

Little Emperors—Behavioral Impacts of China’s One-Child Policy¹

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Abstract

This paper examines the behavioral patterns exhibited by individuals exposed to the One-Child Policy. We conduct an experiment with individuals born just before and just after the One-Child Policy who are otherwise similar. Those who grew up as only children as a consequence of the policy are found to be less trusting, less trustworthy, less likely to take risks, and less competitive than if they had had siblings. They are also less optimistic, less conscientious, and more prone to neuroticism. Thus, the One Child Policy has significant ramifications for Chinese society and for the world with which China increasingly deals.

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1. Introduction

This paper examines the behavioural impacts of China's One-Child Policy (OCP) and the causal behavioral impact of growing up as a single child because of the OCP. The OCP is one of the most radical policy approaches to limiting population growth the world has seen. The policy restricts the number of children urban couples can have to one, with exceptions for ethnic minorities. The policy is claimed to have given rise to a land of "little emperors". Each "emperor" has two parents and four eager grandparents to dote on them exclusively. This has led to widespread concern about poor social skills and a poor ability to cooperate. In March 2007, 30 delegates called on the government in the Chinese People's Political Consultative Conference (CPPCC) to abolish the policy. Their concerns centred on "social problems and personality disorders in young people".

We investigate the impact of the OCP on altruism, trust, trustworthiness, risk attitudes, and competitiveness. Preferences in these areas have important economic implications— for example by affecting the decisions individuals make regarding the provision of public goods and entrepreneurship.

The impact of family configuration on the personalities of only children has been a topic of interest for social scientists for many decades.⁶ In particular, the psychology literature discusses two important channels through which only children may be affected to behave differently from their counterparts with siblings: the influence from differential parental attitude towards them and the difference in the level of interaction with siblings.⁷ Psychologists believe that pro-social development is shaped by parents as well as by social interactions with siblings and cousins (Piaget, 1932).⁸ For example, parents of only children may be more responsive to their needs, which may lead to a greater sense of security,

⁶ Very little economic research has however addressed this topic. Related economic research has mainly focused on the impact of birth order rather than single-childedness. Behrman and Taubman (1986) identify strong endowment effects for firstborns which results in firstborns being more educated in the U.S. Behrman (1988) develops a model that suggests that parents favour older children in household allocation of nutrition and finds support for this in data from India. Ejrnaes and Portner (2004) endogenize fertility in a model of household allocation and show that children with higher birth order (born later) have an advantage. They support this with data from the Philippines.

⁷ Levy-Garboua et al. (2006) provide an excellent review of the studies in psychology and biology on the formation of social preferences. We focus on theories from psychology rather than biology (i.e., genetic influences) since in human societies, learning and rational decision making play critical roles in the development of the type of behavior we are interested in.

⁸ Piaget (1932) argues that there are two stages in moral development. In the first stage, called "moral realism," children obey moral rules because they respect their parents. In the second stage, called "morality of reciprocity," moral development takes place through cooperation and mutual respect among peers.

intellectual competence, and psychological confidence (Bowlby, 1969). In addition, only children could benefit from not having to compete with siblings for scarce family resources, and consequently their general well-being benefits (Blake, 1981). Parents of only children may also be more motivated to interact with their children in ways that promote desirable development (Lewis and Feiring, 1982). More attention from parents can also come with downsides in terms of higher expectations and pressure to succeed in life. Furthermore only children may be disadvantaged as a result of “sibling deprivation”, which could lead to them being self-centered, less cooperative, and less likely to get along with peers (Brill, 1922; Fenton, 1928).

Existing empirical literature on impact of growing up as only children is also predominately psychological and the findings are mixed. Some find few differences between only children and children with siblings in character development (maturity, generosity, cooperativeness, flexibility), personal control (autonomy and believing that one has control over one’s life outcomes), personal adjustment (self-esteem, neuroticism, emotional stability), and sociability, but only children are found to be more motivated to achieve (Falbo and Polit, 1987; Polit and Falbo, 1987; Liu et al., 2010; and Manciallas, 2006). Other studies find that only children are less liked by their classmates and more likely to be aggressive in their peer groups (Kitzmann et al., 2002). They are also found to be less willing to take risks than children with siblings, perhaps as a result of either parental influence or smaller family networks (Dohmen et al., forthcoming). Studies of the social and behavioral characteristics of only children in China fail to establish systematic differences from children with siblings, though an advantage in motivation to achieve is also observed (Chen and Goldsmith, 1991; Falbo and Poston, 1993; Shen and Yuan, 1999; Wang et al., 2001 and Liu et al, 2005). Some studies find that children in urban areas exhibit more negative personalities, including being neurotic and more susceptible to depression and anxiety (Falbo and Poston, 1993 and Liu et al., 2005).⁹

The existing empirical studies, however, examine the effect of growing up as only children without considering the possible endogeneity problem associated with being only children. If parents that choose to have only one child differ systematically in their characteristics from parents who choose to have more than one child, the average behavioural difference between only children and children with siblings may reflect the differential values

⁹ This is in contrast to an earlier study by Yang et al. (1995) which found that only children born under the One Child Policy were less prone to fear, anxiety and depression than children with siblings.

and behaviour of parents of the two groups. Thus a simple comparison of behavioural outcomes between only children and children who have siblings may tell us little about the causal impact of growing up without siblings. To mitigate this problem this paper uses the introduction of the OCP as an exogenous shock to fertility to identify the true causal impact of growing up without siblings.

In addition to focusing on the causal impact on behavior of growing up without siblings, this paper differs from the existing literature in two other ways. First, it uses experimental techniques to identify behavioral differences. The previous literature on only child effects has relied on surveys of parents, teachers, and the children themselves or in some cases, classroom observation. In contrast, we conduct games from the experimental literature that are designed to elicit altruism, the ability to trust and trustworthiness, risk preferences and competitiveness. Experiments have the advantage of allowing the researcher to observe particular, well-defined types of behavior. Experimental participants are also incentivized with money, the amount of which depends on the decisions made in the experiment, which provides a greater motivation for participants to reveal their true preferences (Davis and Holt, 1993).

Second, we study only children in adulthood. The existing literature on only children in China has focused on only children before they reach adulthood – typically comparing children who are still at school or under 18 years of age. It is in adulthood, when they are making economic and political decisions that affect their lives and the lives of others, that their behavior has greater consequences. Studying only children in adulthood means studying them at a time when they have had more experience of the world, and their social preferences and behavioral determinants are more fully formed.

Our results show a significant behavioral impact of the OPC and the causal behavioural impact of growing up as only children in the trust, risk, and competition games. We find that individuals who are only children as a result of the policy are less trusting, less trustworthy, and more risk-averse than if they had had siblings. As a consequence of being more risk averse, they are less competitive. We do not find a significant impact of the policy in the altruism game. Results from personality survey questions reveal that only children are also substantially less trusting, more pessimistic, more neurotic, and less conscientious.

Several studies have established the predictive value of experimental results on real world behavior (see, for example, Liu, 2008; Cameron and Shah, 2011; Fehr and Leibbrandt, 2011). Consistent with our experimental results, our survey data reveal that the effect of

growing up as only children as a result of the OCP is to make them significantly less likely to financially support their parents, even though the parents have fewer children to depend upon for such support. In addition, it makes them less likely to take risky occupations. Understanding how this generation of only children's behaviour differs from previous cohorts may thus have important implications for the Chinese society at large and for the world with which China increasingly trades and interacts.

The paper proceeds as follows. The next section describes some background information on the OCP in China. Section 3 discusses our sampling and experimental methodology. After explaining our identification strategy in section 4, the results are presented in section 5. Section 6 concludes the paper.

2. China and the OCP

In this section, we present some historical background which will help in understanding our methodology and results. Figure 1 shows the fertility rate in China from 1950 to 1987.¹⁰ As can be seen in the figure, throughout the 1960s, Chinese fertility exceeded six births per mother (Banister, 1987). Low agriculture productivity, stagnation of the economy, and economic isolation as a result of the cold-war, however, soon led to concern that China might not be able to feed its growing population. In the early 1970s, in the midst of the Cultural Revolution, a philosophical "debate" over the potential for the country to fall into a Malthusian population trap was initiated. At the end of 1973, the policy of "Later, Longer, and Fewer" was introduced. This policy encouraged couples to have children later, have longer gaps between births, and have fewer children in total (Center for Population Studies, CASS, 1986; Peng, 1991; Feeney and Wang, 1993; Cai, 2010; Avraham, 2010). It had a significant impact on the birth rate, especially for the urban population. Over the 1970s, the total fertility rate declined from above 5% to just around 2% (Wang, 2011). In January 1978, a new policy of "One is the Best and Two is the Most" and "Reward Having One Child and Punish Having Three" was introduced. This was soon followed by the introduction of the "One-Child per Couple" policy (referred to as the OCP) at the second meeting of the fifth People's Congress in June 1979 (Center for Population Studies, CASS, 1986; Peng, 1991).

¹⁰ When the Communist Party came to power in 1949, China had just emerged from WWII and the Civil War. The war-torn country desperately needed people to rebuild the nation. The aim of China's population policy at that time was to encourage high fertility. Following the Soviet model, high birth mothers were awarded "Mother-Hero" status. As in most Western countries, China had a post-WWII baby boom. The total fertility rate hovered around 6% until the great famine which started in 1959. The three year famine significantly reduced the birth rate, but soon after the population growth rate bounced back to above the pre-famine level.

Although the One-Child Policy was meant to cover the country as a whole, by and large, rural areas have always allowed a second child if the first child is a girl (Peng, 1991). In some rural areas and over some periods even 3 children were allowed. In addition, there are different rules for minority groups, which are subject to much looser restrictions. In the urban areas, however, the policy has been strictly enforced since it was introduced (Kane and Choi, 1999; Zhang and Sturm, 1994). Those who obey the policy are financially rewarded while those who violate the policy are subject to fines and their children face higher fees for accessing education and health services. In some cases, children are denied these services (Peng, 1991; Zhang and Sturm, 1994).

The Chinese government claims that the policy has prevented more than 400 million births and has alleviated social, economic, and environmental pressure in China.¹¹ The policy is however routinely criticized as being a violation of a basic human right. The extent of its effect on fertility is even contested as China's fertility rate started a steady and steep decline in 1968, 21 years before the policy's introduction (Wang, 2010). The policy is also criticized on the basis of its unequal enforcement (some government officials have been able to violate the policy with little consequence), and the incentive it provides for aborting, abandoning and even killing female babies in a country where male-preference is strong and boys are expected to support their aging parents financially. As a result, China's gender balance has become increasingly skewed (Hull, 1990). It has also spawned the "four-two-one" problem where only children of only children have the burden of supporting their two parents and four grandparents in old age.

Over the past 30 years, the OCP has been widely viewed as having had a marked impact on the behavior of the one-child generation. Discussions in the mass media as well as amongst psychologists suggest that this new generation could be different – that parents have not been teaching their only children traditional values (such as respect for their elders) and that the children of the one-child generation tend to be self-centred and less cooperative (see, for example, Lee, 1992; Fan, 1994; Wang, Leichtman, and White, 1998). As the first cohorts of the OCP entered the labour market, employers started to add phrases such as "no single children" in job advertisements.¹² To our knowledge, however, no rigorous study has yet identified the impact of the policy on children who would otherwise have had siblings.

¹¹ See "Has China's One-Child Policy Worked?" in BBC News online, 20 Sept 2007. <http://news.bbc.co.uk/2/hi/7000931.stm>.

¹² For example, in the book "Factory Girls", the author Leslie Chang recorded many job advertisements in job fairs in Guangdong province which included such a phrase.

3. Sampling and Experimental Methodology

3.1 Sampling Strategy and the Data

Our sample was selected so that approximately half of participants were born before the introduction of the OCP in 1979 and half were born just after its introduction. Specifically, individuals were recruited from the general population of Beijing, and were selected so that a quarter of the sample was born in each of the following years: 1975, 1978, 1980 and 1983. We sought to have gender balance within each of the birth year cohorts. All participants were required to have parents both of whom had urban residency status (*hukou*) at the time of their birth. This ensures that those born after the introduction of the policy were subject to a strictly-enforced policy.

