Can Superstition Create a Self-Fulfilling Prophecy? School Outcomes of Dragon Children in China

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In China, those who have a dragon zodiac sign are believed to be destined for greatness. We find that if Chinese students are born in a dragon year, they are more likely to have a college degree and receive higher university entrance exam scores. Similarly, Chinese middle school dragon students have higher test scores. The "dragon effect" on test scores is eliminated when we account for parents' expectations of their children. Dragon parents have higher expectations, and they invest more in their children. Although dragon children are not inherently different, the belief in the prophecy of success and the ensuing investment become self-fulfilling.

I. Introduction

Cultural beliefs and preferences affect the behavior of individuals who hold these beliefs. For example, the strength of family ties, based on cultural heritage, negatively influences political participation and civic engagement (Alesina and Giuliano 2011), labor supply and fertility rates in a woman's country of ancestry have explanatory power in determining work and fertility decisions (Fernandez and Fogli 2009), and cultural preferences toward leisure have an impact on the labor market activity of

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women (Mocan 2019). The extent to which residents of a country consider people of another country untrustworthy has an influence on trade and foreign direct investment between these countries (Guiso et al. 2009).

Beliefs and behaviors, even those that can be thought of as having been ingrained in the fabric of culture, react to the economic and institutional environment (Alesina and Fuchs-Schündeln 2007; Di Tella et al. 2007; Mocan and Raschke 2016; Mocan, Bielen, and Marneffe 2020). Yet there is substantial persistence in beliefs over long periods of time, and beliefs are transmitted through generations (Guiso, Sapienza, and Zingales 2008; Voigtlaender and Voth 2012). Such persistence raises the question of whether cultural beliefs, even if they are completely untrue, can be self-fulfilling. For example, Nunn and Sanches de la Sierra (2017) describe a superstitious belief that has emerged in the Democratic Republic of the Congo regarding how to make oneself bulletproof through a ritual. They show that, although untrue, this belief helped villagers coordinate their defense activities against a group of bandits who possessed firearms, and it allowed the villagers to defeat the bandits. Even though some villagers died in the process because the ritual never made them bulletproof, the fact that most people believed in this superstition generated a mass movement of organized and successful defense against the perpetrators, which then reinforced people's beliefs in this particular superstition.

In this paper, we investigate whether a cultural belief about the characteristics of a group of people is self-fulfilling, and we analyze the mechanism that is a source of this self-fulfilling belief. We focus on the widespread belief in Asian cultures that people born in certain zodiac years are inherently different from those born in other years. Specifically, in China people born in dragon years are believed to be superior, powerful, and destined for good fortune.

Because there is no biological reason for people who are born in a certain time period to be more economically successful in comparison with those who are born in adjacent time periods, it is surprising that this superstition has persisted for centuries. In a related domain, researchers started exploring the production of "motivated belief distortions" and their reasons for persistence, including such concepts as wishful thinking and willful blindness (Bénabou 2015; Bénabou and Tirole 2016). For example, Bénabaou and Tirole (2016) state that "people thus hold certain beliefs in part because they attach value to them, as a result of some (usually implicit) tradeoff between *accuracy* and *desirability*. Such beliefs will therefore be resistant to many forms of evidence, with individuals displaying non-Bayesian behaviors such as not wanting to know, wishful thinking, and reality denial" (141–42).

We first analyze province-level panel data from China and find that the number of marriages goes up during the 2 years before a Chinese dragon year, arguably because newlywed parents would like their offspring to be born in a dragon year. Consistent with this conjecture, using province panels we also show that the number of births rises in dragon years. If the cohort size of dragon children is larger because of parents' demand

for a dragon child and the resultant increase in the number of births in dragon years, this would intensify competition among children of that cohort in terms of educational resources. For example, class sizes in schools would be larger for kids born in dragon years, which may reduce the quality of their education. Similarly, competition for a slot in a high-quality college and competition for good jobs could be more intense because kids born in dragon years would have to compete with a larger group of same-age peers. If this is the case, and if children born in a dragon year have worse educational outcomes in comparison with their peers who are similar in age and other attributes, this would beg the question of how this particular belief about dragon children being destined for good fortune and greatness could persist.[1]

Against this backdrop, we investigate whether educational outcomes of dragon children are different from that of their peers. We analyze two separate micro data sets and find that students born in dragon years are more likely (as opposed to less likely) to receive higher scores in the national college entrance examination and that they are more likely to have attained at least a college education in comparison with similar individuals who are of the same age (or who are very similar in age) but who have different zodiac year designations.

When we analyze a third data set that contains detailed information on middle school students, we find that the same pattern exists in middle school. Middle school students who are born in a dragon year have higher test scores in comparison with other students who are of the same age or similar in age, holding constant many determinants of test scores.

In all three data sets, we find that parents of dragon children and parents of other children have similar educational attainment. The same is true regarding family income and the propensity of parents having white-collar jobs. This suggests that the differential educational success of dragon children is not related to family background. Better educational outcomes of dragon children cannot be related to teacher behavior either because it is unlikely for teachers to know the exact birth dates of their pupils to determine their zodiac sign, and the university entrance exam scores are graded with no information about student identity.

One potential mechanism that can generate better educational outcomes for dragon children is higher self-esteem of these children. If children born in dragon years believe that they are superior to other children and if dragon children have higher self-esteem, this could impact their success in school, as higher self-esteem and confidence may lead to better learning. The data set on middle school children allows us to analyze this potential channel because it includes questions designed to gauge students' self-esteem and their aspirations about their own future. The data also contain questions on parents' expectations about their children's

[1] Suen (2004) shows that in a Bayesian framework, if information is difficult to obtain or if the person receives information from like-minded people who provide coarse information, then the existing priors (beliefs) are reinforced and incorrect beliefs can persist.

future success. We find that the parents of dragon children have substantially higher expectations of their children regarding their children's educational attainment and about their children's future success in comparison with other parents. We also find that parents' expectations are transmitted to children. That is, parents shape their kids' self-esteem and confidence: if parents are more hopeful for their kids' future, kids become more self-confident and ambitious for the future. Yet having a dragon zodiac sign has no direct impact on kids' self-esteem and confidence with or without controlling for parent expectations.

We find that the "dragon impact" on test scores disappears once we control for parents' expectations about their children's future. Importantly, we show that parents of dragon children invest more heavily in their children compared with other parents in terms of time and money. This indicates that the educational success of dragon children is driven by parent expectations and investment in children motivated by these expectations.

It may be the case that parents of dragon children do not believe in the superstition. They want their kids to be born in a dragon year for some other reason, but they do not actually think that dragon children are destined for greatness.[2] Yet they recognize that the dragon cohorts are larger and therefore their children would be at a disadvantage unless additional resources are allocated to these kids to compensate for the intensity of competition they would face because of the large cohort size. Under this conjecture, dragon parents invest in their children to counteract the drawback of their kids being a member of a large cohort. We provide evidence against this hypothesis. In the middle school data set, the seventh grade consists only of students who were born in either a dragon year or a snake year. This cohort of the seventh graders is large because of dragon children, and the parents of snake children are presumably aware of this fact. Thus, parents of children with the snake zodiac sign should be similarly worried about the increased competition because of the large cohort size, and therefore they too should invest in their kids. This means that there should not be a significant difference between these two groups of parents in terms of investment in their children. However, analyzing this group of dragon and snake parents whose children are classmates, we find that dragon parents' beliefs and behaviors are significantly different from those of the snake parent. Dragon parents have higher expectations of their children's future than the parents of snake children who are in the same classrooms. Furthermore, dragon parents invest significantly more in their children in comparison with snake parents. Unless one is prepared to argue that parents of snake children do not care about the success of their offspring, this finding refutes the conjecture that dragon parents invest in their kids because they are worried about the competition with a large number of students in the cohort.

[2] As discussed above, we show in the paper that dragon parents in fact have higher expectations of their children in comparison with other parents, refuting this claim.

Finally, although we show that parents of dragon children are no different from other parents in observable ways, they could be different in ways we do not observe as researchers. For example, it could be that mothers of dragon children are more cognizant of the positive impact of a healthy pregnancy on birth outcomes and therefore on the long-run benefits for their children. As a result, expectant mothers of dragon babies may have consumed more health inputs, such as medical care and nutritious foods during pregnancy to improve the health of their baby. The most widely used indicator of health at birth is the birth weight of the baby. Research, however, has shown that an increase in birth weight has only a modest impact on schooling and test scores.[3] This indicates that any potential investment in child health by parents of dragon babies during pregnancy (and the resultant increase in birth weight) is unlikely to be a primary factor that drives the difference in educational outcomes between dragon children and others.[4]

In section II, we provide the background regarding the beliefs about the zodiac in Chinese culture. Section III presents some stylized facts showing the existence of preferences for dragon children in China using national and provincial panel data. Empirical investigation, which consists of three separate data sets and analyses, is presented in section IV. Section V concludes.

II. Background and Previous Literature

In traditional Chinese culture and in Asian cultures generally, there are 12 creature zodiac signs, which represent different characteristics of the

[3] For example, Royer (2009) uses data from California and finds that a 1-kg increase in birth weight (which is a very substantial increase, given that the mean birth weight in the population is about 3,500 g) is associated with an additional 0.16 years of schooling. Using Florida data, Figlio et al. (2014) find that a 1-kg increase in birth weight generates an increase in schooling of 0.156 years. The authors also show that the same 1,000-g increase in birth weight is associated with less than one-twentieth of a standard deviation increases in tests scores in grades 3–8. Bharadwaj et al. (2018) use data from Chile and report that a 10% increase in birth weight (which corresponds to a 250-g increase) raises test scores in math and language by 0.04–0.06 standard deviations. Using Chinese data, Rosenzweig and Zhang (2013) find that an increase in birth weight by one standard deviation (about 0.48 lb or 220 g) is associated with an increase in a combination of math and language grades of students aged 12–15 by 2.3%–3.5%.

[4] One mechanism through which birth weight can impact school outcomes is through the potential influence of birth weight on cognition. The research on the impact of birth weight on intelligence quotient, however, is not conclusive (Newcombe et al. 2007; Cook and Fletcher 2015). In our data set, there is no difference in the cognitive test scores between dragon children and other middle school children. The fact that we find a significant relationship between dragon parents' expectations of their kids' academic professional achievement and the investment parents make in their kids, and that these parent expectations explain the difference in test scores between dragon children and other kids, does not rule out other ways dragon parents can help their kids fulfill these expectations. For example, it could be that when dragon parents invest in their kids in ways we measure in this paper (talking to the classroom teachers more frequently, not asking their kids to help with house chores, etc.), they could also invest in their children in other ways at the same time, such as by buying books and computers for their children, hiring tutors for them, etc.

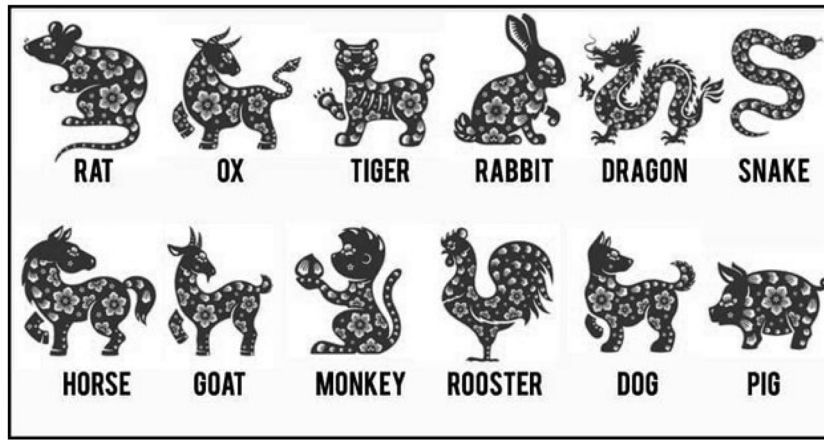

Figure 1.—Order of 12 Chinese zodiac signs.

cohorts born in different Chinese lunar years. The order of the zodiac signs, depicted in figure 1, is rat, ox, tiger, rabbit, dragon, snake, horse, sheep, monkey, rooster, dog, and pig. The zodiac signs follow the Chinese lunar calendar, and each zodiac sign appears approximately every 12 years. For example, the dragon year of 1988 started on February 17, 1988 (the first day of 1988 in the Chinese lunar calendar), and ended on February 5, 1989 (the last day of 1988 in the Chinese lunar calendar). Following a 12-year cycle, another dragon year covered the time span between February 5, 2000, and January 23, 2001.[5]

Of these 12 creatures, the dragon is considered special because of its place in legends and mysteries. The dragon is a symbol of auspiciousness and power in Chinese culture. One adage in Chinese states, "*wang zi cheng long*," which can be literally interpreted as "hope that my children become dragons." Chinese people believe that babies born in a dragon year will have better fortunes than babies born in other years.

