

Superstition and risk-taking: Evidence from “zodiac year” beliefs in China

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Abstract

We show that superstitions – beliefs without scientific grounding – impact the investment and risk-taking of Chinese firms. We focus on widely held beliefs in bad luck during one’s “zodiac year,” which occurs on a 12- year cycle around a person’s birth year, to study superstitions and risk-taking. We first show a direct correspondence between zodiac year and risk-taking via survey data: respondents are 2 percentage points more likely to favor no-risk investments if queried during their zodiac year. Turning to corporate decision-making, we find that return volatility declines in the chairman’s zodiac year, suggesting a reduction in risk-taking overall. Focusing on specific types of risk-taking, investment in R&D and corporate acquisitions both decline during the chairman’s zodiac year; returns around acquisition announcements are also lower, suggesting real allocative consequences of zodiac year beliefs.

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1 Introduction

Many cultures have beliefs or practices – superstitions – that are held to affect outcomes in situations involving uncertainty. Despite having no scientific basis and no obvious function beyond reducing the stresses of uncertainty, superstitions persist and are widespread in modern societies. Furthermore, there is also evidence that superstitions have at least some impact on individual behaviors – for example, buildings often have no thirteenth floor, and airplanes have no thirteenth row, presumably because of Western superstitions surrounding the number 13. There exists a small but growing body of work showing that these superstitions matter for individuals’ consumption or financial decisions. It is possible, however, that superstitions can survive in individual decisions – much as noise traders can survive in equity markets – whereas large corporate investments take place in a setting in which a combination of market competition, management discipline, and somewhat more objective quantitative cost-benefit analyses could plausibly limit the effect of unprofitable traditional beliefs. Empirically, furthermore, the extent to which superstitions affect resource allocation at the level of an entire organization or the broader economy is largely unstudied.

In this paper, we show that superstitious beliefs impact the risk-taking of Chinese firms as a function of the birth year of their chairmen. In Chinese astrology, there exists a superstition that every twelfth year – one’s “zodiac year of birth” – will bring bad luck. We conjecture that corporations will reduce their risk exposure during the chairman’s zodiac year.

We focus on the chairman because this position holds the greatest decision-making power in publicly traded corporations in China. The chairmanship is generally held by the individual who holds a controlling stake in the firm – this is the case for 76 percent of the firm-year observations in our sample.¹

We begin by showing that, based on three waves of the Chinese Household Finance Survey, respondents are more likely to favor no-risk investments when surveyed in their zodiac year. We see this as a necessary validation of the relevance of zodiac superstitions (which is further reinforced

¹As we detail in Section 4, this is not the case for (partially privatized) state-owned enterprises, where the chairman represents the interests of the government shareholder.

by concurrent work on risk-taking by Chinese bureaucrats; see ?).

Turning to our main results on corporate decision-making, we use data on publicly traded Chinese firms during 2007 – 2019, linked to information on their chairmen, to examine proxies for overall corporate risk, as well as specific actions that entail risk or (ex ante) uncertainty. Specifically, we focus on share price volatility as an overall risk metric (e.g., ?), and both R&D expenditures and corporate acquisitions as specific types of high-risk investments.

We observe a small but clearly discernible decrease in volatility (both idiosyncratic as well as total) in the firm chairman’s zodiac year, relative to other years. In event plots, the drop in volatility is observed only in the zodiac year rather than those preceding it. Looking at specific sources of risk, we find that R&D and acquisition announcements both fall in the chairman’s zodiac year. In our favored within-firm specification, R&D rates (R&D deflated by assets) are significantly lower – about 10 percent of the within-firm standard deviation for an average firm – in the chairman’s zodiac year. In the within-firm specification, we find that the probability of a corporate acquisition is 2 percentage points lower, or 16 percent relative to the average annual acquisition rate of about 18 percent. We show in event plots that the value of each of these variables is lower in the zodiac year as compared with those immediately before or after.

Overall, we take our results as highlighting an important role played by non-standard beliefs that have no obvious (present-day) functional purpose.² While we are not the first to study how superstitions impact financial decision-making, we know of no prior work that explores how superstition impacts corporate investment, a setting in which one might assert, most strongly, that organizational and/or market discipline might limit the role of mistaken individual beliefs.

Several recent papers look at the effect of superstitions on economically consequential decisions. The clearest precedent to our work is ?, which studies the impact of Chinese numerology on company listings. They show that “unlucky” numbers are less common in Chinese IPO listings (and “lucky” numbers more common), and that these initial assignments lead to differences in IPO

²In attributing our results to zodiac year beliefs, we are implicitly assuming that risk preferences are constant across time. In practice it is impossible to distinguish between changes in preferences versus beliefs in our data. In either case, however, individuals act more conservatively.

prices and subsequent returns. Several other papers also look at the effect of numerological beliefs agents' decisions. ? show that numerological beliefs affect individual (but not institutional) futures traders' behavior in Taiwan, ? examine the impact of address numbers on the housing market in Singapore, and ? illustrate the spillover price effects of "haunted houses" in Hong Kong. This work is, in turn, motivated by a rich literature in social psychology that documents individual and/or less consequential impacts of numerological beliefs; for example, consumers pay more for "lucky" packages of 8 tennis balls (?), and the luck of digits predict their use in consumer advertisements (?). Economists have studied the related phenomenon of hot hand reasoning in the purchase of lottery tickets – ? show that more tickets are sold at "lucky" locations that sold past winners, while ? document that "streaky" numbers – those that appeared in several consecutive prior weeks – are more likely to be picked by lottery participants. While, as in our setting, the decision-makers in ? are relatively sophisticated, there is evidence that scientific training and sophistication are uncorrelated with superstitious beliefs (e.g.,?). Thus it is plausible, that both in their setting and ours, paying a cost for superstitious beliefs may extend beyond the small-stakes "mistakes" such as overpaying for "lucky" tennis balls.

Our work introduces the study of superstitions' role in corporate decision-making. Beyond studying superstitious beliefs in an economically important and distinct organizational setting, our work thus also contributes to the extensive literature on the determinants of corporate innovation and risk-taking. Most immediately relevant for our work, several papers study the determinants of share price volatility as a way of capturing the determinants of firm risk (??). Several papers look specifically at mergers and acquisitions as a means of reducing volatility in earnings (e.g., ??). While this would seem to be at odds with our findings, earlier work has focused on *ex post* risk, with diversifying acquisitions serving to reduce risk. Our emphasis is on the *ex ante* risk *during the chairman's zodiac year* that results from a significant corporate investment – i.e., an acquisition – with a relatively uncertain and speculative outcome.³ By examining the link to R&D we also

³Whether diversification adds or reduces firm value *on average* is a much-debated topic in corporate finance. See ? for a classic study on the diversification discount, and ? who argue that the apparent discount is driven by target

build on earlier work that uses this as a measure of risky investment; see, for example, ?. Some prior work examines leverage as an indication of risk-taking, e.g., ?. As we will describe in greater detail, there are both regulatory and practical limitations on deleveraging in the Chinese context that make this means of reducing zodiac year risk less plausible.

Beyond our focus on a setting that is distinct from prior work, one additional helpful feature of the superstition we study is that a zodiac year is an attribute that varies both across individuals and across time for a given individual. This affords the possibility of looking at changes in behavior for an individual firm, with non-zodiac-year observations serving as a natural benchmark. Furthermore, in considering the potential relevance of our findings for theory, our focus on zodiac year superstitions also has the advantage of linking superstitions to models and parameterizations that are well-studied by economists: Whereas lucky or unlucky numbers or home addresses are simply to be avoided, zodiac year concerns translate into shifts in an individual’s beliefs about risk, an attribute that is central to economic decision-making.

Finally, given our focus on corporate chairmen’s zodiac years, our paper contributes to the corporate finance literature that emphasizes the role of leadership in influencing organizational decisions. See, most prominently, ?, as well as the more recent contributions of ?, ?, and ?, which focus more specifically on leaders’ attitudes toward risk.