The aim of having cohorts that were one and four years on either side of the policy's introduction was twofold. The 1978 and 1980 cohorts allow us to compare individuals who were affected by the policy with those who were not. Since these two cohorts are drawn from the same general population and their difference in age is kept as small as possible (29.7 years versus 31.7 years in the data), they were expected to be similar in all other respects. We were concerned however that just concentrating on the 1978 and 1980 cohorts might not elicit the full impact of the policy since those born just after the policy's introduction are more likely to grow up with a larger extended family (for example, more older cousins) than those born several years after the policy's introduction. For this reason, we also recruited people born four years before and after the policy (in 1975 and 1983, respectively). Although the impact of the policy for those born four years after its introduction is likely to be less than the impact of the policy for those born after the policy had been in effect for much longer,¹³ we felt that looking beyond these four cohorts would risk attributing what are actually age effects to the policy.¹⁴

The experiments were conducted in early March 2010 in Beijing.¹⁵ The participants were recruited through a private survey company using an advertisement designed by the

¹³ For example, those born a generation after the policy's introduction are likely not to have aunts and uncles, let alone cousins.

¹⁴ We examine the sensitivity of the results to age effects in section 6.4.

¹⁵ Although Beijing is not representative of the nation, it may be reasonably representative of urban areas where the OCP has been strictly implemented. Falbo and Poston (1993) compare only children and children with siblings with respect to personality traits across different urban areas in China. Their results for urban areas in Anhui, Gansu, Hunan and Beijing were largely similar. Further, 12% of our sample was not born in Beijing and we find no difference in the behavior of only children who were born in Beijing and only children born elsewhere. The results are available on request.

researchers. The company recruited the subjects through their regular subject-recruitment-network, by approaching them on the street, and by posting the advertisement on their website, notice boards, and street lampposts across the city.

The final sample consists of 421 subjects.¹⁶ Our data allows us to control for a number of demographic and socio-economic factors, including the participants' education, place of birth, work experience, and occupation. To test the representativeness of our sample, we compare the education level, marital status, and minority status of the participants with those from the Beijing subsample of the National Bureau of Statistics (NBS) 2009 Urban Household Survey data (UHS). This is the only official urban household level survey available. Since the UHS does not provide information on parents' *hukou* status, we restrict the UHS sample to individuals born in 1975, 1978, 1980, and 1983 with urban *hukous*. As can be seen in Table 1, our experimental sample is significantly more educated than the UHS sample across all the cohorts. For marital status, only the cohorts born in 1983 differ significantly. This is due to the UHS survey years not lining up exactly with our sample date. The UHS survey was conducted in 2009, when the 1983 cohort was 26 years of age, while our experiments were conducted in 2010 when these individuals were 27 years old. The 2009 UHS data show that the proportion of individuals that are married increases from 21 percent at age 25 to 46 percent at age 27. This explains why more people are married in our slightly older sample. In terms of minority status, no significant differences are found.

Thus, our sample is biased towards the educated population, but otherwise reasonably representative. It is therefore important for us to carefully control for the educational background of the participants in the empirical work conducted below.¹⁷

¹⁶ 468 subjects participated in the experiment. All reported when they were recruited that both of their parents had urban *hukou* at the time of their birth, but 35 revealed in the post-experiment survey that this was not the case. Five subjects either did not report their birth date or their birth year as reported in the post-experiment survey did not fall into the four cohorts we required. Another 7 did not report gender. These 47 observations are dropped from the sample. Four participants reported being born in 1974 and are grouped with the 1975 cohort. In our estimations below, we further delete a small number of observations as a few of the participants failed the questions that were designed to examine their understanding of each of the games. The test questions can be seen in the protocols in the appendix. The number failing the test questions are: Dictator Game – 11; Trust Game: 13; Risk Game – 5; Competition Game: 2.

¹⁷ One concern that may be raised in regard to our sample selection is that selection effects may differ across cohorts. That is, those who chose to participate in the experiments in the older cohorts may differ from those who chose to participate in the younger cohort (for example, because of differing opportunity costs of time). To examine this, Figure 2 presents the wage distribution of our pre- and post-OCP cohorts against the distribution of wages for these cohorts from the NBS data. It shows that in both cohorts the reported wages are higher amongst participants than in the NBS data (reflecting the bias towards more educated workers), but that this is equally true of both the before and after cohort.

Table 2 presents summary statistics of the experimental data. Across the four cohorts, on average, 88 percent of our sample was born in Beijing, and 49 percent is male. The proportion male varies only slightly across the four birth cohorts. The average age of the sample is 30.68 and it ranges from 26.73 for those who were born in 1983 to 34.66 for the oldest cohort.

Table 2 also shows that of the total sample, 65 percent are single children. This increased from 27 percent for those born in 1975 to 61 percent for the cohort born just before the introduction of the OCP. After the policy's introduction, the ratio increased to 81 percent. Between 1980 and 1983, it further increased to 91 percent. The average number of siblings decreased from 0.97 for the 1975 cohort to 0.12 for the 1983 cohort. We also report the total number of cousins each participant has. On average, individuals in our sample have 7.6 cousins. The difference between the pre-OCP and post-OCP cohorts is small (7.8 for the 1975 cohort and 7.0 for the 1983 cohort). Thus, the extended family effect is small between the pre- and post-OCP cohorts, and the main difference between the two cohorts is in the number of siblings.

At the end of Table 2, we report the proportion of individuals whose mother or father have either 3-year college or university and above degrees. These proxy for family income during our respondents' childhoods. On average, 17 percent mothers and 22 percent fathers have a 3-year college degree, and 6.9 percent mothers and 15 percent fathers have a university and above degree. There is not a systematic change in parental educational attainment across cohorts.

3.2 Experimental Protocols

Each of the four games conducted is described below. All games were played with paper and pen. We conducted sessions with 14-22 participants. All sessions were conducted in one of two rooms in a corporate building complex in central Beijing. On arrival at the rooms, participants were told that they would be playing a number of games and would be paid at the end of the session based on their behavior in one of the games. The game for which they would be paid would be decided by the toss of a die.

The experiment started with reading the instructions for Game 1. At the completion of Game 1, the instructions for Game 2 were given and so forth. At the completion of all four games, participants filled out a survey with questions on demographic variables; personality

traits; outlook on life; and attributes encouraged by parents, and were paid at the end of the session.¹⁸

We chose not to randomize the order of the games. This would have created additional logistical burden in what was already a logistically difficult exercise. Moreover, since our interest is in a comparison of the treatment and comparison groups, order effects would have been differenced out.¹⁹

Participants were seated so as to minimize observation of other people's decisions, and were explicitly told not to look at other people's forms, and all forms for decision-making were distributed and collected in envelopes.²⁰ In games where participants were paired with others, the pairings were pre-determined and anonymous and no two participants were paired twice in the entire experiment to preserve the one-period nature of the games. All participants were informed of these conditions prior to playing the game.

Game 1: The Dictator Game

The Dictator Game is designed to elicit the extent of altruism amongst participants (see, for example, Eckel and Grossman 1995; Forsythe et al. 1994). In this game, participants are randomly paired. One player is designated as Player 1 (the dictator) and must decide how much of his endowment (in this case 200 RMB, which is approximately 1.6 days average earnings for Beijing workers in these cohorts or US\$30²¹) to give to Player 2. Player 2 does not make a decision and simply accepts the amount given, x , where $0 \leq x \leq 200$ RMB. The final payoffs for Player 1 and Player 2 are $200-x$ and x , respectively. In our design, each participant plays both as Player 1 and Player 2. That is, each participant makes an allocation decision with one anonymous partner and is also the recipient of an allocation from a different anonymous partner. The allocations that participants received were not revealed to them until the end of the entire experiment.

¹⁸ Instructions, the survey questionnaire and the recruitment flyer were initially prepared in English. They were translated into Mandarin by a research assistant. The translation was then checked by one of the authors who is fluent in both languages.

¹⁹ Cameron et al. (2011), randomized the order of the same games in experiments conducted with a subject pool of Chinese ethnicity in Australia and found no evidence of order effects.

²⁰ Situating all participants in one room has the advantage of eliminating suspicion about pairings or the presence of a co-player, which could lead participants to act more strategically and consequently for experimenters to 'overstate, systematically, the role of self-interest in individuals' motivations' (Frohlich, Oppenheimer and Moore 2001).

²¹ Using UHIES for the four cohorts in Beijing, we calculated that on average they earn 125.8 RMB daily assuming 300 working days per year. The RMB amounts in each of the games were chosen so as to keep the average payment across the games as similar as possible. The average payoffs in each of the games were: 1) Dictator Game: Player 1 – 117 RMB, Player 2 -83 RMB; 2) Trust Game: Player 1 – 99RMB, Player 2- 97RMB; 3) Risk Game : 94 RMB; 4) Competition Game: 60 RMB.

Game 2: The Trust Game

The Trust Game employed is the standard game used in the literature, based upon Berg et al. (1995). Participants are again paired randomly. Player 1 (the Sender) is given an endowment of 100 RMB. S/he then has the option of sending some amount, x ($0 \leq x \leq 100$ RMB), to Player 2 (the Receiver). Any amount sent is tripled by the experimenter before it reaches Player 2. Both players know that this happens. Player 2 then has the opportunity to send some amount, y ($0 \leq y \leq 3x$), back to Player 1. The payoffs are thus $100-x+y$ for Player 1 and $3x-y$ for Player 2. Player 1's behavior in this game is interpreted as 'trust' and Player 2's behavior is interpreted as 'trustworthiness.'

Each participant plays both the Sender and Receiver roles as in Burks et al. (2003), Chaudhuri and Gangadharan (2007), and Bonein and Serra (2009). After all participants in the room make a decision as Player 1, the forms are collected and then redistributed according to pre-determined anonymous pairings. All participants then receive a form as Player 2 and decide how much to send back. No one is informed of the amount sent back to them until the completion of all games and the survey.

Game 3: The Risk Game

The Risk Game used in this experiment is from Gneezy and List (2008). In this simple game, each participant is given 100 RMB and the choice to put any amount between 0 and the entire endowment into an 'investment', which yields triple the amount invested with 50% probability and 0 with 50% probability. The outcome is decided by the flip of a coin, where heads result in investment success while tails result in investment failure. More risk-averse individuals choose to invest less in the risky option.

Game 4: The Competition Game

This Competition Game is used to elicit how competitive participants are. This particular version is taken from Niederle and Vesterlund (2007). Individuals are told that they are going to be asked to add up as many sets of five two-digit numbers as possible in five minutes. The numbers are randomly generated and presented as below, where participants write the total in the blank box.

22	17	83	61	49	
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Calculators cannot be used, but scrap paper is provided for hand-written calculations. Participants are asked to choose between two different payment schemes. Option 1 is a piece-

rate which paid 5RMB for every sum correctly completed. In Option 2, payments are determined in a competitive way. Each participant is anonymously paired with someone else in the room. S/he is paid 10 RMB for every sum correctly completed if s/he completes more sums correctly than the person with whom s/he is paired, 5 RMB if both participants complete the same amount of correct sums, and 0 RMB if s/he loses the competition. Prior to completing the task, participants are asked how many sums they think they can successfully complete in five minutes. They are also asked whether their performance will be well above average (top quintile), above average (2nd quintile), average (middle quintile), below average (4th quintile), or well below average (bottom quintile). This information is used to examine differences in confidence across the different cohorts.

4. Identification Strategy

This paper examines two questions: 1. The behavioural impact of the OCP; and 2. the causal effect of growing up as only children because of the OCP.

Estimating the following reduced form equation identifies the impact of the OCP.

$$Y_i = \alpha + \beta X_i + \gamma D_i + \varepsilon_i \quad (1)$$

where Y_i is one of the behavioral outcomes we observe from the experiments; and X_i is a vector of exogenous control variables which affect individual behavior. The main variable of interest is D_i which equals 1 if an individual is born after the introduction of the OCP, zero otherwise. The coefficient γ identifies any differences between those born before and after the policy and is our estimate of the behavioral impact of the OCP. Note that although the main effect of the OCP is to grow up as a single-child, the coefficient γ is not an estimate of the effect of being a single child. Being a single child is not a unique characteristic of the after cohort, many before cohort individuals are also single children and some children born after the policy are not single children (see Table 2). The coefficient, γ , is thus the average behavioral effect of the OCP across the population.

