end of year t, which is an efficient variable to show the profit that is generated from the shareholders. Then, $Tobin's\ Q_t$ is a representative ratio to show whether a firm is overvalued or undervalued. It is calculated using the year-end total assets minus market value of equity and plus the book value of equity, divided by total assets. Besides, I add a variable to test whether the company is investing effectively. As the zodiac year of birth influences the chairman's investment decision. Based on one test in Cheng et al. (2013), I calculate the investment efficiency by using capital expenditure in end of year t to total assets in end of year t-1 and name it $CAPEX_t$, which exclude the non-capital expenditure. In addition to these firm performance proxies above, r_{it} is a stock annual return of firm i calculated as the natural logarithm of the firm's stock price in end of year t over its stock price in end of year t-1. Below, I list various control variables that relate to the firm characteristics in multivariate tests. These control variables are all mentioned in the papers that test the impact on firm level (Fisman et al., 2019; Xiang et al., 2018). Firm $Size_t$ always becomes an important element in affecting the results; for example, the chairman or CEO in large firms may own less decision-making than small firms. It computes as the natural logarithm of the total assets in end of year t. Then, I put $Leverage_t$ and $Cash\ ratio_t$ in here as the firm's capital structure impacting much on the firm's performance. $Leverage_t$ is calculated as total debt to total equity in end of year *t*, and $Cash\ ratio_t$ is calculated as cash and cash equivalents in end of year *t* to current liabilities in end of year *t* respectively. $Book\ to\ Market_t$ ratio compares the book value and the market value as well, which is a way to identify overvalued or undervalued. It is the percentage of year-end shareholder equity to market capitalization. Finally, I add the RD_t ratio here basing on the significant relationship between R&D and

zodiac (Fisman et al., 2019). It is the ratio of research and development expenditures in end of year *t* to the lagged total assets. To test my hypotheses, I follow the literature in this area (e.g. Fisman et al., 2019) and employ the following model:

$$Perf_{it} = \alpha_i + \beta_1 Zodiac_{it} + \beta_2 Size_{it} + \beta_3 Leverage_{it} + \beta_4 Book\ to\ Market_{it} +$$
$$\beta_5 Cash\ ratio_{it} + \beta_6 RD_{it} + \beta_7 Female_i + \beta_8 Education_i + \beta_9 Age_{it} + \varepsilon_{it} \qquad (1)$$

where $Perf_{it}$ is either yearly stock returns or accounting-based performance measures. The *i* represents the firm and *t* indicates the year. $Zodiac$ is a dummy variable, which equals one if the chairman or CEO is in his/her zodiac year of birth. $Female_i$ is 1 if the chairman or CEO is a female and 0 otherwise. $Education_i$ indicates their highest education level, namely that 1 represents technical secondary and below, 2 represents college, 3 represents undergraduate, 4 represents postgraduate, 5 represents PhD and 0 represents others. Age_{it} measures their age in the given year.

If the sign of β_1 is negative and significant, my hypotheses will be justified correctly. All the regression analyses implement in E-Views. Besides, I also do several robustness tests by adjusting the samples but use the same regression models. I classify the original data into different groups that belong to the specified industries. . I follow one viable standard in CSMAR that the industries can divide into six categories, namely finance, utilities, properties, conglomerates, industry, and commerce. While other classifications are hard to stratify due to their complex subdivision. To test more specifically, I firstly calculate the average per year of each variable in one industry, as the industry averages and ratios vary depending on their specific properties. It is more precise to remove the firm itself when calculate the reference average; however, the zodiac dummy variable and three personal characteristics (age, gender and education) remain the same. It is an ideal way to find out the true performance of a specific company by comparing and adjusting those of companies that lie within the same industry. Yating et al. (2010) present that this dynamic adjustment in the same industry sector can provide the difference from the industry average, which can be a good indicator of whether a firm is successful or not. Then I use each firm-year observation minus the corresponding average to gain a new sample list. The corresponding industry-adjusted model is:

$$INPerf_{it} = \alpha_i + \beta_1 Zodiac_{it} + \beta_2 INSize_{it} + \beta_3 INLeverage_{it} + \beta_4 INBook\ to\ Market_{it} +$$
$$\beta_5 INCash\ ratio_{it} + \beta_6 INRD_{it} + \beta_7 Female_i + \beta_8 Education_i + \beta_9 Age_{it} + \varepsilon_{it} \qquad (2)$$

where $INPerf_{it}$ is the yearly stock returns or accounting-based performance after the industry adjustments. The *i* represents the firm and *t* indicates the year.

Another sample used in this study is the five-year event groups, which simply extracts the range from the previous two years to the next two years around the zodiac year: [-2,+2] period. I calculate the

changes of each variable in two consecutive years by using current year(t) minus previous year(t); however, the zodiac dummy and chairman characteristics remain the same as well. It is evident that establishing a centralized event window can provide a more accurate estimate of the zodiac effect on performance.

Furthermore, I test the sample that only includes valid R&D data, where more than two-third R&D figures are missing in the initial tests. The response in the chairman's zodiac year shows a significantly negative relation with R&D cost, which is consistent with Fisman et al. (2019). This measure is expected to present some commendable results.

5. Descriptive statistics and Results

5.1 Descriptive statistics and correlation table

Figures 1 to 4 report visible results about the distribution of zodiac and birth information. Figure 1 and 2 show the birth year and month of each unique chairman and CEO separately in the whole sample, where the year of birth shows the distinct normal distribution, and the month of birth distributes evenly. It is obvious that the range of age is from 1935 to 1991, in which a big generation gap can produce different life experiences and thoughts; however, about 60% people are in one zodiac circle. Figure 3 shows the zodiac animal of each unique chairman and CEO and does not appear the difference between each animal. However, when put the chairman or CEO in their position, Figure 4 presents the apparent concentration on the animals from 2010 to 2017. Therefore, the results of the regression analyses are actually affected by the recent eight years.

Figure 1: Bar graph of the birth-year distributions in unique chairman and CEO
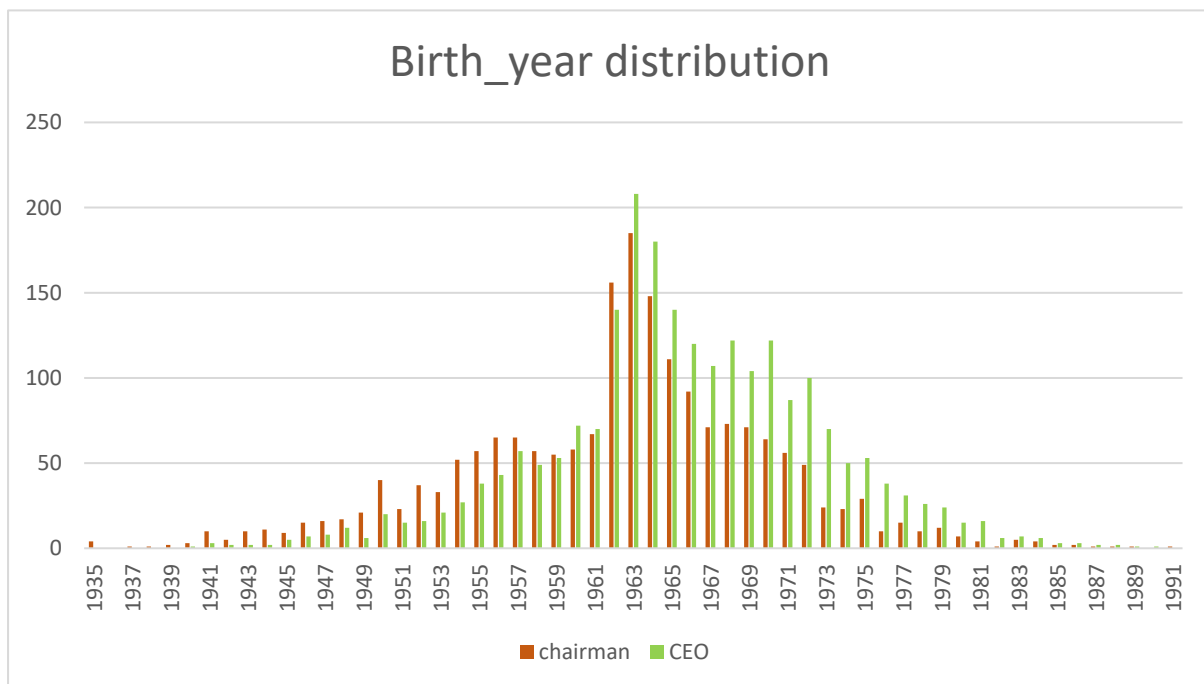
Notes: This figure shows the birth year of each unique chairman and CEO in the whole sample collected from CSMAR, including all firms listed on the Shanghai and Shenzhen stock exchanges from 2004 to 2018. The horizontal axis indicates all birth year range, and the vertical axis reflects the number of people.