There is evidence, reported by previous work, that in many Asian countries the fertility rate goes up during dragon years. Vere (2008) reported that the number of live births in Hong Kong increased significantly in the years of 1988 and 2000, which were two dragon years. The same pattern in birthrates was found among Chinese in Taiwan, Singapore, Malaysia, and the United States,[6] suggesting that people of Chinese heritage indeed time the birth of their offspring to coincide with dragon years. Yet no evidence was found in mainland China to indicate the existence of birth

[5] Therefore, if a child was born in 1988, the child's zodiac sign could be rabbit (the zodiac sign before dragon) or dragon depending on the specific date of his or her birthday. Similarly, if a child was born in 1989, the zodiac sign of this child may be dragon or snake (the zodiac sign after dragon), again depending on the specific date of birth.

[6] See also Goodkind (1991), Yip et al. (2002), Wong and Yung (2005), Johnson and Nye (2011), and Sim (2015).

timing for dragon children. Goodkind (1991) argued that compared with Taiwan, Hong Kong, and Malaysia, local institutional conditions in China in the 1970s and 1980s, the Cultural Revolution between 1966 and 1976, and China's birth control policies were factors that prevented China from experiencing baby booms in the dragon years of 1976 and 1988. During the Cultural Revolution, any activity connected with superstition was strictly forbidden, and the one-child policy had been implemented in China starting in the late 1970s. According to the policy, each couple was allowed to have only one child, and if a couple just missed having a baby in a dragon year, it would be hard for them to plan for a dragon baby unless they were willing to wait for 12 years to have a child. Nevertheless, along with the process of becoming more open, the dragon symbol became acceptable in China again (Goodkind 1991).[7]

As explained in the next section, we show that despite these institutional barriers, parents in mainland China do in fact time the birth of their children. Using national and provincial data on live births, we show that the number of live births spiked in the two most recent dragon years (2000 and 2012).[8] We also show that the number of marriages went up during the 2 years before a dragon year, which supports the conjecture that couples try and time their marriages and subsequent pregnancies so that the birth of their child would coincide with the dragon year.

A handful of studies have examined whether people born in dragon years have better fortunes and reported conflicting results. Using census data sets from Hong Kong, after controlling for education, Wong and Yung (2005) did not find a significant correlation between being born in a dragon year and labor income. Sim (2015) suggested that because of the large number of new babies born in the dragon year of 1976 in Singapore, the dragon cohort should have faced stiffer competition when they applied for universities. He found a negative impact of being born in 1976 and 1977 on the probability of obtaining a college degree in Singapore, although the results need to be interpreted with caution because of the very small sample size employed and the specific way that the dragon cohort was defined.[9] Johnson and Nye (2011) compared Asian immigrants

[7] China's one-child policy has been relaxed over the years. Starting in 1984, parents were allowed to have a second child as long as both parents were single children themselves. In 2013, the policy was revised further to allow parents to have a second child as long as one of the parents was a single child him- or herself. Furthermore, parents can always have more than one child if they are prepared to pay a monetary penalty or lose their government job.

[8] Our finding indirectly supports the argument of Goodkind (1991). It seems that when local institutional conditions got better and when the impacts of the Cultural Revolution gradually faded away, the favor of dragon children reappeared in mainland China.

[9] In Sim (2015), the dragon cohort is defined as all who are born in 1976 or 1977. According to the Chinese lunar calendar, the dragon year of 1976 started on January 31, 1976, and ended on February 17, 1977. This means that the dragon cohort in Sim (2015) included not only dragons but also rabbits (the cohort right before a dragon cohort) and snakes (the cohort right after a dragon cohort). Therefore, the negative dragon effect on college entrance implies that a mixture of three cohorts indicated a lower propensity of getting into a college in Singapore. The author defined the dragon cohort in this way to address the fact that

to the United States with non-Asian immigrants and reported a positive impact of being born in a dragon year on educational attainment among Asian immigrants.[10] Do and Phung (2010) found that in Vietnam, children born in years that are thought to be auspicious have more years of schooling.[11] Lau (2019) shows that there was a spike in fertility in Hong Kong during the dragon years of 1988, and using a difference-in-differences analysis he finds that both dragon and nondragon students of that dragon year cohort increase their time spent studying math, arguably because of competitive pressures of being part of a larger peer group.

III. Aggregate Fertility and Zodiac Signs in China

Figure 2 presents the annual number of live births in mainland China between 1995 and 2014, obtained from the China Health Statistical Yearbook.[12] Live births jumped significantly in 2000 and 2012, which are the two most recent dragon years. Specifically, the number of live births increased by 289,224 in 2000 compared with the year prior and by 935,854

people born in 1976 or 1977 all have to face the competition brought by the baby boom in the dragon year of 1976. The author also mentioned that in the analysis sample the dragon cohort was on average better educated, in the sense that a greater proportion of the dragon cohort was college graduates in their sample compared with that among other cohorts.

[10] However, it is difficult to interpret the results of Johnson and Nye (2011). In the Current Population Survey data used in the paper, the authors classify the "treated" group as those (i) who reported their race as Asians and (ii) who should culturally believe in the dragon superstition. To arrive at the proper treated group, the authors correctly drop certain Asians from this group, such as Pakistanis, Indians, and Filipinos, but they also drop mainland Chinese, even though this latter group should be the most impacted by the dragon superstition. In the other data set used in the paper (the 2000 census data), the authors restrict the sample to the residents of California who reported their race as Asian and define the treatment dummy as being equal to one for those who reported their place of birth as Taiwan. Thus, in these models, those with Chinese heritage are placed in the control group, and they are considered to be not impacted by the dragon superstition (Johnson and Nye 2011, 95). Other issues include admitted misclassification of the dragon variable (Johnson and Nye 2011, 95, n. 10), and the very small number of dragons in the analysis of mothers (34 individuals in a sample of 14,344 and 116 people in the sample of 48,253; Johnson and Nye 2011, 92).

[11] Do and Phung (2010) find that in Vietnam, children born in auspicious years have two more months of schooling, and the authors attribute this outcome to the wantedness of children and the planning of these births by the parents. Thus, a hypothesis is that some parents have high expectations of their children and invest heavily in their children and that these parents also time their pregnancy so that their children are born in the year of the dragon. This is not because these parents necessarily believe in the superstition, but "just in case." In this scenario, children are born in the dragon year not primarily because of parent superstition but mainly because their parents are investors and planners (including planning the timing of the birth in a dragon year). Such a conjecture, of course, begs the question of why nonsuperstitious parents time the birth of their child to coincide with the dragon year after all.

[12] We use the actual number of births rather than the birthrate because population data that are used to calculate the birthrate information provided by the Chinese Statistical Yearbook or by the National Bureau of Statistics of China are inconsistent over time and across regions and are not reliable. Population figures are estimated using different sources (some from household registrations, some from census estimates, some others from annual national surveys on population changes). In contrast, the data we use are the actual number of live births provided by the China Health Statistical Yearbook.

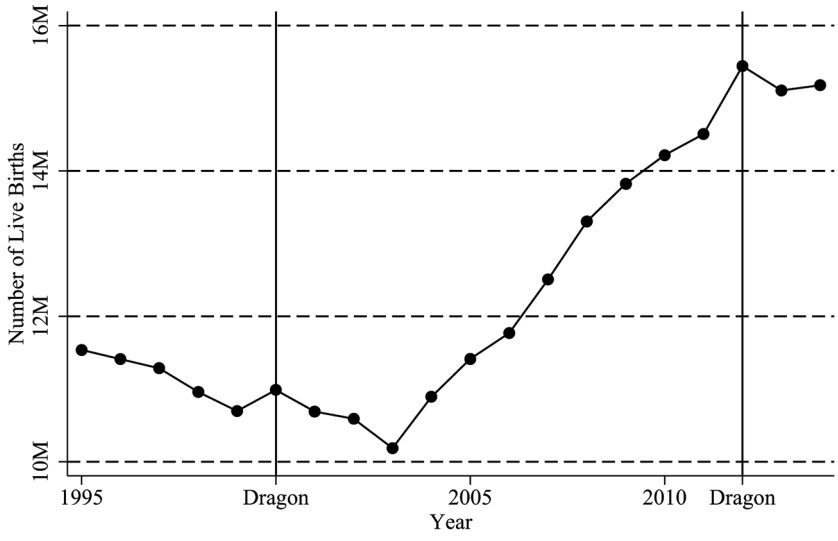

Figure 2.—Number of live births in China, 1995–2014.

in 2012 compared with 2011.[13] Even after the implementation of a new policy at the end of 2013 allowing parents to have a second child as long as one of the parents was a single child in his or her family, the number of babies born in China in 2014 was still much lower than that in the 2012 dragon year.

To more formally analyze the impact of dragon years on births as well as marriages, we employed province-level panel data on the number of marriages and the number of live births.[14] The results, reported in appendix

[13] The jump in the dragon year 2000 may include the impact of parents' wishes to have a "millennium baby." The size of the jump in 2012 could be partly related to the upward trend in births prevailing since 2005.

[14] Using data on the number of marriages newly registered by the government every year between 1979 and 2013, we investigate whether couples are more likely to get married before a dragon year (so that it would be easier for them to have a dragon baby). Similarly, using province-level data on live births, we are able to analyze whether more babies were born in dragon years. The provincial marriage data are from the China Civil Affairs Statistical Yearbook 1979–2014. The data are available for the period 1978–2013. The provincial live births data are available for the period 2003–13, collected from the China Health Statistical Yearbook 2004–14. Because the Chinese zodiac follows the Chinese lunar calendar but the provincial data on the number of marriages and live births follow the Gregorian calendar, and because the two calendars do not overlap perfectly, an adjustment needs to be made to the reported births and marriages. For instance, we let *Dragon* = (366 − 31 − 4)/366 for the year 2000. This is because the entire month of January and the first 4 days in February of 2000 do not belong to the dragon year. Therefore, only (366 − 31 − 4) days in the year 2000 (there are 366 days in 2000 since the year of 2000 is a leap year) belong to the dragon year. We let *Dragon* take the value of 23/365 in the year 2001 because the first 23 days in 2001 were still inside the range of the dragon year. We define tiger and rabbit similarly. We control for per capita income of the province to account for the impact of economic conditions, and province-level unobservables are accounted for by province fixed effects and province-specific linear trends. The data are from 30 provinces or municipalities of China, spanning the years 1979–2013.

table A1, indicate that more couples get married in a tiger year and a rabbit year, which are the two consecutive years before the dragon year. This is presumably because getting married within 2 years before a dragon year makes it easier for couples to plan for a dragon baby. The results also show that more births occur in a dragon year. Thus, Chinese who live in mainland China care about the zodiac so that both their marriages and the birth of their children are timed accordingly, and about half a million more babies are born in a dragon year in comparison with other years.

IV. Empirical Analyses

To investigate the relationship between having been born in a dragon year and educational achievement and the potential mechanisms driving such a relationship, we employ three different data sets and entertain three related but different questions, as explained below.

A. *Analysis of College Education*

In the first analysis, we investigate the propensity for having at least a college education. Using data from the Chinese General Social Survey (CGSS), we estimate

$$College_i = \alpha_1 + \beta_1 Dragon_i + \gamma_1 \mathbf{X}_i + \theta_c + \xi_i, \quad (1)$$

where $College_i$ is a dummy variable indicating whether individual i has attained a college education or higher, $Dragon_i$ is a dummy variable indicating that an individual was born in the dragon year, $\mathbf{X}_i$ stands for a vector of controls including gender, age, ethnicity, and parents' educational level as well as occupation and survey wave dummies, θ_c stands for province fixed effects, and ξ_i is the error term. Standard errors are clustered by dragon zodiac sign by city. This is sensible to the extent that the impact of having a dragon zodiac sign varies between cities. Clustering the standard errors by city or calculating robust standard errors did not alter the conclusions.

The CGSS used in this analysis is a large and nationally representative social survey that covers all provinces and both rural and urban areas in China. We use the 2010, 2012, 2013, and 2015 waves of the CGSS because the exact birth dates of the respondents are provided in these waves, which allows for the accurate determination of their zodiac signs. In addition, these four waves include consistent measurement of parents' employment status. We restrict our data to the survey respondents who were born between 1985 and 1991 (1988 is a dragon year). Hence, in our effective sample, the age of the respondents ranges from 19 to 30. In alternative specifications, we narrow the age window to those who were born between 1986 and 1990 and between 1987 and 1989.