2 Background and data

We begin with a brief discussion of zodiac year superstitions, and then proceed to describe the two distinct datasets used in our analysis.

The Chinese Zodiac, known as “Sheng Xiao”, is based on a twelve-year cycle, with each year in that cycle related to an animal sign (rat, monkey, dragon, etc.). It is calculated according to the Chinese lunar calendar, with its origins dating to astrological beliefs as far back as the Han Dynasty, 202 BC – 220 AD. For the sake of brevity, we do not provide details on the origin and

selection.

evolution of these beliefs, which may easily be found elsewhere.

The animal year when a person was born is called her Ben Ming Nian (Zodiac Year of Birth). Some birth years are considered to be luckier than others (in particular the year of the dragon is seen as lucky which, as demographers have observed, leads to a disproportionate number of births in dragon years; see, e.g., ??). Of more immediate relevance to our paper, years associated with one’s birth animal (“zodiac years”) are expected to bring bad luck. That is, for example, if you are born in the year of the dog, all dog years will be unlucky. Thus, every age that is a multiple of 12 is thought to bring bad fortune.⁴

This “zodiac year” superstition is still taken seriously in China, and even individuals with modern beliefs are thought to avoid making major life changes during their zodiac year.⁵ It is considered ill-advised to, for example, buy a house or get married during one’s zodiac year, and considered prudent to avoid unlucky colors, numbers, or directions.⁶ Of particular relevance for our setting, there are explicit admonitions against taking financial risks in one’s zodiac year, and directives to weigh more carefully the downside of any possible investment.⁷

Data on individual risk preferences

We use all publicly available waves of the China Household Finance Survey (CHFS), which includes 2013, 2015, and 2017. The CHFS is, according to its English language website (<https://chfs.swufe.edu.cn/>), a “national survey, aimed at collecting micro-level information about household income, expenses, assets, liabilities, insurance and securities, etc. collects micro-level

⁴According to astrological traditions, individuals in their zodiac year may come into conflict with *Tai Sui*, also called the God of Age, a mysterious power or celestial body that controls people’s fortunes. This conflict puts them at risk for misfortunes such as sickness, economic loss, physical injuries and career challenges. Thus one’s zodiac year is also called the “Threshold Year” (“Kan Er Nian” in Chinese Pinyin), meaning that it is a year full of obstacles.

⁵We know of no scholarly work in English that details adherence to zodiac year superstitions. One Chinese language reference is ?. Additionally, there is a vast and ever-increasing volume of stories in the popular media describing the continued belief in zodiac year superstitions.

⁶There are also ways of mitigating zodiac year risks – the most popular solution is to wear red socks or underwear, often given as presents from elders at the beginning of the lunar year calendar, since the good luck associated with the color red may offset the unlucky effects of zodiac year ill fortune.

⁷For example, if one searches for “Ben Ming Nian” on Baidu Jingyan (roughly equivalent to quora.com), the top link (accessed May 29, 2019) has as its very first piece of advice to avoid large-scale or new types of investments (<https://jingyan.baidu.com/article/aa6a2c148c8dd40d4c19c4c9.html>). See ? and also ? for more extensive discussions.

information about household financial and physical assets (housing and other property), debts and credit constraints, income, expenditures, social insurance, intergenerational transfer payments, demographics, employment, and payment history.” The sampling was done at the household level, and was designed to be representative at both the national and provincial level(?). Collectively, the three rounds covered 56,283 households, from 355 districts or counties of 29 provinces. Our analysis is based on responses from the head of the household.

We focus on the subjective survey question on investment risk preferences, which the CHFS translates as, “What is your choice among combinations of risk and return?” Respondents are asked to provide a response on a 5-point scale ranging from “High risk, high return” (1) to “Unwilling to take any risk” (5), though the middle three categories describe only modest differences in risk preferences.⁸ Nearly half of respondents (46.5 percent) who answered this question choose option 5. We thus focus on a variable which captures this extreme aversion to financial risk-taking, *NoRisk*, which indicates that the respondent chose option 5. Unfortunately, respondents who had participated in the survey in a prior year were told to skip the risk question in 2017. So while there is some overlap across waves in surveyed households, we are unable to construct a panel for our analysis. Our main sample of 60,103 household-wave observations includes 35,063 who were sampled once, 12,514 who were sampled twice, in 2013 and 2015, and just 12 that were sampled in all three waves.

Since 1949, China has used the internationally accepted Gregorian calendar, and it is on this basis that birth years are recorded in the CHFS (precise birth dates are not available). The mismatch between the Gregorian and Chinese calendars introduces some measurement error. In particular, since the Chinese new year begins sometime between late January and mid-February, respondents born early in the calendar year will be assigned to the “wrong” zodiac year. Most plausibly, this leads to a bias toward zero as a result of classical measurement error. We return to this issue in greater detail below, as we will face similar (though less severe) measurement problems in our

⁸The middle category is “average risk, average return” whereas categories 2 and 4 are similarly worded, with the modifier “slightly above” (option 2) or “slightly below” (option 4) added to the description.

analysis of corporate risk-taking as our data include only birth month and year (but not birth day) of company chairmen.

In addition to birth year, the survey collects rich demographic information on its respondents. In the specifications that follow, we may control for political affiliations (in particular Communist Party or Youth League membership), marital and employment status, education, and gender. We may additionally control for 12-year age cohorts, centered around the zodiac year (i.e., [19, 30], [31, 42], etc.), as well as age and its square.

We include in Table 1 summary statistics for the main variables in this analysis. We note that *NoRisk* has a mean of 0.465, indicating that respondents expressed a relatively strong preference overall for no-risk investments. It is largely on this basis that we group other responses into a single category. There is a wide distribution of ages in the data, and as we will see in the next section, it will be important to control flexibly for this variable.

Data on corporate executives and firm-level outcomes

Our main sample is comprised of all non-state-owned firms (referred to below as non-SOEs) listed on the Shanghai and Shenzhen Stock Exchanges during the years 2007-2019. The start date is dictated by the fact that listed firms have only been required to report disaggregated (annual) accounts in their financial statements since 2007; prior to this date, we cannot observe, for example, cash holdings or R&D expenditures. Furthermore, China implemented new accounting rules in 2006 to be more in line with the International Financial Reporting Standards. These took effect in 2007, making it difficult to compare pre- versus post-2007 data in general (see http://www.gov.cn/gongbao/content/2007/content_549050.htm for a discussion of these changes).

Financial statements and information on each chairman's birth year, education, and gender are obtained from CSMAR, a Shenzhen-based financial data vendor. All Chinese listed firms use the same fiscal year period, based on the Gregorian calendar (i.e., starting on January 1 and ending on December 31).

We focus on the chairman and his zodiac year as important for the firm’s decisions for two related reasons. First, for non-SOEs, the chairman is generally the ultimate controller of the firm (recall that this is true in 76 percent of the firms in our sample).⁹ The controller is the firm’s largest shareholder which, even if its stake falls short of the 50 percent threshold, is by law the highest decision-making authority in the organization. Second, the chairman generally serves as ultimate decision-maker on major strategic decisions, including (but not limited to) mergers and acquisitions as well as investment allocations. CEOs, by contrast, manage daily business operations.¹⁰

Using the CSMAR data, we create our main outcome variables. Our primary measure of risk-taking is *Idiosyncratic Volatility*, which we define as the natural logarithm of the variance in daily abnormal returns in year $t + 1$. This follows ?, who argue that risky investments will increase the volatility of future cash flows, which in turn makes (future) stock returns more volatile. As in ?, we estimate expected returns in $t + 1$ based on the parameters of the market model which are estimated using daily firm return data 36 months prior to the beginning of fiscal year $t + 1$.