Figure 2: Bar graph of the birth-month distributions in unique chairman and CEO
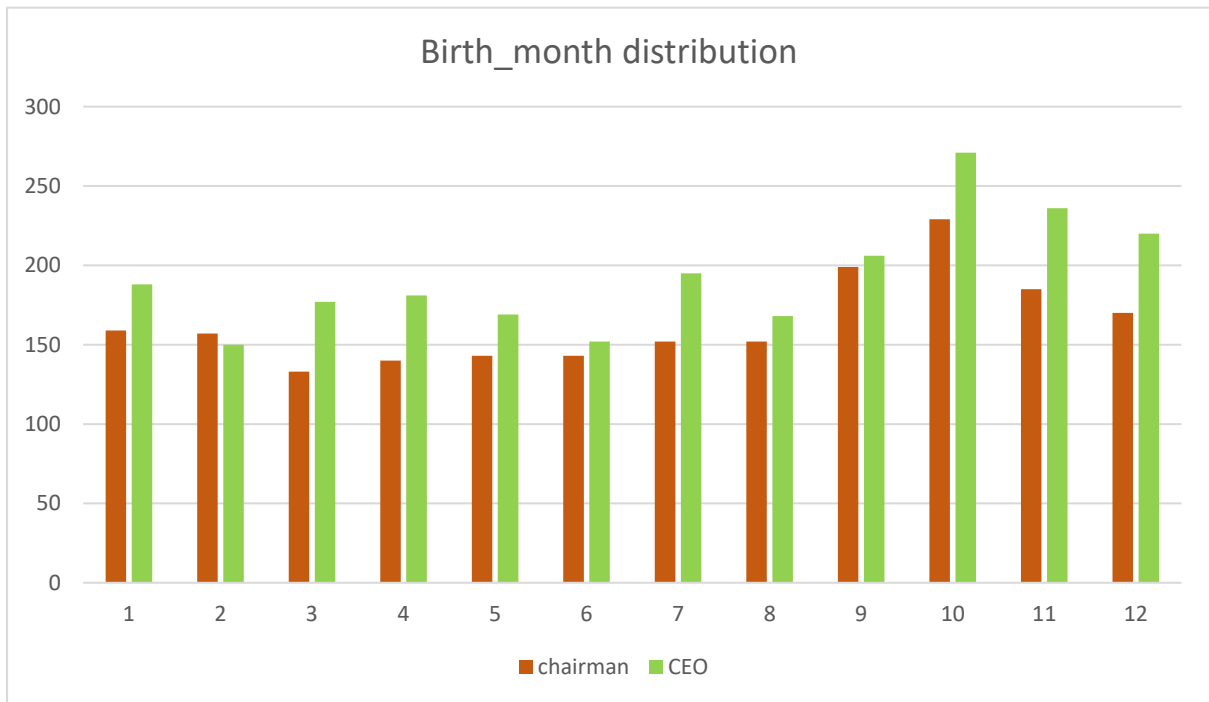
Notes: This figure shows the birth month of each unique chairman and CEO in the whole sample collected from CSMAR, including all firms listed on the Shanghai and Shenzhen stock exchanges from 2004 to 2018. the horizontal axis indicates all birth month range, and the vertical axis reflects the number of people.

Figure 3: Bar graph of the zodiac animal distributions in unique chairman and CEO
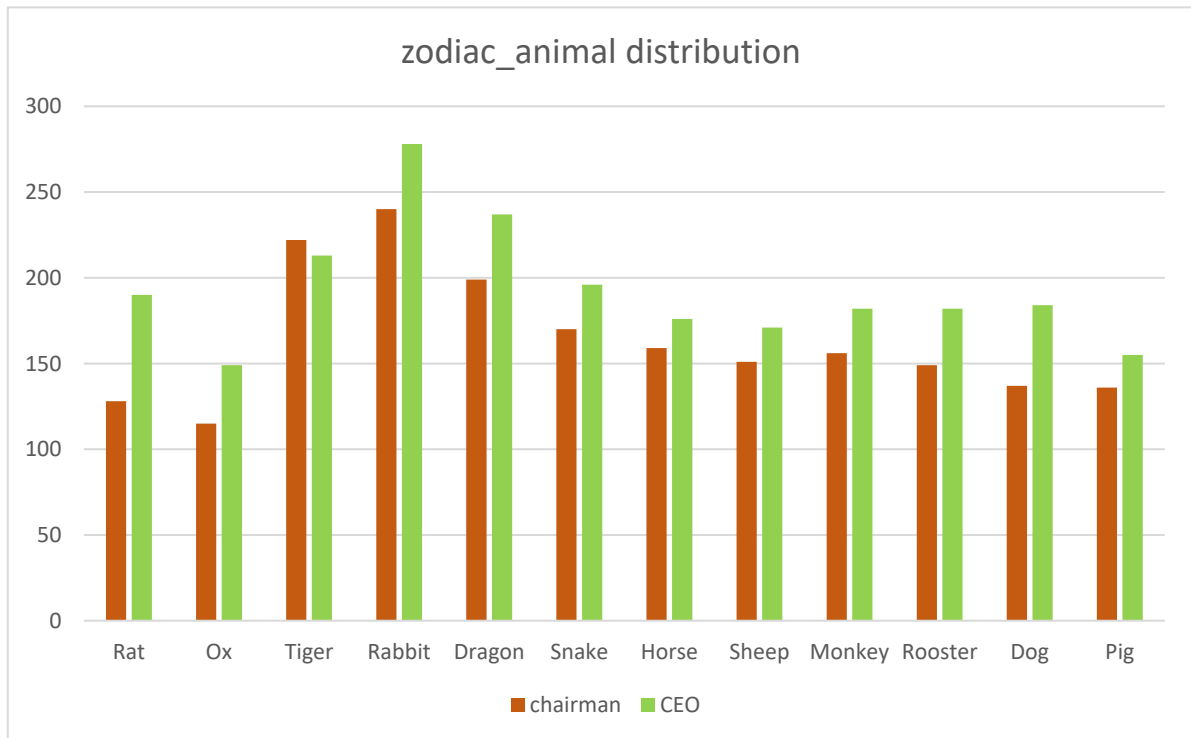
Notes: This figure shows the zodiac animal of each unique chairman and CEO in the whole sample collected from CSMAR, including all firms listed on the Shanghai and Shenzhen stock exchanges from 2004 to 2018. the horizontal axis indicates twelve animals, and the vertical axis reflects the number of people.

Figure 4: Bar graph of the zodiac-year-of-birth distributions in unique chairman/ CEO
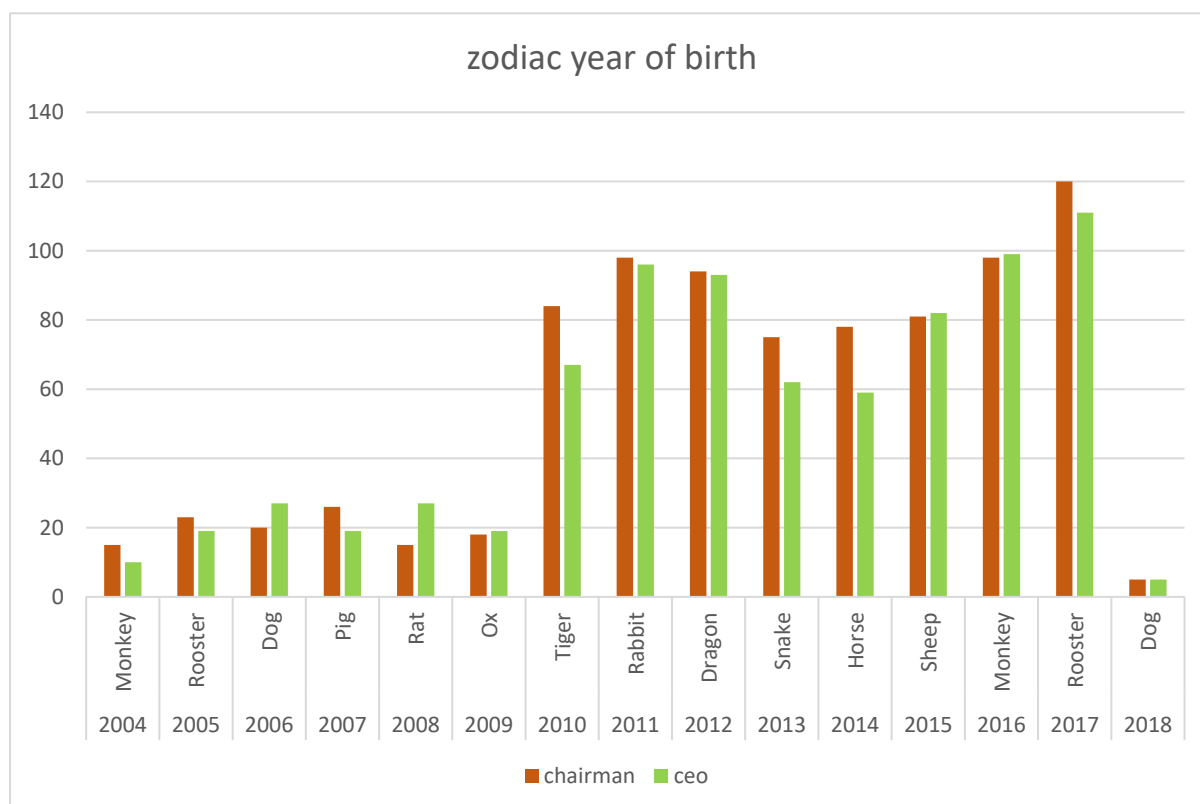
Notes: This figure shows the zodiac year of birth when the chairman or CEO in their position. The whole sample collected from CSMAR, including all firms listed on the Shanghai and Shenzhen stock exchanges from 2004 to 2018. the horizontal axis indicates the time range of testing, and the vertical axis reflects the number of people.

Table 1 presents the summary statistics for all personal and firm characteristic variables contained in this study, which define as above. The presenting numbers are winsorized in 1% and 99% level, where all data collected from CSMAR. As we can see, there are 8.4% and 8.8% chairmen and CEOs experience their zodiac year respectively in the sample, and only about 5% people are female. The average R&D ratio is 0.0146, which includes the missing data before 2007. Because the source of the required R&D only starts in 2007, The proportions of R&D is slightly lower than Fisman et al. (2019), which is 2.09% (0.0209). The average education level is around 3.4, which means between undergraduate and postgraduate degree.

Most notably, the distribution of cash ratio is concentrated on the top, which the mean is far away from the median. It is suspected that the liquidity of the selected firms exists great gaps. Secondly, there are 1% negative numbers in book to market ratio and leverage ratio, which may indicate that some companies' liabilities exceed their assets. The money they boworred for their investment cannot receive expected interest rates. Thus, I also test the sample that excludes those firms or replace those numbers to zero but not report in here. Whereafter, both experiments do not change the results obviously, with similar confidence levels and coefficient. Moreover, the table shows that about half of the yearly returns

are negative. This relatively unhealthy state could drive the subsequent insignificant relation between annual return and zodiac.

Table 2, the correlation table among all 14 variables, provides significant correlations between each pair of two variables. As expected, I drop the book to market ratio when I test the relations between zodiac year and Tobin's Q, because they are highly correlated (-0.53). Specifically, the correlations between R&D and CAPEX is reasonably distinct and positive, namely 0.17 and significant at the 1% level. In panel A, the line of chairman's zodiac, it is evident that ROA, ROE, Tobin's Q, and yearly return are negatively correlated with zodiac year but not strong. At the same time, CAPEX even appears in positive signs. The same items in panel B of CEO, present worse results that only yearly return and ROE are negatively correlated with zodiac year. Depending on both unexpected results in the correlation table and regression analyses, I exclude further tests about the CEO's behavior and only keep the main examination in the report. One reasonable explanation is that the CEO manages the operational business as their primary jobs, the major strategic decisions such as ultimate mergers or acquisitions, new contracts, or substantial investments are generally resorting to the chairman. In this study, only the chairman shows the rights that can impact the firms by facing his/her zodiac year.