Table 1 presents the summary statistics of the CGSS data set. The total number of observations is 3,835. The dragon and nondragon cohorts are

TABLE 1
Descriptive Statistics—CGSS Sample

Variable	Details	Dragon	Nondragon	Difference of Mean (p-Value)
Bachelor degree or above	Dummy variable (=1) if the respondent has a bachelor's degree or higher	.353	.281	.000
		(.478)	(.449)	
Age	Age of the respondent	24.38	24.75	.002
		(1.74)	(2.71)	
Female	Dummy variable (=1) if the respondent is female	.514	.528	.560
		(.500)	(.499)	
Minority	Dummy variable (=1) if the respondent belongs to a minority group in China	.082	.102	.141
		(.274)	(.302)	
Father bachelor degree or above	Dummy variable (=1) if the respondent's father has at least a bachelor's degree	.074	.069	.662
		(.262)	(.254)	
Mother bachelor degree or above	Dummy variable (=1) if the respondent's mother has at least a bachelor's degree	.042	.041	.979
		(.200)	(.199)	
Observations		552	3,283	

Note.—The sample consists of adults who were born between 1985 and 1991. Data are from CGSS waves 2010, 2012, 2013, and 2015. Regressions include parents' occupational characteristics not listed here. There is a total of 34 categories of occupations (17 for the father and 17 for the mother). These 17 categories are (1) employed by others (having a fixed employer), (2) full-time farmer, (3) part-time farmer, (4) contract employee or dispatched worker, (5) casual worker (no fixed employer), (6) working in family business with salary, (7) working in family business without salary, (8) freelance, (9) individual business, (10) owner or partner of a business, (11) retired, (12) unemployed, (13) disabled, (14) in school without having a job, (15) does housework, (16) passed away, and (17) other.

similar in attributes such as gender, ethnicity, and parent education. However, those who are born in the year of the dragon are significantly more likely to have at least a bachelor's degree (35% vs. 28%). Figure 3 provides the same information by displaying the proportion of individuals with at least a bachelor's degree by their zodiac year and shows that the dragon cohort is more likely to have a college education than individuals in both the rabbit and the snake cohorts.

Table 2 presents the results obtained from estimating equation (1) using the CGSS data. Note that the CGSS survey is registered in different years. Thus, the respondents who are of the same age in the data may have different birth years. Because regressions control for age, the variation in zodiac years is obtained from the incomplete overlap between the lunar and Gregorian calendars. All models contain dummies for labor market activity of both the mother and the father. These classifications include not only general categories, such as full-time farming, casual worker, individual

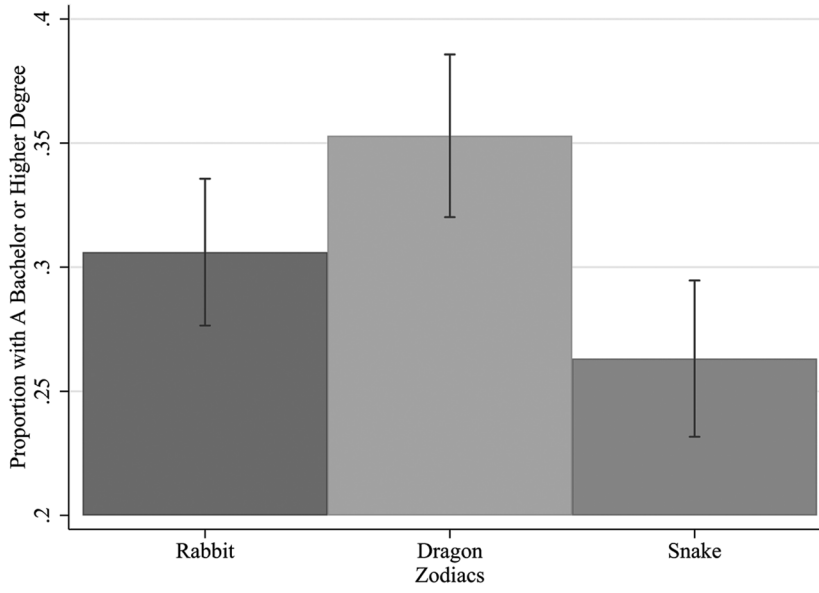

Figure 3.—Proportion of individuals with a bachelor's degree or higher by their zodiac signs (CGSS data).

business, unemployed, retired, and housework, but also such categories as disabled and passed away.[15]

Column 1 of table 2 shows that all else the same, those born in a dragon year are 7 percentage points more likely to have obtained a bachelor's degree or higher in comparison with individuals born in other zodiac years. When the individual's father has a college degree or higher, the individual's propensity to obtain a bachelor's degree is increased by around 20 percentage points.

The sample used in regressions reported in column 1 of table 2 includes individuals who are born between 1985 and 1991. There is one dragon cohort in this group: those who are born in 1988 (the dragon year covered the period between February 17, 1988, and February 5, 1989). To create cohorts of individuals who are more similar in their birth year, we focused on those who are born between 1986 and 1990. This group contains those who are born in the year of the rabbit (the year before dragon), the year of the snake (the year after dragon), the year of the tiger (2 years before dragon), and the year of the horse (2 years after dragon). The results are reported in column 2 of table 2. The sample size goes down to

[15] The 17 categories are (1) employed by others (having a fixed employer), (2) full-time farmer, (3) part-time farmer, (4) contract employee or dispatched worker, (5) casual worker (no fixed employer), (6) working in family business with salary, (7) working in family business without salary, (8) freelance, (9) individual business, (10) owner or partner of a business, (11) retired, (12) unemployed, (13) disabled, (14) in school without having a job, (15) does housework, (16) passed away, and (17) other.

TABLE 2
IMPACT OF ZODIAC SIGN ON THE PROPENSITY OF HAVING AT LEAST A BACHELOR'S DEGREE—CGSS SAMPLE

Variable	Bachelor Degree or Above (Born 1985–91) (1)	Bachelor Degree or Above (Born 1986–90) (2)	Bachelor Degree or Above (Born 1987–89) (3)
Dragon	.07***	.06***	.06***
	(.02)	(.02)	(.02)
Age	.03***	.03***	.02
	(.00)	(.01)	(.01)
Female	.03**	.03**	.06***
	(.01)	(.02)	(.02)
Minority	.01	.01	.03
	(.03)	(.03)	(.04)
Father bachelor degree or above	.20***	.21***	.21***
	(.04)	(.04)	(.05)
Mother bachelor degree or above	.04	.06	.06
	(.05)	(.06)	(.08)
Parents' occupation attributes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Mean of the dependent variable	.30	.31	.31
Observations	3,835	2,850	1,714

Note.—The sample includes individuals born between 1985 and 1991. The age of the respondents ranges from 19 to 30 in col. 1. Standard errors (reported in parentheses) are clustered at the dragon-by-city level.
** Significant at 5%.
*** Significant at 1%.

2,850, but the estimated impact of the dragon dummy remains significant, with a point estimate of 0.06. Narrowing the window of birth year to 1987–89 reduces the sample size further to 1,714 in column 3, but the inference is not altered. The dragon dummy in column 3 of table 2 indicates that a dragon child is 6 percentage points more likely to receive at least a bachelor's degree.

In summary, consistent with the picture revealed in figure 3, the results of table 2 indicate that those who are born in a dragon year are about 6 percentage points (19%) more likely to have a college education in comparison with those born in other zodiac years who are 1 or 2 years older or younger.

B. Performance on National College Entrance Exam

In the second set of analyses, we investigate whether dragon children perform better in the National College Entrance Examination in comparison with other children. We use the Beijing College Students Survey (BCSS) to estimate

$$CollegeEntranceExamScore_j = \alpha_2 + \beta_2 Dragon_j + \gamma_2 \Lambda_j + \rho_s + \upsilon_j, \quad (2)$$

where $CollegeEntraceExamScore_j$ represents college student j's score in the National College Entrance Examination, $Dragon_j$ is a dummy to indicate that student j was born in a dragon year, and Λ_j stands for a set of controls including the student's gender and ethnicity, the parents' educational level, the family's economic condition, and whether the student took the National College Entrance Examination multiple times.[16] Although the college entrance examination is a national exam in China, the questions differ between provinces and municipal cities in different years. To account for differences in educational quality, we include province fixed effects, ρ_s. Because of the design of the survey, all students surveyed took the exam in either 2006 or 2008; thus, the model also controls for the year in which the student took the exam. Standard errors are clustered by dragon zodiac sign by city of origin, where city of origin is the city in which the student took the university entrance exam. Clustering the standard errors by city of origin or calculating robust standard errors did not change the conclusions.

BCSS data include information on about 5,000 students who were randomly selected from 15 universities in Beijing to answer the survey in 2009 (Li 2016).[17] Students were asked to report when they took the National College Entrance Examination and what their scores were. The BCSS data include information on the birth year and birth month of the student, but the day of the birth is not reported. Hence, we are unable to determine the zodiac signs for those students who were born in a particular month if a lunar Chinese New Year started somewhere other than the beginning or the end of that month. We apply two procedures to deal with such cases in which the zodiac sign cannot be identified with precision. First, we treat those students as having been born in a dragon year if at least half of the month in which they were born belongs to a dragon zodiac year. The benchmark results in the paper are based on this procedure. Alternatively, we created an adjusted dragon dummy that takes the value of the proportion of days belonging to the dragon year in that month. For example, if a student was born in February 1988, the dragon dummy will be equal to 12/28 (there were 28 days in February of 1988; the first 16 days belong to the rabbit year, and the other 12 days belong to the dragon year). The results obtained from both procedures were very similar.

The summary statistics of the BCSS data set are presented in table 3. Our effective sample contains 2,956 observations. Twenty-three percent of students were born in the dragon year of 1988. In some specifications,

[16] We also have information on whether the student graduated from an elite high school. Although we do not include this variable as a control—as it could be endogenous if dragon status determines the type of high school the student attends—controlling for this variable does not influence the results.

[17] Almost all of the universities in the sample are top 50 schools in China; one university has a rank of 52.

TABLE 3
Descriptive Statistics—BCSS Sample

Variable	Details	Mean	Standard Deviation	Mean	Standard Deviation
National College Entrance Exam score	Student's score in the National College Entrance Exam in China	602.7	49.94	602.48	50.21
Dragon	Dummy variable (=1) if the student's zodiac sign is dragon	.23	.42	.23	.42
Female	Dummy variable (=1) if the student is female	.47	.50	.47	.50
Minority	Dummy variable (=1) if the student is from an ethnic minority in China	.12	.32	.11	.32
Took multiple exams	Dummy variable (=1) if the student took the National College Entrance Exam multiple times	.10	.31	.10	.30
Good family economic status	Dummy variable (=1) if the family's economic status is better or much better than local average			.15	.35
Father bachelor degree or above	Dummy variable (=1) if the student's father has at least a bachelor's degree			.48	.50
Mother bachelor degree or above	Dummy variable (=1) if the student's mother has at least a bachelor's degree			.40	.49
Observations		2,956		2,738	

Note.—Data are from BCSS wave 2009. Two sets of descriptive statistics are reported for two analysis samples because family background attributes are not available for each respondent and the sample that includes family background variables is smaller (N = 2,956 vs. N = 2,738).

we created subsamples with narrower age bands. For example, we focused on those born in the dragon year (1988), those born the year before (1987), and those born the year after (1989).

Because of the design of the survey, students in the sample took the national entrance exam in either 2006 or 2008, and we restrict the sample to students who took the exam when they were 18 or 19 years old, which is the typical age when a high school graduate takes the college entrance exam in China. Students whose scores are lower than 500 points and students from Hong Kong, Taiwan, Macaw, and Tibet are dropped.[18]

[18] Every year in each province in China, there is a minimum cutoff point that determines whether a student can go to a "key" college in China. All the students in our sample are from top colleges where the cutoff scores are usually much higher than the cutoff point for key colleges. Because the lowest minimum cutoff point in 2006 and 2008 was higher than 500 points in most of the provinces, we therefore drop students whose scores are below 500 points. For a similar reason, we drop students who took the exam in Shanghai, Guangdong, or Jiangsu province in 2008, because the total scores in Shanghai, Guangdong, or Jiangsu in 2008 are much different from those in other provinces, which makes their students incomparable with other students.

As shown in table 3, 12% of students belong to a minority group in China, and 10% of students took the National College Entrance Examination more than once. Parents were asked to rank the income status of their family with respect to average income in their local area, from 1 to 5 (best to worst). We create a dummy variable to indicate that the economic status of the student's family is above average. Table 3 reveals that 15% of parents indicated that their family income can be classified as such. Table 3 also shows that the average college entrance exam score is about 603, and figure 4 displays that those with a dragon zodiac sign have higher scores in comparison with individuals with other zodiac affiliations.

Table 4 presents the results obtained from estimating equation (2). The results, reported in column 1 of table 4, show that all else the same, the National College Entrance Examination scores of those who are born in a dragon zodiac year are around 10.5 points higher. Although this is only about a 1.7% impact relative to the average score, this difference can have a profound effect on student placement. This is because a large population of students takes the exam each year in China, and in the extremely competitive environment each additional point has an impact on whether—and to which university or major—the student will qualify.