We consider several alternative measures of volatility to probe the robustness of our results. First, we use the natural log of *Total Volatility* as an alternative risk measure. This is similar to the idiosyncratic volatility measure, but with variance in stock returns calculated based on total (rather than abnormal) returns. Second, while, going back to the canonical contributions of ? and ?, it is standard to use the log transformation to deal with a long right tail in the distribution of volatility, we also consider the level of both idiosyncratic and total volatility as alternative outcome variables (prior work relating risk to volatility, as in ?, and ?, also uses the log transformation).¹¹

Turning to specific forms of investment, we focus on *R&D*, defined as total R&D expenditure t , divided by total assets in year $t - 1$ and *Acquisition*, an indicator variable which denotes that the firm

⁹We do not have information on the controller’s birth year in the 24 percent of cases that he/she is not also the chairman.

¹⁰See <http://finance.sina.com.cn/leadership/20120106/145311144355.shtml> for survey evidence on this division of roles. According to the survey, the chairman often intervenes even in daily business operations, such that the CEO overall does little more than carry out the chairman’s wishes.

¹¹Note that in our own data we also observe a skewed distribution of volatility, as seen in Appendix Figure A.1, panels A and B, for idiosyncratic and total volatility respectively. The log transformation, provided in panels C and D, leads to distributions that are approximately normal.

was involved with at least one M&A transaction in that year. For M&A, the CSMAR data include information on all announcements of deals for Chinese listed firms. The specific announcement dates are recorded, and we use this information to code whether there was an M&A deal in a given Chinese lunar calendar year.¹²

We also use the financial data from CSMAR to define a range of additional firm-level control variables: *CashRatio* is defined as total cash and cash equivalents in year t divided by total assets in year $t - 1$; *TobinsQ*, available directly from CSMAR, is (year-end) total market value of equity plus book value of debt, divided by total assets; *Short-term Leverage* and *Long-term Leverage* are the ratios of short- or long-term liabilities to total assets in year t . Finally, based on the identity of its controller, we classify each firm as a state-owned enterprise (SOE) or private firm.

As noted earlier, since 1949, China has used the Gregorian calendar, and it is on this basis that ages are recorded in CSMAR. Since the data include only birth year and birth month (i.e., not the day of the month), we need to account for the mismatch between the Gregorian and lunar calendars. Since the Chinese New Year is sometime between late January and mid-February, we assign chairmen born in January to the previous year's animal (e.g., a chairman born in January 1971 will be assigned to the Year of the Dog, which ended on February 6, 1971, whereas a chairman born in February 1971 will be assigned to the Year of the Pig, which is the animal for the following year). This will create some mismeasurement in assigning zodiac years to chairmen with January and February birthdays, and as a result, we expect, a bias toward zero in our estimates. Consistent with this, when we omit all observations with January and February birthdays from the sample, our point estimates are marginally larger (i.e., more negative). Finally, using CSMAR's Corporate Governance database, we obtain information on the chairman's gender and highest level of educational attainment.

¹²In practice we obtain virtually identical results if we use the number of M&A deals in a given year instead, or some transformation thereof. This is unsurprising given that only 6 percent of firm-year cells have more than one M&A deal. Note also that we do not include a broader measure of capital expenditure as an outcome, as it has an ambiguous connection to risk-taking. Past work even finds a *negative* relationship between property, plant, and equipment investment and share price volatility (?), emphasizing the overall ambiguity in the capital-risk relationship. In practice, we find no relationship between zodiac year and capital investment in our data.

We present summary statistics for all chairman and company data in Table 2. In the left panel (Panel A) we show summary statistics for the full sample. In the right panel (Panel B) we present separate summary statistics for $Zodiac = 0$ and $Zodiac = 1$ observations, as well as their difference. Most noteworthy, our volatility-based measures of risk exhibit a significant difference between zodiac and non-zodiac years ($p < 0.01$) and, furthermore, these differences go in the posited direction, with lower volatility in the chairman’s zodiac year. For R&D and acquisitions, we similarly observe lower values for zodiac year observations in the raw data (significant at the 5 and 10 percent levels respectively). Apart from long-term leverage (a difference we will return to in more detail later), there are no significant differences for any other firm-level attribute. We note finally that the table includes non-winsorized values of all variables. There are some extreme outliers for $R\&D$ and also some control variables: for example, the mean of $R\&D$ is 2.4 percent whereas the median is only 1.8 percent, indicating some right skewness. In all of our main analyses we will use winsorized (at the 1 percent level) values of all continuous variables, and present results with non-winsorized data as robustness checks.

3 Results

We proceed in two parts. We begin with a brief motivational set of findings on individual risk preferences as captured by survey responses, before turning to our main results on corporate risk-taking as a function of chairman zodiac year.

Individual zodiac year and investment risk preferences

We begin by showing the fraction of respondents for each age that have $NoRisk = 1$ in Appendix Figure A.2. The graph lays bare the importance in controlling carefully for age (and assessing the sensitivity of our point estimates to age controls) in the analysis that follows: Age is a very strong predictor of $NoRisk$, and we aim to identify the zodiac year effect from deviations from the clear

trend in risk preferences as a function of age.

Our main estimating equation is as follows:

$$NoRisk_{it} = \beta \times Zodiac_{it} + f(Age_{it}) + Controls_{it} + \epsilon_{it}$$

where i denotes the household, t is the survey wave, $f(Age)$ is a potentially flexible control for age, and ϵ_{it} is an error term with clustering at the household-level. We present a range of specifications in Table 3. In column (1) we show the bivariate relationship between *Zodiac* and *NoRisk*. The coefficient of 0.022 (significant at the 1 percent level) implies a 4.7 percent higher rate of risk aversion (as captured by $NoRisk = 1$) in a respondent's zodiac year. Column (2) adds *Age* and Age^2 as covariates. As expected, the age terms are very highly significant; however, the coefficient on *Zodiac* decreases only slightly. Column (3) takes a different approach to controlling for age, including a spline with knots at each of 30, 42, and 54 (i.e., at the midpoint between zodiac years) as well as cohort fixed effects centered around zodiac years. Again, the point estimate on *Zodiac* is largely unaffected. We add our full set of controls in column (4), including gender and employment status, as well as fixed effects for political affiliation, educational attainment, marital status, and survey wave.¹³ Again the coefficient on *NoRisk* is largely unchanged. As a final approach to assessing the sensitivity of our results to age controls, we present the results of specifications with full controls, and the sample limited to ages in relatively narrow bands around zodiac years. In columns (5) – (7) we show results based on $[-3, +3]$, $[-2, +2]$, and $[-1, +1]$ bands respectively. The point estimates are marginally smaller, and significant at least at the 10 percent level in these smaller samples.

We see these results as establishing a plausible and direct link between zodiac year superstitions and risk aversion at the individual level; we now turn to the main results of the paper, on corporate risk-taking.

¹³We used quadratic age controls in this specification, but in practice the point estimates are virtually identical if we use cohort dummies and a spline.

Chairman zodiac year and corporate risk-taking

Before turning to our regression analyses in this section, we present “event plots” in Figures 1 – 3, for each of our three main outcomes. For each graph, we show the value of the outcome variables – *Idiosyncratic Volatility*, *R&D*, and *Acquisition* – in the $[-3, +3]$ window around the chairman’s zodiac year, after removing the annual mean for the firm’s industry. Starting with idiosyncratic volatility which, recall, captures overall risk-taking based on a proxy for future shocks to cash flow, we find a distinct drop in the chairman’s zodiac year (Figure 1; we provide the corresponding figure for total volatility in Appendix Figure A.3). This measure remains relatively low in the following year as well. In interpreting the latter finding, it is useful to revisit the definition of volatility and its relation to zodiac year investment: recall that *Idiosyncratic Volatility* is the share price volatility at time $t + 1$ which reflects cash flow volatility in that year resulting from the riskiness of investments in year t . Yet it is entirely possible that investment decisions at t continue to impact cash flow (and hence share price) volatility for longer than a year, thus the negative effect at $t + 1$. Turning to Figure 2, we observe that R&D expenditure is at its lowest in the chairman’s zodiac year; it is also intriguing that post-zodiac R&D expenditures are actually higher than the pre-zodiac year figures. This suggests that some R&D projects may be delayed from the zodiac year, but undertaken in subsequent (less unlucky) years. However, given that the pre- and post-zodiac confidence intervals largely overlap, we are reluctant to make too much of this observation. We observe a very similar pattern for corporate acquisitions (Figure 3), which reach their minimum in the chairman’s zodiac year before jumping to above-average levels in the years immediately following (again possibly indicating intertemporal substitution).