Table 1: Descriptive statistics

Chairman	ZODIAC	ROA	ROE	BOOK_MARKET	CAPEX	SIZE	YEAR_RET	CASH_RATIO	LEVERAGE	TOBINSQ	R_D	AGE	EDUCATION	FEMALE
min	0	-0.1968	-0.6112	-0.0003	0.0000	18.9714	-1.4043	0.0000	-0.0156	0.0000	0.0000	26	0	0
p5	0	-0.0432	-0.0636	0.0504	0.0000	20.0225	-0.8448	0.0058	0.0004	0.0000	0.0000	40	0	0
p50	0	0.0401	0.0725	0.3125	0.0368	21.5936	0.0000	0.3565	0.0056	1.6480	0.0009	52	3	0
mean	0.0841	0.0483	0.1677	0.3701	0.0932	21.7802	-0.0100	1.5261	0.0092	2.3141	0.0146	52	3.3732	0.0491
p95	1	0.1340	0.2235	0.9090	0.2186	24.3626	0.8808	4.9934	0.0327	6.4898	0.0499	65	7	0
stdev	0.2776	0.0572	0.1168	0.2637	0.0788	1.3298	0.4870	2.5420	0.0164	2.1363	0.0190	8	1.6149	0.2162
max	1	0.2127	0.3858	1.2939	0.4420	26.1711	1.3640	17.9565	0.1213	11.5596	0.0975	81	7	1
observations	8547	8547	8547	8547	8547	8547	8547	8547	8547	8547	8547	8547	8547	8547
CEO														
min	0	-0.2028	-0.5949	-0.0053	0.0000	19.0780	-1.5154	0.0000	-0.0171	0.0000	0.0000	27	0	0
p5	0	-0.0425	-0.0585	0.0778	0.0000	20.0434	-1.0013	0.0180	0.0005	0.2034	0.0000	37	0	0
p50	0	0.0396	0.0734	0.3185	0.0421	21.6221	-0.0221	0.3560	0.0058	1.6853	0.0014	48	3	0
mean	0.0879	0.0417	0.1795	0.3803	0.1006	21.8004	0.0562	1.6241	0.0081	2.3492	0.0151	48	3.4718	0.0611
p95	1	0.1332	0.2252	0.9290	0.2271	24.4277	1.4446	5.0086	0.0326	6.4872	0.0519	59	7	1
stdev	0.2832	0.0578	0.1134	0.2685	0.0775	1.3330	0.7118	2.6175	0.0155	2.0990	0.0194	7	1.5058	0.2395
max	1	0.2202	0.3669	1.3350	0.4205	26.1706	2.3372	18.7161	0.1129	11.4493	0.0985	76	7	1
observations	7857	7857	7857	7857	7857	7857	7857	7857	7857	7857	7857	7857	7857	7857

Notes: Table one shows the descriptive statistics for all dependent and independent variables collected from CSMAR. All the firms listed on Shanghai and Shenzhen exchanges from 2004 to 2018. The mentioned variables are winsorized in 1% and 99%. Personal characteristics are collected directly in database: ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable which equals to 1 if the chairman is a female; EDUCATION indicates the chairman or CEO's highest level of education and AGE indicates the age in the given year.

Table 2: Correlation table

panel A: Chairman	AGE	BOOK_ MARKET	CASH_ RATIO	EDU	FEMALE	CAPEX	LEVERAGE	ROA	ROE	SIZE	TOBINSQ	YEAR_ RET	ZODIAC	R&D
AGE	1													
BOOK_MARKET	**0.0633**	1												
	(5.86)													
CASH_RATIO	**-0.0188**	**-0.0753**	1											
	(-1.74)	(-6.98)												
EDUCATION	**-0.1754**	**0.0380**	0.0000	1										
	(-16.47)	(3.51)	(0)											
FEMALE	**-0.0475**	**-0.0505**	**0.0279**	**-0.0438**	1									
	(-4.4)	(-4.68)	(2.58)	(-4.05)										
INVESTEFFIC	0.0014	**0.0582**	**-0.0291**	-0.0129	0.0006	1								
	(0.13)	(5.39)	(-2.69)	(-1.19)	(0.05)									
LEVERAGE	**-0.0339**	**0.1084**	**-0.2001**	-0.0002	**-0.0411**	**-0.0769**	1							
	(-3.13)	(10.08)	(-18.88)	(-0.02)	(-3.8)	(-7.13)								
ROA	**0.0572**	**-0.1750**	**0.1519**	**-0.0376**	**0.0374**	**0.0878**	**-0.2230**	1						
	(5.29)	(-16.43)	(14.2)	(-3.47)	(3.46)	(8.15)	(-21.15)							
ROE	**0.0487**	**-0.1069**	**0.0350**	**-0.0238**	0.0183	**0.0881**	**-0.1695**	**0.8151**	1					
	(4.51)	(-9.94)	(3.23)	(-2.2)	(1.69)	(8.18)	(-15.9)	(130.7)						
SIZE	**0.1715**	**0.4838**	**-0.1612**	**0.1021**	**-0.0609**	**0.0339**	**0.3532**	**-0.0556**	**0.0694**	1				
	(16.1)	(51.1)	(-15.1)	(9.48)	(-5.64)	(3.14)	(34.9)	(-5.15)	(6.43)					
TOBINSQ	-0.0153	**-0.5349**	**0.2172**	0.0132	**0.0502**	-0.0165	**-0.2390**	**0.2457**	**0.1063**	**-0.3990**	1			
	(-1.42)	(-58.52)	(20.57)	(1.22)	(4.65)	(-1.53)	(-22.75)	(23.43)	(9.88)	(-40.22)				
YEAR_RET	**-0.0298**	**-0.2402**	-0.0105	-0.0072	-0.0111	-0.0056	0.0039	**0.0465**	**0.0716**	**-0.0613**	**0.1887**	1		
	(-2.75)	(-22.87)	(-0.97)	(-0.67)	(-1.03)	(-0.51)	(0.36)	(4.3)	(6.63)	(-5.68)	(17.76)			
ZODIAC	-0.0037	0.0110	-0.0039	-0.0048	-0.0026	0.0102	0.0094	-0.0128	-0.0101	0.0050	**-0.0194**	-0.0127	1	
	(-0.34)	(1.01)	(-0.36)	(-0.44)	(-0.24)	(0.95)	(0.87)	(-1.18)	(-0.93)	(0.46)	(-1.79)	(-1.17)		
R&D	**0.0721**	**-0.1463**	**0.0484**	**0.0518**	-0.0033	**0.1688**	**-0.1511**	**0.1258**	**0.0613**	**-0.0548**	**0.1868**	**-0.0305**	**0.0237**	1
	(6.69)	(-13.67)	(4.48)	(4.8)	(-0.31)	(15.83)	(-14.13)	(11.72)	(5.68)	(-5.08)	(17.58)	(-2.82)	(2.19)	

panel B: CEO	AGE	BOOK_MARKET	CASH_RATIO	EDU	FEMALE	CAPEX	LEVERAGE	R&D	ROA	ROE	SIZE	TOBINSQ	YEAR_RET	ZODIAC
AGE	1													
BOOK_MARKET	**0.0399**	1												
	(3.54)													
CASH_RATIO	0.0098	**-0.0722**	1											
	(0.87)	(-6.42)												
EDUCATION	**-0.0780**	**0.0264**	**0.0247**	1										
	(-6.93)	(2.34)	(2.19)											
FEMALE	**-0.0208**	**-0.0567**	**0.0259**	**-0.0369**	1									
	(-1.84)	(-5.03)	(2.29)	(-3.27)										
INVESTEFFIC	**-0.0206**	**0.0556**	**-0.0333**	0.0179	-0.0124	1								
	(-1.83)	(4.94)	(-2.95)	(1.59)	(-1.11)									
LEVERAGE	0.0115	**0.1223**	**-0.2038**	-0.0021	**-0.0385**	**-0.0632**	1							
	(1.02)	(10.93)	(-18.45)	(-0.18)	(-3.41)	(-5.62)								
R&D	**0.0331**	**-0.1553**	**0.0422**	**0.0796**	**0.0290**	**0.1601**	**-0.1508**	1						
	(2.93)	(-13.93)	(3.75)	(7.08)	(2.57)	(14.38)	(-13.52)							
ROA	-0.0029	**-0.1817**	**0.1503**	0.0074	**0.0404**	**0.0921**	**-0.2166**	**0.1414**	1					
	(-0.26)	(-16.38)	(13.48)	(0.66)	(3.58)	(8.19)	(-19.66)	(12.66)						
ROE	-0.0136	**-0.1270**	**0.0328**	-0.0058	0.0175	**0.0858**	**-0.1574**	**0.0665**	**0.8005**	1				
	(-1.21)	(-11.34)	(2.91)	(-0.52)	(1.55)	(7.63)	(-14.13)	(5.91)	(118.37)					
SIZE	**0.1431**	**0.4907**	**-0.1575**	**0.0956**	**-0.0673**	**0.0255**	**0.3911**	**-0.0683**	**-0.0778**	**0.0577**	1			
	(12.82)	(49.92)	(-14.13)	(8.51)	(-5.98)	(2.26)	(37.66)	(-6.07)	(-6.91)	(5.13)				
TOBINSQ	0.0154	**-0.5331**	**0.2168**	**0.0347**	**0.0588**	-0.0120	**-0.2634**	**0.1996**	**0.2633**	**0.1153**	**-0.3987**	1		
	(1.37)	(-55.85)	(19.68)	(3.08)	(5.22)	(-1.07)	(-24.21)	(18.05)	(24.19)	(10.29)	(-38.53)			
YEAR_RET	**-0.0298**	**-0.2948**	**0.1184**	-0.0117	0.0098	**-0.1047**	**-0.0375**	**-0.0873**	**0.1254**	**0.0983**	**-0.1095**	**0.3156**	1	
	(-2.64)	(-27.34)	(10.57)	(-1.03)	(0.86)	(-9.33)	(-3.33)	(-7.77)	(11.21)	(8.75)	(-9.76)	(29.48)		
ZODIAC	-0.0133	0.0002	0.0160	0.0078	-0.0042	0.0161	0.0078	0.0166	0.0010	-0.0098	0.0079	0.0027	**-0.0263**	1
	(-1.18)	(0.02)	(1.42)	(0.69)	(-0.37)	(1.43)	(0.69)	(1.47)	(0.09)	(-0.87)	(0.71)	(0.24)	(-2.33)	

Note: Table two reports the correlations for the referred variables. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equa to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders' equity; CAPEX is capital expenditure, the indicator of the capital expenditure to lagged total assets; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents to current liabilities; LEVERAGE is the debt-to-asset ratio; R_D is the ratio of research and development expenditures in lagged total assets; SIZE, computes as log(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the chairman or CEO's highest level of education and AGE indicates the age in the given year. The bold figures denote statistical significance at the 10% levels or above.