If being a single child were exogenous, then the effect would be estimated consistently from:

$$Y_i = \alpha + \beta X_i + \phi Single_i + v_{ii} \quad (2)$$

where $Single_i$ is an indicator for being an only child. The coefficient of interest would be ϕ . However, being a single child in the pre-policy cohort was normally a choice of parents. Thus, the coefficient on $Single_i$ in equation (2) picks up not only the effect of being a single

child but also the effect of any omitted family background variables, which influence the probability of being an only child. As we discussed before, this is a problem if the unobserved parental characteristics which make the parents choose to have one child also affect individuals' behavioural outcomes via genetic or "nurture" channels, which is highly likely. The variable $Single_i$ is endogenous.

However, we can use the OCP indicator, D_i , to instrument for the endogenous variable $Single_i$ and thus identify the causal effect of growing up without siblings as a result of the OCP. We estimate the equations below using an IV approach, where equation (3b) is the first stage regression.

$$Y_i = \alpha + \beta X_i + \phi Single_i + v_i \quad (3a)$$

$$Single_i = \eta + \delta X_i + \kappa D_i + u_i \quad (3b)$$

Provided the instrument satisfies a number of assumptions, the IV estimate of $\hat{\phi}$ can be interpreted as the Local Average Treatment Effect (LATE) on growing up as only children because of the OCP on behaviour outcomes. individuals who otherwise would have had siblings but became a single-child only because of the OCP. The assumptions required are that the OCP has a strong impact on an individual being a single-child, that the effect of the policy increases but does not decrease individuals' probability of being a single-child, and that the OCP has no direct impact on individuals' behavioral outcomes other than through its impact on being a single-child (Imbens and Angrist, 1994).²²

The OCP indicator, D_i , clearly satisfies the first assumption (as shown in the first stage regressions presented in Appendix B). To assume that the existence of the OCP worked to increase but not decrease individuals' probability of being a single child is also reasonable. To ascertain that our instrument satisfies the third assumption, we first need to make sure that there were no other policies or events that coincided with the introduction of the OCP in 1979 which might have affected the narrowly defined before and after cohorts differentially through other channels.

One possible candidate for such a policy/event is the introduction of the market oriented economic reforms in 1978. The economic reforms are most likely to have affected behavior of individuals via their effect on household income. If, when growing up, the post-

²² If we substitute equation (3b) into equation (3a), we get $Y_i = (\alpha + \eta\phi) + (\beta + \phi\delta)X_i + \phi\kappa D_i + (v_i + u_i)$. Thus, the coefficient on D_i in equation 1 is the average effect of the policy across the cohort. It is the impact of being an only child diluted by the proportion of the population who would be an only child in the absence of the program.

OCP cohorts were subject to higher economic growth and their families had higher income levels, our identification strategy may be compromised.

China's economic reform was initiated in the agriculture sector first in late 1970s. It was not until the early 1980s (1983-1984) that the reform began to spread to cities and China's "open door" policy was introduced. Urban reforms and economic growth accelerated from 1992 onwards (Tang, 1998). Figure 3 presents urban per capita disposable income for the years 1978 to 2004. It shows a marked acceleration in urban income growth from 1992 onwards. The curve is relatively flat prior to that. By 1993, our oldest cohort was 17 years of age and the youngest was 9. Thus, all cohorts had passed their crucial early childhood development stage. We nevertheless acknowledge that it is possible that the change in the socio-economic environment may have differentially affected the 17 years old and 9 years old. Our middle two cohorts however are only two years apart in age and the impact on them should be very similar. Thus, in our empirical work, we use the middle two cohorts to test the sensitivity of the economic reform effect.

The second possible policy which may affect our identification strategy was introduced 20 years later. In 1999, the Chinese government increased university enrolments by 40 percent and such increments continued until well beyond the mid 2000s. The first cohort being affected by this policy change is those born in 1981 (aged 18 in 1999) and the cohorts born thereafter are also affected. Fortunately, we have two ways to mitigate the potential contamination of the OCP effect. First, only one of our two after-cohorts (the 1983 cohort) is affected by the 1999 university expansion policy. We can compare the 1978 and 1980 cohorts, neither of which is affected by the university expansion policy, to eliminate the impact of the university expansion policy. Second, the channel through which the university expansion policy may affect individual behavior is education. We are able to directly control for individuals' educational attainment.

Another channel, through which the instrument may exert a direct impact on the behavioral outcomes of individuals rather than affecting the outcomes indirectly through being a single-child, is the "peer effect" of being born under the OCP. This may include growing up surrounded by other "little emperors" in the peer group. It could also reflect having fewer cousins and smaller extended family. Our sampling strategy of restricting cohorts to those born close to the introduction of the policy limits the extent of the possible peer effect. For example, the cohort born four years prior to the introduction of the OCP has an average of 7.8 cousins, compared to 7.01 cousins for those born four years after. Although

the OCP undoubtedly caused more people to have single children, the previous less strict family planning policies had already caused the fertility rate to drop substantially (see Figures 1). This further reduces the scope for large differential peer effects. In our sample, 61 percent of the 1978 cohort are single children, compared to 82 percent of those born in 1980 (Table 2). If peer effects are large, we would expect to see different results for the 1978-1980 comparison than for the comparison of the full sample.

Finally, the OCP indicator also captures age differences across the cohorts. If behaviour in the economic experiments differs with age, then this would also constitute a contravention of the third assumption. We closely examine the data for age effects below and find no evidence of them.

5. Results

5.1 Tests of Differences of Means and Distributions

Table 3A presents t-tests and rank sum tests of differences in behavior between those born before and after the OCP for each of the games. Figure 4 presents the unconditional distributions for each of the outcome variables, similarly broken down. Table 3A also disaggregates behavior by whether the participant actually is an only child or has siblings.

Column 1 presents the average amount kept by the “dictator” in the dictator game. Of the 200RMB with which participants were endowed, those born under the OCP kept slightly more for themselves than those born before the policy. OCP participants kept on average 119.8 RMB (60%) versus 113.3 RMB (57%) for pre-OCP participants. The t-test of difference in means is statistically insignificant ($p=0.11$), however the rank sum test indicates the difference is significant at the 10% level ($p=0.06$). The difference in the tests may be due to the significant difference at the right tail of the distribution (see the left top panel of Figure 4).²³ The lower panel of the table indicates the difference on the basis of whether the participant is actually an only child or not. These differences are in the same direction with only children keeping more for themselves (58.7%) than participants with siblings (57.4%). This difference is however smaller and not statistically significant.

Columns (2) and (3) present the results from the trust games. Similar but more marked differences in behavior occur. OCP participants on average kept more for themselves (53.9% versus 49.4%) as did only children (53.8% versus 47.5%). Both of these differences are statistically significant. OCP participants also returned significantly less than those not born

²³ The t-test is a test of differences of means. The rank sum is a test of differences in medians.

under the policy (30.4% versus 35.4%), as did only children when compared to participants with siblings. The distributional difference for the amount kept and the amount returned can also be seen from the top right panel and bottom left panel of Figure 4, respectively.

Significant differences in behavior are also discerned in the risk game. OCP participants invested significantly less in the risky investment. This difference is large and statistically significant (58.1% of the 100 RMB endowment was invested for those born under the Policy versus 66.4% for those not). In contrast, the difference between only children and participants with siblings is small (in the same direction with only children investing less) and statistically insignificant. The difference in these findings is reconciled in our estimation results below.

Many fewer OCP participants chose to compete in the competition game than those born before the policy (44.2% versus 51.8%). Although this difference is substantial, it is not statistically significant ($p=0.11$). When one compares only children to participants with siblings, the difference largely disappears. The sample mean suggests that only children are less confident in their abilities than children with siblings (maybe contrary to expectations), but again the difference is statistically insignificant. Where there is a large difference between participants with and without siblings is in terms of their performance in the competition. Only children and participants born under the OCP completed significantly more sums correctly than their counterparts. This may reflect the attention and assistance only children receive from their parents and is consistent with the papers cited in section 3 that only children generally perform better academically (see, for example, Falbo and Poston, 1993).²⁴

5.2 Regression Results

The results presented above do not control for demographic and other characteristics that may differ across participants and they ignore the possible endogeneity problem associated with growing up as only children. In this section, we present regression results. For each decision that participants make we present three sets of results. First, we present a reduced form regression which examines differences in behavior between those born before and after the policy. This captures the average policy impact across the sample. Second, we present naïve regression results with an only child indicator as an explanatory variable. These results show differences in behavior between only children and children with siblings, but they are

²⁴ Compared to the experimental results in Western countries, the Chinese sample reported in this paper send more in both the trust and dictator games, return more in the trust game, are more risk-averse, and are less competitive. See Cameron et al. (2011).

inconsistent due to the endogeneity problem. Third, we present instrumental variables results that identify the causal effect of growing up as a single-child as a result of the OCP. The first stage regression is presented in Appendix B and confirms that the OCP is a strong predictor of whether a child has siblings or not. Being born under the OCP increases the probability that an individual is an only child by 42 to 44 percentage points ($p < 0.001$).²⁵

Each specification also controls for the participant's gender, educational attainment, and whether the participant was born in Beijing.²⁶ As discussed before, controlling for educational attainment is important because the 1999 university expansion program affects one of the post policy cohorts but not other cohorts. We need to control for education so that we can be sure that our results are being driven by the OCP induced only-child effect, rather than increases in educational attainment. Specifically, we control for whether the participant has a 3-year college education, or a university and above degree with omitted category being below 3-year collage. Educational attainment is significant in many of the specifications, but its inclusion does not affect the coefficients on the OCP and only child measures. Finally, we control for the mother's education level (dummy variables for mother with a 3-college degree or a university and above degrees) to control for family income level during childhood.²⁷

The issue of age deserves some discussion. The OCP indicator is defined according to birth cohort. In our sample, the correlation coefficient between age and the OCP indicator is 85 percent for the full sample and 96 percent for the sample restricted to 1978 and 1980 (the years on either side of the policy's introduction). With such a high correlation, our estimations run into severe multicollinearity problem if age is included as an explanatory variable. One might thus be concerned that behavioral differences that we are attributing to the OCP are actually age effects. In section 6.4 below, we use the pre-OCP cohorts to explore to what extent behavioral outcomes in our data are associated with age. We also conduct sensitivity tests designed to examine the role of age. We find no evidence that the difference in the age of the pre-OCP and post-OCP cohorts is driving our results.

Dictator Game

²⁵ Variations in first stage results are driven by differing number of observations.

²⁶ The majority (88 percent) of our subjects were born in Beijing. We also tried controlling for whether participants had children but this was not a significant determinant of behavior.

²⁷ Due to high degree of correlation between mother's and father's education, we only control for mother's education level. In other specifications we included individuals' income as an explanatory variable. Income was statistically insignificant.

We start by focusing on the results in panel 1 of Table 4A. These are for the full sample. We report results from tobits that control for censoring of the data at zero and 200.²⁸

The results in Column (1) show that those born under the OCP keep on average 5.7 RMB more (3% of the endowment) for themselves. This difference is however not statistically significant. Column (2) shows that there is similarly a small but insignificant difference between the average amount kept by only children and individuals with siblings. The estimate of the causal impact of being an only child is larger but remains insignificant. Hence, we find no evidence of being an only child and the OCP on other-regarding behavior as captured in the dictator game.

Trust Game

Significant differences are however found in the trust game (Columns 4-6). Individuals born under the OCP send 6.98 RMB (7 percentage points) less than others. Being an only child is also associated with sending 7.27 RMB less. Controlling for the potential endogeneity of being an only child (the IV estimates) identifies the causal impact of being an only child as keeping 16.0 RMB more. This suggests that growing up as a single child as a result of OCP makes people less trusting. Similarly, columns (7) to (9) indicate that people born under the OCP returned on average 5 percentage points less of the sum they received. Only children returned 5.6 percentage points less than people with siblings. The causal impact of being an only child for individuals become single child is estimated to be a decrease of 11.3 percentage points in the amounts returned.