We now turn to our basic regression specification to examine whether these patterns continue to hold after accounting for firm fixed-effects as well as time-varying firm-level attributes. Our main specification is as follows:

$$Outcome_{fy} = Zodiac_{C(fy)} + \gamma_y + \omega_f + ChairmanControls_{C(fy)} + FirmControls_{fy} + \epsilon_{fy}$$

where *Outcome* is, depending on the specification, one of *Idiosyncratic Volatility*, *R&D* or *Acquisition*. *Zodiac* denotes that y is the zodiac year of chairman C of firm f . We include in all specifications fixed effects for year γ_y and for firm ω_f , and standard errors are clustered at the firm level. Firm-year controls include the logarithm of the book value of assets, cash, leverage, Tobin's Q, and chairman controls include age, education, and gender. In all tables, we multiple coefficients by 100 for ease of exposition.

We begin with our main measure of risk-taking based on future share price volatility as the outcome variable in Table 4. In the first column, we include only *Zodiac* as a covariate; its coefficient is -7.49 (significant at the 1 percent level). To focus on within-firm variation, we add firm and year fixed effects in column (2). As expected, the coefficient is notably smaller in magnitude, but still significant at the 1 percent level. In the remaining columns we add chairman controls (column (3)), firm controls (column (4)), and a combination of age cohort fixed effects and spline variables (column (5)).¹⁴ The coefficient on *Zodiac* is quite stable across these additional specifications. This reflects a modest but clearly discernable decline in volatility – to provide some sense of magnitude, consider that the median within-firm interquartile range in idiosyncratic volatility is 69.5 (after scaling up by 100 to make it comparable to the table's coefficients), as compared to the coefficient of -3.32 in the within-firm specifications.¹⁵

In column (6) we use the one year lead and the one year lag of *Zodiac* as additional covariates. As suggested by the event plot in Figure 1, the post-zodiac year also has relatively low volatility, though the effect size (and significance) is dissipated. As we noted earlier, this may be a result of the longer-term effects of zodiac year investment decisions on cash flow volatility. In column (7), we show the results using non-winsorized data, and observe that the implied zodiac year effect is marginally higher both in terms of significance and magnitude. Finally, in column (8) we provide a specification which includes chairman fixed effects, so that our zodiac year estimate is identified from

¹⁴The sample size falls in column (4) because market-to-book is missing for 4.8% of our firm-year observations, primarily because of an absence of active stock trading, leading to missing values for market valuation.

¹⁵One possible reason for the modest effect size is the fact that choices in a zodiac year impact future cash flow volatility, which does not have a one-to-one match to return volatility. See, for example, ?.

year-to-year variation for a given chairman (rather than, say, chairman turnover); the coefficient estimate increases marginally in magnitude. In Appendix Tables A1-A3, we show analogous results for *Total Volatility*, as well as level (rather than log) of idiosyncratic and total volatilities as outcome variables. The patterns are essentially identical to those from idiosyncratic volatility.

We next turn to the relationship between chairman zodiac year and specific types of risky investments – R&D and acquisitions. We begin with R&D expenditures in Table 5, with specifications that exactly parallel those of our volatility analyses. In the specification with no controls, the coefficient on R&D is -0.12, significant at the 5 percent level, a little more than 11 percent of the within-firm standard deviation in R&D expenditure, or about 5.3 percent of the (winsorized) sample mean. While the coefficient and its standard error are both marginally smaller across additional specifications – in all cases, the coefficient on *Zodiac* is significant at least at the 5 percent level. The coefficient on *Zodiac* is quite stable across these additional specifications.

Turning now to *Acquisition* as an outcome in Table 6, we again find a distinct zodiac year decline, significant at least at the 10 percent level in all specifications, and at the 5 percent level in our preferred specification with firm-year and chairman-year controls (column (4)). The coefficient of approximately -2 implies a more than 11 percent reduction relative to the mean acquisition rate of just over 18 percent (recall again that the coefficients have been scaled up by 100 for readability).

Corporate acquisitions may also provide a window into whether zodiac year superstitions distort investments in ways that are value-reducing, since we may examine how investors respond to announcement decisions in zodiac versus non-zodiac years. We note at the outset that the overall impact is ambiguous. On the one hand, if chairmen are more averse to acquisitions in zodiac years, they may have a higher value threshold, which would lead to a positive market response conditional on an acquisition actually taking place in a zodiac year. However, acquisitions may instead be driven by agency problems, as suggested by past work which argues that mergers and acquisitions may serve the interests of insiders at the expense of shareholders (see, e.g., ? on agency problems in acquisitions and ? on the ambiguous valuation implications of M&A).¹⁶ A chairman may weigh,

¹⁶To the extent that investors themselves are subject to superstitions (as suggested by the results of ?), market

in particular, the private benefits he may obtain – for example, through the types of related party transactions that are plausibly common enough in our sample period in China – against the riskiness of M&A transactions. In this formulation, profit is replaced by private returns in the chairman’s assessment of acquisition targets. In a zodiac year, the M&A transactions that take place are those that clear a higher private benefit threshold, and thus may have lower announcement returns. Finally, to the extent that investors themselves are subject to superstitions (as suggested by the results of ?) and are attentive to the chairman’s birth year, market reaction may be more negative in zodiac years, holding acquisition target constant. Media reports do in fact suggest that a chairman’s birth year is given ample attention in the financial press. For one recent and particularly relevant example, see “Chairman of Chinachem Technology pushes the Shanghai Stock Exchange into a capital game by a former Cathay Pacific researcher,” *Sina Finance*, February 18, 2021. The article describes the zodiac-year M&A activity of Chinachem that, according to regulators, was suspect because of the benefits that were to accrue to the company’s chairman, Yuan Jinqing. The narrative, while anecdotal, fits with both the concern that zodiac-year acquisitions may need to clear a higher value threshold in terms of *private* returns for the chairman, and also emphasizes the relevance of a chairman’s birth year to investors.

We present our merger return results in Table 7, with windows ranging from [-1,1] to [-10,10] around the announcement date, to allow for both pre-event information leakage and post-event drift. In specifications that include firm and year fixed effects, we observe a more negative market reaction in zodiac years, an effect that is significant for all but the shortest event window. We find this result to be very intriguing and, given the ambiguity in interpretation, a useful fact to probe further in future research.

In Appendix Table A.4, we show a set of placebo tests, focused on state-controlled firms, for each of our three main outcome variables. In this table we use the specification with firm and year fixed effects as well as firm-year and chairman-year controls, though in practice the results reaction may be more negative in zodiac years, holding acquisition target constant.

are quite similar regardless of the choice of control variables. In contrast to non-SOE firms, where the chairman generally represents his own financial interests as controlling shareholder, in SOEs the chairman represents the interests of (and takes instructions from) the government. Indeed, in a very tangible sense, the M&A activities we study are strictly controlled by the government via the State-owned Assets Supervision and Administration Commission (SASAC), a body created by China's State Council in 2003 to oversee the decisions of SOEs. Regulations passed in May 2004 explicitly specify that the transfer of state ownership stakes (which is a part of most M&A activity by SOEs) must be approved by the local SASAC office as well as the local government.¹⁷ Even for regular CAPEX investment, it is typical for local governments as well as local SASAC offices to set up rules governing SOE investment to maintain tight control over firms' strategic decisions.¹⁸ Firms owned by the central government are even more directly controlled by SASAC regulations, which stipulate that any diversified investments (i.e., investments not in the firm's main line of business) require approval. Additionally, these firms must submit annual investment plans to the SASAC for feedback and guidance.^{19,20} In summary, the chairman of an SOE serves more of a custodial role in carrying out government wishes, and hence we assert that his personal characteristics (including zodiac year status) are less plausibly relevant for firms' investment decisions.