5.2 Results

I employ five main examinations in this study, beginning with all the observations I collected. The results get better when I adjust the sample in several steps: winsorizing the 1% and 99% figures, controlling both period and cross-sectional fixed effects (the tests without fixed effects will show in the appendix), removing all SOE firms, adding personal and firm control variables, making the industry adjustment model, focusing on [-2,+2] period. However, I focus mainly on the results for the chairman, while the CEO results report in the last table.

The results in Table 3 are partly consistent with the expectations, of which ROA, ROE and Tobin's Q show the negative relationships with the zodiac year. The zodiac coefficient of -0.0034 for ROA (in Table 3, panel A) indicates that ROA on average reduces 0.34% in the zodiac year of the firm's chairman compared to normal years. Similarly, ROE and Tobin's Q on average reduce 0.79% and 13.67% respectively in the first tests. Then the firm's ROA slightly drops from -0.0034 to -0.0032; Tobin's Q drops to -0.1151 when I add several control variables, but the significance level remain same. ROA is significant at the 10% level, while the other two are at the 5% level. On the other hand, the capital expenditure ratio and yearly stock return are insignificant with the unstable sign of coefficients. This indicates that the stock market is not directly affected by the chairman's bad fortune in his/her zodiac year of birth, which is inconsistent with my first hypothesis.

Comparing to Table 3, Table 4 appears more significant results by making the industry adjustment, especially that ROE increases to the 1% significant level. Both Tables 3 and 4 repeat the same regression model: Panel A reports the univariate model between the zodiac year and each dependent variable, and the multivariate model is presented in panel B, since the results may be affected by other personal or firm characteristics. Besides, I examine the zodiac year with merely personal characteristics tests in appendix Table A.3 and Table A.4 since the results not change much. Although the sample size decreases a lot, because of the missing industry information, the coefficients are staying close among two tables. The most confident result for ROA is in Panel B, Table 4, which shows 0.23% lower than the non-zodiac years. Column two in both tables provide the changes in ROE, which always become the strong evidence of my hypotheses. The decrease of ROE fluctuates between 0.79% and 0.91%, where the industry adjustment increases the absolute coefficient of ROE. Consistent with those two dependent variables, Tobin's Q presents reliable results as well, where it declines more than 10% in zodiac year and reaches to 15% after doing the industry adjustment. The results are consistent with the second hypothesis in that these performance decreases may be influenced by the reductions of investments or other strategic decisions made by the chairman. Furthermore, the coefficient of ROA are approximately 10% of their mean descriptive statistics (0.0035 of 0.048), which represents both economically and statistically meaningful changes in firm performance. For the results in ROE and Tobin's Q, they occupy 5% of the average descriptive statistics and the average numbers are 0.179 and

2.349 respectively. The following tests also show the consistent economically significance in those three dependent variables.

In addition, control variables can exclude alternative explanations while testing hypotheses. The performance of control variables remain stable through the tests. For three personal characteristics, only age presents a significantly negative relationship with Tobin's Q, while others not reveal any significant results. Analogously, the results in Fisman et al. (2019) only shows the significant relationship in age as well. Mowen and Carlson, (2003) investigate the antecedents of superstition and propose that education or gender are not associated with superstitious belief, while age only presents a moderated factor. However, the firm characteristics, especially firm size, leverage and book-to-market ratio, exhibit solid results under each test. Concretely, firm size is always positively related to ROA, ROE and capital expenditure; and it is negatively related to Tobin's Q. All of them are significant at the 1% level. Then, leverage and book-to-market ratio are both negatively associated with all dependent variables, and the results are significant at the 1% level in most of the tests. Those outcomes are within expectations because of the impact of capital structure on firm performance. For cash ratio, which is negatively related to ROE and captial expenditure ratio and is positively related to ROA, Tobin's Q and stock return, which are consistent with all following tables. Comparing to Fisman et al. (2019), they gain the similar results: significant positive coefficients in firm size and significant negative coefficients in cash ratio.

Table 3: Relationship between chairman zodiac year and firm performance or stock return

	ROA		ROE		Tobin's Q		CAPEX		Year Ret	
panel A: univariate analysis										
Zodiac	**-0.0034**	*	**-0.0079**	**	**-0.1367**	**	0.0014		-0.0113	
	(-1.72)		(-1.98)		(-2.04)		(0.44)		(-0.61)	
Firm FE	✓		✓		✓		✓		✓	
Year FE	✓		✓		✓		✓		✓	
R-squared	0.4947		0.3819		0.6257		0.3595		0.4127	
Adjusted R-squared	0.3795		0.2410		0.5405		0.2136		0.2789	
F-statistic	4.30		2.71		7.34		2.46		3.08	
Prob(F-statistic)	0		0		0		0		0	
No. observations	6969		6969		6969		6969		6969	
Panel B: multivariate analysis										
Zodiac	**-0.0032**	*	**-0.0079**	**	**-0.1151**	**	-0.0013		-0.0097	
	(-1.66)		(-2.03)		(-1.99)		(-0.44)		(-0.54)	
Education	-0.0011		-0.0020		0.0277		0.0011		-0.0017	
	(-1.61)		(-1.45)		(1.24)		(1.07)		(-0.26)	
Age	-0.0002		-0.0006	*	-0.0240	***	0.0000		-0.0001	
	(-1.42)		(-1.94)		(-4.34)		(0.02)		(-0.05)	
Female	0.0038		-0.0097		-0.0211		0.0032		-0.0735	
	(0.7)		(-0.89)		(-0.12)		(0.39)		(-1.45)	
Size	0.0033	**	0.0186	***	-0.6708	***	0.0285	***	-0.0175	
	(2.12)		(7)		(-16.02)		(14.09)		(-1.42)	
Leverage	-0.0023	***	-0.0154	***	-0.1247	***	-0.0037	***	-0.0124	**
	(-3.93)		(-13.48)		(-6.61)		(-4.29)		(-2.35)	
CashRatio	0.0010	***	-0.0009	*	0.0545	***	-0.0007	*	0.0043	*
	(3.27)		(-1.79)		(6.4)		(-1.78)		(1.8)	
Book-to-Market	-0.0416	***	-0.1178	***			-0.0117	*	-0.5241	***
	(-8.71)		(-14.14)				(-1.84)		(-13.59)	
R&D	0.1371	**	0.0295		13.8249	***	1.4862	***	1.3739	***
	(2.42)		(0.34)		(9.59)		(22.35)		(3.4)	
Firm FE	✓		✓		✓		✓		✓	
Year FE	✓		✓		✓		✓		✓	
R-squared	0.5118		0.4194		0.6552		0.4382		0.4364	
Adjusted R-squared	0.3997		0.2862		0.5761		0.3093		0.3070	
F-statistic	4.57		3.15		8.29		3.40		3.37	
Prob(F-statistic)	0		0		0		0		0	
No. observations	6969		6969		6969		6969		6969	

Note: Table three reports the relationship between chairman zodiac year and firm performance or stock return. This sample only contains the non-SOE firms from 2004 to 2018. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equa to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders' equity; CAPEX is capital expenditure, the indicator of the capital expenditure to lagged total assets; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents to current liabilities; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures in lagged total assets; SIZE, computes as ln(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the chairman's highest level of education and AGE indicates the chairman's age in the given year. ***,**,* denote statistical significance at the 1%, 5% and 10% levels.

Table 4: Industry-adjusted results of firm performance and stock return

	ROA		ROE		Tobin's Q		CAPEX		Year_Ret	
panel A: univariate analysis										
Zodiac	**-0.0033**	*	**-0.0092**	***	**-0.1606**	**	0.0005		-0.0038	
	(-1.79)		(-2.76)		(-2.04)		(0.13)		(-0.18)	
Firm FE	✓		✓		✓		✓		✓	
Year FE	✓		✓		✓		✓		✓	
R-squared	0.5711		0.6118		0.6197		0.3624		0.3087	
Adjusted R-squared	0.4498		0.6118		0.6197		0.3624		0.3087	
F-statistic	4.71		5.57		5.76		2.01		1.58	
Prob(F-statistic)	0		0		0		0		0	
No. observations	4785		4785		4785		4785		4785	
Panel B: multivariate analysis										
Zodiac	**-0.0023**	**	**-0.0081**	***	**-0.1466**	*	-0.0019		0.0017	
	(-2.3)		(-2.57)		(-1.93)		(-0.55)		(0.08)	
Education	-0.0025	***	-0.0055	***	0.0385		0.0028	**	-0.0041	
	(-3.56)		(-4.44)		(1.3)		(2.1)		(-0.5)	
Age	0.0000		0.0000		-0.0220	***	0.0002		-0.0011	
	(0.3)		(0.14)		(-3.19)		(0.61)		(-0.58)	
Female	0.0137	**	0.0168		0.0212		0.0002		-0.1497	**
	(2.23)		(1.52)		(0.08)		(0.02)		(-2.06)	
Size	0.0072	***	0.0202	***	-0.4120	***	0.0294	***	-0.0358	*
	(4.56)		(7.17)		(-6.3)		(9.55)		(-1.92)	
Leverage	-0.0095	***	-0.0042	*	-0.5545	***	-0.0019		-0.0349	**
	(-7.53)		(-1.86)		(-10.22)		(-0.78)		(-2.33)	
CashRatio	0.0001		-0.0015	***	0.0521	***	-0.0012	***	0.0037	
	(0.52)		(-3.62)		(5.23)		(-2.71)		(1.36)	
Book-to-Market	-0.0862	***	-0.1722	***			0.0147		-0.4376	***
	(-18.2)		(-20.28)				(1.59)		(-7.8)	
R&D	0.0199		0.0028		14.6272	***	1.5517	***	0.7716	*
	(0.56)		(0.04)		(9.58)		(22.4)		(1.84)	
Firm FE	✓		✓		✓		✓		✓	
Year FE	✓		✓		✓		✓		✓	
R-squared	0.6122		0.6559		0.6476		0.4644		0.3252	
Adjusted R-squared	0.5014		0.5577		0.5470		0.3114		0.1325	
F-statistic	5.53		6.67		6.44		3.04		1.69	
Prob(F-statistic)	0		0		0		0		0	
No. observations	4785		4785		4785		4785		4785	

Note: Table three reports the relationship between chairman zodiac year and firm performance or stock return. This sample only contains the non-SOE firms from 2004 to 2018. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equa to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders' equity; CAPEX is capital expenditure, the indicator

of the capital expenditure to lagged total assets; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents in lagged total assets; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures in lagged total assets; SIZE, computes as ln(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the chairman's highest level of education and AGE indicates the chairman's age in the given year. ***,**,* denote statistical significance at the 1%, 5% and 10% levels.