The Sender's decision in the trust game may be influenced not only by trust, but also by risk attitudes, altruism and/or inequity aversion. To examine this, we include the amount invested in the risk game and the amount kept in the dictator game as explanatory variables in the trust game regressions. Panel 2 of Table 4A shows that being more risk averse is associated with sending less in Player 1's role in the trust game. Those who kept more in the dictator game also kept more in the trust game and returned less in the trustworthiness game. Even after controlling for risk-aversion and altruism, the effect of the OCP and the causal impact of growing up as only children as a result of the OCP remain unchanged. With respect to trustworthiness, controlling for altruism reduces the precision of the estimate of the

²⁸ Similar results are obtained from linear probability models.

coefficient on the One-Child Policy variable and the causal impact is now marginally insignificant ($p=0.107$).²⁹

Risk Game

The results for the risk game confirm that being born under the OCP is associated with taking fewer risks. People born under the policy invested on average 8 percentage points less than others. Being an only child as a result of the policy (the IV result) is associated with the average amount invested in the risky option being 19 percentage points lower.

The risk game results show evidence of a parental-selection effect. When selection is taken into account, (column 12) we find that growing up as an only child makes one more risk-averse. When the endogeneity of only child status is not taken into account (column 11), only children do not differ from others in their risk-taking behavior. This suggests that the parental selection effect offsets the no-sibling effect. Thus, it is consistent with more risk-loving parents choosing to have only one child, and children inheriting or learning this behavior from their parents. Children play an important role in supporting parents in old age in China. Risk-averse parents may have a preference for more children so as to increase the chance that at least one child survives to provide support in old age.

In results available from the authors, we also find that only children born before the policy (where parental-selection plays a role) are significantly more risk-loving than only children born after the policy. They invest 8.2 percentage points more in the risky option (significant at the 5% level). This is again consistent with people who are only children by parental choice inheriting or learning their parents' more risk-taking behavior.

Competition Game

Column (14) shows no significant difference between only children and others in terms of their propensity to compete. The OCP however make people less likely to choose to compete (column 13) and the causal impact of being an only child is associated with a large and statistically significant reduction in the probability of selecting to compete by 20 percentage points. The comparison of columns (14) and (15) suggests that prior to the OCP, more

²⁹ We asked the participants in the post-experiment survey to choose from a list of personal attributes that their parents encouraged. In line with the results from the trust game, only children are significantly less likely to report that their parents encouraged them to trust other people. Having only one child also causes parents to be less likely to teach their children not to be selfish. It may be that having more than one child naturally leads parents to discuss the benefits of being less selfish and the need to trust others, whereas such discussions do not arise so often in a one-child household where there is less need for the child to work with others. These results are available from the authors on request.

competitive people chose to have only children. This would be consistent with these parents having only one child so as to be able to invest heavily in that child.

Interestingly, these differences in competitiveness are not driven by differences in ability or confidence in the competitive task. Table 4B presents results with individuals' own predictions of their rank in the competitive game and their actual number of correct answers as dependent variables. (The predicted rank equals 5 if an individual believes he/she is among the best, and 1 if they think they are among the worst. Thus, a positive sign indicates confidence.) The table shows that there is no effect of the policy or being an only child on confidence in the task. Columns (1) to (3) show that only children get significantly more sums correct. Taken together, that only children are more able at the task, just as confident as non-onlies, but less likely to choose to compete suggests that growing up as a single child reduces one's competitive drive. Indeed, when we control for the number of correct answers in the competition regression, we find that the effect of being an only child due to the OCP is slightly larger and more statistically significant than without such a control.³⁰ Being university educated increases the predicted rank and the actual number of sums that subjects get correct. Being male is associated with greater confidence but getting 1.2 fewer sums correct.³¹

Since the decision whether to compete or not in the competition game involves an assessment of the risks involved, we include the amount invested in the risk game as an explanatory variable in the competition. Panel 2 of Table 4A shows that being more risk averse is associated with being less likely to choose to compete in the competition game. The effect of the policy on competitiveness becomes insignificant once we control for risk-aversion, although the sign and magnitude do not change. Hence, it seems that there is no statistically significant difference in competitiveness between only children and others once risk aversion is controlled for. Controlling for the ability of doing sums does not change these results.

5.3 Subjective Assessments

In addition to the behavior observed in the games, participants were asked a number of questions that seek to assess their personality type and outlook on life. In this section, we

³⁰ These results are available upon request from the authors.

³¹ In unreported results, we interact "only child" and "One-Child Policy" variables with gender. We do not find a difference by gender.

examine the impact of having siblings on these traits and attitudes in the same way as above. In particular, we examine individuals' answers to the following questions:

1. What do you think are the chances that it will be sunny tomorrow? Please write a number from 0 to 100, where 0 means 'absolutely no chance' and 100 means 'absolutely certain'.
2. Generally speaking, would you say that most people can be trusted or that you need be very careful in dealing with people?
3. Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?

The first question is widely used as an indicator of optimism.³² The latter two questions provide survey-based measures of trust in other people.

The post-experiment survey also implemented the "Big Five Inventory" (BFI), which contains 44 questions designed to categorize people in terms of openness (inventive/curious versus consistent/cautious); conscientiousness; extraversion; agreeableness; and neuroticism (sensitive/nervous versus secure/confident). The five broad factors together encompass most known personality traits and the 44 questions are used to construct scores for each of these traits.³³ We also examine to what extent these traits are determined by the OCP and single-child status.

Tables 5 and 6 present the results. Those born under the OCP exhibit significantly less optimism than others (after controlling for the day on which the sessions were conducted). We do not find statistically significant results for the first survey-based measure of trust (although the point estimates are in line with our experimental results). However, the results for the second survey-based measure of trust are striking. We find that those born under the OCP are 9.4 percent less likely to think that most people like to help others, and growing up as a single child due to the OCP makes individuals 21 percent less likely to think that most people like to help others. These findings are consistent with the experimental results from the trust game.³⁴

In terms of personality type, the causal impact of being an only child is to decrease the extent of conscientiousness and increase the extent of neuroticism. The finding that

³² See, for example, the U.S. Health and Retirement Survey.

³³ For details of the questions used and how the index is calculated, see <http://www.ocf.berkeley.edu/~johnlab/bfi.htm>.

³⁴ People are more likely to trust others if they think people are less likely to be just looking out for themselves. Gächter et al. (2004) find that this question is positively associated with cooperation in the public good game.

conscientiousness decreases is counter to the argument in the empirical literature in psychology that single children have a greater motivation to achieve, but it is consistent with Chinese parents' views of their only children as reported in Zhang et al. (2001).

The survey also asks participants to choose from a list of personal attributes their parents have encouraged and taught them to have. These include being independent; hard working; responsible; imaginative; being tolerant and respectful of others; trusting other people; giving and looking after less fortunate people; thrift and saving money; determination and perseverance; religious faith; unselfishness; and competitiveness. We define attributes that are encouraged by both the mother and father as being 'encouraged by parents'. Table 7 reports the results.

There are several statistically significant causal consequences of being an only child. Only children are significantly less likely to report that their parents encouraged to trust other people. This result coincides strongly with our experimental results that single children are less trusting and less trustworthy. Having only one child also causes parents to be less likely to teach children not to be selfish. Only children also report that their parents are significantly less likely to teach them to care for the less fortunate, although this seems to be a parental-selection effect as it becomes insignificant once we instrument. No single attribute maps directly into risk-taking behaviour but being thrifty could be associated with greater risk-aversion. Table 7 shows that parents of only children are more likely to teach the importance of thrift and saving money. Parents of single children are also less likely to teach their children to be imaginative. Teaching children to be imaginative may also increase the probability that they learn to take risks. There is no significant impact of being an only child on the teaching of competitiveness by parents (although the point estimates are negative, in line with the experimental results.) In contrast to what one might predict from the existing literature, the teaching of values associated with "achievement motivation" like hard work, and responsibility are not affected by one child status.

The teaching of unselfishness, thrift, trust and imagination all appear to be causal impacts of having only one child. (Note that there is no significant difference between only children and others when we do not instrument.) It may be that having more than one child naturally leads parents to discuss the benefits of being less selfish and the need to trust others, whereas such discussions don't arise so often in a one child household where there is less need for the child to work with others.

That parents of the One Child Policy cohort are more likely to teach thrift is consistent with the finding that in urban China parents of the One-Child generation have saved significantly more than their counterparts who have more children (Banerjee, Meng, and Qian, 2010). We conjecture that parents of the single-child generation have recognised that as adults their children will not have as much support as children from a larger family. Thus, they need to save to support themselves and also to support their parents in old age. Being less generous to others and more conservative (less imaginative) may also work to maximise the probability of having adequate financial resources in later life.

5.4 Robustness

As mentioned above, a difficulty with isolating the impact of the OCP is that being born under it is correlated with age. In our sample, participants born under the OCP are aged between 26.7 and 29.7. In contrast, those not born under the policy are aged 31.7 to 34.7. It may be that what we are attributing to the policy is an age effect. The psychology literature however suggests that personality characteristics are largely stable at around this age (Costa and McCrae, 1988; Cobb-Clark and Schurer, 2011).

We do two things to examine whether age effects are likely to be driving our results.³⁵ First, we look within the pre-OCP and post-OCP samples for evidence of age effects. Table 8 presents the results. Age is insignificant in every specification (all p-values are greater than 0.25). Second, we examine results estimated over only participants who were born the year before and the year after the OCP. This reduces the role age differences can play in the results. As discussed above, it also reduces the likelihood of peer effects and the likelihood that the economic reforms introduced in 1978 and the university expansion policy introduced in 1999 play a role in the results. The results are presented in Panel 3 of Table 4A, and Panel 2 of Tables 5 and 6. In all cases where we had significant results over the whole sample, the sign of the point estimates are the same over the narrower sample, and in most cases similar

³⁵ Schechter (2007) and Sutter and Kocher (2007) find that age is not a determinant of behavior in the trust game. Harrison, Lau and Rutstrom (2005), Charness and Villeval (2008), and Liu (2008) find that age has no effect on risk aversion. In contrast, Anderson et al. (2004) and Harrison, Humphrey and Verschoor (2010) find a decrease in risk-aversion with age. While Charness and Villeval (2008), and Gneezy, Leonard, and List (2008) find no effect of age on competitiveness, Garatt et al. (2010), using data from a natural field experiment, find that older participants exhibit competition-avoiding behavior (as does OECD using survey data from 2006). This would mean that our finding that being born under the OCP is associated with being less competitive understates the true extent of the impact. Finally, in a meta-analysis of the dictator game results Engel (2010) finds that age is positively correlated with giving in the dictator game. This would bias us towards finding that the OCP reduces giving, which we do not find.

or larger in magnitude. In some cases, statistical significance is reduced as a result of the smaller sample size.³⁶

5.5 Real world outcomes

What do these results mean in terms of real world outcomes? Previous studies have shown that behaviour in games of the type played, correlates with real world behaviour. For example Liu (2010) shows that Chinese farmers that took more risk in experimental risk games were more likely to adopt new technologies. Cameron and Shah (2011) show that those taking less experimental risk are less likely to change jobs or open a business. Fehr and Leibbrandt (2011) show that fisherman in Brazil who act more cooperatively in the lab are less likely to exploit the fishing grounds. Various studies have also shown that non-cognitive attributes like conscientiousness, neuroticism and optimism are important determinants of educational attainment (Heckman et al., 2006; Sayelyev, 2010), health (Sayelyev, 2010) and marriage and divorce (Lundberg, 2010).

The real world outcomes we focus on here are whether individuals are taking more risky jobs, which we define to include private firm managers, stock brokers, people who are self-employed or freelancing; and whether individuals gave money to their parents in the previous 12 months. Table 9 presents the results. Columns (1) to (3) show that being born under the One Child Policy is associated with a decrease in the probability of taking up risky jobs by 9.3 percent, and the causal impact of the Policy on only child is to reduce the probability of taking one of these jobs by 22.7 percent.

Only children born as a result of the policy were also 13.7 percentage points less likely to have provided financial support to their parents in the past year. To allay concerns that the before cohort may have older parents who need more support, we also control for mother's age. This does not change the results. These results are consistent with parents of only children being less likely to encourage unselfishness and more likely to encourage thrift.