Consistent with the view outlined above, we find no correlation between SOE chairmen's zodiac year status and any measure of firm-level risk-taking. Focusing first on the SOE subsample in the odd-numbered columns, *Zodiac* never approaches significance. If we instead use the full sample and include a *Zodiac * SOE* interaction term (even columns), the direct effect of *Zodiac* is negative

¹⁷See in particular Article 23 of Section 4. The full English text of these regulations may be found at http://en.sasac.gov.cn/2003/11/24/c_118.htm (last accessed February 10, 2019).

¹⁸See, for example, http://www.tl.gov.cn/zxxz/xwzx/136/201807/t20180731_448570.html (last accessed February 10, 2019) for rules governing SOE investment for firms in Tongling City (population 1.7 million in 2017). The rules specify that investment must be approved by the local SASAC office, and then require a further layer of approval from the prefecture administration.

¹⁹See <http://www.lehmanlaw.com/newsletter/CentralEnterprisesJune282006.pdf> (last accessed February 10, 2019) for an English translation of the relevant regulations. See in particular Article 9.

²⁰In 2017, the State Council began to relax SASAC and government regulations on M&A, restructuring, and IPOs by SOEs, through its "Notice of the General Office of the State Council on Forwarding the Plan of the SASAC for Promoting the Transformation of Functions with the Focus Put on Capital Management (No. 38 [2017])" The full Chinese text is available at http://www.gov.cn/zhengce/content/2017-05/10/content_5192390.htm (accessed on Feb 11, 2019).

and significant in all cases, implying a zodiac-year reduction in risk-taking, whereas the interaction term has a coefficient that is consistently positive and – apart from $R\&D$ – significant at least at the 10 percent level. Looking at the sums of the two coefficients the overall zodiac-year effect for SOEs is never significant and of inconsistent sign.

Finally, in Appendix Tables A.5 – A.9, we present a series of further extensions to probe the consistency and robustness of our results. In Appendix Table A.5, we include the CEO’s zodiac year as a covariate and observe that, as expected, it is uncorrelated with idiosyncratic volatility, R&D, or acquisitions.

Appendix Table A.6 examines other outcomes – namely market valuation (Tobin’s Q) and leverage. Plausibly, particularly for firms facing uncertain cash flow, leverage might be seen as a marker for risk (see, e.g., ?, and ?, for references). We distinguish between long-term and short-term debt, since the latter could plausibly be adjusted more rapidly to accommodate short-run shifts in attitudes toward risk. We find no correlation between the chairman’s zodiac year and firm value, nor with short- or long-term leverage. This is consistent with our prior expectations. Capital structure is remarkably stable and persistent over time within the same firm, and when the firm does change its capital structure, it adjusts slowly towards its target ratio, possibly due to adjustment costs (see ?, and ?, for references). In the Chinese context, deleveraging is further complicated by constraints imposed by policymakers, who wish to maintain high growth for political reasons.^{21,22}

Finally, in Appendix Table A.7 – A.9, we consider a number of dimensions of potential heterogeneity in the zodiac effect for each of our three main outcomes. We look at whether there is a stronger zodiac year effect for those born in dragon years (as Chinese astrological beliefs might suggest) or for females; in neither case do we find consistent or significant differences. We also look

²¹See, for example, the following post and links therein, which emphasize bureaucrats’ concerns that deleveraging may slow economic growth and lead to instability: <https://www.moneyandbanking.com/commentary/2017/7/9/china-deleveraging-is-hard-to-do>. A further discussion of the tradeoffs between growth and leverage is provided in http://www.xinhuanet.com/english/2017-07/09/c_136430117.htm.

²²Furthermore, for financially constrained firms, deleveraging is also difficult since it requires ample free cash flow. This was required of many Chinese real estate developers in the late 2010s when the central government directed them to delever, which required them to rapidly sell off the residential properties they had developed to secure the necessary cash flow.

at whether chairman sophistication (as captured by college education, or overseas education). We again do not find any substantial heterogeneity. As we noted in Section 2, even well-educated Chinese seem to subscribe to zodiac year superstitions, which makes the lack of any heterogeneity in the estimated relationship unsurprising. Finally, we consider whether there is heterogeneity based on governance, as captured by CEO/chairman dual role or ownership concentration; we similarly find no consistent nor significant impact on the estimated relationship between *Zodiac* and risk-taking.

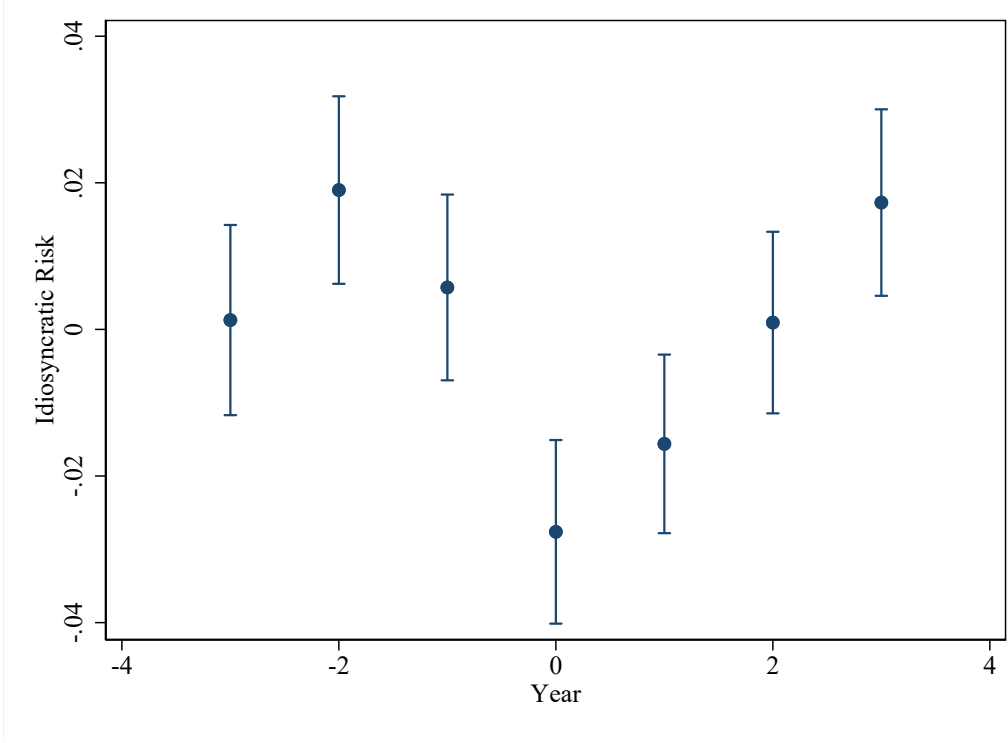
4 Conclusion

We show that astrological superstitions – in particular belief in bad luck during one’s zodiac year – affect corporate investment and decision-making. Our results emphasize the role of non-standard beliefs in influencing important decisions even in relatively large and sophisticated organizations, and illustrate the potential consequences of leaders’ beliefs on decision-making that affect corporate structure and innovation.