To investigate the questions more accurately, Table 5 reports the sample focusing on the [-2, +2] period around the zodiac year. Panel B with industry adjustment shows the stronger confidence level in ROA, ROE and Tobin's Q compared with Table 3 and Table 4. These tests essentially narrow down the reference of non-zodiac year. The upper panel of this table does not gain effective results; however, it still proves the evidence in ROA and ROE, which are significant at the 10% and 5% level respectively. Move to panel B, Table 5, ROA and Tobin's Q decrease 0.47% and 16.48% respectively, which are significant at the 5% level. The coefficient of ROE rises to -0.0118 and is significant at the 1% level. The absolute coefficient of the three variables increase conspicuously compared with other panels. Meanwhile, the yearly return and capital expenditure ratio remain insignificant and unstable.

Table 6 provides the results that only extract valid R&D numbers. However, both two panels in Table 6 do not show strong evidence like the preceding tables. While it shows a salient negative relationship between zodiac year and capital expenditure ratio (CAPEX) or Tobin's Q. As mentioned before, I infer that these results on CAPEX can be explained by the relatively high correlations between R&D and capital expenditure. When the chairman is during his/her zodiac year, we can anticipate a 11% to 15% lower capital expenditure ratio. Interestingly, the R&D ratios in control variables always express the significant results in both panel A and panel B, which positively relate to the firm performance. Fisman et al. (2019) test whether the zodiac year frightens the chairman to lessen the R&D investment and affirm the negative relationship between them. I re-estimate the relationship by using this sample in Table 6 and find similar results in the appendix Table A.1. However, after deducting the incomplete information in the birth month and R&D, I only gain about 5000 workable data, which only half volume comparing with Fisman et al. (2019). Overall, the assessment is valid that the belief of bad fortune in the zodiac year is an essential factor to Chinese firms.

Table 5: Five-year event analysis of zodiac year and firm performance or stock return

	ROA		ROE		Tobin's Q		CAPEX		Year_Ret	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Panel A: no-industry adjusted										
Zodiac	**-0.0037** *	**-0.0036** *	**-0.0115** **	**-0.0114** **	-0.0762	-0.0749	-0.0028	-0.0033	0.0004	0.0022
	(-1.75)	(-1.74)	(-2.41)	(-2.45)	(-1.28)	(-1.3)	(-0.86)	(-1.07)	(0.02)	(0.11)
Education		-0.0154		-0.0687 **		-0.6597 *		-0.0060		0.0139
		(-1.1)		(-2.21)		(-1.72)		(-0.29)		(0.11)
Age		0.0000		-0.0012		-0.0293 ***		0.0003		-0.0005
		(0.07)		(-1.54)		(-3.01)		(0.64)		(-0.16)
Female		-0.0010		-0.0074 **		0.0051		-0.0006		-0.0162
		(-0.77)		(-2.49)		(0.14)		(-0.29)		(-1.33)
Size		0.0107 ***		0.0252 ***		-0.6483 ***		0.0323 ***		-0.0295
		(3.5)		(3.71)		(-7.95)		(7.09)		(-1.05)
Leverage		-0.0013		-0.0157 ***		-0.1061 ***		-0.0010		-0.0079
		(-1.58)		(-8.41)		(-4.62)		(-0.83)		(-1.03)
Cash Ratio		0.0012 **		-0.0007		0.0579 ***		-0.0018 **		0.0106 **
		(2.14)		(-0.54)		(3.75)		(-2.14)		(2.04)
Book-to-Market		-0.0205 **		-0.0683 ***				-0.0272 **		-0.8154 ***
		(-2.44)		(-3.65)				(-2.17)		(-10.58)
R&D		0.1278		0.1957		10.2501 ***		1.4295 ***		2.2206 ***
		(1.48)		(1.02)		(4.32)		(11.11)		(2.8)
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R-squared	0.5453	0.5515	0.4173	0.4467	0.7123	0.7314	0.4649	0.5182	0.4661	0.5042
Adjusted R-squared	0.4061	0.4117	0.2390	0.2741	0.6242	0.6478	0.3012	0.3680	0.3027	0.3497
F-statistic	3.92	3.94	2.34	2.59	8.09	8.75	2.84	3.45	2.85	3.26
Prob(F-statistic)	0	0	0	0	0	0	0	0	0	0
No. observations	2395	2395	2395	2395	2395	2395	2395	2395	2395	2395

Panel B: industry adjusted

Zodiac	**-0.0047**	**	**-0.0040**	**	**-0.0118**	***	**-0.0106**	***	**-0.1648**	**	**-0.1560**	**	-0.0022	-0.0020	0.0032	0.0066
	(-2.45)		(-2.15)		(-3.41)		(-3.22)		(-2.25)		(-2.21)		(-0.59)	(-0.58)	(0.14)	(0.3)
Education			-0.0019				-0.0028				0.0014			0.0005		-0.0349 **
			(-1.44)				(-1.22)				(0.03)			(0.22)		(-2.23)
Age			-0.0001				-0.0001				-0.0332 ***			0.0001		-0.0020
			(-0.23)				(-0.17)				(-2.85)			(0.13)		(-0.53)
Female			-0.0293 *				-0.0578 *				-0.7686			-0.0275		-0.1452
			(-1.72)				(-1.9)				(-1.18)			(-0.86)		(-0.71)
Size			0.0167 ***				0.0303 ***				-0.7746 ***			0.0191 ***		0.0168
			(4.62)				(4.69)				(-5.78)			(2.8)		(0.39)
Leverage			-0.0161 ***				-0.0155 ***				-0.5338 ***			0.0089 *		-0.0568 *
			(-6.14)				(-3.29)				(-5.38)			(1.79)		(-1.79)
Cash Ratio			-0.0003				-0.0019 **				0.0576 ***			-0.0009		0.0016
			(-0.71)				(-2.37)				(3.37)			(-1.1)		(0.29)
Book-to-Market			-0.0810 ***				-0.1649 ***							0.0069		-0.5551 ***
			(-8.97)				(-10.22)							(0.41)		(-5.1)
R&D			0.0446				0.0859				12.0520 ***			1.5759 ***		1.3461
			(0.63)				(0.68)				(4.48)			(11.87)		(1.59)

Firm FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R-squared	0.6269	0.6581	0.6598	0.6913	0.6706	0.6970	0.4202	0.4917	0.3348	0.3537
Adjusted R-squared	0.5064	0.5448	0.5499	0.5890	0.5641	0.5968	0.2329	0.3232	0.1200	0.1395
F-statistic	5.20	5.81	6.00	6.76	6.30	6.96	2.24	2.92	1.56	1.65
Prob(F-statistic)	0	0	0	0	0	0	0	0	0	0
No. observations	1668	1668	1668	1668	1668	1668	1668	1668	1668	1668

Note: Table four reports the relationship between chairman zodiac year and firm performance or stock return. This sample only focuses on the [-2,+2] five- year period, with non-SOE firms from 2004 to 2018. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equal to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders' equity; CAPEX is capital expenditure, the indicator of the capital expenditure to lagged total assets; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents to current liabilities; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures in lagged total assets; SIZE, computes as ln(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the chairman's highest level of education and AGE indicates the chairman's age in the given year. ***,**,* denote statistical significance at the 1%, 5% and 10% levels.

Table 6: Valid R&D sample of firm performance and stock return

	ROA		ROE		Tobin's Q		CAPEX		Year_Ret	
Panel A: no-industry adjusted										
Zodiac	-0.0008		-0.0043		**-0.1177**	*	**-0.0113**	***	-0.0072	
	(-0.39)		(-1.11)		(-1.7)		(-3.62)		(-0.34)	
Education	-0.0004		0.0001		-0.0591	**	0.0008		-0.0093	
	(-0.45)		(0.06)		(-1.97)		(0.56)		(-1.01)	
Age	0.0004	*	0.0003		-0.0313	***	0.0001		-0.0028	
	(1.83)		(0.81)		(-4.48)		(0.44)		(-1.29)	
Female	0.0095		0.0094		-0.1806		-0.0093		-0.1198	*
	(1.5)		(0.76)		(-0.81)		(-0.92)		(-1.75)	
Size	0.0130	***	0.0377	***	-0.9543	***	0.0288	***	-0.0200	
	(6.98)		(10.28)		(-15.12)		(9.76)		(-1)	
Leverage	-0.0102	***	-0.0407	***	-0.0717	**	-0.0058	***	-0.0144	
	(-10.77)		(-21.73)		(-2.16)		(-3.87)		(-1.4)	
Cash Ratio	0.0009	***	-0.0011		0.0189		0.0001		0.0050	
	(2.7)		(-1.65)		(1.64)		(0.11)		(1.4)	
Book-to-Market	-0.0572	***	-0.1235	***			-0.0219	**	-0.7182	***
	(-10.35)		(-11.29)				(-2.5)		(-12.01)	
R&D	0.4201	***	0.6328	***	18.3974	***	1.2278	***	1.8752	***
	(7.87)		(6)		(9.82)		(14.49)		(3.25)	
Firm FE	✓		✓		✓		✓		✓	
Year FE	✓		✓		✓		✓		✓	
R-squared	0.5651		0.4165		0.6957		0.5651		0.4165	
Adjusted R-squared	0.4334		0.2397		0.6037		0.4334		0.2397	
F-statistic	4.29		2.36		7.56		4.29		2.36	
Prob(F-statistic)	0		0		0		0		0	
No. observations	4222		4222		4222		4222		4222	