Table 4 also shows that female students and minorities have lower scores. In regressions not reported here, we found that those who have attended an elite high school receive substantially higher scores than students who graduate from other high schools but that adding this

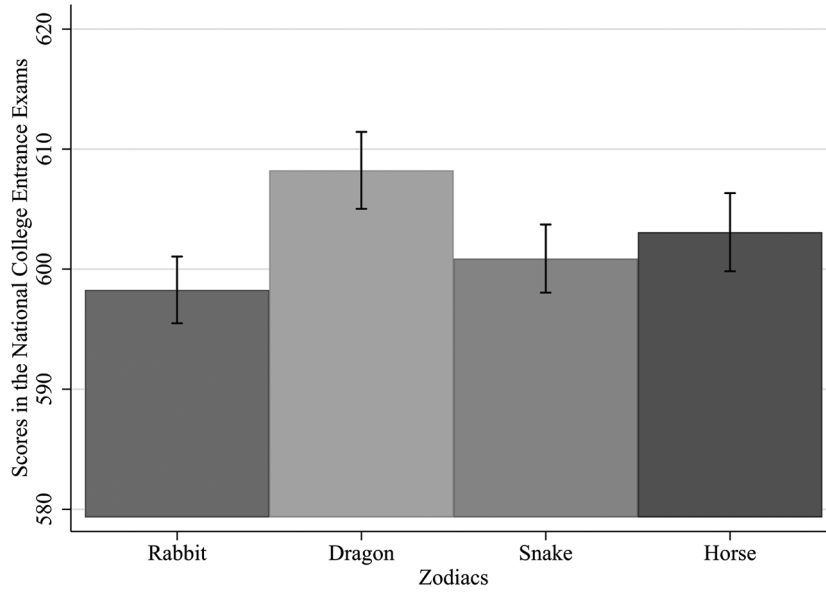

Figure 4.—National College Entrance Exam scores and zodiac signs (BCSS data).

TABLE 4
IMPACT OF ZODIAC SIGN ON THE NATIONAL COLLEGE ENTRANCE EXAM SCORES—BCSS SAMPLE

				Using Adjusted Dragon Dummy		
Variable	National College Entrance Exam Score (1)	National College Entrance Exam Score (2)	National College Entrance Exam Score (Born 1987–89) (3)	National College Entrance Exam Score (4)	National College Entrance Exam Score (5)	National College Entrance Exam Score (Born 1987–89) (6)
Dragon	10.50***	8.80***	9.12***	10.36***	8.38***	8.67***
	(2.28)	(1.89)	(1.87)	(2.12)	(1.67)	(1.58)
Female	−7.11***	−8.49***	−8.22***	−7.06***	−8.43***	−8.14***
	(1.01)	(1.32)	(1.27)	(1.00)	(1.30)	(1.25)
Minority	−8.02***	−6.11***	−6.52***	−8.00***	−6.10***	−6.51***
	(1.87)	(1.76)	(1.59)	(1.88)	(1.75)	(1.58)
Took multiple exams	−.22	1.83	2.64	−.34	1.69	2.48
	(2.60)	(2.21)	(1.90)	(2.62)	(2.20)	(1.87)
Good family economic status		3.87	5.00		3.88	5.02
		(3.18)	(3.85)		(3.15)	(3.82)
Father bachelor degree or above		9.84***	8.04***		9.89***	8.10***
		(2.15)	(2.42)		(2.15)	(2.44)
Mother bachelor degree or above		7.55***	7.78***		7.47***	7.68***
		(1.41)	(2.06)		(1.42)	(2.07)
Average exam score	602.69	602.48	602.16	602.69	602.48	602.16
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,956	2,738	2,029	2,956	2,738	2,029

Note.—Data are collected from BCSS wave 2009. "Using Adjusted Dragon Dummy" takes the value of the proportion of days belonging to the dragon year in that month. Standard errors (reported in parentheses) are clustered at the dragon-by-city level.
*** Significant at 1%.

(potentially endogenous) variable to the model had no impact on the estimated coefficient of the dragon dummy.[19]

Column 2 of table 4 reveals that students whose parents are better educated score higher on the university entrance exam. The same is true if family income is above average. The magnitude of the coefficient of the dragon dummy is reduced slightly by controlling for parent education and family income. Column 3 restricts the sample to the cohorts born between 1987 and 1989; thus, in this sample students differ in age by a maximum of 3 years. There was a dragon year in 1988 (between February 17, 1988, and February 5, 1989). Thus, of the 2,029 students in this sample (born between 1987 and 1989), 622 (30.7%) are born in the year of the dragon, 666 (31.9%) are born in the year of the snake, and the rest are born in the year of the rabbit or tiger. In this sample, being a dragon child is associated with an increase in the National College Entrance Examination score by about 9.1 points. The results using the adjusted dragon dummy are reported in columns 4–6 of table 4. The inference did not change. Overall, the results in table 4 show that, controlling for a number of covariates, having been born in a dragon year leads to an increase in the university exam score by about nine points.[20]

C. Analyses of Middle School Test Scores

In the third set of analyses, we examine the relationship between having a dragon zodiac sign and the test scores among middle school students by making use of the China Education Panel Study (CEPS) data. We estimate regressions of the form

$$TestScore_{ks} = \alpha_3 + \beta_3 Dragon_k + \gamma_3 \Theta_k + \lambda_c + \mu_k, \quad (3)$$

where $TestScore_{ks}$ represents the midterm test score of student k in subject s (where the subjects are math, Chinese, and English), $Dragon_k$ is a dummy variable equal to one if student k was born in a dragon year, and Θ_k is the vector of control variables, including the attributes of the students, such

[19] The elite high schools are called key high schools or key point (literal interpretation) high schools. There are some key high schools in China in different jurisdictions (province level, city level, county level). The government allocates much more resources to the key high schools, such that the key high schools have more funding, better teachers, etc. Every middle school has to take a high school entrance exam to apply to a high school, and the score a student gets in this exam is the only determinant of acceptance. Key high schools have higher minimum required scores than ordinary high schools. Some details are discussed in Ye (2015).

[20] It should be kept in mind that this sample contains some of the best students in China. With the exception of one, all universities in the sample are among the top 50 in the country. Although there is no clear reason as to why the parents of these students would be systematically different from other parents, to the extent that families of these students have stronger (weaker) superstitions about the dragon zodiac sign that form their expectations about the success of their offspring, the results in table 4 overstate (understate) the connection between the dragon zodiac sign and university entrance exam scores nationwide.

as age, gender, type of *hukou*,[21] ethnicity, and whether they are the only child in their family.[22] Also included in the data set are parents' characteristics, ranging from parents' education to whether parents have white-collar jobs to the income level of the family, reported by the parents. The parameter λ_c stands for a set of classroom fixed effects, and μ_k is an error term. Standard errors are clustered by dragon zodiac sign by classroom. This formulation allows for the possibility of errors being correlated within students in the classroom. Clustering the standard errors by classroom or using robust standard errors did not alter the conclusions.

Using the same data, we also run models depicted by equation (3), but we employ as dependent variables those that gauge the extent of students' self-esteem and aspirations, reported by the students. These dependent variables include six separate indicators that measure whether the student believes that he or she (i) is articulate, (ii) is a fast thinker, (iii) is a quick learner, (iv) has faith in his or her future, (v) wants to go to college, and (vi) expects to be a leader or officer at national or governmental institutions, a scientist, an engineer, or an executive in a company.

We similarly analyze the extent to which parents' expectations regarding their children's future are different between parents of dragon-year children and other parents. These regressions follow the same format as equation (3), but the dependent variables include such measures as whether the parent expects his or her child to obtain at least a college degree, whether the parent expects the child to get a job in the future as a leader or officer at national or governmental institutions, a scientist, an engineer, or an executive in a company, and whether the parent has faith in the child's future.

Finally, we investigate parents' investment in their children. These variables include whether the child went to kindergarten,[23] the amount of pocket money parents give to the child (in middle school), how many times parents have talked to the teachers in the current semester, and whether the kids help the parents by doing any chores at home.

It is conceivable that the parents of dragon children are systematically different from other parents. For example, they may be more educated, or they can have more income. In all three data sets, we investigated whether dragon parents differ from other parents in observable dimensions, ranging from parent education to occupation and family income. As explained below, there is no difference between the two groups of parents in terms of these attributes, and controlling for these attributes in regressions does not alter the results.

[21] *Hukou* can be understood as a certificate of residency in China. It is correlated with people's choices and rights in terms of housing and schooling.

[22] The CEPS data provide information on students' cognitive ability. The baseline regressions do not include this variable, as cognitive ability may be "determined" by the zodiac sign of the student if cognitive ability in part measures skills learned at school or in the family. Adding cognitive ability to the model, however, has no impact on the results.

[23] In China, children are not allowed to enter kindergarten before they are 3 years old.

The CEPS sampling design is based on randomly selecting 438 classrooms from 112 schools in 28 districts, counties, or cities after the first-stage stratification by education level and intensity of population mobility. In the main analyses, we use the first wave of the CEPS, which is conducted in 2013–14. The CEPS collects data on middle school students in grades 7 and 9 who were born in 1996–2002. Consequently, we have one dragon cohort (spanning February 5, 2000, to January 23, 2001).

As shown in table 5, of approximately 15,000 middle school students in our sample, 23% were born in the dragon year of 2000. About half of the students are female. The data set contains the midterm test scores in the subjects of math, English, and Chinese. The midterm exam scores are provided by the head teacher of the class or the dean of studies in these middle schools.

A unique aspect of this data set is the questions about self-esteem and expectations about the future. The students answered questions measuring their self-esteem and ambitions and expectations about their future. Specifically, students are asked to evaluate statements about themselves by providing a rating for each statement, ranging from 1 ("completely disagree") to 4 ("completely agree"). The dummy variable "Articulate" takes the value of one if the student "completely agrees" or "agrees" with the statement that "I can express my opinions clearly." "Fast thinker" is another dummy variable that takes the value of one if the student completely agrees or agrees with the statement of "I respond quickly to things." "Quick learner" takes the value of one if the student believes that he or she can learn new knowledge quickly.

The students were also asked to evaluate the extent of their faith in their own future. Possible answers range from "I have no faith at all in my future" to "I have a lot of faith in my future." We build a dummy to indicate that a student has some faith or a lot of faith in his or her future. In addition, the survey asks the students what degree they would like to obtain and what kind of job they would like to have in the future. The variable "Wants a bachelor's degree or higher" takes the value of one if the student wishes to obtain at least a college degree. We define "Strong career ambition" as a dummy variable indicating whether a student expects to have a job as a leader or officer at national or governmental institutions, a scientist, an engineer, or an executive in a company.

The CEPS contains information about parents' expectations of their children's future. We create a dummy variable to indicate that parents expect their children to obtain at least a bachelor's degree based on the question, "What degree do you expect your children to achieve?" Parents are also asked the question, "What occupation do you expect your children to have in the future?" We created a dummy variable to indicate whether parents have strong career ambition for their children, revealed by their expectation of their children becoming a leader or officer at national or governmental institutions, a scientist, an engineer, or an executive in a company. Another dummy takes the value of one if parents are

"confident" or "very confident" that their children are going to have a bright future. We also constructed a dummy variable to indicate whether parents expect their child to perform better than the class average.

We created a set of dichotomous indicators that measure various aspects of parents' investment in their children. For example, we created a dummy variable to indicate whether parents have contacted the teachers of their kids frequently in the current semester. We also built a variable that measures the amount of pocket money given to the kids each week by their parents. The CEPS survey asks the students whether they usually help parents with housework during the summer or winter holiday. A similar question asks the students how much time they spent helping parents with house chores during the past week. We created two separate dummy variables indicating whether the kids help parents around the house with chores during the holiday and whether the child helped with house chores during the past week. The survey also contains a question asking the students whether they ever attended kindergarten after the age of 3. We treat the information on kindergarten attendance as another aspect of parents' investment in children, and we create a dummy variable that takes the value of one if the child attended kindergarten.

We observe in the data whether it was the mother or the father who answered the questions about parents' expectations, and we add this dichotomous indicator to the relevant regressions as a control. We drop an observation if someone other than the student's biological parents (e.g., stepparent, uncle, or grandfather) answered the survey questions.

We have indicators for both the mother and the father having at least a college degree. Similarly, "Father white collar" and "Mother white collar" are two dummy variables indicating whether the father and the mother have white-collar and skilled jobs. The model also includes a dummy variable gauging the income status of the family. Parents were asked about the current economic conditions of their family. The options were "very bad," "bad," "intermediate," "rich," and "very rich." The dichotomous variable "Family has high income" takes the value of one if the parent indicated that their family income was above average.

As was the case in the BCSS data described earlier, the CEPS data contain information on the month and year of birth but not the day of birth. Thus, we used the same procedure that we employed in the BCSS data and considered students as having been born in a dragon year if at least half of the month in which they were born belonged to a dragon zodiac year. An alternative method, where the dragon dummy equals the proportion of days belonging to the dragon year in that month, provided very similar results.[24]

[24] For example, if a student was born in February 1988, the dragon dummy will be equal to 12/28 (there were 28 days in February of 1988; the first 16 days belong to the rabbit year, and the remaining 12 days belong to the dragon year).