6. Conclusion

We have analyzed the behavioral impacts of China's OCP and the causal impact of growing up as only children as a result of the OCP, focusing on pro-social behavior, risk aversion and

³⁶ We also examined to what extent the "only-child effects" are distinct from first-born effects. In results available from the authors on request we find that where only children differ from people with siblings, they also differ from first-borns with siblings. The only exception was for conscientiousness where we could not reject equality of first borns and only children. First-borns with siblings do not differ systematically from non-first borns.

competitiveness. We find large and statistically significant impacts of the OCP as well as the causal effects of growing up as single children as a result of the OCP in the trust, risk, and competition games. Our results suggest that by producing more single-children families, the OCP has led to a generation that is less trusting, less trustworthy, and less inclined to take risks. As a consequence of being more risk averse, they are less competitive. We do not find statistically significant impact of the OCP on altruism. Our post-experiment survey reveals that the OCP cohorts are also less optimistic, less conscientious, and more prone to neuroticism.³⁷ These are stark findings and perhaps they are, to some extent, associated with what parents of the OCP generation have been teaching them. We find evidence that parents of only children are less likely to teach certain pro-social values. In addition, individuals who grew up as a single child as a result of the One Child Policy are less likely to financially support their parents and less likely to take risky jobs.

We stress that these findings are obtained from comparisons of cohorts born directly around the time of the policy's introduction. The effect of the policy on the behavior of people born long after this may differ as they will be affected by peer effects – the consequence of living in a society where everybody else is also only child. Under such circumstances however, it seems likely that the policy's effect would, if anything, be magnified.³⁸ Identifying such an effect over the longer term is however difficult given that there have been so many concomitant changes. This is an area for further research.

Maybe single children are in the best position to judge the impact of a childhood without siblings. Our cohorts are now in their child-bearing years. On average being a single child as a result of the One Child Policy is associated with a desire for 0.35 more children.³⁹

³⁷ Various studies have also shown that non-cognitive attributes like conscientiousness, neuroticism and optimism are important determinants of educational attainment (Heckman et al., 2006; Sayelyev, 2010), health (Sayelyev, 2010), and marriage and divorce (Lundberg, 2010).

³⁸ Unreported results show that frequent contact with cousins works to partially offset the only-child effect. Hence, having fewer cousins would exacerbate the impact of the policy.

³⁹ This is the instrumental variables coefficient on being a single child (controlling for whether an individual already has a child or not) and is statistically significant ($p=0.086$).

References:

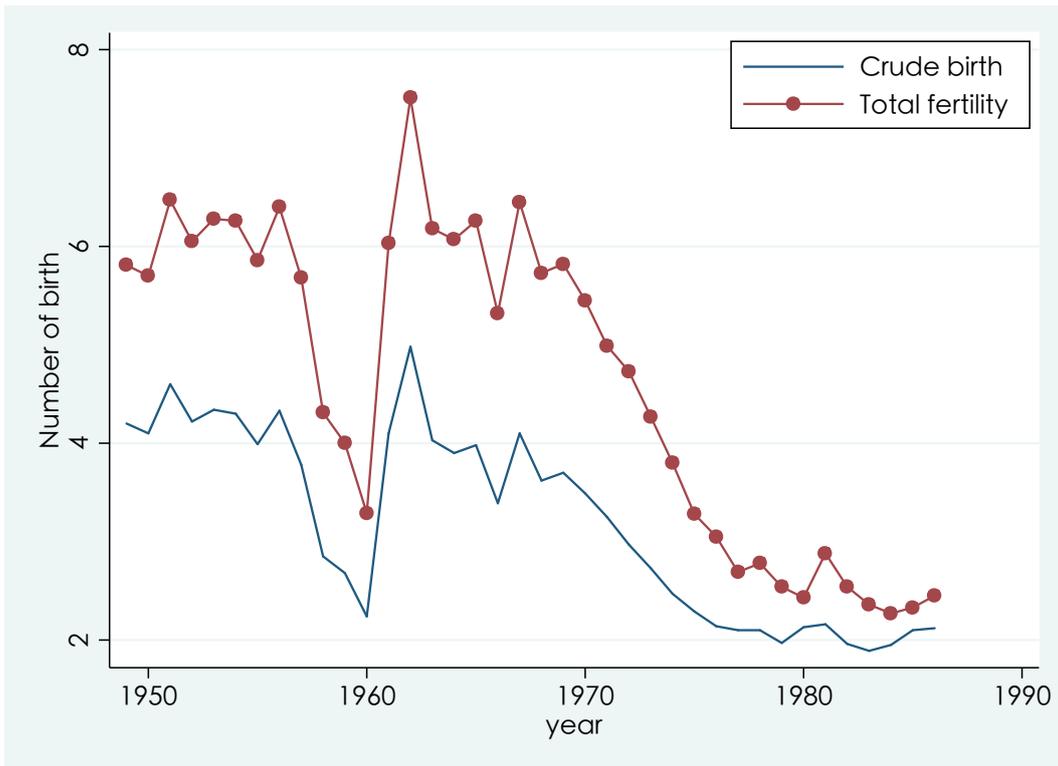
- Andersen, S., G. Harrison, M. Lau and E. Rutstrom, 2005. "Preference Heterogeneity in Experiments; Comparing the Field and Lab", working paper.
- Bandura, A. 1986. *Social Foundations of Thought and Action*, Prentice-Hall, Engelwood Cliffs, NJ.
- Banister, Judith. 1987, *China's Changing Population*, Palo Alto, Calif.: Stanford Univ Press.
- Bisin, A. and T. Verdier. 2001. "The Economics of Cultural Transmission and the Dynamics of Preferences," *Journal of Economic Theory*, 97, 298-319.
- Bisin, A. and T. Verdier. 2000. "Beyond the Melting Pot: Cultural Transmission, Marriage and the Evolution of Ethnic and Religious Traits," *Quarterly Journal of Economics*, 3, 955-988.
- Blake, J. 1981. "Family Size and the Quality of Children," *Demography*, 18, 421-442.
- Bowlby, J. 1982. *Attachment. Attachment and Loss*, Vol. 1, 2nd edition. New York: Basic Books. (Original work published in 1969.)
- Brill, A. A. 1922. *Psychoanalysis – Its Theories and Practical Applications*, Philadelphia: Saunders.
- Cameron, L., Erkal, N., Gangadharan, L. and M. Zhang (2011), "Cultural Integration: Experimental Evidence of the Evolution of Immigrant's Preferences", working paper, University of Melbourne.
- Cameron, L. and M. Shah (2011), "Risk-Taking Behavior in the Wake of Natural Disasters", working paper, University of California-Irvine.
- Center for Population Studies, Chinese Academy of Social Sciences & Editorial Board of the China's Population Yearbook, 1986, "The major events of China's population activities," the China's Population Yearbook (1985), Chinese Social Sciences Press, Beijing. pp. 1263-1288.
- Charness, G. and M. C. Villeval. 2008. "Cooperation, Competition and Risk Attitudes: An Intergenerational Field and Laboratory Experiment" *American Economic Review*.
- Cipriani, M., P. Giuliano, and O. Jeanne. 2007. "Like Mother Like Son? Experimental Evidence on the Transmission of Values from Parents to Children," IZA Discussion Paper No. 2768.
- Cobb-Clark, D. and S. Schurer (2011), "The Stability of Big-Five Personality Traits", IZA Discussion Paper No. 5943, August, pp1-10.
- Costa, P. and R. McCrae (1988), "Personality in adulthood: A six-year longitudinal study of self-reports and spouse ratings on the NEO Personality Inventory. *Journal of Personality and Social Psychology*, Vol 54(5), May 1988, 853-863.
- Dohmen, T., A. Falk, D. Huffman, and U. Sunde. Forthcoming. "The Intergenerational Transmission of Risk and Trust Attitudes," *Review of Economic Studies*.
- Engel, Christoph. 2011. "Dictator Games: A Meta Study", working paper, Max Planck Institute for Research on Collective Goods.
- Falbo, T. and D. F. Polit. 1986. "Quantitative Review of the Only Child Literature: Research Evidence and Theory Development," *Psychological Bulletin*, 100, 176-189.

- Falbo, T. and D. Poston (1993), "The Academic, Personality, and Physical Outcomes of Only Children in China". *Child Development*, Vol. 64, No. 1 (Feb), pp. 18-35.
- Fan, C., 1994, "A comparative study of personality characteristics between only and nononly children in primary schools in Xian", *Psychological Science*, 17(2), pp.70-74 (in Chinese).
- Feeney, Griffith, Feng Wang, Mingkun Zhou and Baoyu Xiao (1989). "Recent fertility dynamics in China: results from the 1987 one percent population survey", *Population and Development Review*, 15(2):297-322.
- Feeney, Griffith and Wang, Feng, 1993, "Parity progression and birth intervals in China: The influence of policy in hastening fertility decline," *Population and Development Review* 19 (1), pp. 61–101.
- Fehr, E. and A. Leibbrandt (2011), "A Field Study on Cooperativeness and Impatience in the Tragedy of the Commons", working paper, University of Zurich.
- Fenton, N. 1928. "The Only Child," *Journal of Genetic Psychology*, 35, 546–556.
- Gächter, S., B. Herrmann, & C. Thöni. (2004). Trust, Voluntary Cooperation, and Socio-Economic Background: Survey and Experimental Evidence. *Journal of Economic Behavior and Organization*, 55, 505-531.
- Garratt, R.J., C. Weinberger and N. Johnson. 2010, "The State Street Mile: Age and Gender Differences in Competition-Aversion in the Field", *Economic Inquiry*, Forthcoming.
- Harrison, G., Humphrey, S. and A. Verschoor (2010), "Choice Under Uncertainty: Evidence from Ethiopia, India and Uganda", *Economic Journal*, 120, March, pp80-104.
- Heckman, J., Stixrun, J. and S. Urzua (2006), "The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior", NBER Working Paper N. 12006, Cambridge, MA.
- Hull, T. (1990), "Recent Trends in Sex Ratios at Birth in China", *Population and Development Review*, 16(1), March, pp63-83.
- Imbens, G. and J. Angrist (1994), "Identification and Estimation of Local Average Treatment Effects" *Econometrics*, 62(2), March, pp467-475.
- Kane, Penny and Choi, Ching, 1999, "China's one child family policy", *British Medical Journal*, 319(7215), pp. 992-994.
- Kitzmann, K., Cohen, R. and R. Lockwood (2002), "Are Only Children Missing Out? Comparison of the Peer-Related Social Competence of Only Children and Siblings", *Journal of Social and Personal Relationships* **June 2002** vol. 19 no. 3 **299-316**
- Krebs, D.L. and F. Van Hesteren. 1994. "The Development of Altruism: Toward an Integrative Model," *Developmental Review*, 14, 103-158.
- Ladd, G. 1992. "Themes and Theories: Perspectives on Processes in Family–Peer Relationships," in *Family–Peer Relationships: Modes of Linkage*, R. D. Parke and G. W. Ladd (eds.), Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.
- Lee, L. C., 1992, "Day care in the People's Republic of China", in Lamb, M.E., and Sternberg, K. (eds.) *Child Care in Context: Cross Cultural Perspectives*, Lawrence Erlbaum Associates, Hillsdale, NJ, pp.355-392.
- Levy-Garboua, L., C. Meidinger, and B. Rapoport. 2006. "The Formation of Social Preferences: Some Lessons from Psychology and Biology," in the *Handbook of the*