We see a number of fruitful directions for further research. The most immediate connection to our current research is that one might consider how a shift in beliefs impacts the behavior of agents, rather than the behavior of a principal as we do in this paper. One might be circumspect in generalizing our findings to the behavior of managers and other agents, as it introduces complications that result from the joint modeling of zodiac beliefs as well as how the shift in beliefs interact with common incentive schemes. We leave this important topic for future research. Furthermore, in the current paper we cannot make any decisive conclusions about whether the superstitions we study lead to longer-term misallocation or only intertemporal shifting of investment – such fine-grained assessments and the resultant welfare consequences may require more modeling structure and additional data and, again, will be left for future work.

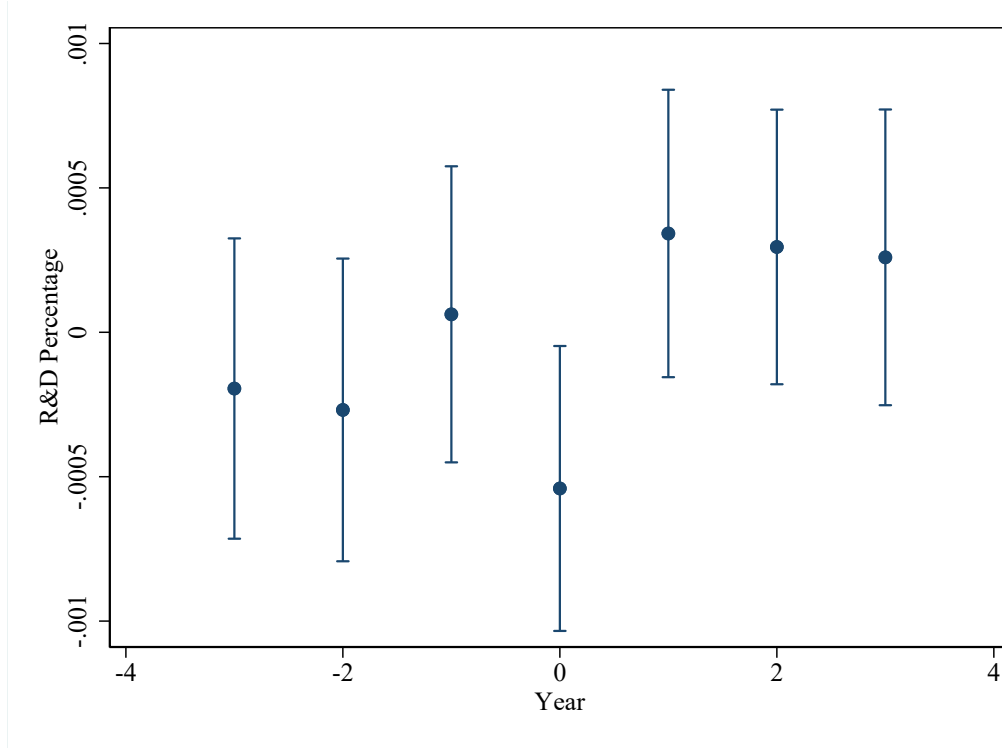
References

Figure 1: Event plot illustrating the relationship between chairman zodiac year and idiosyncratic risk



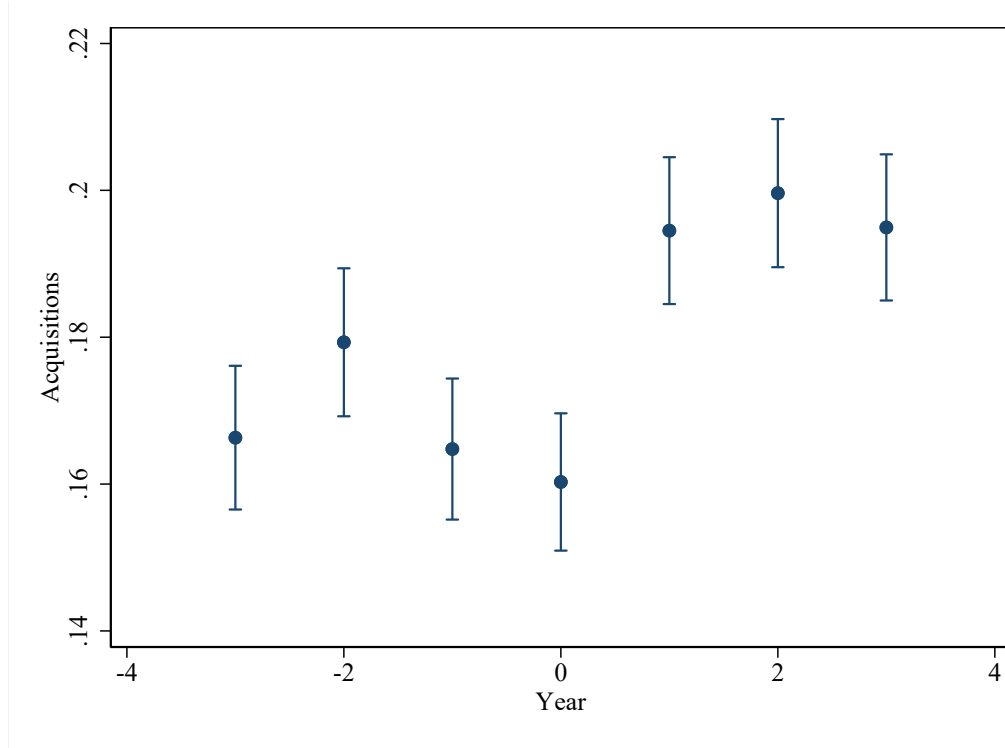
Notes: This figure shows the mean value of industry-adjusted logged idiosyncratic risk for non-SOE firms listed on the Shanghai and Shenzhen stock exchanges, for the years 2007–2019, as a function of the chairman’s zodiac year. The horizontal axis reflects years relative to the chairman’s zodiac year. The markers at each year reflect the mean value of industry-adjusted idiosyncratic risk, and the “whiskers” denote 95 percent confidence intervals.

Figure 2: Event plot illustrating the relationship between chairman zodiac year and R&D investment



Notes: This figure shows the mean value of industry-adjusted R&D for non-SOE firms listed on the Shanghai and Shenzhen stock exchanges, for the years 2007–2019, as a function of the chairman’s zodiac year. The horizontal axis reflects years relative to the chairman’s zodiac year. The markers at each year reflect the mean value of industry-adjusted R&D investment, and the “whiskers” denote 95 percent confidence intervals.

Figure 3: Event plot illustrating the relationship between chairman zodiac year and M&A activity



This figure shows the mean fraction of firms engaging in M&A activity, for non-SOE firms listed on the Shanghai and Shenzhen stock exchanges, for the years 2007–2019, as a function of the chairman’s zodiac year. The horizontal axis reflects years relative to the chairman’s zodiac year. The markers at each year reflect the mean value of the fraction of firms engaging in M&A activity in a given year, and the “whiskers” denote 95 percent confidence intervals.

Table 1: CHFS Analysis Summary Statistics

Variable Name	Mean	StdDev	Observations
NoRisk	0.465	0.499	60103
Zodiac	0.085	0.279	60103
Age	46.471	12.064	60103
Female	0.488	0.500	60103
Employed	0.679	0.467	60080

Notes: *NoRisk* is an indicator variable denoting that the respondent expressed a preference for investments without any risk associated with them. *Zodiac* is an indicator variable denoting that the respondent was in his or her zodiac year at the time of the interview (based on the Gregorian calendar). *Age*, *Female*, and *Employed* are all self-explanatory. Other control variables include the categorical variables listed in the notes to Table 2. All data come from the China Household Finance Survey (2013, 2015, and 2017). See text for additional details.