TABLE 5
SUMMARY STATISTICS—CEPS SAMPLE (Middle School Students)

Variable	Details	Mean	Standard Deviation	*N*
Test score in math	Student's midterm exam score in the subject of math	81.57	30.59	13,309
Test score in Chinese	Student's midterm exam score in the subject of Chinese	85.41	19.54	13,309
Test score in English	Student's midterm exam score in the subject of English	82.27	29.71	13,309
Student characteristics:				
Dragon	Dummy variable (=1) if the student's zodiac sign is dragon	.23	.42	14,954
Female	Dummy variable (=1) if the student is female	.50	.50	14,954
Age	Age of the student measured as the survey year minus the student's birth year	13.88	1.33	14,954
Single child	Dummy variable (=1) if the student is a single child	.45	.50	14,954
Student self-esteem:				
Articulate	Dummy variable (=1) if the student believes that he or she can present his or her opinions clearly	.80	.40	14,541
Fast thinker	Dummy variable (=1) if the student believes that he or she reacts to things rapidly	.77	.42	14,537
Quick learner	Dummy variable (=1) if the student believes that he or she learns new knowledge quickly	.76	.43	14,428
Wants bachelor's degree or higher	Dummy variable (=1) if the student wants to obtain at least a bachelor's degree in the future	.67	.47	14,954
Strong career ambition	Dummy variable (=1) if the student wants to become a leader or officer at national or governmental institutions, a scientist, an engineer, or an executive in a company in the future	.36	.48	14,926
Has faith in the future	Dummy variable (=1) if the student has faith in his or her own future	.86	.35	14,954
Parents' attributes, investments, and beliefs:				
Parents expect their child to obtain at least a high school diploma	Dummy variable (=1) if parents expect their child to obtain at least a high school degree	.93	.25	13,764
Parents expect their child to obtain at least a bachelor's degree	Dummy variable (=1) if parents expect their child to attain a college education or higher	.76	.42	13,764
Parents have strong career ambitions for their child	Dummy variable (=1) if parents hope that their child becomes a leader or officer at national or government institutions, a scientist, an engineer, or an executive in a company in the future	.43	.50	13,829
Parents have faith in their child's future	Dummy variable (=1) if parents have faith in the child's future	.88	.32	13,747
Parents require their child to have grades at least higher than the class average	Dummy variable (=1) if parents require the kids' grades to be at least better than the class average	.73	.45	13,769

TABLE 5 (*Continued*)

Variable	Details	Mean	Standard Deviation	*N*
Parents contacted teachers spontaneously more than five times this semester	Dummy variable (=1) if parents contacted the teachers of their kid spontaneously more than five times during this semester	.14	.34	13,739
Student went to kindergarten	Dummy variable (=1) if the student has attended kindergarten after 3 years of age	.81	.39	13,765
Log(weekly pocket money)	Logarithm of the average weekly pocket money the student receives from parents	3.16	.94	11,097
Student helps parents with housework during the holidays	Dummy variable (=1) if the student often helps parents with housework during the summer and/or winter holiday	.55	.50	13,760
Student helped parents with housework last week	Dummy variable (=1) if the student helped parents with housework (1–15 hours) every day during the last week	.38	.48	13,506
Father bachelor degree or higher	Dummy variable (=1) if the student's father has at least a bachelor's degree	.16	.37	14,954
Mother bachelor degree or higher	Dummy variable (=1) if the student's mother has at least a bachelor's degree	.13	.34	14,954
Father white collar	Dummy variable (=1) if the student's father has a white-collar or better job	.19	.39	14,954
Mother white collar	Dummy variable (=1) if the student's mother has a white-collar or better job	.14	.35	14,954
Family income status:				
Family has high income	Dummy variable (=1) if the student's family income is average or above average, based on parents' perception	.06	.24	14,954
Mother answers the parents' survey	Dummy variable (=1) if the student's mother answers the survey questions on behalf of parents	.53	.50	13,829

Note.—For the outcomes of parents' expectations, we include only parents who are biological parents of the students. Descriptive statistics of the students' type of *hukou* are not reported.

The regressions reported in table 6 analyze the impact of having been born in a dragon year on test scores of middle school students. The regressions use 13,309 middle school students who are in the seventh or ninth grade in 438 classrooms from 112 schools. In this sample, those born in 2000 have the zodiac sign of the dragon. Figure 5 presents the timeline of the Gregorian calendar and its overlap with the relevant zodiac signs and the school years.

The results in table 6 display three regressions, where the dependent variables are students' midterm test scores in math, Chinese, and English. In addition to student characteristics, the regressions also control for

TABLE 6
Impact of Dragon Zodiac Sign on Midterm Test Scores in Middle School—CEPS Sample

Variable	Test Score in Math (1)	Test Score in Chinese (2)	Test Score in English (3)
Dragon	.306	.695***	.924**
	(.443)	(.222)	(.364)
Female	1.525***	6.816***	11.031***
	(.463)	(.243)	(.437)
Age	−3.600***	−1.309***	−3.057***
	(.403)	(.195)	(.345)
Single child	.402	−.090	.927**
	(.521)	(.259)	(.441)
Father bachelor degree or above	4.680***	1.951***	4.131***
	(.832)	(.398)	(.695)
Mother bachelor degree or above	3.328***	1.077***	3.592***
	(.754)	(.374)	(.635)
Father white collar	.526	.479	.461
	(.653)	(.316)	(.579)
Mother white collar	−.128	.497	.644
	(.679)	(.346)	(.655)
Family has high income	−1.950**	−.376	−1.253*
	(.867)	(.420)	(.729)
Mother answers the parents' survey	.862**	.057	.375
	(.437)	(.224)	(.385)
Average midterm exam scores	81.57	85.41	82.27
Classroom fixed effects	Yes	Yes	Yes
Observations	13,309	13,309	13,309

Note.—Age of the students ranges from 11 to 18. Regressions control for students' type of *hukou*. Standard errors (reported in parentheses) are clustered at the dragon-by-classroom level.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

parent attributes and classroom fixed effects. The coefficients reported in table 6 reveal that parent education has a significant impact on test scores in all three subjects. Female students score higher, and age has a negative impact on midterm scores.

Column 1 of table 6 shows that the students born in a dragon year score higher in math, although the estimated impact is not statistically different from zero. Columns 2 and 3 indicate that dragon children score higher in both Chinese and English midterm exams and that these magnitudes are statistically different from zero. Specifically, being born in a dragon year leads to around 0.04 and 0.03 of a standard deviation increase in the test scores in Chinese and English, respectively. The magnitude of the effect is as large as peer effect and teacher's gender effect found in some previous studies (e.g., Hanushek et al. 2009; Brunello et al. 2010; Lavy et al. 2012; Lim and Meer 2017). Alternatively, we present the results

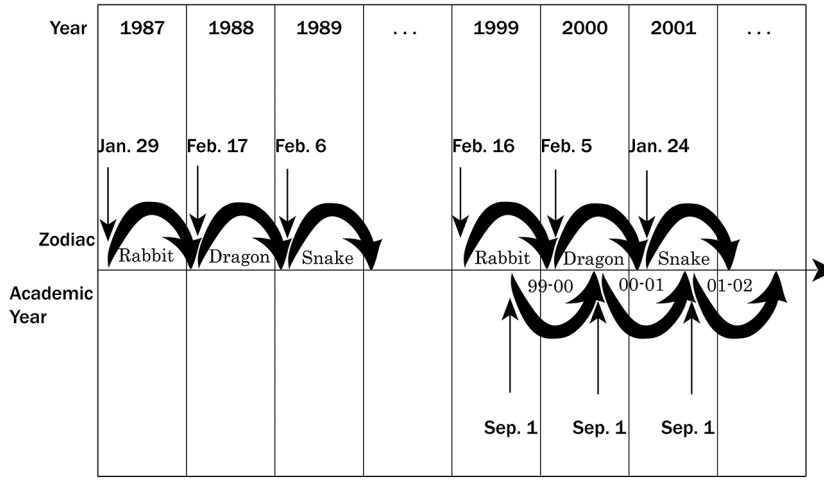

Figure 5.—Overlap between the Chinese lunar calendars, the cycle of zodiac signs, and academic years.

obtained utilizing the adjusted dragon dummy in appendix table A2. The results are very similar to the results displayed in table 6.

As an alternative approach, we calculated the rank of each student within school grade block for each subject. Using students' rank in each subject as dependent variables provided the same inference as table 6. Similarly, using the standardized test scores did not change the conclusions. These results are provided in appendix tables A3 and A4.

1. Are Dragon Parents Different?

As mentioned earlier in the paper, it can be argued that parents of dragon children may be different from other parents. For example, they may be more educated, or they may have higher incomes. If such attributes of the parents make them more likely to time their birth to have a dragon child, and if these attributes also impact child outcomes, then it would be the influence of these factors that impact the child's education and test scores. To eliminate such confounding in the regressions, we control for all available parent attributes, including income, occupation, and education.

To formally investigate whether dragon parents and other parents differ from each other in observable dimensions, we run parent attributes on a dummy to indicate whether their child was born in a dragon year. We do this in all data sets used in the paper. The results are reported in table 7. Panel A displays the results from the CGSS sample, which shows that the probability of the father having at least a bachelor's degree is not different between the father of dragon children and other fathers. The coefficient of the dragon dummy is 0.005 and highly insignificant. The same is true about the mother's education. Mothers of dragon children are no more likely to have a college education or higher. Panels B and

TABLE 7
Relationship between Being Born in a Dragon Year and Parent Attributes

	Father Bachelor Degree or Above (1)	Mother Bachelor Degree or Above (2)	Good Family Economic Status (3)	Father White Collar (4)	Mother White Collar (5)	Family Has High Income (6)	Single Child (7)
			A. CGSS Sample				
Dragon	.005	.000					
	(.022)	(.014)					
p-value	.813	.987					
Dependent mean	.07	.04					
Observations	3,835	3,835					
			B. BCSS Sample				
Dragon	.023	−.019	.022				
	(.064)	(.077)	(.021)				
p-value	.719	.805	.307				
Dependent mean	.48	.40	.15				
Observations	2,738	2,738	2,738				
			C. CEPS Sample				
Dragon	−.012	−.005		−.001	−.010	−.003	−.014
	(.018)	(.017)		(.016)	(.014)	(.006)	(.026)
p-value	.488	.781		.930	.500	.605	.589
Dependent mean	.16	.13		.19	.14	.06	.45
Observations	14,954	14,954		14,954	14,954	14,954	14,954

Note.—Standard errors are clustered at the dragon-by-city level in panels A and B and at the dragon-by-classroom level in panel C and are reported in parentheses.

C of table 7 demonstrate the same picture in other data sets. In no case do we see a difference between the parents of dragon children and other parents regarding their education, income, or probability of having a white-collar occupation.

2. Parents' Beliefs and Transmission of Beliefs to Children

Middle school test score regressions in table 6 control for parents' education, parents' job type (white-collar occupations), and an indicator for high family income. Therefore, the impact of the dragon zodiac sign on test scores is not driven by parents' education or income. It could, however, be the case that dragon children have higher self-esteem and stronger beliefs in their future success than other kids and that higher self-esteem can have a positive impact on test scores.

To investigate the interplay between parents' expectations, students' self-esteem, and test scores, we first analyzed parents. The middle school data set includes questions about how parents perceive their kids' future and what they expect their children's future to look like. The questions that were posed to parents include whether parents believe their child will obtain at least a high school diploma, whether they believe that their child will obtain at least a bachelor's degree, whether they expect the child to become a leader or officer in national or governmental institutions, a scientist, an engineer, or an executive in a company, and whether they have faith in their child's future.[25] Table 8 presents the results of the regressions where parent expectations are used as dependent variables. The models include attributes of the children, as well as parent characteristics including parent education and family income status. In all cases, the dragon dummy is positive, and in four of the five models it is highly significant. This indicates that all else the same, parents have higher expectations of their child if their child was born in the year of the dragon. Because we investigate multiple outcomes in table 8 that gauge different but related parent expectations, we adjust the p-values of the dragon dummy for multiple hypothesis testing (Benjamini and Yekutieli 2001; Newson 2010). The adjusted p-values, presented in table 8's note, reveal that the inference is not altered.

3. Transmission of Expectations from Parents to Children

Table 9 reports regression results that analyze students' self-evaluations on six dimensions. For example, the dependent variable in column 1 of table 9 is a dummy variable to indicate whether the student believes that he or she can articulate his or her thoughts clearly. The dependent variable of the model in column 2 is an indicator for whether the student believes that he or she is a fast thinker. Other self-evaluated attributes are whether the student believes that he or she is a quick learner, whether he

[25] There are 64 parents in the data who expect their children's education to stop before regular high school but still wish their children to find a job as a leader or employer in national or governmental institutions.