- Economics of Giving, Altruism and Reciprocity*, Vol. I, S.C. Kolm and J. Mercier-Ythier (eds.), 545-613. Elsevier B.V.
- Lewis, M. and C. Feiring. 1982. "Some Families at Dinner," in *Families as Learning Environment for Children*, L. M. Laosa and I. E. Sigel (eds.), 115-145. New York: Plenum.
- Liu, E. (2008), "Time to Change What to Sow: Risk Preferences and Technology Adoption Decisions of Cotton Farmers in China", Working Paper, University of Houston.
- Liu, R. X., W. Lin and Z. Chen. 2010. "School Performance, Peer Association, Psychological and Behavioral Adjustments: A Comparison between Chinese Adolescents With and Without Siblings," *Journal of Adolescence*, 33, 411-417.
- Liu, C., Muakata, T. and F. Onuoha, 2005. "Mental Health Condition of the Only-Child: A Study of Urban and Rural High School Students in China". *Adolescence*, 40, p831.
- Lundberg, S. (2010), "Personality and Marital Surplus", Department of Economics, University of Washington, Seattle.
- Mancillas, A. 2006. "Challenging the Stereotypes about Only Children: A Review of the Literature and Implications for Practice," *Journal of Counseling and Development*, 84, 268-275.
- Meredith, W., Abbott, D. and L. Zhu (1989), "A Comparative Study of Only Children and Sibling Children in the People's Republic of China", *School Psychology International*, 10(4), pp251-256.
- National Bureau of Statistics (1989), *China Statistical Yearbook, 1989*, Beijing: China Statistics Press.
- National Bureau of Statistics (1999), *Comprehensive Statistical Data and Materials on 50 Years of New China*, Beijing: China Statistics Press.
- Peng, Xizhe. 1991, *Demographic Transition in China*. Oxford: Clarendon Press.
- Piaget J. 1997. *The Moral Judgment of the Child*, New York: Free Press Paperbacks. (Original published in 1932 as *Le jugement moral chez l'enfant*, Presses Universitaires de France, Paris.)
- Polit, D. F. and T. Falbo. 1987. "Only Children and Personality Development: A Quantitative Review," *Journal of Marriage and the Family*, 49, 309-325.
- Savelyev, P. (2010), "Conscientiousness, Education, and Longevity of High-Ability Individuals", working paper, University of Chicago.
- Schechter, L. 2007, "Traditional Trust Measurement and the Risk Confound: An Experiment in Rural Paraguay", *Journal of Economic Behavior and Organization*.
- Shen, J. and B.J. Yuan, 1999. "Moral Values of Only and Sibling Children in Mainland China". *Journal of Psychology: Interdisciplinary and Applied*, 133(1), Jan, pp115-124.
- Sutter, M. and M. Kocher (2007), "Trust and Trustworthiness across different age groups", *Games and Economic Behavior*, 59, pp. 364-382.
- Wan, C., Fan, C. Lin G. and Q. Jing (1994), "Comparison of Personality Traits of Only and Sibling Children in Beijing", *Journal of Genetic Psychology: Research and Theory on Human Development*, 155(4), pp377-388.

- Wang, Feng, 2011, "The future of a demographic overachiever: Long-term implications of the demographic transition in China", *Population and Development Review*, 37(supplement), pp.173-190.
- Wang, D., Kato, N., Inaba, Y., Tango, T., Yoshida, Y., Kusaka, Y., Deguchi, Y., Tomita, F. and Q. Zhang, 2000. "Physical and personality traits of preschool traits in Fuzhou, China: Only Children vs Sibling". *Child: Care, Health and Development*, 26(1), pp49-60.
- Wang, Q., Leichtman, M. D., and White, S.H., 1998, "Childhood memory and self-description in young Chinese adults: the impact of growing up an only child", *Cognition*, 69, pp.73-103.
- Yang, B., Ollendick, T., Dong, Q., Xia, Y. and L.Lin, 1995. "Only Children and Children with Siblings in the People's Republic of China: Levels of Fear, Anxiety and Depression", *Child Development*, 66(5), October, pp1301-1311.
- Zhang, Junsen and Sturm, Roland, 1994, "When do couples sign the one-child certificate in urban China?", *Population Research and Policy Review*, 13 (1), pp. 69-81.

Figure 1: China's Fertility, 1950-1987 (Banister and Feeney et al.)



Sources: The data for years 1950 to 1972 are from Banister (1987) and for the years from 1973 to 1978 are from Feeney et al. (1989).

Figure 2: Wage Distribution of the Before and After Cohorts

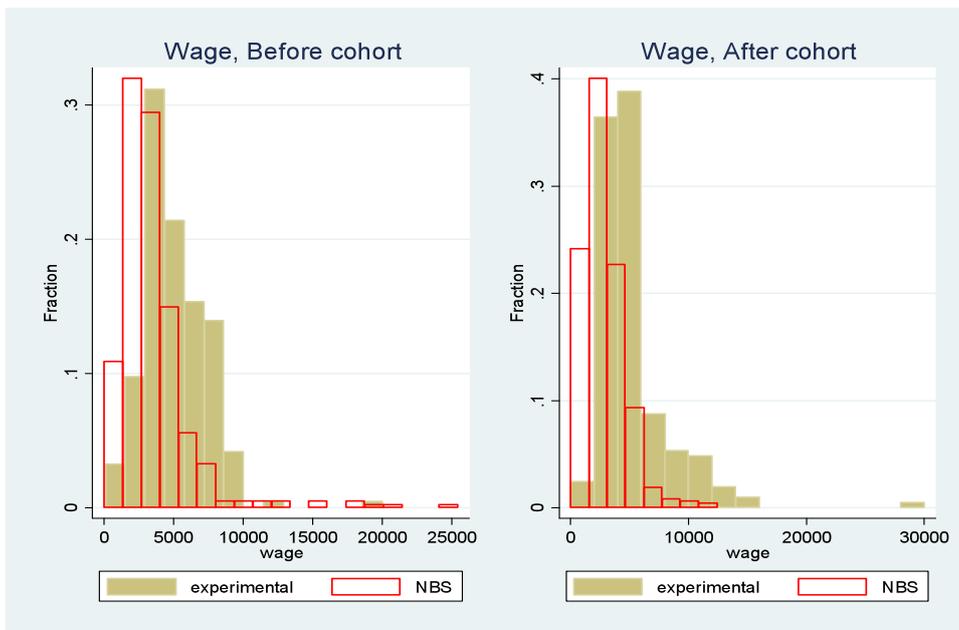
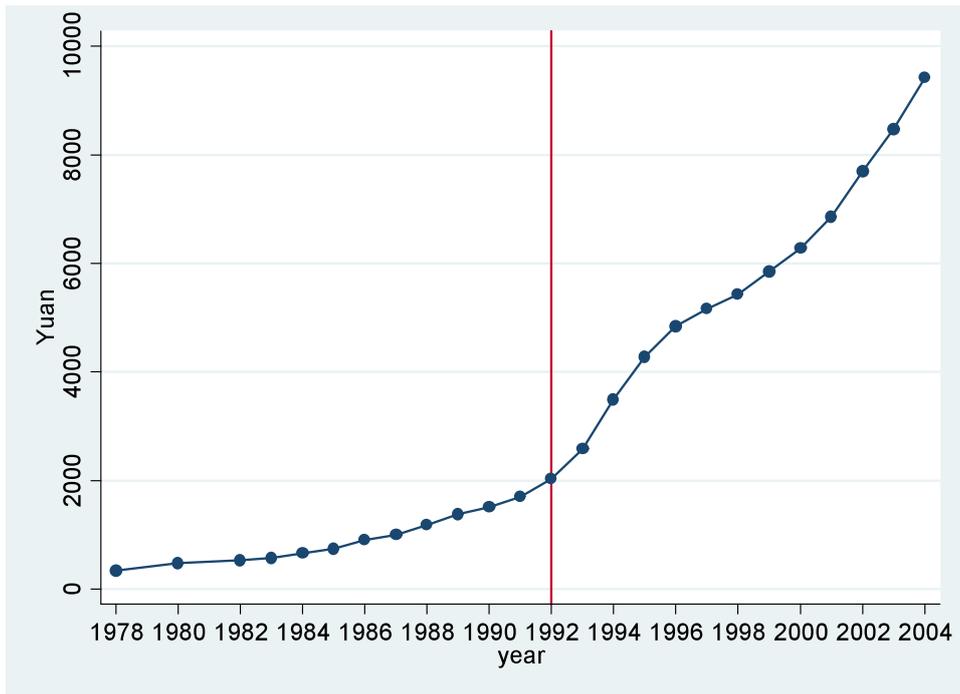
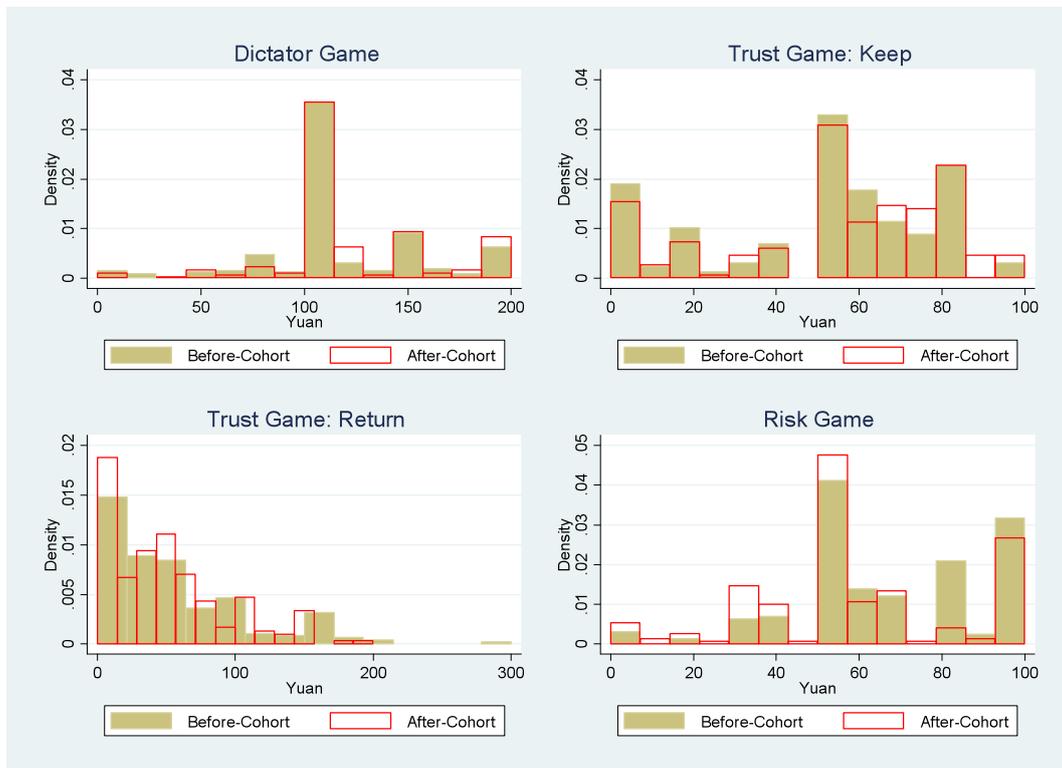


Figure 3: Urban per capita income change 1978-2004



Source: China Statistical Yearbook, 1989 for 1982, 1983 and 1984 data points, and Comprehensive Statistical Data and materials on 50 years of New China (1999) for the rest of the data points.

Figure 4: Unconditional distribution of the outcome variables by One-Child Policy status



Appendix A:

**Participate in Economics Experiments for
Cash**

Participate in an economics research experiment
where decisions earn money.

The amount of money you will receive will depend
on the decisions you make in the experiment.

Average earnings are 150 RMB.

Applicants can only participate once.

Experiments will be held at xxx on date

Experiments last approximately 1 ½ hours.

Contact xxx for details.