Panel B: industry adjusted

	(1)	(2)	(3)	(4)	(5)
Zodiac	0.0006	-0.0028	**-0.1521** **	**-0.0120** ***	0.0086
	(0.3)	(-0.89)	(-2.02)	(-3.45)	(0.36)
Education	-0.0007	-0.0012	-0.0383	0.0017	-0.0115
	(-0.82)	(-0.85)	(-1.13)	(1.07)	(-1.07)
Age	0.0002	0.0002	-0.0289 ***	0.0002	-0.0035
	(1.16)	(0.7)	(-3.78)	(0.44)	(-1.45)
Female	0.0161 **	0.0182	-0.1758	-0.0167	-0.1864 **
	(2.4)	(1.63)	(-0.64)	(-1.33)	(-2.16)
Size	0.0153 ***	0.0345 ***	-0.7470 ***	0.0330 ***	-0.0057
	(8.03)	(10.9)	(-10.02)	(9.3)	(-0.23)
Leverage	-0.0154 ***	-0.0175 ***	-0.3582 ***	-0.0043	-0.0177
	(-8.4)	(-5.74)	(-4.82)	(-1.26)	(-0.75)
Cash Ratio	0.0007 **	-0.0004	0.0206 *	-0.0004	0.0055
	(2.29)	(-0.76)	(1.65)	(-0.68)	(1.41)
Book-to-Market	-0.0810 ***	-0.1539 ***		-0.0209 *	-0.7325 ***
	(-13.84)	(-15.8)		(-1.92)	(-9.76)
R&D	0.3061 ***	0.5019 ***	15.4324 ***	1.2242 ***	2.1525 ***
	(5.94)	(5.85)	(7.41)	(12.73)	(3.26)
Firm FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
R-squared	0.6517	0.6397	0.6781	0.5560	0.3860
Adjusted R-squared	0.5485	0.5330	0.5829	0.4244	0.2041
F-statistic	6.32	5.99	7.12	4.23	2.12
Prob(F-statistic)	0	0	0	0	0
No. observations	3366	3366	3366	3366	3366

Note: Table six reports the relationship between chairman zodiac year and firm performance or stock return. This sample only focuses on non-SOE firms from 2007 to 2018, which the R&D is vaild. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equal to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders' equity; CAPEX is capital expenditure, the indicator of the capital expenditure to lagged total assets; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents to current liabilities; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures in lagged total assets; SIZE, computes as ln(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the CEO's highest level of education and AGE indicates the CEO's age in the given year. ***,**,* denote statistical significance at the 1%, 5% and 10% levels.

The last table in the main article is the relationship between the CEO zodiac year and firm performance or stock return. No persuasive evidence in Table 7 indicates that the zodiac year of CEO affects the firm performance or investors, regardless of any strict conditions. As mentioned before, CEO usually focuses on the managing or operating departments rather than the decision makings. Similarly, the reason I exclude the SOE firms is consistent with it. Comparing to the unreported sample which includes all firms, the results become signifiacntly effecitve when I only keep the non-SOE firms.

Table 7: Relationship between CEO's zodiac year and firm performance or stock return

	ROA		ROE		Tobin's Q		CAPEX		Year_Ret	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
panel A: no-adjusted firms										
Zodiac	-0.0004	-0.0004	-0.0035	-0.0032	0.0630	0.0687	0.0001	-0.0014	-0.0395	-0.0355
	(-0.22)	(-0.19)	(-0.92)	(-0.85)	(0.93)	(1.05)	(0.03)	(-0.46)	(-1.32)	(-1.24)
Education		0.0001		-0.0004		0.0269		0.0004		0.0060
		(0.09)		(-0.31)		(1.3)		(0.42)		(0.65)
Age		-0.0001		-0.0003		-0.0095 *		-0.0003		0.0006
		(-0.59)		(-1.1)		(-1.94)		(-1.19)		(0.3)
Female		0.0032		-0.0018		0.2890 **		-0.0040		0.0029
		(0.8)		(-0.23)		(2.19)		(-0.64)		(0.05)
Size		0.0027 *		0.0166 ***		-0.5846 ***		0.0287 ***		0.0164
		(1.85)		(6.09)		(-12.76)		(12.84)		(0.78)
Leverage		-0.0042 ***		-0.0128 ***		-0.1196 ***		-0.0033 ***		-0.0278 ***
		(-6.41)		(-10.43)		(-5.6)		(-3.24)		(-2.95)
Cash Ratio		0.0007 ***		-0.0009 *		0.0451 ***		-0.0010 **		0.0451 ***
		(2.67)		(-1.78)		(5.18)		(-2.45)		(11.75)
Book-to-Market		-0.0495 ***		-0.1238 ***				-0.0067		-0.7417 ***
		(-11.61)		(-15.5)				(-1.02)		(-12.1)
R&D		0.0581		0.0403		14.8618 ***		1.4500 ***		-7.3020 ***
		(1.3)		(0.48)		(10.17)		(21.13)		(-11.34)
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R-squared	0.5180	0.5346	0.4175	0.4541	0.6507	0.6732	0.3801	0.4557	0.4202	0.4649
Adjusted R-squared	0.4008	0.4206	0.2760	0.3203	0.5658	0.5932	0.2294	0.3224	0.2793	0.3339
F-statistic	4.42	4.69	2.95	3.40	7.67	8.42	2.52	3.42	2.98	3.55
Prob(F-statistic)	0	0	0	0	0	0	0	0	0	0
No. observations	6283	6283	6283	6283	6283	6283	6283	6283	6283	6283

Panel B: industry-adjusted firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Zodiac	0.0008	0.0002	-0.0002	-0.0014	0.0502	0.0439	-0.0013	-0.0024	-0.0294	-0.0320
	(0.39)	(0.11)	(-0.06)	(-0.43)	(0.6)	(0.55)	(-0.34)	(-0.66)	(-0.73)	(-0.83)
Education		-0.0004		-0.0017		0.0575 **		0.0018		0.0048
		(-0.68)		(-1.49)		(2.02)		(1.37)		(0.35)
Age		0.0000		-0.0001		-0.0101		-0.0001		0.0011
		(0.26)		(-0.23)		(-1.63)		(-0.23)		(0.38)
Female		-0.0061		-0.0135 *		0.2971 *		-0.0074		-0.0073
		(-1.52)		(-1.86)		(1.68)		(-0.92)		(-0.09)
Size		0.0075 ***		0.0216 ***		-0.3699 ***		0.0300 ***		0.1098 ***
		(4.5)		(7.14)		(-5.2)		(8.98)		(3.08)
Leverage		-0.0097 ***		-0.0041 *		-0.5607 ***		-0.0001		-0.1796 ***
		(-7.2)		(-1.68)		(-9.46)		(-0.02)		(-6.21)
Cash Ratio		0.0001		-0.0015 ***		0.0479 ***		-0.0017 ***		0.0468 ***
		(0.36)		(-3.47)		(4.65)		(-3.55)		(9.35)
Book-to-Market		-0.0881 ***		-0.1782 ***				0.0258 ***		-1.0196 ***
		(-17.91)		(-19.94)				(2.61)		(-9.69)
R&D		0.0168		0.0015		15.9741 ***		1.5373 ***		-8.1641 ***
		(0.45)		(0.02)		(9.74)		(20.65)		(-10.27)
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R-squared	0.5861	0.6257	0.6302	0.6733	0.6251	0.6529	0.3782	0.4753	0.3839	0.4374
Adjusted R-squared	0.4531	0.5042	0.5113	0.5672	0.5046	0.5403	0.1784	0.3050	0.1859	0.2547
F-statistic	4.41	5.15	5.30	6.35	5.19	5.80	1.89	2.79	1.94	2.39
Prob(F-statistic)	0	0	0	0	0	0	0	0	0	0
No. observations	4404	4404	4404	4404	4404	4404	4404	4404	4404	4404

Note: Table seven reports the relationship between CEO zodiac year and firm performance or stock return. This sample focuses on non-SOE firms from 2004 to 2018. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equal to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders' equity; CAPEX is capital expenditure, the indicator of the capital expenditure to lagged total assets; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents to current liabilities; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures to current liabilities; SIZE, computes as ln(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the CEO's highest level of education and AGE indicates the CEO's age in the given year. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.

6. Conclusion

There is an extensive evidence confirming the impact of superstition on human's behavior, where the most evident phenomenon is associated with the numbers. Many paper study the anomalies of Friday the Thirteen in the U.S or wider international markets, and many researchers investigate the digit eight and four in Chinese market or wider Asian markets. The former topic exhibits some inconsistent results based on the expanded conditions in subsequent tests. The explanatory concept they adopted is the calendar anomaly. However, the later theme exhibits the relatively consistent outcomes that people saliently prefer the digit eight, which sounds like treasures; while avert the digit four, which sounds like death. This preference embodies in many aspects, such as stock code, house address, and commodity price. primarily, this paper attempts to investigate the impact on the zodiac year of birth, which is a superstition combining the Chinese lunar calendar and the unlucky prophesy. Due to the recognized theory that the zodiac year of birth brings bad luck to people who own the same animal symbol, Fisman et al. (2019) test the variation of the risky investments (R&D and M&A) in a firm when the chairman is suffering his/her zodiac year of birth. The result shows a significant depression during that year. Thus, I follow this conclusion and build the examinations to test if the zodiac year of chairman and CEO influence the firm performance and the indirect effects of stock market. Meanwhile, it is a good indicator to show whether this belief is baseless or not, as the bad luck comes and reflects in both firm and market level.

I establish a regression model with the panel least squares method. The sample includes all the Chinese public non-SOE firms listed on Shanghai and Shenzhen Stock Exchange from 2004 to 2018, and the corresponding variables are from CSMAR database. The independent variable is the birth year and month of chairman and CEO; however, I only focus on the firm's chairman in the robustness tests because of the insignificant results related to the CEO. Then, I cite the ROA, ROE, Tobin's Q, capital expenditure ratio and stock return as the separate dependent variables.