Table 2: Summary statistics for zodiac year and corporate risk-taking

	Panel A: Full Sample				Panel B: Balance		
	Obs	Mean	St.D	Median	Zodiac=0	Zodiac=1	Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(6)-(5)
Zodiac	18281	0.084	0.278	0.000			
Chairman characteristics:							
Education	18550	2.318	0.789	3.000			
Age	18281	51.391	8.108	51.000			
Female	18550	0.057	0.232	0.000			
Firm-year characteristics:							
Log of Idiosyncratic Risk	15853	-2.049	0.603	-2.050	-2.045 (0.005)	-2.122 (0.016)	-0.078*** (0.017)
R&D	18550	0.024	0.032	0.018	0.024 (0.000)	0.023 (0.001)	-0.002** (0.001)
Acquisition	18550	0.177	0.382	0.000	0.180 (0.003)	0.160 (0.009)	-0.020* (0.010)
log(Assets)	18550	21.581	1.166	21.486	21.593 (0.009)	21.560 (0.029)	-0.033 (0.031)
Short-term Leverage	18550	0.377	1.390	0.307	0.369 (0.008)	0.362 (0.016)	-0.007 (0.028)
Long-term Leverage	18550	0.046	0.082	0.003	0.045 (0.001)	0.049 (0.002)	0.003 (0.002)
PctCash	18550	0.272	0.524	0.158	0.271 (0.004)	0.283 (0.012)	0.012 (0.014)
Tobins Q	17560	2.432	7.013	1.728	2.431 (0.057)	2.343 (0.094)	-0.088 (0.190)

Notes: This table is based on firm and chairman characteristics for all non-SOE firms traded on the Shanghai and Shenzhen exchanges during 2007 – 2019. Zodiac is an indicator variable denoting the chairman's zodiac year; all other chairman characteristics are self-explanatory (see text for details). Firm-year characteristics Idiosyncratic Risk, the natural logarithm of the variance of daily abnormal returns in fiscal year $t+1$; R&D, the ratio of research and development expenditures to lagged assets; Acquisition, an indicator variable denoting M&A activity; log(Assets), the logarithm of the firm's total asset; Short-term Leverage, the ratio of short-term debt to total assets; Long-term Leverage, the ratio of long-term debt to total assets; PctCash, the percentage of the firm's assets held as cash, and TobinsQ, the ratio of the market value of equity and book value of debt to total assets. See text for further details. The last three columns provide mean values for zodiac and non-zodiac year observations separately, as well as their difference. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.

Table 3: Relationship between CHFS respondent zodiac year and investment risk preferences

	<i>Dependent variable: NoRisk</i>						
	Full Sample				± 3 years	± 2 years	± 1 years
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Zodiac	0.022*** (0.00731)	0.020*** (0.00683)	0.019*** (0.00685)	0.017** (0.00670)	0.015** (0.00692)	0.015** (0.00716)	0.013* (0.00781)
Age		0.018*** (0.00103)		0.009*** (0.00117)	0.008*** (0.00163)	0.007*** (0.00196)	0.009*** (0.00255)
Age^2		-0.000*** (0.0000117)		0.000** (0.0000131)	0.000** (0.0000184)	0.000*** (0.0000222)	0.000 (0.0000289)
Female				0.080*** (0.00388)	0.080*** (0.00501)	0.077*** (0.00592)	0.078*** (0.00758)
Employed				-0.008* (0.00451)	0.001 (0.00582)	0.002 (0.00688)	-0.004 (0.00882)
Age cohort FE and spline	No	No	Yes	No	No	No	No
Personal background FE	No	No	No	Yes	Yes	Yes	Yes
Survey Wave FE	No	No	No	Yes	Yes	Yes	Yes
Mean of the D.V.	0.465	0.465	0.465	0.465	0.469	0.469	0.473
Adjusted R^2	0.000	0.122	0.123	0.165	0.166	0.171	0.173
Number of observations	60103	60103	60103	60042	35647	25470	15409

Notes: This table shows, using data from the China Household Finance Survey (2013, 2015 and 2017), the relationship between a respondent's birth year and his response to the question, "What is your choice among combinations of risk and return?" The dependent variable, *NoRisk*, is an indicator variable denoting the choice, "Unwilling to take any risk." Zodiac is an indicator variable denoting that, in the survey year, the respondent's age was a multiple of 12. Columns (4) - (7) include, in addition to basic demographic controls, fixed effects for political status, educational attainment, marital status and survey wave. The other variables definitions are self-explanatory. Columns (5) - (7) limit the sample to individuals whose ages in the survey year is within 3, 2, and 1 years of their zodiac year respectively. See text for details on variable definitions and construction. Robust standard errors in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.

Table 4: Relationship between chairman's zodiac year and idiosyncratic risk

	<i>Dependent variable: Log of Idiosyncratic Risk</i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Zodiac	-7.485*** (1.666)	-3.532*** (1.324)	-3.580*** (1.323)	-3.493*** (1.320)	-3.322** (1.319)	-3.855*** (1.413)	-3.624*** (1.331)	-3.786*** (1.347)
Zodiac (1 year lag)						-0.234 (1.395)		
Zodiac (1 year forward)						-2.118 (1.376)		
Education			0.336 (1.358)	0.912 (1.426)	0.626 (1.440)	0.909 (1.427)	0.890 (1.449)	
Age			-0.209** (0.102)	-0.125 (0.102)		-0.126 (0.102)	-0.138 (0.105)	
Female			0.249 (3.134)	0.451 (3.208)	0.809 (3.235)	0.408 (3.211)	0.834 (3.298)	
log(Assets)				-10.036*** (1.140)	-10.297*** (1.140)	-10.034*** (1.141)	-8.567*** (1.062)	-15.556*** (1.460)
Short-term Leverage				15.061*** (4.387)	15.278*** (4.384)	15.094*** (4.389)	-0.043 (0.692)	19.049*** (5.085)
Long-term Leverage				21.234*** (8.142)	21.380*** (8.110)	21.335*** (8.139)	7.624 (7.935)	23.758*** (8.737)
PctCash				8.376*** (2.808)	8.483*** (2.818)	8.395*** (2.806)	0.464 (1.917)	9.481*** (2.985)
Tobins Q				-0.299 (0.462)	-0.309 (0.461)	-0.296 (0.462)	-0.043 (0.0419)	-1.255** (0.514)
Winsorized	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Age cohort FE and spline	No	No	No	No	Yes	No	No	No
Firm FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chairman FE	No	No	No	No	No	No	No	Yes
Mean of the D.V.	-2.054	-2.055	-2.055	-2.070	-2.070	-2.070	-2.068	-2.079
Adjusted R^2	0.001	0.453	0.453	0.458	0.458	0.458	0.452	0.351
Number of observations	15664	15558	15558	15100	15100	15100	15100	14532

Notes: This table shows the relationship between the birth of a firm's chairman and *IdiosyncraticRisk*, the natural logarithm of the variance of daily abnormal returns in fiscal year $t+1$. The sample of firms includes all non-SOE firms traded on the Shanghai and Shenzhen exchanges during 2007–2019. Zodiac is an indicator variable denoting the chairman's zodiac year; all other chairman characteristics are self-explanatory (see text for details). Firm-year controls include the logarithm of the firm's total asset; Short-term Leverage, the ratio of short-term debt to total assets; Long-term Leverage, the ratio of long-term debt to total assets; PctCash, the percentage of the firm's assets held as cash, and TobinsQ, the ratio of the market value of equity and book value of debt to total assets. In columns (1) - (6) and (8), all continuous variables are winsorized at the 1 percent level. All coefficients have been scaled up by a factor of 100 to make them readable. Robust standard errors, clustered at the firm level, are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.