Phone number and Email address

Appendix B: First Stage Estimation Results

	Dictator	Trust-keep	Trust-return	Risk	Competition
One-Child policy	0.420*** [0.042]	0.435*** [0.042]	0.442*** [0.042]	0.420*** [0.042]	0.430*** [0.040]
Dummy for males	-0.027 [0.041]	-0.009 [0.041]	-0.01 [0.042]	-0.024 [0.041]	-0.017 [0.041]
University or above	0.093 [0.096]	0.099 [0.095]	0.101 [0.095]	0.108 [0.098]	0.096 [0.107]
3-year college	0.104 [0.097]	0.105 [0.097]	0.092 [0.097]	0.127 [0.099]	0.101 [0.109]
Born in Beijing	0.336*** [0.065]	0.319*** [0.063]	0.319*** [0.063]	0.323*** [0.064]	0.318*** [0.070]
Mother with 3-year college	0.107* [0.056]	0.093* [0.056]	0.094* [0.056]	0.101* [0.055]	0.103* [0.054]
Mother with uni or above	0.14 [0.087]	0.096 [0.082]	0.092 [0.082]	0.125 [0.086]	0.1 [0.067]
Constant	0.044 [0.113]	0.045 [0.112]	0.044 [0.112]	0.043 [0.114]	0.052 [0.125]
Observations	410	408	398	416	419

Table 1: Sample Representativeness: Comparison between Experimental Data and NBS Survey Data

	<u>Experimental sample</u>					<u>NBS Beijing sample</u>				
	1975	1978	1980	1983	Total	1975	1978	1980	1983	Total
Education level										
Primary and below						0.00	0.45	0.40	0.00	0.23
Junior high						14.71	4.91	3.61	1.35	5.54
Senior high	7.00	6.96	3.03	2.80	4.99	15.88	15.18	18.07	18.83	17.09
3-year college	46.00	35.65	28.28	32.71	35.63	28.82	36.16	28.51	33.18	31.76
University or above	47.00	57.39	68.69	64.49	59.38	40.59	43.30	49.40	46.64	45.38
T-Test of the across sample diff.	3.78	3.55	4.43	4.31	7.73					
Marrital status										
Single	6.00	26.09	36.36	58.88	32.07	8.24	20.54	44.98	74.44	39.03
Married	93.00	72.17	61.62	41.12	66.75	89.41	79.02	54.22	25.11	60.05
Divorced	1.00	1.74	2.02	0.00	1.19	2.35	0.45	0.80	0.45	0.92
T-Test of the across sample diff.	0.04	-0.98	1.60	2.87	2.43					
Minority status										
% being Minority	7.00	6.96	5.05	4.67	5.94	2.35	5.80	6.43	4.93	5.08
T-Test of the across sample diff.	-1.77	-0.39	0.48	0.12	-0.55					
Total # of observations	100	115	99	107	428	170	224	249	223	866

Table 2: Summary Statistics

	1975	1978	1980	1983	Total
% born in Beijing	89.00	94.78	83.84	84.11	88.12
% being males	47.00	48.70	50.51	49.53	49.00
Actual age	34.69	31.72	29.73	26.73	30.68
% being the only child	27.00	60.87	81.82	90.65	65.00
% being the first born	52.00	66.96	85.86	93.46	75.00
Average # of siblings	0.97	0.50	0.19	0.12	0.44
% with one sibling	56.57	32.17	17.17	5.66	27.68
% with two siblings	10.10	4.35	1.01	1.89	4.30
% with three sibling	4.04	1.74	0.00	0.94	1.67
% with four siblings	2.02	0.87	0.00	0.00	0.72
Average # of cousins	7.82	8.10	7.49	7.01	7.60
% with mothers having a 3-year college degree	13.00	19.13	16.16	17.76	16.63
% with mothers having uni or above degree	4.00	3.48	11.11	9.35	6.89
% with fathers having a 3-year college degree	15.00	28.70	21.21	23.36	22.33
% with fathers having uni or above degree	18.00	12.17	19.19	13.08	15.44

Table 3A: Tests of Differences

	Dictator Game	Trust Game	Risk Game		Competition Game		
	Amount kept	Amount kept	% returned	Amount invested	Compete	Confidence #sums	Performance
Born Under One Child Policy							
No	113.3	49.4	35.40%	66.4	51.80%	20.16	11.37
Yes	119.8	53.9	30.40%	58.1	44.20%	18.4	12.46
P-values							
t-test	0.110	0.092*	0.023**	0.001***	0.117	0.359	0.012**
rank sum test	0.062*	0.069*	0.021**	0.0002***	0.117	0.605	0.006***
Only child							
No	114.8	47.5	35.80%	63.26	0.493	20.9	11.29
Yes	117.4	53.8	31.50%	61.9	0.475	18.5	12.2
P-values							
t-test	0.541	0.027**	0.063*	0.600	0.720	0.217	0.040*
rank sum test	0.420	0.019**	0.136	0.477	0.720	0.410	0.028*

Table 4A: Main Estimation Results

	Dictator Game (amount kept)			Trust Game (amount kept)			Trustworthiness (% returned)			Risk Game (amount invested)			Competition (Yes or No)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Panel 1: Full sample	Reduced form tobit			Reduced form tobit			Reduced form tobit			Reduced form tobit			Reduced form probit (ME)	Probit (ME)	Ivprobit (ME)
Single-child		1.127 [4.896]	13.486 [11.152]		7.273** [3.303]	15.998** [7.269]		-5.649* [2.888]	-11.336* [6.257]		-1.731 [3.409]	-19.002** [7.902]		-0.052 [0.053]	-0.203* [0.108]
One-Child policy	5.669 [4.641]			6.980** [3.138]			-5.024* [2.755]				-7.987** [3.197]		-0.090* [0.050]		
Dummy for males	1.292 [4.578]	1.593 [4.580]	1.658 [4.616]	-10.731*** [3.092]	-10.602*** [3.092]	-10.604*** [3.117]	0.694 [2.716]	0.584 [2.714]	0.584 [2.727]	3.086 [3.147]	2.841 [3.176]	2.641 [3.265]	0.072 [0.049]	0.069 [0.049]	0.067 [0.049]
University or above	28.743*** [10.581]	29.848*** [10.587]	27.484** [10.838]	-1.496 [7.154]	-1.307 [7.146]	-3.064 [7.323]	-15.337** [6.170]	-15.337** [6.162]	-14.192** [6.290]	-14.030* [7.656]	-15.829** [7.722]	-11.998 [8.076]	0.149 [0.115]	0.140 [0.114]	0.166 [0.114]
3-year college	26.550** [10.746]	27.113** [10.776]	25.146** [10.974]	3.989 [7.269]	3.717 [7.278]	2.323 [7.411]	-15.531** [6.275]	-15.340** [6.276]	-14.486** [6.360]	-5.323 [7.774]	-6.391 [7.862]	-2.93 [8.191]	0.12 [0.118]	0.118 [0.117]	0.138 [0.118]
Born in Beijing	10.638 [7.192]	9.394 [7.281]	6.108 [7.803]	11.019** [4.748]	8.075* [4.791]	5.914 [5.089]	4.788 [4.160]	7.094* [4.197]	8.442* [4.416]	5.391 [4.829]	7.107 [4.929]	11.528** [5.388]	0.082 [0.075]	0.109 [0.075]	0.142* [0.075]
Mother with 3-year college	-1.035 [6.153]	-1.16 [6.187]	-2.477 [6.325]	-8.887** [4.196]	-9.582** [4.211]	-10.396** [4.288]	4.594 [3.658]	5.112 [3.666]	5.642 [3.720]	8.123* [4.246]	8.167* [4.299]	10.045** [4.488]	-0.009 [0.067]	-0.005 [0.067]	0.011 [0.069]
Mother with uni or above	8.727 [9.630]	9.79 [9.655]	6.837 [10.017]	-6.983 [6.165]	-6.98 [6.166]	-8.522 [6.322]	-2.612 [5.398]	-2.573 [5.394]	-1.571 [5.506]	5.004 [6.522]	3.712 [6.590]	7.361 [6.942]	0.091 [0.100]	0.084 [0.099]	0.109 [0.099]
Observations	410	410	410	408	408	408	398	398	398	416	416	416	419	419	419
Panel 2: Full sample with Risk control															
Single-child					6.923** [3.176]	12.161* [6.936]		-5.484* [2.797]	-9.746 [6.045]					-0.047 [0.054]	-0.343 [0.293]
One-Child policy				5.366* [3.051]			-4.328 [2.674]						-0.060 [0.052]		
Dictator (amount kept)				0.203*** [0.038]	0.205*** [0.038]	0.204*** [0.038]	-0.166*** [0.033]	-0.168*** [0.033]	-0.168*** [0.033]						
Risk (amount invested)				-0.114* [0.059]	-0.124** [0.059]	-0.121** [0.059]							0.005*** [0.001]	0.005*** [0.001]	0.012*** [0.003]
Panel 3: Narrow sample 1978 vs. 1980 cohorts															
Single-child		1.704 [7.439]	58.306 [37.009]		8.407* [4.887]	42.340** [21.059]		-3.369 [4.319]	-9.050 [16.891]		3.691 [4.811]	-25.616 [22.054]		0.013 [0.077]	-0.285 [0.248]
One-Child policy	12.344* [6.893]			10.181** [4.534]			-2.193 [4.068]			-5.670 [4.476]			-0.071 [0.071]		
Observations	211	211	211	207	207	207	202	202	202	213	213	213	213	213	213

Table 4B: Competition Game: Expectations and Performance

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	<u>sums correct</u> OLS	IV	Ologit	<u>predict rank</u> Ologit	IV
Single-child		0.799* [0.475]	1.952* [1.017]		0.281 [0.186]	-0.188 [0.254]
One-Child policy	0.840* [0.435]			-0.033 [0.188]		
Dummy for males	-1.240*** [0.435]	-1.210*** [0.437]	-1.206*** [0.442]	-0.576*** [0.187]	-0.579*** [0.187]	-0.175 [0.108]
University or above	2.215* [1.235]	2.252* [1.241]	2.027 [1.291]	-1.148** [0.476]	-1.213*** [0.470]	-0.512** [0.231]
3-year college	1.333 [1.246]	1.317 [1.253]	1.136 [1.296]	-0.571 [0.477]	-0.616 [0.471]	-0.183 [0.273]
Born in Beijing	-0.268 [0.576]	-0.605 [0.580]	-0.888 [0.642]	0.154 [0.248]	0.094 [0.248]	0.152 [0.151]
Mother with 3-year college	0.465 [0.542]	0.389 [0.547]	0.263 [0.557]	-0.129 [0.297]	-0.158 [0.295]	0.251 [0.301]
Mother with uni or above	-0.55 [1.004]	-0.535 [1.020]	-0.746 [1.036]	-0.707** [0.338]	-0.764** [0.333]	-0.192 [0.169]
Observations	419	419	419	419	419	419
R-Squared	0.053	0.052	0.037			

Table 5: Attitudes

	<u>Is tomorrow a sunny day?</u>			<u>Can most people be trusted?</u>			<u>Do most people like to help others?</u>		
	Tobit	Tobit	IV Tobit	Probit (ME)	Probit (ME)	IV Probit (ME)	Probit (ME)	Probit (ME)	IV Probit (ME)
Panel 1: Full Sample									
Single-child		-6.555* [3.901]	-18.684** [9.088]		-0.117** [0.047]	-0.147 [0.097]		-0.092* [0.048]	-0.205** [0.093]
One-Child policy	-8.049** [3.850]			-0.064 [0.046]			-0.094** [0.047]		
Dummy for males	-0.775 [3.661]	-0.985 [3.666]	-1.195 [3.693]	-0.096** [0.045]	-0.099** [0.045]	-0.099** [0.045]	-0.086* [0.047]	-0.090* [0.047]	-0.089* [0.046]
University or above	2.084 [5.925]	5.112 [5.835]	8.167 [6.170]	0.050 [0.075]	0.092 [0.078]	0.101 [0.081]	-0.043 [0.070]	-0.006 [0.073]	0.026 [0.078]
3-year college	12.377 [8.444]	11.973 [8.399]	14.286 [8.846]	0.011 [0.112]	0.018 [0.111]	0.024 [0.111]	-0.139 [0.118]	-0.147 [0.116]	-0.119 [0.118]
Born in Beijing	15.750* [8.846]	16.015* [8.799]	17.980** [9.142]	-0.030 [0.114]	-0.018 [0.113]	-0.013 [0.112]	-0.167 [0.129]	-0.167 [0.128]	-0.142 [0.127]
Mother with 3-year college	-0.973 [4.566]	-0.252 [4.534]	0.902 [4.552]	-0.128** [0.065]	-0.116* [0.065]	-0.112* [0.066]	-0.031 [0.064]	-0.021 [0.063]	-0.007 [0.062]
Mother with uni or above	12.755* [7.627]	12.282 [7.819]	14.670* [7.989]	-0.086 [0.097]	-0.076 [0.097]	-0.069 [0.099]	-0.144 [0.102]	-0.144 [0.101]	-0.119 [0.03]
Date of the survey	Yes	Yes	Yes	No	No	No	No	No	No
Observations	419	419	419	421	421	421	421	421	421
Panel 2: Narrow sample									
Single-child		-10.448* [5.831]	-60.998** [26.615]		-0.053 [0.071]	-0.121 [0.272]		-0.110 [0.071]	-0.384** [0.166]
One-Child policy	-14.821*** [5.593]			-0.028 [0.068]			-0.110 [0.068]		
Date of the survey	Yes	Yes	Yes	No	No	No	No	No	No
Observations	214	214	214	214	214	214	214	214	214