TABLE 8
PARENTS' EXPECTATIONS OF THEIR CHILDREN—CEPS SAMPLE

Variable	Parents Expect Their Child to Obtain at Least a High School Diploma (1)	Parents Expect Their Child to Obtain at Least a Bachelor's Degree (2)	Parents Have Strong Career Ambitions for Their Child (3)	Parents Have Faith in Their Child's Future (4)	Parents Require Their Child to Have Grades at Least Higher than Class Average (5)
Parent of a dragon child	.017***	.024***	.032***	.006	.024***
	(.005)	(.007)	(.009)	(.006)	(.008)
Female	.019***	.039***	−.179***	.024***	.040***
	(.004)	(.007)	(.008)	(.006)	(.008)
Age	−.021***	−.051***	−.023***	−.019***	−.041***
	(.004)	(.006)	(.007)	(.005)	(.006)
Single child	.010*	.025***	−.022*	−.000	.001
	(.005)	(.009)	(.011)	(.007)	(.010)
Mother answers the parents' survey	.002	.010	−.033***	−.004	−.006
	(.005)	(.008)	(.009)	(.006)	(.008)
Father bachelor degree or above	.020***	.072***	.000	−.003	.064***
	(.005)	(.010)	(.018)	(.009)	(.014)

Mother bachelor degree or above	−.000	.015	−.049***	.025***	.009
	(.005)	(.010)	(.018)	(.009)	(.017)
Father white collar	−.000	.012	.065***	.010	.012
	(.005)	(.010)	(.014)	(.008)	(.012)
Mother white collar	.007	.033***	.031*	.004	.018
	(.005)	(.009)	(.016)	(.009)	(.013)
Family has high income	−.008	−.003	.034*	.048***	−.024
	(.008)	(.014)	(.020)	(.009)	(.016)
Mean of dependent variables	.931	.764	.433	.884	.727
Classroom fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	13,764	13,764	13,829	13,747	13,769

Note.—The sample includes only biological parents of the students. Regressions control for students' type of *hukou*. Standard errors are clustered at the dragon-by-classroom level and are reported in parentheses. The *p*-values of the dragon dummies, adjusted for multiple hypothesis testing, are .001, .003, .001, .266, and .004 for cols. 1–5, respectively.

* Significant at 10%.

*** Significant at 1%.

TABLE 9
IMPACT OF PARENTAL EXPECTATIONS AND THE DRAGON ZODIAC SIGN ON STUDENTS' SELF-ESTEEM—CEPS SAMPLE

Variable	Articulate (1)	Fast Thinker (2)	Quick Learner (3)	Wants Bachelor's Degree or Higher (4)	Strong Career Ambition (5)	Has Faith for the Future (6)
	A. No Control Variables					
Dragon	.010	.013*	−.002	−.012	.011	−.007
	(.007)	(.008)	(.008)	(.007)	(.008)	(.006)
	B. Controlling for Student and Family Attributes					
Dragon	.006	.012	−.002	−.003	.003	−.001
	(.008)	(.008)	(.008)	(.007)	(.008)	(.006)
Female	.040***	−.071***	−.022***	.082***	−.179***	−.029***
	(.007)	(.007)	(.008)	(.007)	(.008)	(.006)
Age	.015***	−.003	.000	−.007	−.002	−.012**
	(.005)	(.005)	(.006)	(.005)	(.006)	(.005)
Parents expect their child to obtain at least a high school diploma	−.004	−.000	.070***	.122***	.019	.013
	(.018)	(.018)	(.017)	(.014)	(.014)	(.016)

Parents expect their child to obtain at least a bachelor's degree	.033***	.031***	.052***	.334***	.051***	.037***
	(.011)	(.010)	(.010)	(.012)	(.010)	(.009)
Parents have strong career ambitions for their child	.009	.012*	.016**	.024***	.303***	−.005
	(.007)	(.007)	(.007)	(.007)	(.009)	(.006)
Parents have faith in their child's future	.074***	.081***	.092***	.071***	.027**	.229***
	(.012)	(.012)	(.014)	(.012)	(.012)	(.013)
Parents require their child to have grades at least higher than class average	.009	.042***	.093***	.175***	.089***	.065***
	(.008)	(.009)	(.009)	(.009)	(.009)	(.007)
Test for joint significance of parent expectations:						
F statistic	12.90	21.60	60.54	519.46	345.91	105.35
p-value	.000	.000	.000	.000	.000	.000
Classroom fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,357	14,352	14,246	14,763	14,736	14,762

Note.—The age of the students ranges from 11 to 18. Regressions control for students' type of *hukou*. Panel A reports simple correlations with no control variables. Regressions in panel B control for student and family attributes, as included in table 6. Standard errors (reported in parentheses) are clustered at the dragon-by-classroom level. The *p*-values of dragon dummies, adjusted for multiple hypothesis testing, are .62, .47, .71, .51, .47, and .71 for cols. 1–6, respectively.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

or she wants to obtain a college degree, whether he or she wants to be a leader or officer at national or governmental institutions, a scientist, an engineer, or an executive in a company, and whether he or she has faith in his or her own future. The descriptive statistics of these variables are provided in table 5.

Panel A of table 9 presents simple correlations between the dragon zodiac sign and children's self-esteem and confidence indicators, holding constant classroom fixed effects. There is no statistically significant "dragon effect" with the exception of column 2, where the estimated coefficient is small (1.3 percentage points, which corresponds to a 1.6% impact from the baseline of 77%) and barely significant. Panel B displays the regression results that control for parent expectations and observable child and family attributes. The results underline two important points. First, parent expectations significantly influence children's expectations. Most of the five parent-expectation variables are significant determinants of children's self-esteem and their future expectations, and parent-expectation variables are jointly significant in all six regressions. Second, the coefficient of the dragon dummy is small and never statistically significant in panel B of table 9. Thus, it is parents' expectations but not having been born in the year of the dragon that has an impact on children's self-esteem and their expectations about their future. Dropping from the regressions all child and family attributes (e.g., child's sex and age, father's education, etc.) did not alter the estimated coefficients or the standard errors of dragon dummies in any of the outcomes analyzed. The same was true for models that dropped parent expectations. Taken together, these results reveal that the dragon zodiac sign facilitates the formation of parent expectations (table 8) and that parent expectations influence children's self-esteem and children's own expectations (table 9) but that having been born in the year of the dragon has no direct impact on children's self-esteem and confidence (table 9).

4. Parents' Investment in Children

Parents' heightened expectations about their child's current success in school and about the child's achievements in the future can translate into devoting resources to the child. For example, parents may spend more time consulting teachers about their child, or they may be less likely to require their children to help with the chores around the house. Importantly, if parents' expectations about their child's future are related to the investment made in the child (the effort and the resources parents spend on their child), parent expectations would be positively related to the child's test scores. To investigate this hypothesis, we modified the midterm test score regressions (displayed in table 6) by including the variables that gauge parent expectations. Any change in the estimated value of the coefficient of the dragon dummy in these regressions reveals information about the mechanism through which the dragon dummy impacts

test scores. Specifically, given that parents of dragon children have higher expectations of their children (see table 8), to the extent that the dragon dummy acts as a proxy for these expectations, including both the dragon dummy and parent expectations as explanatory variables to the model to explain test scores should provide a coefficient of the dragon dummy that is smaller in magnitude in comparison with the models that exclude parent expectations.

The results are reported in table 10. Compared with those reported in table 6, the coefficients of the dragon dummy variable are about half as large in the Chinese midterm score regression (col. 2) and 80% smaller in English midterm score regression (col. 3), it becomes negative in the math score regression (col. 1), and they are not different from zero in any of the three columns. This indicates that after controlling for parents' expectations, the dragon zodiac sign no longer explains higher test scores of the dragon children. On the other hand, all five variables measuring parent expectations have positive and significant coefficients.

Consistent with Chinese cultural beliefs regarding the impact of the zodiac, we argue that dragon parents' expectations of their children's success are formed when these children are born. Thus, these expectations predate any school outcomes, and they do not vary significantly over time. On the other hand, it could be the case that higher or lower test scores of the students would prompt the parents to modify their expectations about the student's future—that is, test scores may shape parent expectations. To investigate the validity of such reverse causality between students' test scores and parental expectations, we replicate the analyses in tables 6 and 10 by employing data from the 2014–15 wave of the CEPS. The CEPS conducted a follow-up survey 1 year later for all students who were in the seventh grade in the previous wave (2013–14). Thus, we regress eighth grade test scores on parent expectation in the seventh grade.[26] Because eighth grade test scores cannot impact parents' expectations formed 1 year earlier, any potential bias because of reverse causality is not relevant in this specification. The results, reported in appendix table A5, are consistent with those reported in tables 6 and 10. They show that accounting for last year's parental expectations eliminates the dragon effect on this year's test scores and confirm the finding that parental expectations are the channel through which the dragon effect works.[27]

[26] Students who were previously in the ninth grade were not surveyed in the follow-up wave of the CEPS conducted in 2014–15.

[27] Because parents are not surveyed in multiple years about their expectations of the life success of their offspring, we cannot implement a detailed analysis of the formation of parent expectations. The results of app. table A5, however, are consistent with the hypothesis that parent expectations of dragon children are formed when these kids are born and that these expectations are stable over time. Thus, accounting for parent expectations in year t eliminates the impact of the dragon effect on test scores in year $t + 1$. Here year-to-year variation in test scores does not impact parent expectations. If expectations vary over time but test scores are stable, we would obtain the same basic results of app. table A5, but the stability of test scores would rule out the conjecture of reverse causality from test scores to expectations. If

TABLE 10
Impact of Dragon Zodiac Sign on Midterm Test Scores in Middle School, Accounting for Parental Expectations—CEPS Sample

Variable	Test Score in Math (1)	Test Score in Chinese (2)	Test Score in English (3)
Dragon	−.613	.300	.200
	(.399)	(.204)	(.326)
Female	.623	6.386***	10.154***
	(.413)	(.229)	(.409)
Age	−2.047***	−.645***	−1.788***
	(.342)	(.177)	(.306)
Single child	.102	−.231	.679*
	(.460)	(.239)	(.402)
Mother answers the parents' survey	.965***	.091	.443
	(.365)	(.203)	(.331)
Parents expect their child to obtain at least a high school diploma	9.368***	4.719***	5.942***
	(1.018)	(.622)	(.895)
Parents expect their child to obtain at least a bachelor's degree	9.007***	3.804***	7.621***
	(.664)	(.305)	(.557)
Parents have strong career ambitions for their child	1.950***	.601***	.904***
	(.398)	(.189)	(.339)
Parents have faith in their child's future	7.535***	2.732***	6.485***
	(.687)	(.361)	(.581)
Parents require their child to have grades higher at least higher than class average	17.123***	7.410***	14.769***
	(.613)	(.309)	(.533)
Father bachelor degree or above	2.777***	1.120***	2.537***
	(.734)	(.360)	(.634)
Mother bachelor degree or above	2.986***	.931***	3.267***
	(.711)	(.340)	(.577)
Father white collar	.014	.281	.069
	(.577)	(.289)	(.506)
Mother white collar	−.803	.212	.104
	(.633)	(.331)	(.596)
Family has high income	−1.948**	−.339	−1.243*
	(.768)	(.389)	(.643)
Average midterm exam scores	81.57	85.41	82.27
Classroom fixed effects	Yes	Yes	Yes
Observations	13,309	13,309	13,309

Note.—Regressions control for students' type of *hukou*. Standard errors (reported in parentheses) are clustered at the dragon-by-classroom level.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 11 presents the regression results that analyze whether parents of dragon children in fact invest more in their children in comparison with

both the expectations and the test scores are stable over time, this too by definition would rule out the possibility of test scores influencing expectations.

TABLE 11
PARENTAL INVESTMENT IN CHILDREN—CEPS SAMPLE

Variable	Parents Contacted Teachers Spontaneously More Than Five Times This Semester (1)	Student Went to Kindergarten (2)	Log(Weekly Pocket Money) (3)	Student Helps Parents with Housework during Holidays (4)	Student Helped Parents with Housework Last Week (5)
Parent of a dragon child	.014**	.033***	.050***	−.025***	−.027***
	(.007)	(.007)	(.018)	(.009)	(.009)
Female	−.051***	.009	.011	.098***	.026***
	(.006)	(.006)	(.017)	(.009)	(.008)
Age	−.011**	−.050***	.020	.006	.035***
	(.005)	(.006)	(.013)	(.007)	(.007)
Single child	−.002	.024***	−.044**	−.057***	−.036***
	(.008)	(.008)	(.020)	(.011)	(.010)
Mother answers the parents' survey	−.000	.014**	−.079***	−.008	−.017**
	(.006)	(.007)	(.018)	(.009)	(.008)
Father bachelor degree or above	.025**	−.009	−.104***	.003	−.027*
	(.012)	(.010)	(.032)	(.016)	(.014)
Mother bachelor degree or above	.033***	.007	.023	−.001	.001
	(.013)	(.011)	(.036)	(.017)	(.015)
Father white collar	.019*	.006	.042	−.015	−.000
	(.010)	(.010)	(.029)	(.014)	(.013)
Mother white collar	.028***	.008	−.006	−.018	−.000
	(.011)	(.010)	(.034)	(.015)	(.015)
Family has high income	.024*	.012	.429***	−.016	.018
	(.013)	(.012)	(.039)	(.018)	(.017)
Mean of dependent variable	.136	.813	3.164	.545	.378
Classroom fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	13,739	13,765	11,097	13,760	13,506

Note.—The sample includes only biological parents of the students. Regressions control for students' type of *hukou*. Standard errors (reported in parentheses) are clustered at the dragon-by-classroom level.
* Significant at 10%.
** Significant at 5%
*** Significant at 1%.

other parents. The results reported in column 1 suggest that parents of dragon children are 1.4 percentage points (10%) more likely to take the initiative to actively contact their child's teachers five or more times in the current semester in comparison with other parents. The results in columns 2 and 3 indicate that parents of dragon children have a higher propensity to enroll their children in kindergarten and that they give more pocket money to their children. The dependent variables in columns 4 and 5 measure whether the child often spends time on house chores. The estimates suggest that dragon children are less likely to help parents with housework. Thus, the results of table 11 reveal that parents of dragon children invest more time and money in their offspring in comparison with other parents.