The empirical analyses suggest that ROA, ROE and Tobin's Q shows both economically and statistically significant results, where they are negatively related to the zodiac year of the chairman and are significant at the 1% or the 5% level. The industry adjustment or the five year event window make little but meaningful improvements on the significance levels. For capital expenditure ratio and stock return, the tests do not provide any explanatory outcomes that are consistent with my hypotheses. Additionally, the respective adjusted R squares are significantly, with approximately 50% fitness. Regarding the research questions, it is demonstrable that the chairman's zodiac year of birth provide an influential decline in firm performance, namely firm profitability and value. However, the evidence about the market and investors' behavior is not strong enough. Therefore, the results can follow the previous proofs, which the investors pay more attention on the market risks or the wealth rather than the ethics or the chairman's private information; meanwhile, most of the individual investors are unsophisticated to assess a stock. Another reason I mentioned in the report is the effect of calendar

anomaly, which influence generally in the field of behavioral finance. The further tests can focus on those effects and develop a representative method on testing the zodiac effects.

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Appendix

Table A.1: Fisman retest

	Dependent Variable: R&D					
	(1)		(2)		(3)	
Zodiac	**-0.0049**	***	**-0.0039**	***	**-0.0037**	***
	(-6.8)		(-6.29)		(-6.02)	
Education			-0.0001		0.0000	
			(-0.34)		(-0.14)	
Age			-0.0002	***	-0.0001	**
			(-2.6)		(-1.97)	
Female			0.0026		0.0024	
			(1.27)		(1.19)	
Size					0.0028	***
					(4.95)	
Leverage					-0.0001	
					(-0.35)	
CashRatio					0.0000	
					(-0.36)	
Tobins Q					0.0015	***
					(9.75)	
Winsorized	✓		✓		✓	
Firm FE	✓		✓		✓	
Year FE	✓		✓		✓	
R-squared	0.7684		0.7381		0.7449	
Adjusted R-squared	0.6829		0.6626		0.6710	
F-statistic	8.99		9.78		10.08	
Prob(F-statistic)	0		0		0	
No. observations	4953		4953		4953	

Note: this table reports the relationship between chairman zodiac year and R&D. This sample focuses on non-SOE firms from 2007 to 2015. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equal to 1 if the chairman is female; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; CASH_RATIO, the proportion of cash and cash equivalents to current liabilities; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures in lagged total assets; SIZE, computes as ln(Assets); EDUCATION indicates the chairman's highest level of education and AGE indicates the chairman's age in the given year. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.

Table A.2: Variable description

Name	Description	Source
Zodiac	Zodiac is a dummy variable, which equals one if the chairman is in his/her zodiac year of birth	CSMAR personal characteristics database
Education	Education represents the chairman's highest education level, which define as 1=Specialized Secondary Education and Below, 2=Short-cycle Higher Education, 3=Bachelor, 4=Master, 5=Doctor,0=others	CSMAR personal characteristics database
Age	Age measures the chairman's age in each year	CSMAR personal characteristics database
Female	Female is 1 if the chairman is a female and 0 otherwise	CSMAR personal characteristics database
ROA	ROA defines as operational income to total assets	CSMAR corporate database
ROE	ROE is the ratio of net income to shareholders' equity	CSMAR corporate database
Tobin's Q	Tobin's Q is calculated using the year-end total assets minus market value of equity and plus the book value of equity, divided by total assets	CSMAR corporate database
CAPEX	Capital expenditure is the indicator of the capital expenditure to lagged total assets	CSMAR corporate database
Year_Ret	The yearly return of the stocks	CSMAR corporate database
R&D	R&D is the ratio of research and development expenditures in lagged total assets	CSMAR corporate database, DataStream
Size	Size computes as ln (Assets)	CSMAR corporate database
Leverage	Leverage is the debt-to-asset ratio	CSMAR corporate database
Cash Ratio	Cash ratio is the proportion of cash and cash equivalents in lagged total assets	CSMAR corporate database
Book-to-Market	The percentage of shareholder equity to market capitalization	CSMAR corporate database

Table A.3: Relationship between chairman zodiac year and firm performance or stock return

	ROA			ROE			Tobin's Q			CAPEX			Year_Ret		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Zodiac	-0.0034 *	-0.0023	-0.0036	-0.0080 **	-0.0066 *	-0.0074 *	-0.1405 **	-0.1139	-0.1197	0.0014	0.0006	0.0005	-0.0115	-0.0093	-0.0105
	(-1.75)	(-1.17)	(-1.62)	(-2)	(-1.68)	(-1.77)	(-2.1)	(-1.57)	(-1.57)	(0.45)	(0.2)	(0.14)	(-0.62)	(-0.44)	(-0.62)
Education	-0.0014 **	-0.0019 ***	-0.0012 ***	-0.0023 *	-0.0039 ***	-0.0023 ***	0.0168	0.0840	0.0474 ***	0.0022 **	-0.0018 *	-0.0014 **	-0.0070	-0.0060	0.0006
	(-2.11)	(-2.83)	(-3.15)	(-1.65)	(-2.94)	(-3.17)	(0.73)	(3.38) ***	(3.59)	(2.04)	(-1.71)	(-2.46)	(-1.1)	(-0.82)	(0.21)
Age	-0.0003 **	-0.0007 ***	0.0002 **	-0.0008 **	-0.0017 ***	0.0002	-0.0299 ***	0.0004	0.0003	0.0002	-0.0015 ***	0.0000	-0.0015	-0.0015	-0.0003
	(-2.06)	(-4.25)	(2.9)	(-2.21)	(-5.27)	(1.19)	(-5.2)	(0.06)	(0.1)	(0.61)	(-6.11)	(0.03)	(-0.96)	(-0.87)	(-0.52)
Female	0.0036	0.0011	0.0062 **	-0.0104	-0.0170	0.0055	-0.0470	0.1814	0.0458	0.0058	-0.0098	0.0041	-0.0655	-0.1283 **	-0.0215
	(0.65)	(0.2)	(2.3)	(-0.92)	(-1.54)	(1.1)	(-0.25)	(0.89)	(0.49)	(0.65)	(-1.14)	(1.05)	(-1.27)	(-2.15)	(-1.06)
Size		-0.0034 ***	0.0075 ***		0.0013	0.0278 ***		-0.3424 ***	-0.6859 ***		0.0045 ***	0.0072 ***		-0.0614 ***	0.0088
		(-3.41)	(11.11)		(0.65)	(22.01)		(-9.38)	(-36.4)		(2.91)	(7.24)		(-5.67)	(1.72)
Leverage		-0.0038 ***	-0.0083 ***		-0.0146 ***	-0.0148 ***		-0.1452 ***	-0.0453 ***		-0.0030 ***	-0.0059 ***		-0.0112 *	0.0011
		(-6.6)	(-18.87)		(-12.7)	(-17.91)		(-6.83)	(-3.02)		(-3.4)	(-9.19)		(-1.79)	(0.32)
CashRatio		0.0012 ***	0.0021 ***		-0.0004	0.0003		0.0554 ***	0.0980 ***		-0.0002	-0.0016 ***		0.0018	0.0002
		(4.59)	(8.83)		(-0.75)	(0.67)		(5.87)	(12.25)		(-0.42)	(-4.6)		(0.66)	(0.1)
Book-to-Market		-0.0370 ***	-0.0586 ***		-0.0855 ***	-0.1285 ***					0.0231 ***	-0.0020		-1.0085 ***	-0.2520 ***
		(-11.63)	(-16.83)		(-13.35)	(-19.78)					(4.65)	(-0.38)		(-29.05)	(-9.6)
R&D		-0.0180	0.2415 ***		-0.0787	0.2640 ***		11.6430 ***	9.7287 ***		1.2809 ***	0.9479 ***		1.1220 ***	-0.5475 **
		(-0.42)	(6.83)		(-0.92)	(4)		(7.37)	(8.05)		(19.34)	(18.3)		(2.43)	(-2.05)
Firm FE	✓	✓		✓	✓		✓	✓		✓	✓		✓	✓	
Year FE	✓		✓	✓		✓	✓		✓	✓		✓	✓		✓
R-squared	0.4954	0.4951	0.1360	0.3826	0.4002	0.1152	0.6277	0.5522	0.3519	0.3600	0.3962	0.0905	0.4130	0.2001	0.3456
Adjusted R-squared	0.3801	0.3871	0.1257	0.2415	0.2719	0.1046	0.5426	0.4565	0.3443	0.2138	0.2670	0.0796	0.2789	0.0289	0.3378
F-statistic	4.30	4.58	13.22	2.71	3.12	10.93	7.38	5.77	46.17	2.46	3.07	8.35	3.08	1.17	44.33
Prob(F-statistic)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. observations	6969	6969	6969	6969	6969	6969	6969	6969	6969	6969	6969	6969	6969	6969	6969

Note: Table three reports three additional tests for the relationship between chairman zodiac year and firm performance or stock return. This sample only contains the non-SOE firms from 2004 to 2018. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equal to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders' equity; CAPEX is capital expenditure, the indicator of the capital expenditure to lagged total assets; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents to current liabilities; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures in lagged total assets; SIZE, computes as ln(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the chairman's highest level of education and AGE indicates the chairman's age in the given year. ***, **, * denote statistical significance at the 1%, 5% and 10% levels