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Personality Big Five

	Extroversion			Agreeableness			Conscientiousness			Neuroticism			Openness		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Panel 1: Full Sample	OLS	OLS	IV	OLS	OLS	IV	OLS	OLS	IV	OLS	OLS	IV	OLS	OLS	IV
Single-child		-0.392	-1.012		-0.388	-0.643		-0.918*	-2.399**		0.885**	2.915***		0.525	-0.134
		[0.416]	[0.935]		[0.443]	[1.033]		[0.517]	[1.181]		[0.438]	[1.038]		[0.467]	[1.063]
One-Child policy	-0.440			-0.265			-1.011**			1.245***			-0.057		
	[0.406]			[0.426]			[0.489]			[0.430]			[0.454]		
Dummy for males	-0.150	-0.163	-0.159	0.092	0.078	0.073	-0.256	-0.297	-0.291	-0.650	-0.590	-0.546	0.418	0.411	0.418
	[0.392]	[0.393]	[0.394]	[0.425]	[0.426]	[0.427]	[0.490]	[0.489]	[0.495]	[0.424]	[0.426]	[0.437]	[0.455]	[0.454]	[0.456]
University or above	2.349***	2.375***	2.610***	1.263	1.314	1.393	0.282	0.267	0.660	-0.437	-0.371	-0.889	4.485***	4.272***	4.525***
	[0.904]	[0.911]	[0.990]	[0.988]	[0.965]	[1.022]	[1.235]	[1.212]	[1.238]	[0.900]	[0.853]	[0.899]	[0.902]	[0.921]	[0.974]
3-year college	1.900**	1.957**	2.178**	1.714*	1.782*	1.858*	0.284	0.321	0.659	-0.631	-0.657	-1.142	4.103***	3.922***	4.143***
	[0.919]	[0.928]	[0.994]	[1.008]	[0.988]	[1.042]	[1.251]	[1.226]	[1.243]	[0.928]	[0.888]	[0.917]	[0.944]	[0.954]	[0.979]
Born in Beijing	1.614***	1.788***	1.946***	-0.356	-0.223	-0.163	-0.164	0.211	0.590	-0.055	-0.501	-1.002	0.570	0.446	0.613
	[0.537]	[0.541]	[0.585]	[0.600]	[0.611]	[0.657]	[0.767]	[0.769]	[0.847]	[0.734]	[0.726]	[0.827]	[0.659]	[0.676]	[0.740]
Mother with 3-year college	0.603	0.645	0.724	-0.546	-0.506	-0.474	-0.024	0.050	0.204	0.218	0.145	-0.080	0.505	0.449	0.519
	[0.530]	[0.535]	[0.561]	[0.622]	[0.623]	[0.645]	[0.654]	[0.671]	[0.694]	[0.584]	[0.598]	[0.612]	[0.646]	[0.648]	[0.657]
Mother with uni or above	0.891	0.878	0.980	-1.215*	-1.194*	-1.144	-0.055	-0.135	0.131	0.442	0.535	0.187	2.157***	2.070***	2.163***
	[0.750]	[0.731]	[0.748]	[0.685]	[0.683]	[0.704]	[0.954]	[0.952]	[0.977]	[0.684]	[0.689]	[0.741]	[0.745]	[0.756]	[0.750]
Observations	381	381	381	384	384	384	382	382	382	379	379	379	387	387	387
Panel 2: Narrow Sample		Extroversion			Agreeableness			Conscientiousness			Neuroticism			Openness	
Single-child		0.244	-2.672		-0.195	0.128		-0.322	-5.072		0.471	1.416		1.307*	-1.869
		[0.598]	[2.539]		[0.591]	[2.846]		[0.694]	[3.215]		[0.596]	[2.770]		[0.686]	[3.011]
One-Child policy	-0.641			0.026			-1.147*			0.319			-0.408		
	[0.575]			[0.566]			[0.644]			[0.617]			[0.635]		
Observations	194	194	194	198	198	198	201	201	201	191	191	191	197	197	197

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Personal Attributes Parents Encourage to have

	Independent			Hard working			Responsible			Imaginative			Tolerance and respect			Trust in others		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	Probit (ME)	Probit (ME)	IVProbit (ME)	Probit (ME)	Probit (ME)	IVProbit (ME)	Probit (ME)	Probit (ME)	IVProbit (ME)	Probit (ME)	Probit (ME)	IVProbit (ME)	Probit (ME)	Probit (ME)	IVProbit (ME)	Probit (ME)	Probit (ME)	IVProbit (ME)
Panel 1: Full sample																		
Single-child		0.031 [0.048]	-0.020 [0.103]		-0.029 [0.041]	-0.127 [0.079]		0.032 [0.041]	-0.014 [0.090]		-0.059 [0.051]	-0.270*** [0.103]		0.008 [0.043]	-0.050 [0.088]		-0.063 [0.051]	-0.283*** [0.085]
One-Child policy	-0.008 [0.045]			-0.059 [0.039]			-0.006 [0.039]			-0.118** [0.048]			-0.022 [0.040]			-0.136*** [0.048]		
Observations	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421
	<u>Care for less fortunate</u>			<u>Thrift and saving money</u>			<u>Determination and</u>			<u>Religious faith</u>			<u>Unselfishness</u>			<u>Competitiveness</u>		
Single-child		-0.096** [0.041]	-0.083 [0.092]		0.044 [0.042]	0.189* [0.101]		-0.016 [0.048]	-0.057 [0.104]		-0.029 [0.027]	-0.123 [0.088]		-0.050 [0.050]	-0.233** [0.093]		-0.081 [0.052]	-0.108 [0.116]
One-Child policy	-0.035 [0.042]			0.076** [0.039]			-0.025 [0.046]			-0.043* [0.025]			-0.108** [0.048]			-0.047 [0.050]		
Observations	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421
Panel 2: Narrow sample																		
Single-child		0.074 [0.069]	0.098 [0.295]		0.079 [0.065]	-0.008 [0.247]		0.084 [0.066]	0.073 [0.283]		-0.026 [0.073]	-0.322 [0.260]		0.028 [0.063]	-0.145 [0.203]		0.057 [0.076]	-0.352** [0.176]
One-Child policy	0.022 [0.062]			0.000 [0.056]			0.017 [0.059]			-0.075 [0.066]			-0.036 [0.058]			-0.102 [0.069]		
Observations	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214
	<u>Care for less fortunate</u>			<u>Thrift and saving money</u>			<u>Determination and</u>			<u>Religious faith</u>			<u>Unselfishness</u>			<u>Competitiveness</u>		
Single-child		0.000 [0.065]	0.092 [0.288]		0.104 [0.064]	0.627*** [0.116]		0.082 [0.073]	0.043 [0.301]		0.026 [0.031]	-0.042 [0.162]		0.063 [0.075]	-0.361** [0.178]		-0.032 [0.076]	-0.162 [0.299]
One-Child policy	0.020 [0.061]			0.155*** [0.051]			0.011 [0.066]			-0.011 [0.031]			-0.104 [0.070]			-0.037 [0.071]		
Observations	214	214	214	214	214	214	214	214	214	192	192	192	214	214	214	214	214	214

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.10

Table 8: Test for Age Effect

	<u>Dictatorship</u>		<u>Trust</u>		<u>Trustworthiness</u>		<u>Risk</u>		<u>Competition</u>	
	Before	After	Before	After	Before	After	Before	After	Before	After
Age (in days)	0.006	0.006	0.002	0.003	0.004	0.002	-0.002	0.005	0.000	0.000
	[0.006]	[0.006]	[0.004]	[0.004]	[0.003]	[0.004]	[0.004]	[0.004]	[0.000]	[0.000]
Dummy for males	4.140	-1.796	-14.741***	-7.048	0.783	0.410	4.541	1.487	0.135**	0.002
	[6.346]	[6.669]	[4.316]	[4.472]	[3.709]	[3.966]	[4.335]	[4.617]	[0.069]	[0.071]
University or above	24.591*	32.337*	-0.286	-1.669	-17.397**	-7.984	-11.214	-24.445	0.240*	-0.082
	[12.995]	[19.497]	[8.769]	[13.122]	[7.432]	[11.368]	[9.081]	[15.474]	[0.136]	[0.207]
3-year college	27.232**	24.408	1.014	7.460	-19.424**	-8.981	-3.599	-14.092	0.166	-0.078
	[13.128]	[19.846]	[8.874]	[13.354]	[7.549]	[11.544]	[9.185]	[15.689]	[0.140]	[0.207]
Born in Beijing	9.945	11.474	15.499*	9.151	16.353**	-1.717	7.265	4.482	0.001	0.146
	[11.802]	[9.180]	[7.862]	[6.016]	[6.842]	[5.271]	[7.842]	[6.241]	[0.129]	[0.092]
Mother with 3-year college	-2.453	1.155	-12.463**	-4.238	10.314**	-1.993	9.762*	6.234	-0.032	0.017
	[8.492]	[8.951]	[5.833]	[6.031]	[4.945]	[5.355]	[5.899]	[6.135]	[0.095]	[0.096]
Mother with uni or above	16.735	5.898	-23.945*	-1.231	-16.436	-1.828	13.217	1.960	-0.137	0.174
	[19.136]	[11.326]	[12.199]	[7.479]	[10.387]	[6.593]	[12.306]	[7.886]	[0.194]	[0.117]
Observations	208	200	204	201	200	195	211	203	212	204

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Real World Outcomes

	past 12 months?			Employed in risky occupation		
	Probit (ME)	Probit (ME)	IV Probit (ME)	Probit (ME)	Probit (ME)	IV Probit (ME)
Panel 1: Full sample						
Single-child		-0.076*	-0.137*		-0.012	-0.227**
		[0.042]	[0.082]		[0.042]	[0.103]
One-Child policy	-0.063			-0.093**		
	[0.041]			[0.040]		
Log monthly income	0.020	0.024	0.023			
	[0.032]	[0.032]	[0.032]			
Dummy for males	-0.015	-0.018	-0.017	0.089**	0.086**	0.083**
	[0.042]	[0.042]	[0.042]	[0.040]	[0.040]	[0.040]
Born in Beijing	0.185**	0.222***	0.242***	-0.013	0.003	0.052
	[0.074]	[0.078]	[0.081]	[0.062]	[0.061]	[0.057]
University or above	0.094	0.102	0.119	0.062	0.048	0.080
	[0.104]	[0.107]	[0.113]	[0.091]	[0.091]	[0.092]
3-year college	-0.021	-0.008	0.006	0.020	0.015	0.042
	[0.102]	[0.103]	[0.107]	[0.098]	[0.097]	[0.101]
Mother with 3-year college	0.013	0.020	0.027	-0.003	0.000	0.019
	[0.055]	[0.053]	[0.052]	[0.052]	[0.053]	[0.056]
Mother with uni or above	0.068	0.069	0.079	-0.035	-0.048	-0.015
	[0.071]	[0.072]	[0.069]	[0.072]	[0.071]	[0.081]
Observations	416	416	416	421	421	421
Panel 2: Narrow sample						
only_child		-0.133**	-0.416***		0.061	-0.359
		[0.058]	[0.121]		[0.057]	[0.239]
one_child_policy	-0.140**			-0.082		
	[0.061]			[0.056]		
Observations	212	212	212	214	214	214
Panel 3: Narrow sample controlling for mother's age						
only_child		-0.078	-0.574***			
		[0.071]	[0.257]			
one_child_policy	-0.075					
	[0.067]					
Mother's age	0.020**	0.021**	-0.025			
	[0.009]	[0.009]	[0.036]			
Observations	212	212	212			

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1