This result is consistent with the theoretical and empirical literature that investigates the determinants of intrafamily distribution of resources and parents' investments in their offspring. For example, Behrman, Pollak, and Taubman (1982) show in a model where children's expected lifetime earnings are determined by their genetic endowment and education that parents may adopt a reinforcing strategy (investing more in the child who has greater genetic endowment) or a compensating strategy (investing more in the child with lower genetic endowment), depending on the properties of the earning function, inequality aversion, and so on. Rosenzweig and Schultz (1982) show that children who are expected to be more economically productive adults receive more family resources. Brown (2006) finds that more educated parents expect higher returns to education for their children, which in turn yields greater investment in both goods and time by such parents.[28]

5. Child Height

Parents may also invest in their children in terms of nutrition. The data set contains no information about the food intake of children, but there is information on the height of middle school students. Given the evidence that height in adolescence is strongly correlated with nutrition intake during childhood (see Micklewright and Ismail 2001, Case and Paxson 2008, and the literature they cite), we ran regressions of height of middle school students on the dragon dummy, controlling for the same set of explanatory variables as before, including the age of the student.[29] The results are displayed in table 12. Column 1 shows that female students are about 6.4 cm shorter than males but that being a female dragon child has a positive impact on height. Specifically, having been born in the year of the dragon helps reduce the female height gap by 2.7 cm. Columns 2 and 3

[28] Parental investment in children and the formation of human capital also have a role in macro models of long-run growth (Becker, Murphy, and Tamura 1990; Ehrlich and Lui 1991; Glomm 1997; Ehrlich and Pei 2020).

[29] Nunn and Qian (2011) show that increased nutrition, related to the introduction of the potato to France in the eighteenth century, increased the height of French soldiers born between 1658 and 1770.

TABLE 12
Impact of Dragon Zodiac Sign on Middle School Students' Height—CEPS Sample

Variable	Height (Full Sample) (1)	Height (Rural) (2)	Height (Urban) (3)	Height (Full Sample) (4)
Dragon	−.384*	−.483	−.156	−.268
	(.229)	(.300)	(.352)	(.339)
Female	−6.446***	−6.065***	−6.776***	−6.780***
	(.223)	(.278)	(.305)	(.289)
Rural	−.807***			−1.231***
	(.152)			(.251)
Female × dragon	2.722***	3.329***	1.920***	1.987***
	(.347)	(.425)	(.506)	(.487)
Rural × dragon				−.225
				(.449)
Rural × female				.632*
				(.333)
Rural × female × dragon				1.432**
				(.587)
Mean of height	161.92	160.82	163.18	161.92
Classroom fixed effects	Yes	Yes	Yes	Yes
Observations	13,309	7,091	6,218	13,309

Note.—The dependent variable is the height of students, measured in centimeters. A full set of covariates, as in table 6, is included in all regressions. Standard errors (reported in parentheses) are clustered at the dragon-by-classroom level.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

present the results by students' location of residence. The average height of rural students is 160.8 cm, whereas students in urban areas are 163.2 cm tall on average. Columns 2 and 3 reveal that the impact on height of being a female dragon child is larger in rural areas (3.3 cm vs. 1.9 cm), which is confirmed by the results presented in column 4. Thus, the results in table 12 indicate that even though girls are 6 cm shorter than boys, this height disadvantage is mitigated by having a dragon zodiac sign. Specifically, if a female middle school student is born in the year of the dragon, she is 2.7 cm taller than another female student of the same age. This is consistent with the hypothesis of allocation of additional nutritional resources to girls if they are born in the year of the dragon. That this effect is larger in rural areas is also consistent with the hypothesis that food and nutrition may be driving this finding because investment in children in terms of food and nutrition should be more prevalent in rural (as opposed to urban) areas.

6. Do Dragon Parents Invest in Their Kids because of the Fear of Competition?

As table 11 demonstrates, parents of middle school dragon children invest more heavily in their kids in comparison with other parents. The assumption behind this finding is that the parents of dragon children

believe that their children are inherently more productive, as suggested by the superstition. Thus, an investment in these kids would produce higher returns in comparison with investment in other kids (by other parents). In other words, dragon parents would invest more heavily in their kids as opposed to other parents because the return of their investment is higher. It can be argued, however, that parents do not believe that dragon children are superior. That is, they prefer their kids to be born in a dragon year for some other reason, but they do not actually think that dragon children are destined for greatness.[30] Yet everyone recognizes that the dragon cohorts are larger and therefore these dragon children would be at a disadvantage unless additional resources are allocated to them to compensate for the intensity of competition they would face due to the large cohort size. In this scenario, dragon parents invest in their children to counteract the drawback of their kids being a member of a large cohort. To investigate the validity of this conjecture, we focus exclusively on seventh grade students who are classmates. This subsample of middle school students consists of only those who were born in a dragon year or a snake year. This cohort of the seventh graders is large because of the dragon children, and the parents of the snake children should also be aware of this fact. Thus, seventh grade parents whose children were born in the year of the snake should be worried about the increased competition due to the large cohort size generated by the dragon children in the seventh grade, and these snake parents are expected to invest in their kids as heavily as do the parents of the "competing" dragon children. This argument suggests that there should not be a significant difference between these two groups of parents in terms of investment in their offspring.

Appendix table A6 presents the summary results of the analyses conducted in this sample of seventh graders. Panel A of table A6 (which is the counterpart of table 6) shows that dragon children receive higher test scores in comparison with snake children who are in the same grade. Consistent with table 9, panel B of table A6 shows that seventh grade dragon children are not different from seventh grade snake children (the category left out of these regressions) in terms of their self-esteem or about expectations for their own future.

Panel C of table A6, which is the counterpart of table 8, demonstrates that parents of dragon children have higher expectations of their children in comparison with the parents of snake children who are classmates of dragon children. The point estimates and statistical significance in table 8 and panel C of table A6 are almost identical despite the reduction in the sample size by half in the latter table.

Regressions reported in panel D of table A6 report models of test scores (as in panel A). The difference between panel A and panel D is that the latter regressions include parent expectations. Panel D reveals that holding

[30] As discussed above, we show in the paper that dragon parents have higher expectations of their children in comparison with other parents, refuting this claim.

constant parent expectations eliminates the dragon effect from the test score regressions of the seventh graders (as was the case in the large sample of seventh and ninth graders; see table 10). Finally, panel E of table A6 shows that parents of dragon children in seventh grade classrooms invest more heavily in their kids in comparison with parents of snake kids in the same classrooms. This finding is inconsistent with the hypothesis that dragon parents invest more in their kids because they want to compensate for the large cohort size in which their kids operate. This is because the same argument applies to the snake parents: the kids of the snake parents also face intensified competition because of the large cohort size, inflated by dragon children. But panel E of table A6 reveals that dragon parents invest more in their kids in comparison with parents of kids with snake zodiac signs and that the point estimates are very similar to those obtained from the large sample (of seventh and ninth grades) displayed in table 11. Unless one is prepared to argue that parents of snake children do not care about the success of their offspring, this finding refutes the conjecture that dragon parents invest in their kids because they are worried about the competition with a large number of students in the cohort.

7. Is This an Age Effect?

It could be argued that the dragon students outperform the students who are born in the year of the snake (although both types are in the same classroom) because dragon students in the seventh grade are a few months older than their classmates who were born in the year of the snake. If this were the case, however, one would observe the same age impact on test scores among other cohorts as well. Thus, we analyze a sample of ninth grade students that consists of only the tiger and rabbit cohorts. We regress the test scores on a dummy that indicates a student being born in the tiger year. Although all students in this sample are in the ninth grade, those who were born in the year of the tiger are a few months older than those born in the year of the rabbit (see fig. 1). As shown in appendix table A7, however, the tiger dummy is not different from zero, indicating that test scores are not different between classmates who are either rabbit or tiger. This suggests that the results reported in table A6 are not attributable to dragon students being a few months older than their classmates in the seventh grade. Along the same lines, we examine whether the parents of the tiger students have higher expectations than the parents of the rabbit students. As shown in table A8, we again find no difference in parental expectations between the tigers and the rabbits, indicating that the results are not an artifact of small age differences between students who are in the same grade.

V. Conclusion

In Chinese culture, those who are born in a dragon year are believed to be destined for good fortune and greatness. Because there is no biological

reason for people who are born in a certain time period to be more economically successful in comparison with those who are born in adjacent time periods, it is surprising that this superstition has persisted for many centuries.

If the cohort size of dragon children is larger, this would intensify competition among children of that cohort in terms of educational resources. For example, class sizes in schools would be larger for kids born in dragon years, which may reduce the quality of education they receive. Similarly, competition for a slot in a high-quality college could be more intense. If this is the case and if children born in a dragon year have worse educational outcomes in comparison with their peers who are similar in age and other attributes, this would beg the question of how this particular belief about dragon children being destined for good fortune and greatness could persist.

Using three micro-data sets from China, we show that those born in a dragon year have better (rather than worse) educational outcomes in comparison with similar individuals who are of the same age or who are very similar in age but who have different zodiac year designations. Those born in a dragon year are more likely to have a college education, and they obtain higher scores at the university entrance exam. Similarly, Chinese middle school students have higher test scores if they are born in dragon year. We show that these results are not because of family background, self-esteem, or students' expectations about their own future.

In all three data sets, we find that parents of dragon children are not different from other parents in terms of education or occupation. Using the middle school data, we show that parents of dragon children have higher expectations for their children's educational success and their professional future in comparison with other parents and that the dragon effect on test scores is eliminated when we account for parents' expectations about their children's educational and professional success. Importantly, we find that dragon parents invest more heavily in their children in terms of time and money (the amount of pocket money parents give to the child, how many times parents talk to the child's teachers during the semester, whether the child is protected from doing chores at home, etc.). Taken together, these results indicate that parents' expectations of their children's success, generated by the superstition, motivate them to invest in their children, which in turn leads to better educational outcomes. We also find that although female middle school students are about 6 cm shorter than male students of the same age, this height disadvantage is cut by about half by having a dragon zodiac sign, and we find that this effect is larger in rural areas. This may suggest that parents may be allocating more food and nutrition to female dragon children, especially in rural (and poorer) areas as a form of investment. A number of supplemental analyses demonstrate the robustness of these results.

It is possible that dragon parents who believe in the superstition invest in their kids not only in the ways we measure in this paper (e.g., talking to

the classroom teachers more frequently in the middle school, protecting their kids from doing house chores, etc.) but also in other ways, such as buying books and computers for their children, hiring tutors for them, and so on.[31] These potential additional investment avenues that may have also been utilized by parents do not alter the message of this paper: even though children born in a dragon year are no different from other children in the dimensions we observe in our data, ranging from family background to self-esteem and expectations and aspirations about their future, dragon students are more successful in school. This is because parents of dragon children have higher expectations of their children and they invest in their children more intensely. In the end, these expectations and the ensuing investment yield better educational outcomes and create this self-fulfilling prophecy.

Appendix

TABLE A1
Impact of Zodiac Sign on Marriages and Live Births in Chinese Provinces

	Marriages (1)	Marriages (2)	Log(Live Births) (3)	Log(Live Births) (4)
Tiger year		1.844***		−.005
		[.000]		[.654]
Rabbit year		2.142***		.015
		[.000]		[.183]
Dragon year	.655	.957*	.046***	.050***
	[.211]	[.085]	[.000]	[.000]
Province-specific linear trends	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes
Observations	968	968	319	319

Note.—In cols. 1 and 2, the outcome is the number of marriages approved by the government annually per 10,000 population. Data in cols. 1 and 2 span the years 1979–2013. The data used in regressions reported in cols. 3 and 4 span the years 2003–13. The mean value of log live births is 12.67. All regressions include provincial GDP. In cols. 3 and 4, the number of newly approved marriages is also included as a covariate. The *p*-values are reported in brackets, and they pertain to bootstrapped standard errors clustered at the province level.
* Significant at 10%.
*** Significant at 1%.