Table A.4: Industry-adjusted results of firm performance

	ROA			ROE			Tobin's Q			CAPEX			Year_Ret		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Zodiac	-0.0034 *	-0.0019	-0.0027	-0.0095 ***	-0.0079 **	-0.0082 **	-0.1634 **	-0.1352	-0.1001	0.0007	-0.0001	-0.0018	-0.0044	0.0040	-0.0026
	(-1.86)	(-1.07)	(-1.29)	(-2.85)	(-2.44)	(-1.97)	(-2.07)	(-1.56)	(-1.13)	(0.18)	(-0.03)	(-0.48)	(-0.21)	(0.17)	(-0.14)
Education	-0.0032 ***	-0.0038 ***	-0.0008 **	-0.0068 ***	-0.0082 ***	-0.0015 **	0.0370	0.0806 **	0.0378 **	0.0042 ***	0.0007	0.0002	-0.0084	-0.0069	0.0003
	(-4.47)	(-5.5)	(-2.3)	(-5.22)	(-6.53)	(-2.08)	(1.2)	(2.4)	(2.48)	(2.86)	(0.54)	(0.31)	(-1.02)	(-0.78)	(0.08)
Age	-0.0002	-0.0007 ***	0.0002 ***	-0.0004	-0.0014 ***	0.0001	-0.0218 ***	-0.0101	-0.0039	0.0004	-0.0011 ***	0.0000	-0.0024	-0.0004	-0.0003
	(-1.08)	(-4.55)	(2.91)	(-1.3)	(-4.95)	(0.37)	(-3.04)	(-1.35)	(-1.18)	(1.1)	(-3.68)	(-0.1)	(-1.23)	(-0.18)	(-0.38)
Female	0.0155	0.0099	0.0060 **	0.0189	0.0098	0.0250 ***	0.0889 ***	-0.0342	0.1468	0.0087	-0.0084	0.0089 **	-0.1515 **	-0.1769 **	-0.0230
	(2.41)	(1.57)	(2.36)	(1.62)	(0.86)	(5.02)	(0.32)	(-0.11)	(1.39)	(0.66)	(-0.68)	(2.01)	(-2.06)	(-2.21)	(-1)
Size		-0.0094 ***	0.0090 ***		-0.0105 ***	0.0232 ***		-0.1474 ***	-0.6162 ***		-0.0016	0.0090 ***		-0.1021 ***	-0.0183 ***
		(-8.6)	(11.6)		(-5.4)	(15.22)		(-2.85)	(-21.8)		(-0.75)	(6.57)		(-7.43)	(-2.61)
Leverage		-0.0085 ***	-0.0157 ***		-0.0019	-0.0071 ***		-0.5953 ***	-0.3400 ***		-0.0004	-0.0041 **		-0.0094	0.0036
		(-6.63)	(-16.77)		(-0.82)	(-3.85)		(-9.69)	(-8.73)		(-0.14)	(-2.46)		(-0.58)	(0.42)
CashRatio		0.0008 ***	0.0010 ***		-0.0004	-0.0003		0.0387 ***	0.0899 ***		0.0001	-0.0022 ***		0.0002	0.0003
		(3.32)	(4.57)		(-1.04)	(-0.79)		(3.53)	(9.92)		(0.15)	(-5.65)		(0.09)	(0.15)
Book-to-Market		-0.0505 ***	-0.1061 ***		-0.1059 ***	-0.1949 ***					0.0536 ***	0.0034		-0.6718 ***	-0.1839 ***
		(-14.19)	(-26.01)		(-16.61)	(-24.28)					(7.74)	(0.47)		(-14.96)	(-4.96)
R&D		0.0040	0.0806 ***		-0.0312	0.1161 *		9.3216 ***	11.4481 ***		1.4776 ***	0.8770 ***		1.3551 ***	-0.5556 **
		(0.11)	(2.63)		(-0.49)	(1.92)		(5.48)	(8.95)		(21.38)	(16.2)		(3.02)	(-1.99)
Firm FE	✓	✓		✓	✓		✓	✓		✓	✓		✓	✓	
Year FE	✓		✓	✓		✓	✓		✓	✓		✓	✓		✓
R-squared	0.5744	0.5786	0.2138	0.6151	0.6260	0.1590	0.6210	0.5284	0.3271	0.3639	0.4242	0.1154	0.3097	0.1657	0.1925
Adjusted R-squared	0.4535	0.4688	0.1999	0.5058	0.5285	0.1441	0.5134	0.4056	0.3154	0.1832	0.2742	0.0998	0.1137	-0.0518	0.1782
F-statistic	4.75	5.27	15.40	5.63	6.42	10.71	5.77	4.30	27.88	2.01	2.83	7.39	1.58	0.76	13.50
Prob(F-statistic)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
No. observations	4785	4785	4785	4785	4785	4785	4785	4785	4785	4785	4785	4785	4785	4785	4785

Note: Table four reports three additional tests for the relationship between chairman zodiac year and firm performance or stock return. This sample is based on the industry- adjusted non-SOE firms from 2004 to 2018. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equal to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders'

equity; CAPEX is capital expenditure, the indicator of the capital expenditure to lagged total assets; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents in lagged total assets; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures to current liabilities; SIZE, computes as ln(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the chairman's highest level of education and AGE indicates the chairman's age in the given year. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.

Table A.5: Five-year event analysis of zodiac year and firm performance or stock return

	ROA		ROE		Tobin's Q		CAPEX		Year_Ret	
	(2)		(2)		(2)		(2)		(2)	
Panel A: no-industry adjusted										
Zodiac	**-0.0037**	*	**-0.0115**	**	-0.0769		-0.0028		0.0002	
	(-1.74)		(-2.41)		(-1.3)		(-0.84)		(0.01)	
Education	-0.0184		-0.0787	**	-0.5472		-0.0166		0.0460	
	(-1.31)		(-2.49)		(-1.39)		(-0.76)		(0.36)	
Age	0.0000		-0.0010		-0.0325	***	0.0008		-0.0039	
	(0.08)		(-1.28)		(-3.27)		(1.47)		(-1.2)	
Female	-0.0009		-0.0064	**	0.0045		0.0007		-0.0174	
	(-0.68)		(-2.13)		(0.12)		(0.32)		(-1.43)	
Firm FE	✓		✓		✓		✓		✓	
Year FE	✓		✓		✓		✓		✓	
R-squared	0.5458		0.4205		0.7142		0.4659		0.4671	
Adjusted R-squared	0.4058		0.2419		0.6261		0.3012		0.3028	
F-statistic	3.90		2.35		8.11		2.83		2.84	
Prob(F-statistic)	0		0		0		0		0	
No. observations	2395		2395		2395		2395		2395	
Panel B: industry adjusted										
Zodiac	-0.0047	**	-0.0117	***	-0.1644	**	-0.0020		0.0026	
	(-2.43)		(-3.39)		(-2.24)		(-0.55)		(0.12)	
Education	-0.0018		-0.0029		-0.0013		0.0021		-0.0357	**
	(-1.36)		(-1.21)		(-0.03)		(0.82)		(-2.27)	
Age	-0.0002		-0.0005		-0.0280	**	0.0005		-0.0031	
	(-0.76)		(-0.88)		(-2.32)		(0.74)		(-0.85)	
Female	-0.0362	**	-0.0664	**	-0.8621		-0.0298		-0.1736	
	(-2.05)		(-2.09)		(-1.28)		(-0.87)		(-0.84)	
Firm FE	✓		✓		✓		✓		✓	
Year FE	✓		✓		✓		✓		✓	
R-squared	0.6287		0.6614		0.6723		0.4211		0.3379	
Adjusted R-squared	0.5076		0.5510		0.5654		0.2323		0.1220	
F-statistic	5.19		5.99		6.29		2.23		1.56	
Prob(F-statistic)	0		0		0		0		0	
No. observations	1668		1668		1668		1668		1668	

Note: Table five reports the relationship between chairman zodiac year and firm performance or stock return with only personal control variables. This sample only focuses on the [-2,+2] five- year period, with non-SOE firms from 2004 to 2018. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equal to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders' equity; CAPEX is capital expenditure, the indicator of the capital expenditure to lagged total assets; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents to current liabilities; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures in lagged total assets; SIZE, computes as ln(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the chairman's highest level of education and AGE indicates the chairman's age in the given year. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.

Table A.6: Relationship between CEO's zodiac year and firm performance or stock return

	ROA		ROE		Tobin's Q		CAPEX		Year_Ret	
panel A: no-adjusted firms										
Zodiac	-0.0004		-0.0035		0.0618		0.0004		-0.0395	
	(-0.21)		(-0.9)		(0.92)		(0.01)		(-1.32)	
Education	-0.0005		-0.0018		0.0219		0.0009		-0.0008	
	(-0.73)		(-1.44)		(1.03)		(0.86)		(-0.08)	
Age	-0.0000		-0.0002		-0.0139	***	-0.0003		0.0006	
	(-0.64)		(-0.8)		(-2.74)		(-1.06)		(0.25)	
Female	0.0043		0.0003		0.3594	***	0.0023		-0.0074	
	(1.06)		(0.03)		(2.64)		(0.35)		(-0.12)	
Firm FE	✓		✓		✓		✓		✓	
Year FE	✓		✓		✓		✓		✓	
R-squared	0.5181		0.6311		0.6518		0.3803		0.4202	
Adjusted R-squared	0.4007		0.5121		0.5670		0.2293		0.2789	
F-statistic	4.41		5.30		7.68		2.52		2.97	
Prob(F-statistic)	0		0		0		0		0	
No. observations	6283		6283		6283		6283		6283	
Panel B: industry-adjusted firms										
Zodiac	0.0008		-0.0001		0.0470		-0.0014		-0.0294	
	(0.41)		(-0.04)		(0.57)		(-0.35)		(-0.73)	
Education	-0.0011		-0.0029	***	0.0523	*	0.0027	*	-0.0007	
	(-1.56)		(-2.35)		(1.78)		(1.93)		(-0.05)	
Age	0.0000		-0.0000		-0.0101		0.0001		0.0002	
	(0.17)		(-0.34)		(-1.58)		(0.31)		(0.07)	
Female	-0.0028		-0.0127		0.6171	***	0.0015		0.0152	
	(-0.68)		(-1.66)		(3.39)		(0.17)		(0.17)	
Firm FE	✓		✓		✓		✓		✓	
Year FE	✓		✓		✓		✓		✓	
R-squared	0.5865		0.6311		0.6270		0.3789		0.3840	
Adjusted R-squared	0.4531		0.5121		0.5067		0.1785		0.1852	
F-statistic	4.40		5.30		5.21		1.89		1.93	
Prob(F-statistic)	0		0		0		0		0	
No. observations	4404		4404		4404		4404		4404	

Note: Table six reports the relationship between CEO zodiac year and firm performance or stock return with only personal control variables. This sample focuses on non-SOE firms from 2004 to 2018. ZODIAC denotes as the dummy variable to show the chairman or CEO's zodiac year of birth; FEMALE is the dummy variable equal to 1 if the chairman is female; ROA defines as operational income to total assets; TOBINSQ is calculated using the market value of equity and book value of debt to total assets; ROE is the ratio of net income to shareholders' equity; CAPEX is capital expenditure, the indicator of the capital expenditure to current liabilities; BOOK_MARKET, the percentage of shareholder equity to market capitalization; CASH_RATIO, the proportion of cash and cash equivalents in lagged total assets; LEVERAGE is the debt-to-asset ratio; R&D is the ratio of research and development expenditures in lagged total assets; SIZE, computes as ln(Assets); YEAR_RET, the yearly return of the stocks; EDUCATION indicates the CEO's highest level of education and AGE indicates the CEO's age in the given year. ***,**,* denote statistical significance at the 1%, 5% and 10% levels.