Table 5: Relationship between chairman's zodiac year and firm R&D

	<i>Dependent variable: R&D</i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Zodiac	-0.123** (0.0529)	-0.101** (0.0404)	-0.102** (0.0404)	-0.085** (0.0392)	-0.084** (0.0389)	-0.092** (0.0445)	-0.108** (0.0459)	-0.092** (0.0393)
Zodiac (1 year lag)						-0.038 (0.0438)		
Zodiac (1 year forward)						-0.010 (0.0385)		
Education			0.058 (0.0516)	0.077 (0.0509)	0.079 (0.0515)	0.077 (0.0509)	0.101* (0.0571)	
Age			-0.007** (0.00346)	0.001 (0.00327)		0.001 (0.00326)	-0.001 (0.00401)	
Female			0.061 (0.107)	0.041 (0.106)	0.038 (0.106)	0.040 (0.106)	0.029 (0.117)	
log(Assets)				0.128** (0.0546)	0.131** (0.0551)	0.128** (0.0546)	0.100 (0.0640)	0.073 (0.0652)
Short-term Leverage				0.037 (0.155)	0.042 (0.154)	0.037 (0.155)	-0.002 (0.0248)	0.203 (0.173)
Long-term Leverage				-0.780*** (0.279)	-0.770*** (0.277)	-0.779*** (0.279)	-0.717** (0.301)	-0.297 (0.294)
PctCash				1.833*** (0.0973)	1.829*** (0.0973)	1.833*** (0.0973)	0.883** (0.368)	1.887*** (0.0983)
Tobins Q				0.061*** (0.0195)	0.062*** (0.0195)	0.062*** (0.0195)	0.003 (0.00210)	0.067*** (0.0191)
Winsorized	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Age cohort FE and spline	No	No	No	No	Yes	No	No	No
Firm FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chairman FE	No	No	No	No	No	No	No	Yes
Mean of the D.V.	0.023	0.023	0.023	0.023	0.023	0.023	0.024	0.023
Adjusted R^2	0.000	0.676	0.676	0.712	0.712	0.712	0.614	0.684
Number of observations	18281	18128	18128	17197	17197	17197	17197	16643

Notes: This table shows the relationship between the birth of a firm's chairman and R&D, the ratio of research and development expenditures to lagged assets. The sample of firms includes all non-SOE firms traded on the Shanghai and Shenzhen exchanges during 2007–2019. Zodiac is an indicator variable denoting the chairman's zodiac year; all other chairman characteristics are self-explanatory (see text for details). Firm-year controls include the logarithm of the firm's total asset; Short-term Leverage, the ratio of short-term debt to total assets; Long-term Leverage, the ratio of long-term debt to total assets; PctCash, the percentage of the firm's assets held as cash, and TobinsQ, the ratio of the market value of equity and book value of debt to total assets. In columns (1) - (6) and (8), all continuous variables are winsorized at the 1 percent level. All coefficients have been scaled up by a factor of 100 to make them readable. Robust standard errors, clustered at the firm level, are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.

Table 6: Relationship between chairman zodiac year and firm M&A activity

	<i>Dependent variable: Acquisition</i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Zodiac	-1.988** (0.960)	-1.764* (0.937)	-1.732* (0.937)	-2.148** (0.956)	-2.110** (0.955)	-2.020** (0.988)	-2.122** (0.958)	-2.080** (1.000)
Zodiac (1 year lag)						-0.193 (1.019)		
Zodiac (1 year forward)						1.049 (1.025)		
Education			0.542 (0.872)	0.232 (0.878)	0.160 (0.882)	0.235 (0.878)	0.219 (0.884)	
Age			0.179*** (0.0619)	0.123** (0.0621)		0.124** (0.0621)	0.127** (0.0624)	
Female			-1.131 (1.882)	-0.423 (1.966)	-0.303 (1.965)	-0.412 (1.966)	-0.574 (1.968)	
log(Assets)				7.205*** (0.797)	7.258*** (0.801)	7.206*** (0.797)	5.416*** (0.695)	7.422*** (1.001)
Short-term Leverage				-0.627 (2.877)	-0.605 (2.879)	-0.647 (2.878)	0.091 (0.244)	0.238 (3.757)
Long-term Leverage				7.615 (6.092)	7.697 (6.098)	7.578 (6.096)	7.336 (4.772)	6.009 (7.096)
PctCash				-2.759*** (1.059)	-2.787*** (1.063)	-2.756*** (1.059)	-1.044* (0.591)	-2.971*** (1.111)
Tobins Q				2.195*** (0.344)	2.203*** (0.343)	2.195*** (0.344)	0.148*** (0.0266)	2.129*** (0.389)
Winsorized	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Age cohort FE and spline	No	No	No	No	Yes	No	No	No
Firm FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chairman FE	No	No	No	No	No	No	No	Yes
Mean of the D.V.	0.178	0.180	0.180	0.180	0.180	0.180	0.180	0.182
Adjusted R^2	0.000	0.154	0.154	0.168	0.168	0.168	0.165	-0.004
Number of observations	18281	18128	18128	17197	17197	17197	17197	16643

Notes: This table shows the relationship between the birth of a firm's chairman and *Acquisition*, an indicator variable denoting M&A activity in a given year. The sample of firms includes all non-SOE firms traded on the Shanghai and Shenzhen exchanges during 2007–2019. Zodiac is an indicator variable denoting the chairman's zodiac year; all other chairman characteristics are self-explanatory (see text for details). Firm-year controls include log(Assets), the logarithm of the firm's total asset; Short-term Leverage, the ratio of short-term debt to total assets; Long-term Leverage, the ratio of long-term debt to total assets; PctCash, the percentage of the firm's assets held as cash, and TobinsQ, the ratio of the market value of equity and book value of debt to total assets. In columns (1) - (6) and (8), all continuous variables are winsorized at the 1 percent level. We multiply all coefficients in this table by 100 to make them more readily comparable to our R&D results. Robust standard errors, clustered at the firm level, are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.

Table 7: Relationship between chairman's zodiac year and firm's market value in M&A events

	<i>Dependent variables:</i>			
	CAR[-1,1]	CAR[-3,3]	CAR[-5,5]	CAR[-10,10]
	(1)	(2)	(3)	(4)
Zodiac	-1.284 (0.866)	-3.024** (1.345)	-4.726*** (1.698)	-7.078*** (2.280)
Education	-0.051 (1.159)	-1.254 (2.162)	-1.231 (2.597)	-1.749 (3.058)
Age	0.164* (0.0900)	0.281** (0.142)	0.352* (0.206)	0.276 (0.274)
Female	2.674 (2.443)	2.057 (4.020)	0.513 (5.061)	-3.739 (8.200)
log(Assets)	-1.841** (0.889)	-3.666*** (1.389)	-4.919** (1.958)	-6.062** (2.549)
Short-term Leverage	0.862 (3.177)	2.473 (4.968)	-1.317 (6.592)	-6.311 (7.955)
Long-term Leverage	2.135 (5.189)	5.804 (8.212)	3.036 (9.879)	2.335 (11.85)
PctCash	3.056 (2.255)	4.786 (3.065)	8.019* (4.485)	6.370 (5.433)
Tobins Q	0.590 (0.441)	0.994 (0.626)	1.232 (0.866)	0.985 (1.033)
Winsorized	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Mean of the D.V.	0.018	0.034	0.043	0.052
Adjusted R^2	0.403	0.485	0.497	0.534
Number of observations	4641	4641	4641	4641

Notes: This table shows the relationship between the birth of a firm's chairman and firm's CARs (cumulative abnormal returns) in M&A events, we construct CARs for different windows, including CAR[-1,1], CAR[-3,3], CAR[-5,5] and CAR[-10,10]. The sample of firms includes all non-SOE firms traded on the Shanghai and Shenzhen exchanges during 2007–2019. Zodiac is an indicator variable denoting the chairman's zodiac year; all other chairman characteristics are self-explanatory (see text for details). Firm-year controls include the logarithm of the firm's total asset; Short-term Leverage, the ratio of short-term debt to total assets; Long-term Leverage, the ratio of long-term debt to total assets; PctCash, the percentage of the firm's assets held as cash, and TobinsQ, the ratio of the market value of equity and book value of debt to total assets. In all columns, all continuous variables are winsorized at the 1 percent level. All coefficients have been scaled up by a factor of 100 to make them readable. Robust standard errors, clustered at the firm level, are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% levels.