[31] Dragon parents could have invested in their kids even before they were born, by consuming more health inputs during pregnancy (nutritious foods, prenatal care, etc.). While we cannot test whether birth weight is different between dragon children and others, research indicates that the impact of birth weight on test scores and educational attainment is modest (Royer 2009; Rosenzweig and Zhang 2013; Figlio et al. 2014). Furthermore, our middle school data set, which contains information on cognitive test scores, shows that there is no difference between dragon children and other kids in cognition, as measured by this test.

TABLE A2
IMPACT OF DRAGON ZODIAC SIGN ON MIDTERM TEST SCORES IN MIDDLE SCHOOL
CEPS DATA—USING THE ADJUSTED DRAGON DUMMY

Variable	Test Score in Math (1)	Test Score in Chinese (2)	Test Score in English (3)
Dragon (adjusted)	.394	.764***	1.005**
	(.474)	(.238)	(.390)
Female	1.525***	6.817***	11.032***
	(.463)	(.243)	(.437)
Age	−3.616***	−1.326***	−3.079***
	(.409)	(.198)	(.349)
Single child	.402	−.090	.927**
	(.521)	(.259)	(.441)
Father bachelor degree or above	4.681***	1.951***	4.131***
	(.832)	(.398)	(.695)
Mother bachelor degree or above	3.326***	1.076***	3.591***
	(.754)	(.374)	(.635)
Father white collar	.526	.478	.460
	(.653)	(.316)	(.579)
Mother white collar	−.128	.497	.644
	(.679)	(.346)	(.656)
Family has high income	−1.950**	−.374	−1.251*
	(.867)	(.420)	(.729)
Mother answers the parents' survey	.862**	.056	.374
	(.437)	(.224)	(.385)
Average midterm exam scores	81.57	85.41	82.27
Classroom fixed effects	Yes	Yes	Yes
Observations	13,309	13,309	13,309

Note.—Regressions control for students' type of *hukou*. The adjusted dragon dummy takes the value of the proportion of days belonging to the dragon year in that month. Standard errors are clustered at the dragon-by-classroom level and are reported in parentheses.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

TABLE A3
IMPACT OF DRAGON ZODIAC SIGN ON MIDTERM TEST SCORE RANKINGS
IN MIDDLE SCHOOL—CEPS SAMPLE

Variable	Rank in Math (1)	Rank in Chinese (2)	Rank in English (3)
Dragon	−.000	.014**	.011*
	(.007)	(.007)	(.007)
Female	.021***	.174***	.159***
	(.006)	(.005)	(.006)
Age	−.042***	−.031***	−.044***
	(.005)	(.004)	(.005)
Single child	.006	.003	.014**
	(.007)	(.007)	(.006)
Father bachelor degree or above	.054***	.048***	.051***
	(.010)	(.010)	(.009)
Mother bachelor degree or above	.041***	.032***	.061***
	(.011)	(.010)	(.010)
Father white collar	.018**	.013*	.016**
	(.008)	(.008)	(.008)
Mother white collar	.000	.012	.008
	(.009)	(.008)	(.009)

TABLE A3 (*Continued*)

Variable	Rank in Math (1)	Rank in Chinese (2)	Rank in English (3)
Family has high income	−.012	−.010	−.013
	(.011)	(.009)	(.010)
Mother answers the parents' survey	.006	−.002	.007
	(.005)	(.005)	(.005)
Block fixed effects	Yes	Yes	Yes
Observations	13,309	13,309	13,309

Note.—Dependent variables are students' rankings in math, Chinese, and English midterm exam scores. The ranks are constructed within blocks (school × grade) using $Rank_{i,b} = (RawRank_{i,b} - 1)/(N_b - 1)$, where $RawRank_{i,b}$ and N_b represent the raw rank of student i in school grade block b and the total number of students in block b, respectively. Students' raw ranks (based on the test scores) range from zero to N_b, where zero stands for the lowest rank and N_b stands for the highest. Therefore, students' objective percentile ranks are approximately uniformly distributed from zero to one, indicating the lowest rank to the highest. Students with the same test score in the same block are assigned the same rank. Standard errors are clustered at the dragon-by-block level and are reported in parentheses.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

TABLE A4
Impact of Dragon Zodiac Sign on Standardized Test Scores in Middle School—CEPS Sample

Variable	Standard Scores in Math (1)	Standard Scores in Chinese (2)	Standard Scores in English (3)
Dragon	−.003	.043*	.045**
	(.022)	(.022)	(.022)
Female	.084***	.562***	.528***
	(.020)	(.018)	(.020)
Age	−.146***	−.103***	−.150***
	(.016)	(.015)	(.016)
Single child	.039*	.008	.063***
	(.022)	(.022)	(.022)
Father bachelor degree or above	.184***	.138***	.165***
	(.033)	(.033)	(.030)
Mother bachelor degree or above	.138***	.104***	.165***
	(.036)	(.033)	(.029)
Father white collar	.038	.052**	.034
	(.026)	(.025)	(.027)
Mother white collar	−.009	.028	.022
	(.030)	(.028)	(.028)
Family has high income	−.073**	−.030	−.053*
	(.037)	(.031)	(.032)
Mother answers the parents' survey	.028*	−.000	.017
	(.017)	(.017)	(.016)
Block fixed effects	Yes	Yes	Yes
Observations	13,309	13,309	13,309

Note.—Dependent variables are students' standardized test scores in math, Chinese, and English. The test scores are standardized within blocks (school × grade cells). Standard errors are clustered at the dragon-by-block level and are reported in parentheses.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

TABLE A5
Impact of Dragon Zodiac Sign on Midterm Test Scores in the Eighth Grade, Accounting for Parental Expectations in the Seventh Grade—CEPS Sample

	Eighth Grade Test Score in Math (1)	Eighth Grade Test Score in Chinese (2)	Eighth Grade Test Score in English (3)
	A. Without Controlling for Parental Expectations		
Dragon	.571	.745**	1.158**
	(.647)	(.318)	(.506)
Observations	6,463	6,463	6,461
	B. Controlling for Parental Expectations in Seventh Grade		
Dragon	−.397	.303	.393
	(.616)	(.303)	(.475)
Observations	6,463	6,463	6,461

Note.—The models control for a full set of covariates as in the main analyses using the CEPS data. Dependent variables are scores in math, Chinese, and English midterm tests in the eighth grade. Standard errors are clustered at the dragon-by-classroom level and are reported in parentheses.
** Significant at 5%.

TABLE A6
Analyses of Middle School Students (Seventh Grade Students Only)—CEPS Sample

	Dragon (1)	Adjusted *p*-Value (2)	Dependent Mean (3)	*N* (4)
	A. Midterm Test Scores			
Test score in math	.311		80.30	6,760
	(.531)			
Test score in Chinese	.826***		81.33	6,760
	(.283)			
Test score in English	1.311***		85.98	6,760
	(.424)			
	B. Self-Esteem (Controlling for Student and Family Attributes)			
Articulate	.014	.183	.810	7,402
Fast thinker	.017	.170	.792	7,400
Quick learner	.005	.622	.774	7,332
Wants bachelor or higher degree	.018	.170	.680	7,625
Strong career ambition	.013	.343	.352	7,618
Has faith for the future	.006	.430	.898	7,625
	C. Parents' Expectations of Their Children			
Parents expect their child to obtain at least a high school diploma	.022***	.000	.940	6,959
Parents expect their child to obtain at least a bachelor's degree	.025***	.008	.796	6,959
Parents have strong career ambitions for their child	.034***	.001	.423	7,002
Parents have faith in their child's future	.003	.685	.898	6,954
Parents require their child to have grades at least higher than class average	.030***	.004	.765	6,964

TABLE A6 (*Continued*)

	Dragon (1)	Adjusted *p*-Value (2)	Dependent Mean (3)	*N* (4)
	D. Midterm Test Scores Accounting for Parental Expectations			
Test score in math	−.655		80.30	6,760
	(.258)			
Test score in Chinese	.366		81.33	6,760
	(.258)			
Test score in English	.543		85.98	6,760
	(.389)			
	E. Parental Investment in Children			
Parents contacted teachers spontaneously more than five times this semester	.013		.128	6,950
	(.008)			
Student went to kindergarten	.032***		.827	6,968
	(.009)			
Log(weekly pocket money)	.050**		2.978	5,504
	(.021)			
Student helps parents with housework during the holidays	−.011		.548	6,955
	(.010)			
Student helped parents with housework last week	−.027***			
	(.010)		.404	6,824

Note.—The working samples are restricted to the seventh grade students. A full set of covariates are controlled for in all regressions. Panel A corresponds to table 6. Panel B corresponds to panel B of table 9. Panels C, D, and E correspond to tables 8, 10, and 11, respectively. Standard errors (reported in parentheses) are clustered at the dragon-by-classroom level in panels A, D, and E. Adjusted *p*-values for multiple hypothesis testing using the Simes adjustment are reported for panels B and C.
** Significant at 5%.
*** Significant at 1%.

TABLE A7
Test Scores of Tigers and Rabbits (Ninth Grade Students Only)—CEPS Sample

Variable	Test Score in Math (1)	Test Score in Chinese (2)	Test Score in English (3)
Tiger	−.233	.517	.394
	(.717)	(.354)	(.635)
Female	1.446*	7.032***	11.871***
	(.741)	(.393)	(.699)
Age	−3.095***	−1.056***	−2.325***
	(.603)	(.288)	(.528)
Single child	.214	−.572	.254
	(.861)	(.422)	(.717)
Father bachelor degree or above	6.285***	3.509***	5.959***
	(1.441)	(.655)	(1.245)
Mother bachelor degree or above	4.088***	.930	4.268***
	(1.210)	(.603)	(1.080)
Father white collar	2.241**	1.423***	1.924*
	(1.100)	(.518)	(.999)

TABLE A7 (*Continued*)

Variable	Test Score in Math (1)	Test Score in Chinese (2)	Test Score in English (3)
Mother white collar	.406	1.172**	1.832
	(1.162)	(.588)	(1.223)
Family has high income	−1.164	−.423	−1.196
	(1.339)	(.669)	(1.158)
Mother answers the parents' survey	1.133*	.377	.534
	(.684)	(.356)	(.641)
Classroom fixed effects	Yes	Yes	Yes
Observations	6,549	6,549	6,549

Note.—Dependent variables are scores in math, Chinese, and English on midterm tests. Regressions control for students' type of *hukou*. Standard errors are clustered at the dragon-by-classroom level and are reported in parentheses.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

TABLE A8
PARENTS' EXPECTATIONS OF CHILDREN (Ninth Grade Students and Tiger and Rabbit Zodiac Signs Only)—CEPS SAMPLE

Variable	Parents Expect Their Child to Obtain at Least a High School Diploma (1)	Parents Expect Their Child to Obtain at Least a Bachelor's Degree (2)	Parents Have Strong Career Ambitions for Their Child (3)	Parents Have Faith in Their Child's Future (4)	Parents Require Their Child to Have Grades at Least Higher Than Class Average (5)
Parent of a tiger child	.000	−.011	.004	−.010	.001
	(.006)	(.010)	(.010)	(.007)	(.009)
Female	.022***	.036***	−.166***	.021**	.028**
	(.007)	(.011)	(.012)	(.010)	(.012)
Age	−.016***	−.042***	−.021**	−.021***	−.033***
	(.006)	(.010)	(.010)	(.007)	(.009)
Single child	.006	.017	−.018	−.001	−.003
	(.008)	(.013)	(.016)	(.010)	(.015)
Mother answers the parents' survey	.006	.028**	−.035***	−.011	.000
	(.007)	(.012)	(.013)	(.009)	(.012)
Father bachelor degree or above	.022***	.087***	−.012	.004	.100***
	(.008)	(.016)	(.026)	(.014)	(.020)
Mother bachelor degree or above	−.006	−.005	−.036	.013	.033
	(.009)	(.016)	(.026)	(.015)	(.026)

TABLE A8 (*Continued*)

Variable	Parents Expect Their Child to Obtain at Least a High School Diploma (1)	Parents Expect Their Child to Obtain at Least a Bachelor's Degree (2)	Parents Have Strong Career Ambitions for Their Child (3)	Parents Have Faith in Their Child's Future (4)	Parents Require Their Child to Have Grades at Least Higher Than Class Average (5)
Father white collar	.007	.026*	.102***	.014	.037*
	(.008)	(.015)	(.020)	(.012)	(.019)
Mother white collar	.017**	.060***	.021	.019	.032
	(.008)	(.015)	(.027)	(.015)	(.020)
Family has high income	−.003	.002	.052*	.056***	−.046*
	(.012)	(.020)	(.027)	(.012)	(.024)
Classroom fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	6,805	6,805	6,792	6,793	6,805

Note.—The working sample includes only students born in the tiger and rabbit years. Regressions control for students' type of *hukou*. Standard errors are clustered at the tiger-by-classroom level and are reported in parentheses.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1% or better.

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